FLIGHT MANUAL
PERFORMANCE DATA

USAF SERIES
C-124A
AND
C-124C
AIRCRAFT

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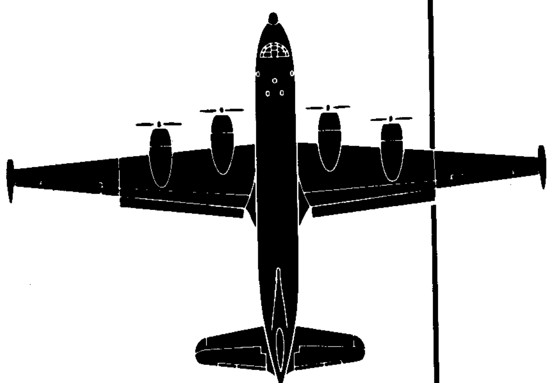

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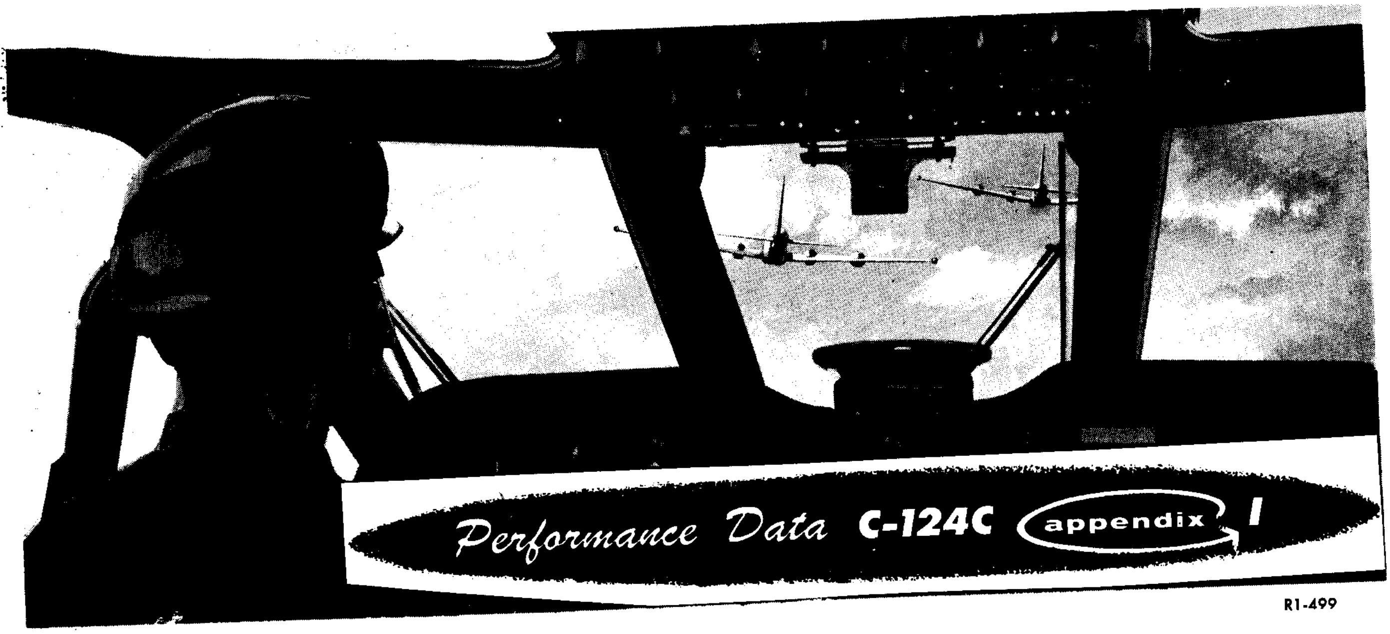

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PART I

INTRODUCTION

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LIST OF CHARTS

INTRODUCTION.

The information in this appendix is presented to assist the operating personnel in a better understanding of the conditions for which the performance charts have been determined, of why these conditions have been used, and of the potential effects on performance for conditions of operation other than those for which the performance charts are presented. The data contained in this Appendix supplements T.O. 1C-124A-1 for all C-124C Aircraft, both production C-124C's and those aircraft redesignated as C-124C following modification in accordance with T. O. 1C-124A-548.

CHARTS.

The performance charts are presented in graphic form and are based on data obtained during flight tests of a production model aircraft. No arbitrary conservatism has been included in preparation of the data. The charts have been prepared to represent the C-124C aircraft with partial span wing flaps and wing tip heaters. Some C-124C aircraft have full span wing flaps with wing tip heaters, and others have full span wing flaps without wing tip heaters. Performance for these aircraft can be obtained by using the corrections indicated in the applicable sections and on the charts in this Appendix. When no correction is indicated under the various headings or on the charts, no correction is considered necessary. No correction is necessary for zero degree wing flap configuration. Table A1-1 gives correction factors to apply to the basic performance data to obtain data for other specific configurations:

TABLE A1-1. PERFORMANCE CORRECTION FACTORS

Item	Full Span Flaps (AF49-243 Through AF51-182)	No Wing Tip Heaters (AF49-243 Through AF50-1268)
Takeoff Performance	Multiply takeoff distances by 0.98 with wing flaps = 10 or 20 degrees. No change for wing flaps = zero degrees.	Negligible
Gross Weight Limited by Climb Performance	Subtract 700 pounds with wing flaps = 20 degrees, or 1000 pounds with wing flaps = 10 degrees, to obtain corrected gross weight.	Negligible
Gross Weight Limited by Critical Field Length	Multiply actual field length by 0.99 to obtain corrected gross weight with wing flaps = 10 or 20 degrees.	Negligible
Refusal Speed	Negligible	Negligible
Emergency Climb Performance	Add 200 FPM rate of climb to data for wing flaps = 45 degrees (partial span) to obtain data for wing flaps = 40 degrees (full span).	Negligible
Cruise Performance	Negligible	Reduce BHP required for cruise by 10 BHP per engine.
Landing Performance	Multiply by following correction factors to obtain corrected landing distance for configurations noted: Wing flaps full down — brakes plus four-engine reverse thrust: Distance x 0.94. Wing flaps full down — Brakes only: Distance x 0.92. Wing flaps 30 degrees — Brakes plus four-engine reverse thrust and brakes only: Distance x 0.95. Wing flaps = 20 degrees — brakes plus four-engine reverse thrust and brakes only: Distance x 0.97. No correction for zero degrees flaps.	Negligible

Takeoff, Landing, Emergency Climb, Power Schedule, Fuel Flow and Range Performance charts are presented in such a manner that the performance may be determined for any reasonable atmospheric conditions. Long Range Prediction and Summary charts are presented for ICAO Standard Atmospheric Conditions. Climb performance charts are presented for both ICAO Standard Atmospheric and Army Hot Day Conditions. The emergency performance charts (one or more engines inoperative) are identified by a solid red border with black E's on the pages; hot day conditions are identified by a yellow border; and emergency charts, hot day, are identified by a dashed red border with black E's.

The performance charts are presented for engine operation with Rich mixture setting for dry takeoff, Normal mixture setting for wet takeoff and climb, and Normal or Manual Lean mixture setting, as applicable, for cruise. Fuel grade 115/145 has been used for all performance data. In addition, Maximum Brake Horsepower charts and Climb Performance charts are included for fuel grade 100/130. Limits for operation with fuel grade 100/130 are shown on all charts affected by such limits.

DEFINITIONS.

Pressure Altitude	The number of feet from the 29.92 inches of mercury datum plane.
Critical Engine Failure Speed	The speed at which engine failure permits acceleration to takeoff in the same distance that the aircraft may be decelerated to a stop. (Deceleration is accomplished with normal braking and two engines in reverse thrust.)
Critical Field Length	The total length of runway required to accelerate on all engines to critical engine failure speed, experience an engine failure, then continue to takeoff or stop.
Predicted Torque	Maximum torque reading available (in psi) for takeoff with normal engine operation corrected for atmospheric conditions.
Reject Torque	The minimum torque reading acceptable (in psi) for takeoff (5% less than predicted torque).
Steady Wind Value	Reported steady wind.
Gust Increment	Reported wind in excess of steady wind value.
Headwind	Effective wind parallel to the runway, determined from the steady wind value.
Tailwind	Effective wind parallel to the runway, determined from the stady wind value plus the gust increment.
Crosswind	Effective wind across the runway, determined from the steady wind value plus the gust increment.
Wind Component	Effective wind parallel or across the runway.
Refusal Speed	The highest speed to which the airplane may be accelerated on four engines and stopped safely within the limits of the runway.
Refusal Distance	The distance required to accelerate to refusal speed under normal conditions.
Takeoff Speed	Recommended IAS (105 percent of power-off stall speed) at which the main gear leaves the ground or lifts off.

Climbout Speed	Recommended IAS (110 percent of power-off stall speed) for climbout after takeoff, when it is not necessary to clear an obstacle. When an obstacle near the end of the runway must be cleared, it is recommended that climb be accomplished at takeoff speed.
Flap Retraction Speed	Recommended IAS for raising flaps after takeoff and climbout are accomplished.
Climbing Speed	The EAS for climbing to cruising altitude after gear and flaps are up and takeoff power has been reduced to climb power. This is the speed for the best rate of climb, considering proper engine cooling.
Speed for Best Rate of Climb	The speed at which the rate of climb is maximum for existing conditions.
Recommended Speed for Best Angle of Climb	The speed at which the angle of the climbout flight path will be maximum. Flight at speeds less than 105 percent of power-off stall speed is not recommended, although at low gross weights best angle of climb may occur at lower speeds.
Runway Condition Reading	A number indicating the relative slickness or coefficient of friction of the runway surface as measured by the James brake decelerometer, used to correct stopping distances for landing on other than a dry hard surface runway.

DISCUSSION OF CHARTS.

AIRSPEED CALIBRATION AND ATMOSPHERIC DATA.

The Airspeed Position Error Correction charts are presented for three configurations of the aircraft: (1) clean configuration, (2) wing flaps 20 degrees, and (3) wing flaps full down. Effects of static pressure errors (due to static pressure pickup location) on altimeter readings are negligible; therefore, no data are presented. The following data are also included in this section.

Compressibility Correction to Calibrated Airspeed Chart

Temperature Correction for Compressibility Chart

Density Altitude Chart

ICAO Standard Atmosphere Charts

Specific Humidity Chart

Temperature Conversion Chart

SYMBOLS AND DEFINITIONS.

Symbol	Definition
Alt.	Altitude
BHP.	Brake horsepower (RPM x T.P. x 0.00524)
BMEP	Brake mean effective pressure
°C	Degrees Centigrade
CAS	Calibrated airspeed, instrument reading corrected for instrument and position error
CAT.	Carburetor air temperature
CBR	California bearing ratio
CHT.	Cylinder head temperature

Corr . . . . . . Correction, corrected

Cyl . . . . Cylinder

DEG. . . . . . . Degrees

Dist . . . . Distance

Dn . . . . Down

EAS . . . . Equivalent airspeed, calibrated airspeed corrected for compressibility

Eng . . . . Engine

Est . . . . Estimated

ESWL . . . . . Equivalent single wheel load

°F . . . . Degrees Fahrenheit

FF . . . . Fuel Flow

FPM . . . . . . Feet per minute

Ft . . . . Feet

Gal . . . . Gallon

Gr. Wt . . . . . Gross weight

Symbol	Definition
Hd	Density altitude
Hr	Hour
Hp	Pressure altitude
IAS	Indicated airspeed, instrument reading corrected for instrument error
ICAO	International Civil Aviation Organization
In. Hg	Inches of mercury (pressure)
Inb'd	Inboard
Inst	Instrument
IOAT	Indicated Outside Air Temperature
Kts	Knots
LB.	Pound
LCN.	Load classification number
Max.	Maximum
METO	Maximum except takeoff
Min	Minutes
MAP	Manifold absolute pressure, inches of mercury
NM	Nautical miles
NMPP	Nautical miles per pound of fuel
OAT.	Outside air temperature, actual
Outb'd	Outboard
P.	Pressure, static atmosphere
Press.	Pressure
PSI	Pounds per square inch (pressure)

Symbol	Definition
R/C	Rate of climb, feet per minute
RCR.	Runway condition reading
R/D	Rate of descent, feet per minute
RPM	Revolutions per minute
SL	Sea level
Sp. Hum	Specific humidity
Sq	Square
Std.	Standard
T.	Absolute temperature in °R or °K
t	Temperature in °F or °C
TAS	True airspeed, equivalent airspeed corrected for atmospheric density $TAS = EAS \times \frac{1}{\sqrt{\sigma}}$
TEMP	Temperature
TD.	Touchdown
TO.	Takeoff
TP.	Torque pressure (psi)
UCI	Unit construction index
V.	Velocity
V_s	Power-off stall speed
V_{to}	Takeoff speed
Wt	Weight
Δ(Delta)	Increment of weight, drag, or airspeed
$\delta_{C.F.}$(Delta)	Cowl flap setting (degrees)
δ_f	Wing flap deflection (degrees)
ρ(Rho)	Air density, slugs per cubic foot
σ(Sigma)	Air density ratio, ρ / ρ_0
μ(mu)	Coefficient of friction

AIRSPEED POSITION ERROR CORRECTION

MODEL: C-124C
DATE: 7-15-60
DATA BASIS: FLIGHT TEST

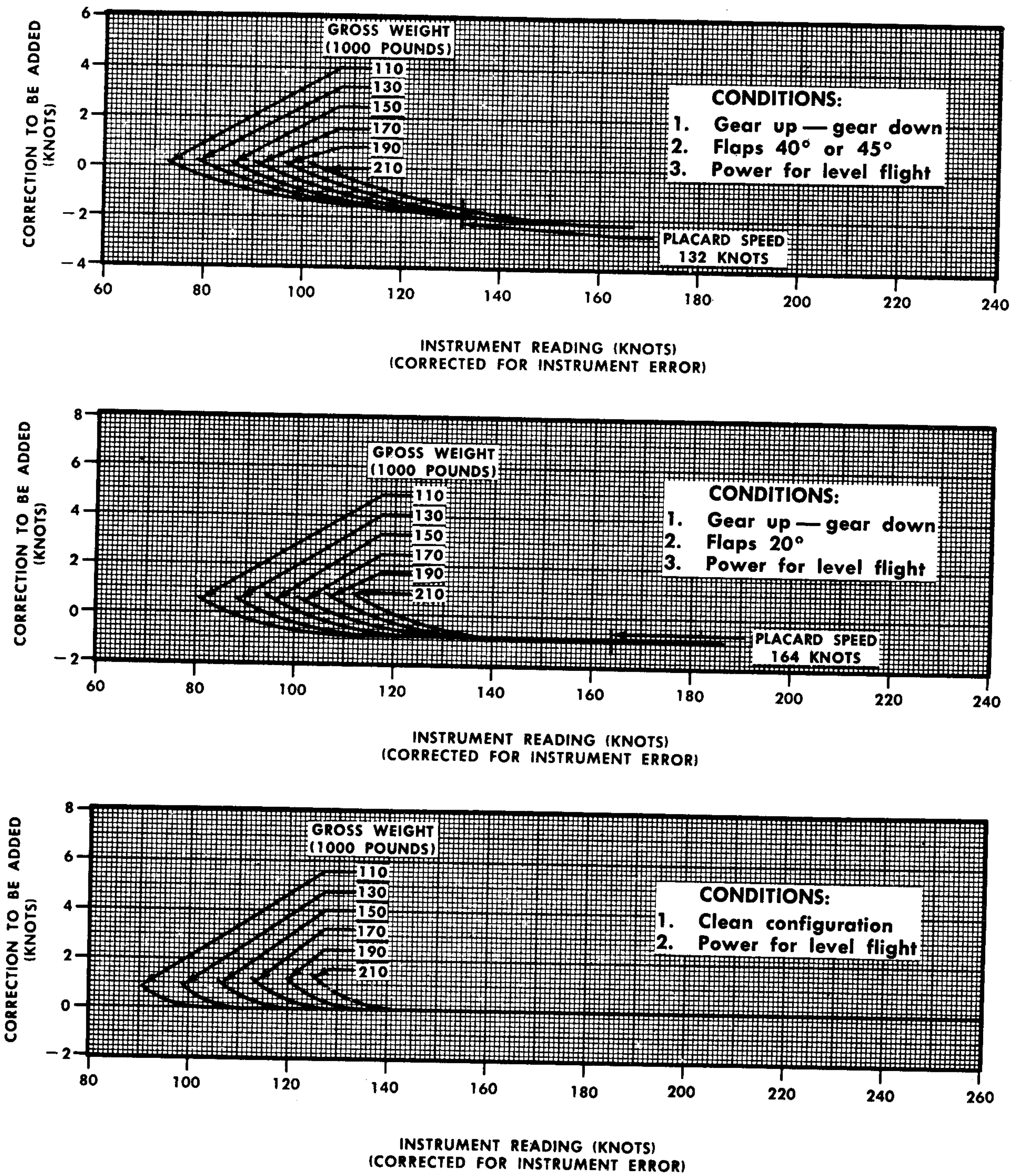

Figure A1-1. Airspeed Position Error Correction

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MODEL: C-124C
DATE: 7-15-60
DATA BASIS: FLIGHT TEST

COMPRESSIBILITY CORRECTION TO CALIBRATED AIRSPEED

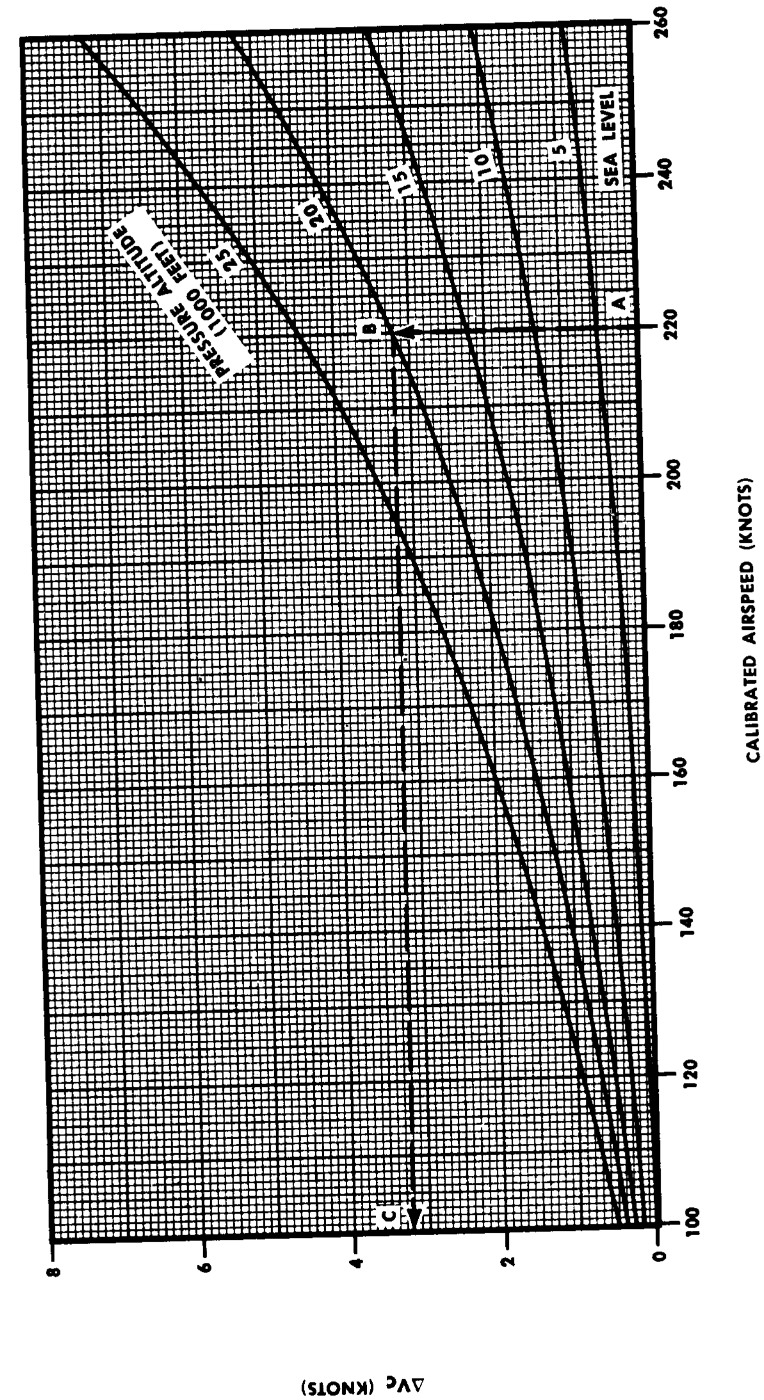
$V = EAS \times \frac{1}{\sqrt{\sigma}}$

EAS = Equivalent airspeed

V_c = Calibrated airspeed

V = True airspeed

σ = Atmospheric density ratio.



SAMPLE PROBLEM:

A. Calibrated airspeed = 220 knots.
B. Pressure altitude = 20,000 feet.
C. ΔV_c = 3.2 knots; EAS = 220 − 3.2 = 216.8 knots.

NOTE:
Subtract correction from calibrated airspeed to obtain equivalent airspeed.

Figure A1-2. Compressibility Correction to Calibrated Airspeed

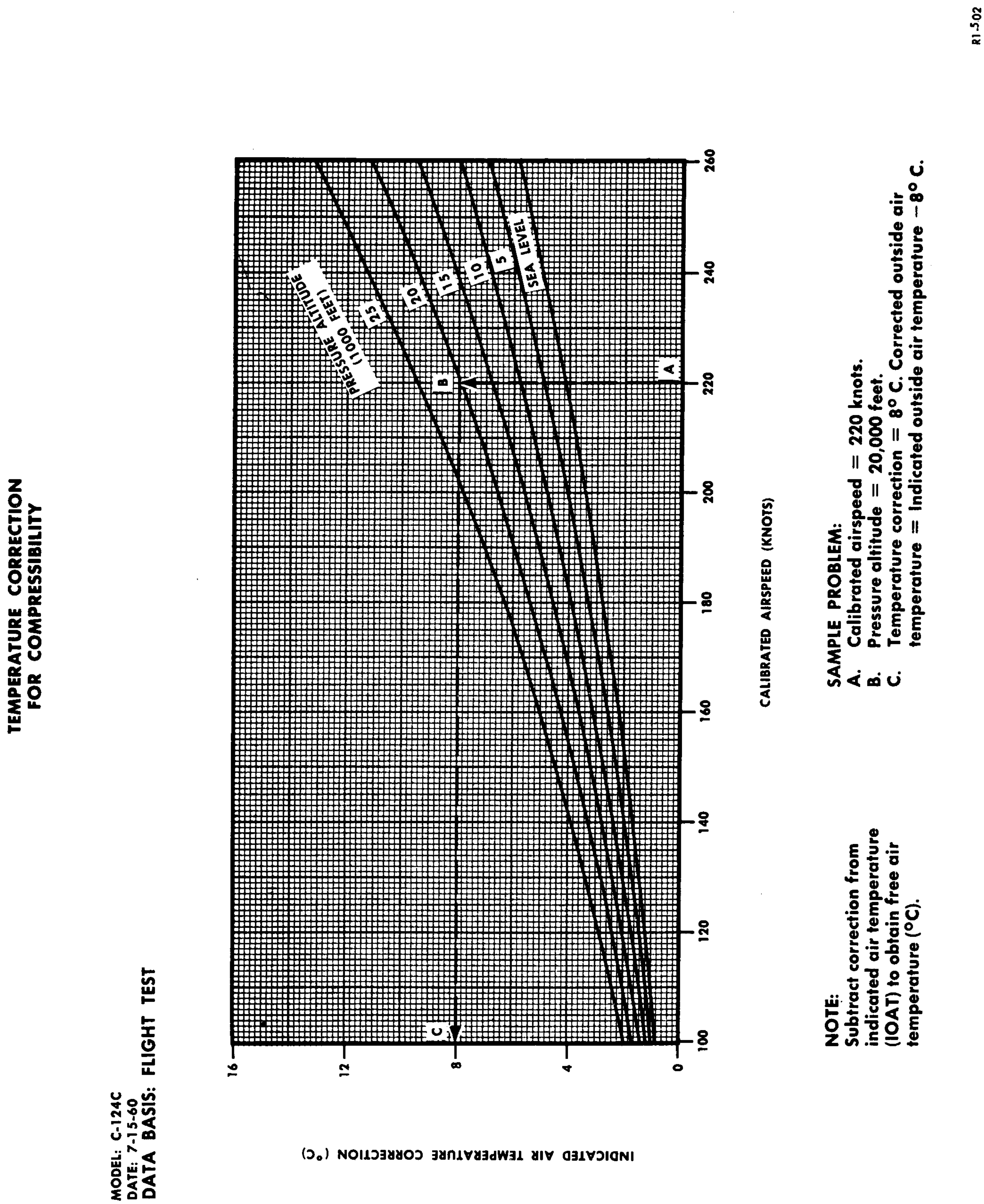


Figure A1-3. Temperature Correction for Compressibility

DENSITY ALTITUDE

SAMPLE PROBLEM:

A. OAT. = −23° C (−9° F).

B. Pressure altitude = 8000 feet.

C. Density altitude = 5200 feet.

D. $\frac{1}{\sqrt{\sigma}} = 1.08$.

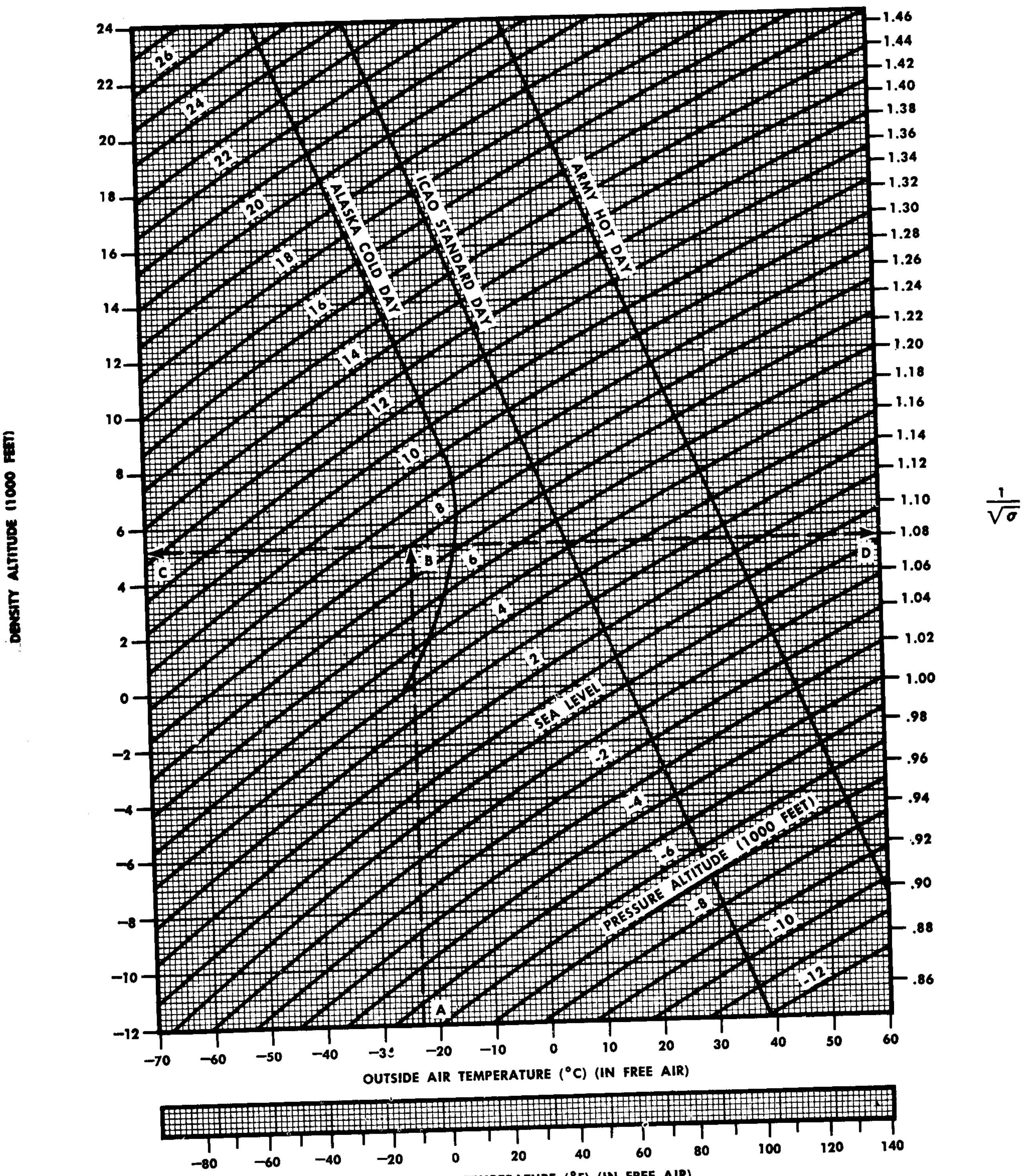


Figure A1-4. Density Altitude

R1-503

ICAO STANDARD ATMOSPHERE TABLE

STANDARD S. L. CONDITIONS:
Temperature = 15°C (59°F)
Pressure = 29.921 in. Hg (2116.216 lb/sq. ft.)
Density = .0023769 slugs/cu. ft.
Speed of sound = 1116.89 ft/sec. (661.7 knots)

CONVERSION FACTORS:
1 in. Hg = 70.727 lb/sq. ft.
1 in. Hg = 0.49116 lb./sq. in.
1 Knot = 1.151 mph
1 Knot = 1.688 ft./sec.

Altitude Feet	Density Ratio σ	SMOE Factor $\frac{1}{\sqrt{\sigma}}$	Temperature °C	Temperature °F	Speed of Sound (Knots)	Pressure In. Hg	Pressure Ratio δ
0	1.000	1.0000	15.000	59.000	661.7	29.921	1.0000
1000	.9711	1.0148	13.019	55.434	659.5	28.856	.9644
2000	.9428	1.0299	11.038	51.868	657.2	27.821	.9298
3000	.9151	1.0454	9.056	48.302	654.9	26.817	.8962
4000	.8881	1.0611	7.075	44.735	652.6	25.842	.8637
5000	.8617	1.0773	5.094	41.169	650.3	24.896	.8320
6000	.8359	1.0938	3.113	37.603	647.9	23.978	.8014
7000	.8106	1.1107	1.132	34.037	645.6	23.088	.7716
8000	.7860	1.1279	- 0.850	30.471	643.3	22.225	.7428
9000	.7620	1.1456	- 2.831	26.905	640.9	21.388	.7148
10,000	.7385	1.1637	- 4.812	23.338	638.6	20.577	.6877
11,000	.7155	1.1822	- 6.793	19.772	636.2	19.791	.6614
12,000	.6932	1.2011	- 8.774	16.206	633.9	19.029	.6360
13,000	.6713	1.2205	-10.756	12.640	631.5	18.292	.6113
14,000	.6500	1.2403	-12.737	9.074	629.1	17.577	.5875
15,000	.6292	1.2606	-14.718	5.508	626.7	16.886	.5643
16,000	.6090	1.2815	-16.699	1.941	624.3	16.216	.5420
17,000	.5892	1.3028	-18.680	- 1.625	621.9	15.569	.5203
18,000	.5699	1.3246	-20.662	- 5.191	619.4	14.942	.4994
19,000	.5511	1.3470	-22.643	- 8.757	617.0	14.336	.4791
20,000	.5328	1.3700	-24.624	-12.323	614.6	13.750	.4595
21,000	.5150	1.3935	-26.605	-15.889	612.1	13.184	.4406
22,000	.4976	1.4176	-28.586	-19.456	609.6	12.636	.4223
23,000	.4806	1.4424	-30.568	-23.022	607.2	12.107	.4046
24,000	.4642	1.4678	-32.549	-26.588	604.7	11.597	.3876
25,000	.4481	1.4938	-34.530	-30.154	602.2	11.103	.3711
26,000	.4325	1.5206	-36.511	-33.720	599.7	10.627	.3552
27,000	.4173	1.5480	-38.492	-37.286	597.2	10.168	.3398
28,000	.4025	1.5762	-40.474	-40.852	594.6	9.725	.3250
29,000	.3881	1.6052	-42.455	-44.419	592.1	9.297	.3107
30,000	.3741	1.6349	-44.436	-47.985	589.6	8.885	.2970
31,000	.3605	1.6654	-46.417	-51.551	587.0	8.488	.2837
32,000	.3473	1.6968	-48.398	-55.117	584.4	8.106	.2709
33,000	.3345	1.7291	-50.380	-58.683	581.8	7.737	.2586
34,000	.3220	1.7623	-52.361	-62.249	579.3	7.382	.2467
35,000	.3099	1.7964	-54.342	-65.816	576.7	7.041	.2353
36,000	.2981	1.8315	-56.323	-69.382	574.0	6.712	.2243
36,089	.2971	1.8347	-56.500	-69.700	573.7	6.683	.2234
37,000	.2843	1.8753	-56.500	-69.700	573.7	6.397	.2138
38,000	.2710	1.9209	-56.500	-69.700	573.7	6.097	.2038
39,000	.2583	1.9677	-56.500	-69.700	573.7	5.811	.1942
40,000	.2462	2.0155	-56.500	-69.700	573.7	5.538	.1851
41,000	.2346	2.0645	-56.500	-69.700	573.7	5.278	.1764
42,000	.2236	2.1148	-56.500	-69.700	573.7	5.030	.1681
43,000	.2131	2.1662	-56.500	-69.700	573.7	4.794	.1602
44,000	.2031	2.2189	-56.500	-69.700	573.7	4.569	.1527
45,000	.1936	2.2728	-56.500	-69.700	573.7	4.355	.1455

Figure A1-5. ICAO Standard Atmosphere Table (Sheet 1 of 2)

ICAO STANDARD ATMOSPHERE TABLE

ALTITUDE IN 100-FOOT INCREMENTS AND $\frac{1}{\sqrt{\sigma}}$

Altitude Feet	$\frac{1}{\sqrt{\sigma}}$	Altitude Feet	$\frac{1}{\sqrt{\sigma}}$	Altitude Feet	$\frac{1}{\sqrt{\sigma}}$	Altitude Feet	$\frac{1}{\sqrt{\sigma}}$	Altitude Feet	$\frac{1}{\sqrt{\sigma}}$
100	1.0015	6100	1.0955	12100	1.2030	18100	1.3269	24100	1.4704
200	1.0029	6200	1.0971	12200	1.2049	18200	1.3291	24200	1.4729
300	1.0044	6300	1.0988	12300	1.2069	18300	1.3313	24300	1.4755
400	1.0059	6400	1.1005	12400	1.2088	18400	1.3335	24400	1.4781
500	1.0074	6500	1.1022	12500	1.2107	18500	1.3358	24500	1.4807
600	1.0088	6600	1.1039	12600	1.2127	18600	1.3380	24600	1.4833
700	1.0103	6700	1.1056	12700	1.2146	18700	1.3403	24700	1.4860
800	1.0118	6800	1.1073	12800	1.2166	18800	1.3425	24800	1.4886
900	1.0133	6900	1.1090	12900	1.2185	18900	1.3448	24900	1.4912
1000	1.0148	7000	1.1107	13000	1.2205	19000	1.3470	25000	1.4938
1100	1.0163	7100	1.1124	13100	1.2224	19100	1.3493	25100	1.4965
1200	1.0178	7200	1.1141	13200	1.2244	19200	1.3516	25200	1.4991
1300	1.0193	7300	1.1158	13300	1.2264	19300	1.3539	25300	1.5018
1400	1.0208	7400	1.1175	13400	1.2284	19400	1.3561	25400	1.5045
1500	1.0223	7500	1.1193	13500	1.2303	19500	1.3584	25500	1.5071
1600	1.0238	7600	1.1210	13600	1.2323	19600	1.3607	25600	1.5098
1700	1.0253	7700	1.1227	13700	1.2343	19700	1.3630	25700	1.5125
1800	1.0269	7800	1.1245	13800	1.2363	19800	1.3653	25800	1.5152
1900	1.0284	7900	1.1262	13900	1.2383	19900	1.3677	25900	1.5179
2000	1.0299	8000	1.1279	14000	1.2403	20000	1.3700	26000	1.5206
2100	1.0314	8100	1.1297	14100	1.2423	20100	1.3723	26100	1.5233
2200	1.0330	8200	1.1314	14200	1.2444	20200	1.3746	26200	1.5260
2300	1.0345	8300	1.1332	14300	1.2464	20300	1.3770	26300	1.5287
2400	1.0360	8400	1.1350	14400	1.2484	20400	1.3793	26400	1.5315
2500	1.0376	8500	1.1367	14500	1.2504	20500	1.3817	26500	1.5342
2600	1.0391	8600	1.1385	14600	1.2525	20600	1.3840	26600	1.5370
2700	1.0407	8700	1.1403	14700	1.2545	20700	1.3864	26700	1.5397
2800	1.0422	8800	1.1420	14800	1.2565	20800	1.3888	26800	1.5425
2900	1.0438	8900	1.1438	14900	1.2586	20900	1.3911	26900	1.5453
3000	1.0454	9000	1.1456	15000	1.2606	21000	1.3935	27000	1.5480
3100	1.0469	9100	1.1474	15100	1.2627	21100	1.3959	27100	1.5508
3200	1.0485	9200	1.1492	15200	1.2648	21200	1.3983	27200	1.5536
3300	1.0501	9300	1.1510	15300	1.2668	21300	1.4007	27300	1.5564
3400	1.0516	9400	1.1528	15400	1.2689	21400	1.4031	27400	1.5592
3500	1.0532	9500	1.1546	15500	1.2710	21500	1.4055	27500	1.5620
3600	1.0548	9600	1.1564	15600	1.2731	21600	1.4079	27600	1.5649
3700	1.0564	9700	1.1582	15700	1.2752	21700	1.4103	27700	1.5677
3800	1.0580	9800	1.1600	15800	1.2773	21800	1.4128	27800	1.5705
3900	1.0595	9900	1.1618	15900	1.2794	21900	1.4152	27900	1.5734
4000	1.0611	10000	1.1637	16000	1.2815	22000	1.4176	28000	1.5762
4100	1.0627	10100	1.1655	16100	1.2836	22100	1.4201	28100	1.5791
4200	1.0643	10200	1.1673	16200	1.2857	22200	1.4225	28200	1.5819
4300	1.0659	10300	1.1692	16300	1.2878	22300	1.4250	28300	1.5848
4400	1.0676	10400	1.1710	16400	1.2899	22400	1.4275	28400	1.5877
4500	1.0692	10500	1.1729	16500	1.2921	22500	1.4299	28500	1.5906
4600	1.0708	10600	1.1747	16600	1.2942	22600	1.4324	28600	1.5935
4700	1.0724	10700	1.1766	16700	1.2963	22700	1.4349	28700	1.5964
4800	1.0740	10800	1.1784	16800	1.2985	22800	1.4374	28800	1.5993
4900	1.0757	10900	1.1803	16900	1.3006	22900	1.4399	28900	1.6022
5000	1.0773	11000	1.1822	17000	1.3028	23000	1.4424	29000	1.6052
5100	1.0789	11100	1.1840	17100	1.3049	23100	1.4449	29100	1.6081
5200	1.0806	11200	1.1859	17200	1.3071	23200	1.4474	29200	1.6110
5300	1.0822	11300	1.1878	17300	1.3093	23300	1.4499	29300	1.6140
5400	1.0838	11400	1.1897	17400	1.3115	23400	1.4525	29400	1.6170
5500	1.0855	11500	1.1916	17500	1.3136	23500	1.4550	29500	1.6199
5600	1.0871	11600	1.1935	17600	1.3158	23600	1.4576	29600	1.6229
5700	1.0888	11700	1.1954	17700	1.3180	23700	1.4601	29700	1.6259
5800	1.0905	11800	1.1973	17800	1.3202	23800	1.4627	29800	1.6289
5900	1.0921	11900	1.1992	17900	1.3224	23900	1.4652	29900	1.6319
6000	1.0938	12000	1.2011	18000	1.3246	24000	1.4678	30000	1.6349

Figure A1-5. ICAO Standard Atmosphere Table (Sheet 2 of 2)

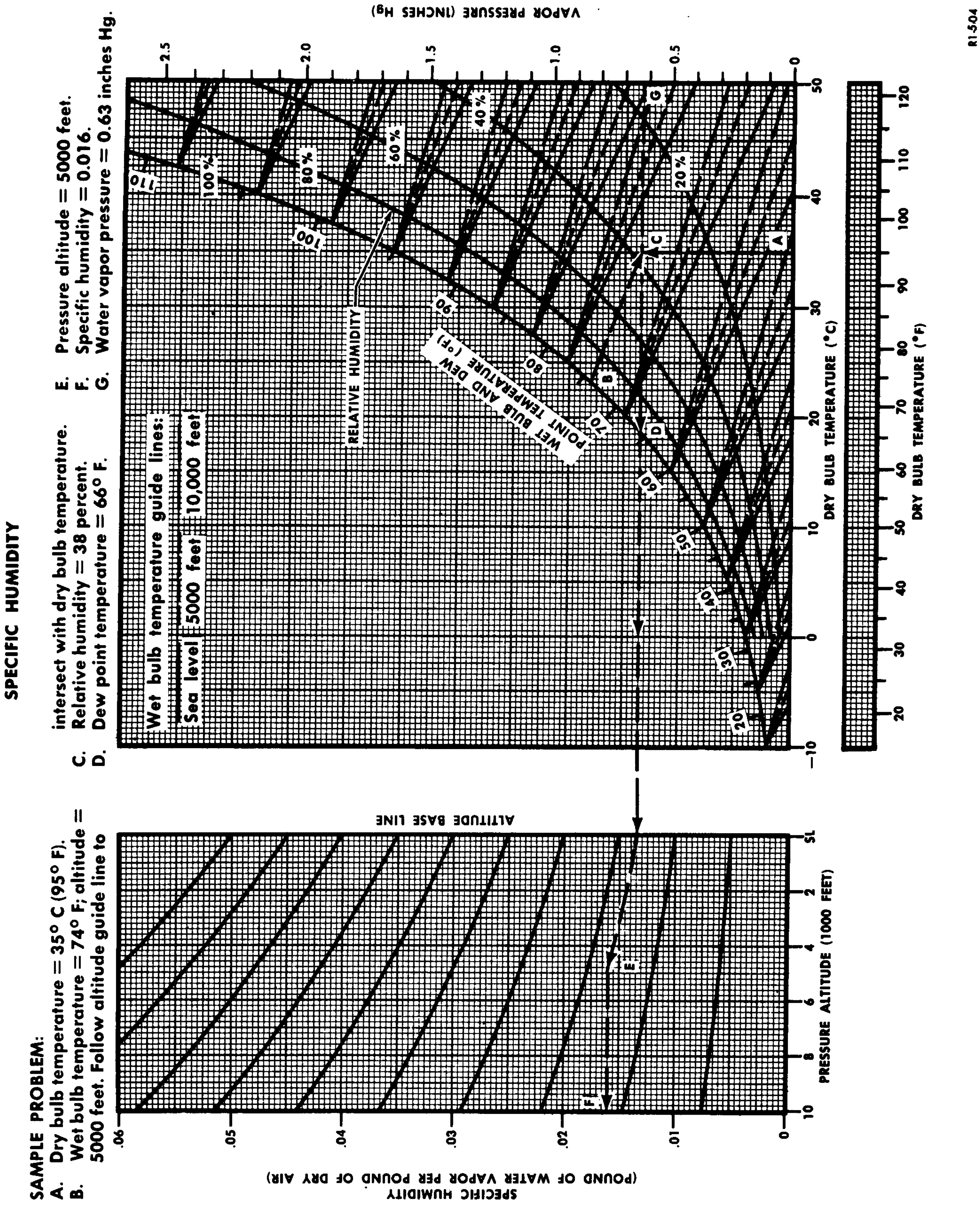


Figure A1-6. Specific Humidity

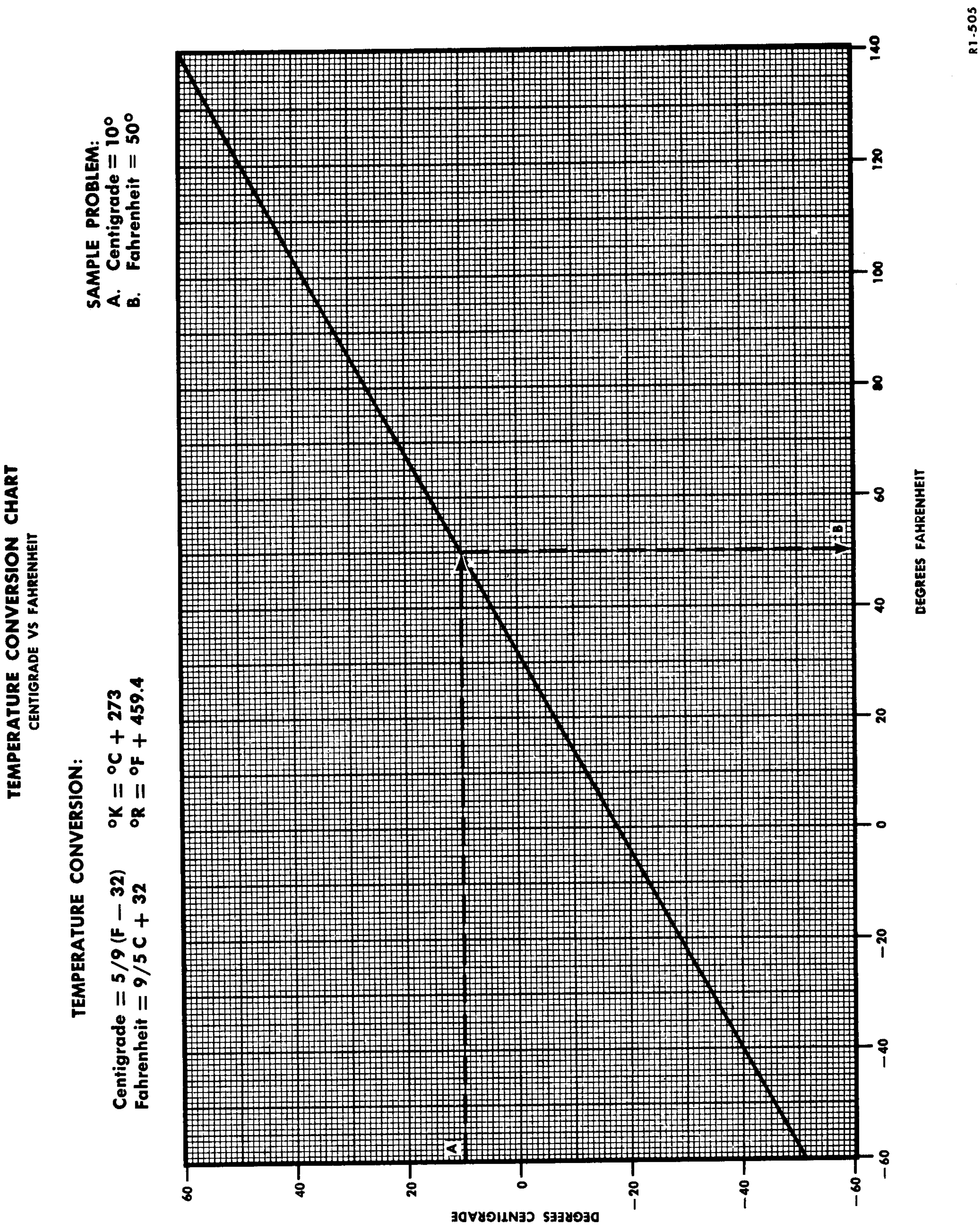


Figure A1-7. Temperature Conversion Chart

PART II

POWER PLANT

TABLE OF CONTENTS

LIST OF CHARTS

POWER PLANT CHARACTERISTICS.

Power plant characteristics are presented for both 115/145 and 100/130 grade fuel on the Maximum Brake Horsepower charts (figures A2-16 and A2-17). The Brake Horsepower — RPM Schedule curves (figures A2-2 through A2-5), Brake Horsepower — Manifold Pressure Schedule curves (figures A2-6 through A2-9) the Torque Pressure Vs RPM and BHP chart (figure A2-10) and the Fuel Flow curves (figures A2-11 through A2-14) are based on operation with fuel grade 115/145; however, limits have been added to allow their use with fuel grade 100/130. The Engine Limitations Curve (figure A2-1) is based on operation with fuel grade 115/145 but may be used with fuel grade 100/130 providing the limits shown in Section V, T. O. 1C-124A-1 are adhered to. The Effect of Humidity on Max Power chart (figure A2-18) may be used with either 115/145 or 100/130 grade fuel.

It is important to note that the performance charts are based on engine calibration data with the carburetor heat control in the COLD position. With this setting, the carburetor air temperature should indicate approximately 5°C above corrected outside air temperature. This temperature difference is the result of the adiabatic temperature rise of the ram air, and the location of the intake duct above the engine.

EFFECTS OF CARBURETOR AIR PREHEAT ON ENGINE PERFORMANCE.

When carburetor air preheat is used, there will be a loss in engine performance for two reasons. First, because of the increase in carburetor air temperature, the operating density altitude of the engine is increased and the power for a given manifold pressure is decreased. Second, the normal air induction system is blocked off and carburetor air is taken from a location above the rear bank of cylinders. This air has passed through the fins on the forward banks of cylinders and is low energy air. Thus, little or no benefit is obtained from the ram pressure available at the front face of the engine. If temperatures other than normal carburetor air temperature prevail, the correction plots on the charts should be used to determine the proper power settings.

EFFECTS OF CARBURETOR AIR TEMPERATURE ON ENGINE PERFORMANCE.

The effect of temperature on brake horsepower can be approximated by the following equation, provided there is no change in supercharger impeller efficiency.

$$\frac{BHP_1}{BHP_2} = \sqrt{\frac{T_2}{T_1}}$$

(where T = absolute carburetor air temperature)

For ambient air temperatures near 280°Kelvin, the loss in BHP for each increase in air temperature of 5°C is approximately 1 percent. The loss in impeller efficiency in the supercharger results in additional power loss of between 0.5 and 1 percent of the total power. For general use, the approximation that a power loss of 1.5 percent of the total power occurs for each 5°C rise in temperature is valid. This method should NOT be used for power predictions. The charts included in this section give sufficient coverage for power predictions throughout the normal operating range.

PROPELLER LOAD.

The propeller load is the relationship between the RPM of a propeller of constant pitch and the power required to drive it at a given speed. Propeller load lines are determined from the following formula:

$$BHP_1 = BHP_2 \left[\frac{RPM_1}{RPM_2} \right]^3$$

The propeller load line defines a region of engine operation with normal mixture, higher than the rated limit (150 BMEP Low Blower, 140 BMEP High Blower) up to METO power.

DISCUSSION OF CHARTS.

ENGINE LIMITATIONS CURVE.

The Engine Limitations curve (figure A2-1) is presented for general information on engine operating limitations and characteristics. The data are based on flight tests corrected to zero ram conditions.

BRAKE HORSEPOWER-RPM AND BRAKE HORSEPOWER-MANIFOLD PRESSURE SCHEDULES.

The Brake Horsepower-RPM Schedules (figures A2-2 through A2-5) and the Brake Horsepower-Manifold Pressure Schedules (figures A2-6 through A2-9), indicate the proper RPM and manifold pressure settings for any desired brake horsepower for operation with fuel grade 115/145. Limits for operation with fuel grade 100/130 are called out in notes on each chart where necessary. These schedules allow the use of a constant RPM for each BHP for any CAT during part throttle operation. Only the MAP is adjusted to obtain the desired brake horsepower. The CAT correction grid to the left of the MAP schedules make this correction. The CAT correction grid at the bottom of each schedule is a correction for critical altitude which will vary when a constant BHP-RPM combination is used for all CAT's. For full throttle operation, the critical altitude correction grid also corrects RPM for non-standard day CAT's. The MAP is corrected in the same manner as for part throttle operation. The correction plot limits and proper engine limits are shown on the charts and will not be exceeded when the desired BHP is selected from Part 5 (Range section) as outlined in Part 7 (Mission Planning, Cruise).

In Normal Mixture, low blower critical altitude is defined by a propeller load curve through 2800 BHP and 2600 RPM (METO), or 150 BMEP, whichever is lower. High blower critical altitude is defined by a propeller load curve through 2300 BHP and 2550 RPM (METO) or 140 BMEP, whichever is lower. In Manual Lean Mixture, the critical altitudes are determined by 150 BMEP in low blower and 140 BMEP in high blower down to minimum RPM for normal operation (1600 RPM). Sample problems are given to illustrate the use of these charts.

Note

> All cruise performance data in the appendix are designed to conform to these power schedules and the limits shown on the curves.

TORQUE PRESSURE VERSUS RPM AND BHP CHART.

This chart (figure A2-10) is presented for determining torque pressure for any given BHP-RPM combination. 150 and 140 BMEP limits are shown for convenience. Low blower and high blower propeller loads are also presented. In high blower the power schedules have been built with a prop load originating at 2300 BHP. This gives a slightly conservative BMEP as compared to the prop load limit shown on this chart.

FUEL FLOW CHARTS.

Fuel Flow charts for fuel grades 115/145 and 100/130 (figures A2-11 through A2-14) show values of fuel flow per engine during all normal cruising operations for normal and manual lean mixture settings. Limits for operation with fuel grade 100/130 are called out in the notes on each chart where necessary. The desired BHP used to enter the curves should also be selected from Part 5 (Range Section) as mentioned in the previous paragraphs. The correction plots are the same as for the BHP-RPM Schedule charts and provide for constant fuel flow for any BHP during part throttle operation. The limits are given and the proper RPM and MAP for any BHP-pressure altitude combination on the fuel flow charts should be taken from the BHP-RPM and BHP-Manifold Pressure charts at the same BHP-pressure altitude combination. The sample problems or chase arounds used are for the same conditions as those given on the power schedule charts.

Note

> Approximately the same amount of fuel will be used during descent as would be consumed in continuing cruise at altitude for the same length of time as required for the descent.

DETERMINING BHP AND AVERAGE POWER VARIATION.

The average amount of power variation, if variation does exist, may be determined by the operators of each individual aircraft. This can be accomplished during the first several takeoffs after the aircraft is received. Pressure altitude and specific humidity should be recorded before the takeoff; torque pressures, RPM, and CAT for all four engines should be recorded during each takeoff. From the recorded data an average power variation may be obtained with the use of the Maximum Brake Horsepower charts. The brake horsepower may be determined from the torque pressure and RPM by using the equation:

$$BHP = 0.00524\ (TP)\ (RPM)$$

The percent power variation curves on the Maximum BHP charts can then be entered with a predetermined percent variation which will correct predicted power and torque pressure to the expected indicated power and torque pressure. A reject torque pressure or power variation of minus 5 percent from predicted will be used as minimum for takeoff. If this reject torque pressure cannot be obtained for takeoff, the aircraft should be rejected until the engines can be inspected for possible malfunctions and corrective action taken.

HEATER FUEL CONSUMPTION.

The Heater Fuel Consumption chart (figure A2-15) is included to show heater fuel flows for the following combination of heater usage:

Flight compartment heater only.

Cabin heater only.

Flight compartment and cabin heaters.

Flight compartment, cabin and surface heaters.

The charts show the average fuel flow rate in pounds per hour as a function of outside air temperature.

MAXIMUM BRAKE HORSEPOWER CHARTS.

The Maximum Brake Horsepower charts for wet and dry power (figures A2-16 and A2-17) provide data for determining MAP, the predicted torque pressure and corresponding BHP and the reject torque pressure for takeoff. An installation loss of 100 BHP has also been built into the curves.

Separate charts for fuel grade 115/145 and 100/130 are provided for operation from sea level to 8000 feet. The charts for operation from 7000 to 14,000 feet are based on operation with either 115/145 or 100/130 grade fuel.

Note

> Wet Power operation is limited under extremely low temperatures due to the freezing temperature of the water-alcohol mixture, regardless of CAT. Normal C-124 water-alcohol mixture (50/50) begins to freeze at -42°C. Therefore dry takeoff is recommended at temperatures below -30°C.

For take-off below sea level pressure altitude, use sea level values for computing data. Do not exceed the maximum limits indicated on the charts. Data are shown for low blower only; this is because no high blower takeoff rating is given for the P & W 4360-63A engine-supercharger combination presently installed. All takeoffs should therefore be accomplished in low blower only. Maximum manifold pressure varies linearally between the full throttle limit at critical altitude and sea level. This variation allows the use of the maximum available power at lower altitudes and still provides a limit so that the engine will not be overboosted at the higher altitudes.

Manifold Pressure Correction To Limit BHP.

Under certain operating conditions, the combination of CAT and pressure altitude may result in manifold pressure settings, which will exceed the maximum allowable BHP. The Manifold Pressure correction curve is applicable to all powers above the maximum of 3800 BHP (259-psi Torque Pressure) for part and full throttle low blower. To avoid the possibility of overboost during maximum power operation, any power obtained for a given CAT-pressure altitude condition and corrected for dew point which still exceeds the maximum BHP limit, should be extended to the manifold pressure correction curve to obtain the manifold pressure correction. Applying this correction to the manifold pressure obtained for the original conditions will result in operation at the maximum BHP limit (3800 BHP-WET or DRY). In the event the torque pressure indicating system is inoperative during cold weather operations, overboosting may be avoided by setting power to the level indicated by the corrected manifold pressure.

Manifold Pressure Correction For Humidity.

Under certain conditions of humidity and carburetor air temperature, the maximum manifold pressures shown on the charts may be exceeded by as much as 1. 5 inches Hg MAP due to the existing vapor pressure. This correction is presented so that at any given dew point temperature a correction may be obtained within the limits of the correction plots for both dew point and carburetor air temperature. Where vapor pressure exists, the MAP instrument reading will include this pressure as part of the total reading. Adding the MAP correction available will allow some recovery of the MAP and power lost due to the vapor pressure. During some instances of part throttle operation at high dew point temperatures and pressure altitudes near the critical altitude for high CAT's, full throttle may be reached before the full correction to the MAP can be attained. This will result in less power recovery. For all normal operation at or near standard day the full correction allowed will be obtainable. The correction plots are shown so that they can be used only for the temperature ranges for which the correction is applicable.

EFFECT OF HUMIDITY ON MAXIMUM POWER CHART.

The effect of humidity on maximum power engine performance is shown on figure A2-18. This effect is reflected in the dew point correction curves on the maximum brake horsepower charts. The power loss due to humidity correction can be shown to be the result of the following items:

1. The density altitude of dry air is increased because of the presence of vapor which is less dense than air.
2. Fuel air ratio is increased because fuel is metered on total flow through the venturi, and the total flow includes water vapor as well as air.
3. The thermal efficiency of the combustion process is reduced because of the presence of water vapor.

BLOWER SHIFT.

The shift from low blower to high blower is accompanied by a temporary power loss because the power required to effect the shift is greater than the increase of power due to the shift. Before shifting to high blower in cruise reduce MAP 3 to 4 inches Hg. After the shift is complete add power up to the desired level. For Blower Shift during climb see the discussion in Part 4 — Climb.

ENGINE LIMITATIONS CURVE
SEA LEVEL CALIBRATION
ICAO STANDARD DAY
LOW BLOWER — ZERO RAM

MODEL: C-124C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-63A
FUEL GRADE: 115/145 & 100/130

NOTE:
Operating limits with alternate grade 100/130 fuel are tabulated in Section V, T.O. 1C-124A-1.

SAMPLE PROBLEM:

A. On altitude calibration curve locate 2000 RPM and 33 inches Hg manifold pressure.
B. On sea level calibration curve locate same RPM and manifold pressure. Read BHP = 1490.
C. Transfer 1490 BHP from B to C and draw straight line from C to A.
D. Assume altitude of 5400 feet and read BHP = 1600.

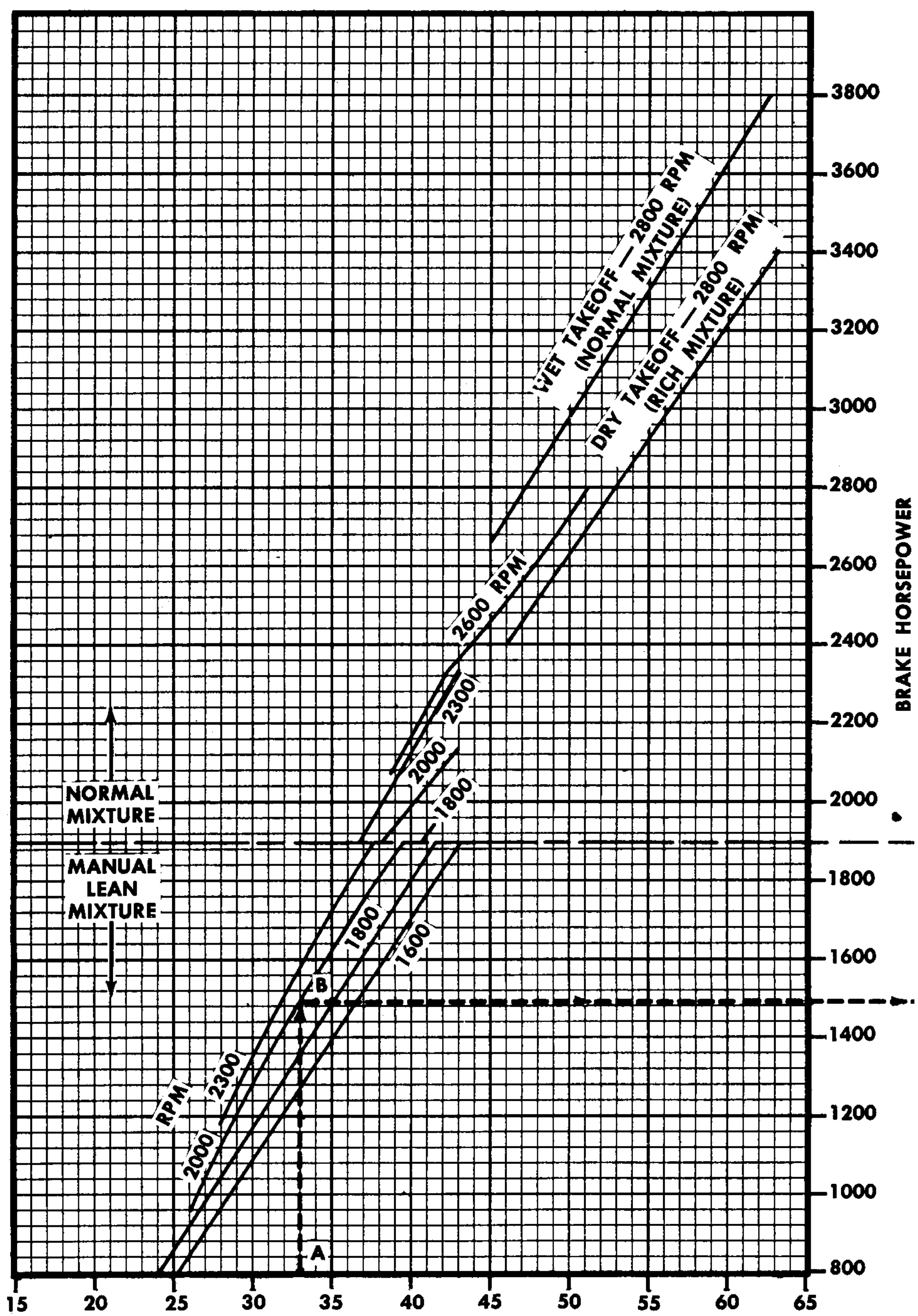


Figure A2-1. Engine Limitations Curve — Sea Level Calibration — ICAO Standard Day — Low Blower (Sheet 1 of 2)

ENGINE LIMITATIONS CURVE
ALTITUDE CALIBRATION
ICAO STANDARD DAY
LOW BLOWER — ZERO RAM

MODEL: C-124C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-63A
FUEL GRADE: 115/145 & 100/130

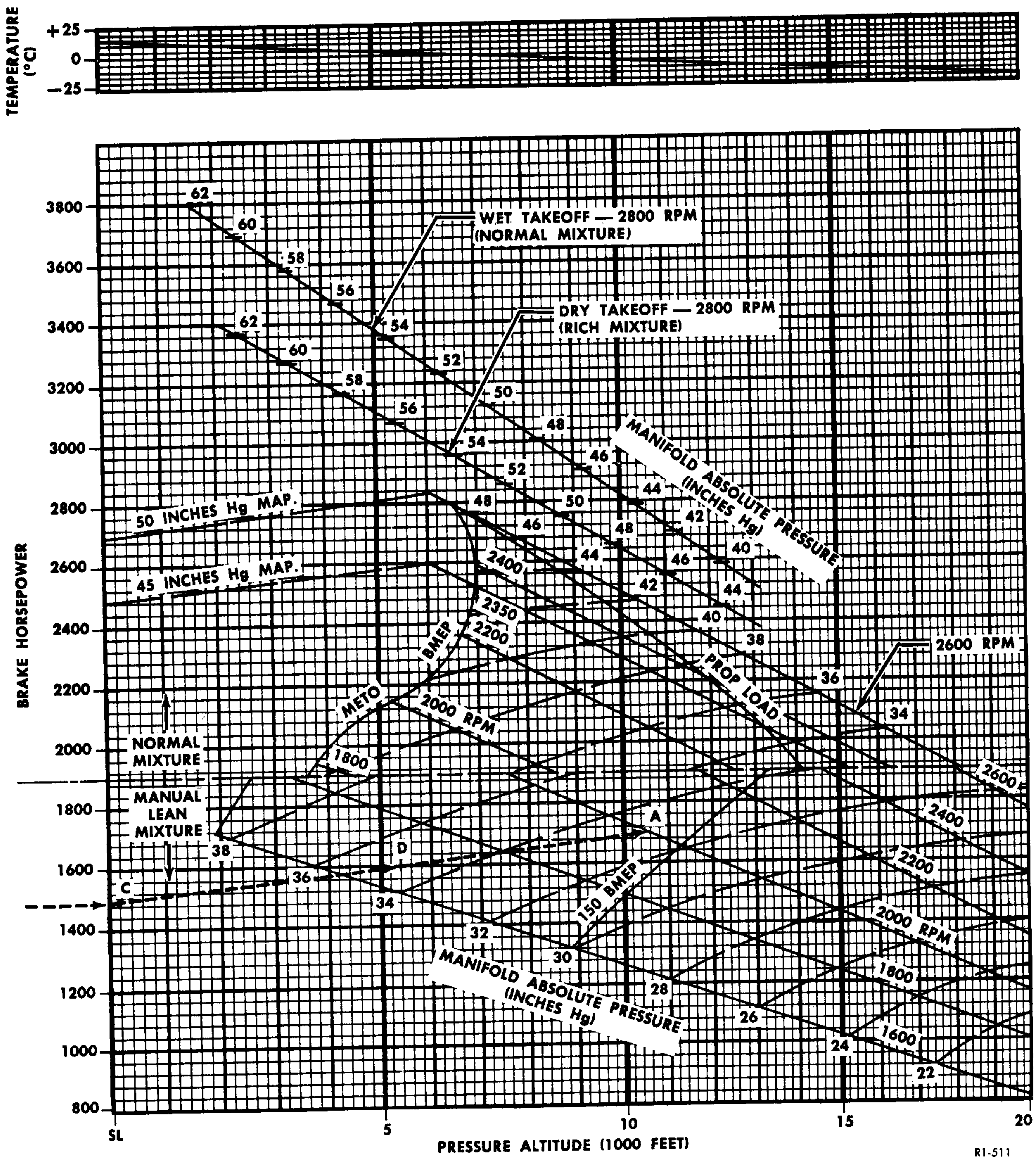


Figure A2-1. Engine Limitations Curve — Altitude Calibration — ICAO Standard Day — Low Blower (Sheet 2 of 2)

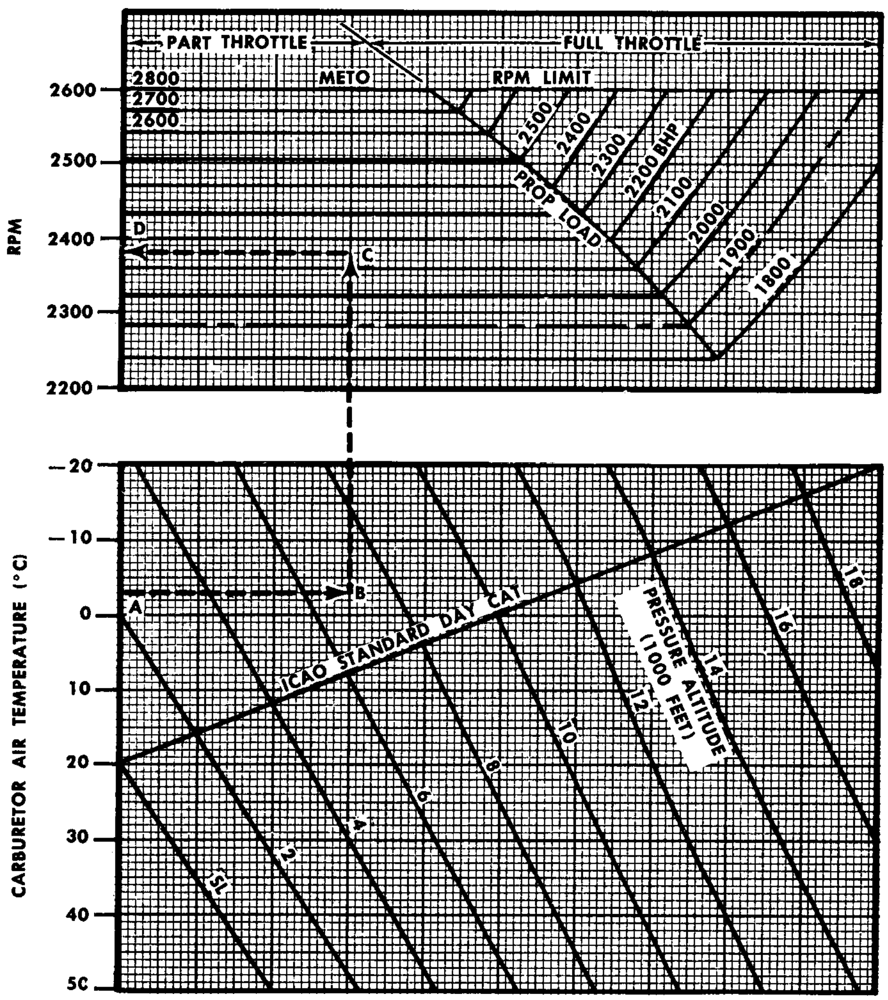
MODEL: C-124C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

BRAKE HORSEPOWER — RPM SCHEDULE
LOW BLOWER
NORMAL MIXTURE

ENGINES: (4) P&W 4360-63A
FUEL GRADE: 115/145 & 100/130

NOTE:

1. This chart must be used in conjunction with the low blower — NORMAL MIXTURE BHP — MAP Schedule chart.
2. For operation with fuel grade 115/145 do not use data below 1900 BHP.
3. All data good for operation with fuel grade 100/130.
4. Carburetor air temperature = OAT +5°C.
5. Method of obtaining desired brake horsepower outlined in part 7 (Mission Planning, Cruise).



SAMPLE PROBLEM:

A. Indicated CAT = −3°C.
B. Pressure Altitude = 7000 feet.
C. Desired BHP = 2150.
D. RPM setting = 2380 (part throttle).

R1-512

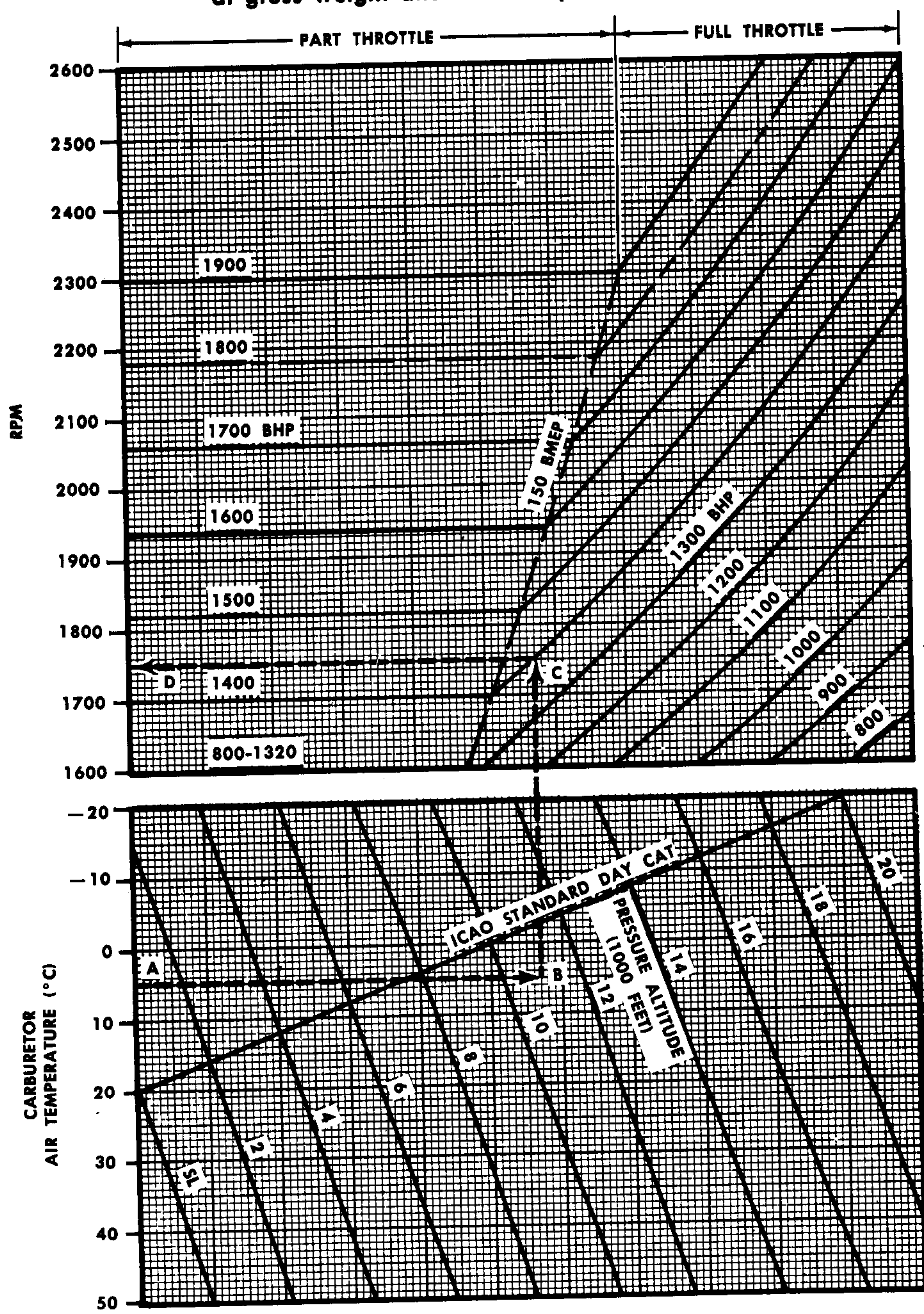
Figure A2-2. Brake Horsepower — RPM Schedule — Low Blower — Normal Mixture

BRAKE HORSEPOWER — RPM SCHEDULE
LOW BLOWER
MANUAL LEAN MIXTURE

MODEL: C-124C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-63A
FUEL GRADE: 115/145 & 100/130

NOTE:
1. This chart must be used in conjunction with the Low Blower — MANUAL LEAN MIXTURE BHP — MAP Schedule chart.
2. All data good for operation with fuel grade 115/145.
3. For operation with fuel grade 100/130, do not use data above 1800 BHP.
4. Carburetor air temperature = OAT +5°C.
5. Method of obtaining desired brake horsepower outlined in Part 7 (Mission Planning, Cruise).
6. Refer to the Propeller Restriction chart (figure A5-1) for minimum RPM at gross weight and desired speed.



SAMPLE PROBLEM:
A. Indicated CAT = +5°C.
B. Pressure altitude = 11,000 feet.
C. Desired BHP = 1400.
D. RPM setting = 1750 (full throttle).

Figure A2-3. Brake Horsepower — RPM Schedule — Low Blower — Manual Lean Mixture

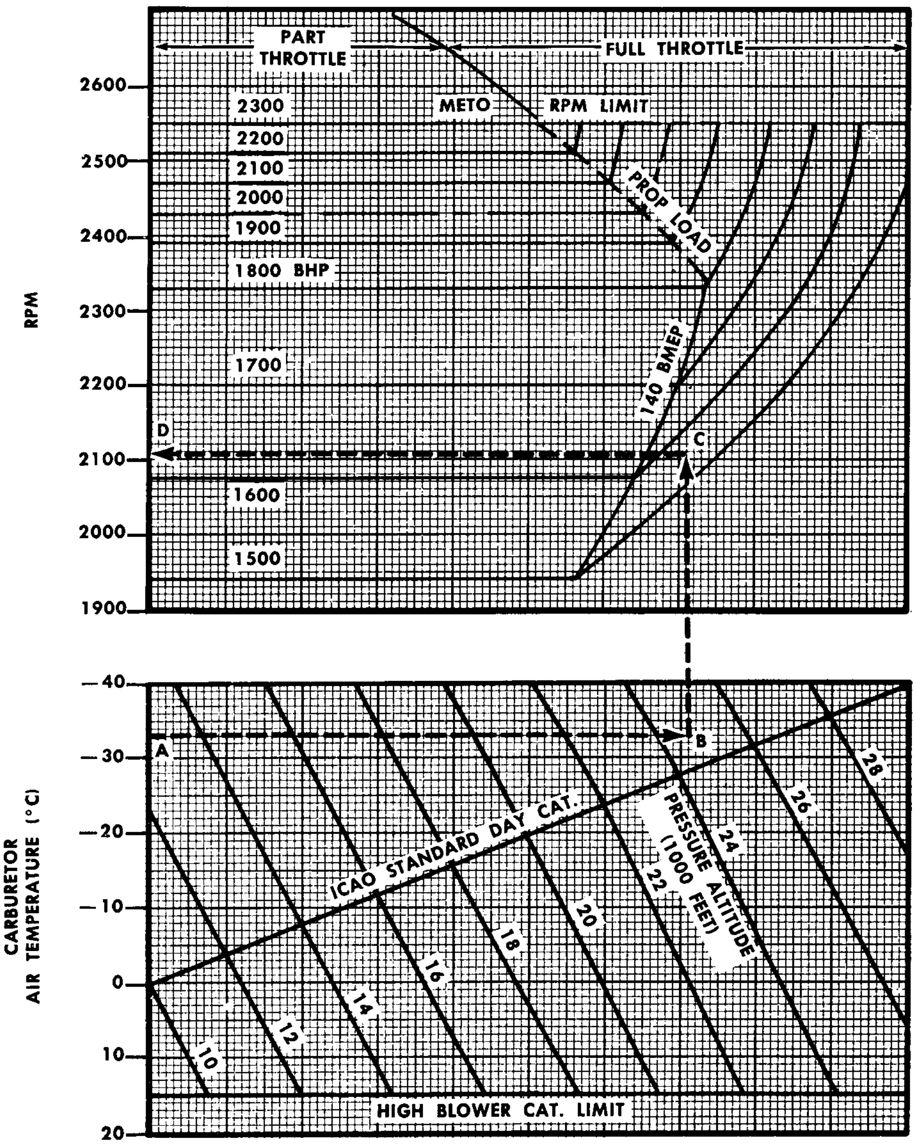
BRAKE HORSEPOWER — RPM SCHEDULE
HIGH BLOWER
NORMAL MIXTURE

MODEL: C-124C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-63A
FUEL GRADE: 115/145 & 100/130

NOTE:

1. This chart must be used in conjunction with the High Blower — NORMAL MIXTURE BHP — MAP. Schedule chart.
2. All data good for operation with fuel grade 115/145.
3. For operation with fuel grade 100/130, do not use data above 2000 BHP. If higher BHP operation is desired, lower CAT. limits must be maintained. See alternate fuel grade operating limits table in Section V, T.O. 1C-124A-1, (Operating Limitations) for high blower METO BHP CAT. limits.
4. Carburetor air temperature = OAT. +5°C.
5. Method of obtaining desired brake horsepower outlined in Part 7 (Mission Planning, Cruise).



SAMPLE PROBLEM:

A. Indicated CAT. = −33°C.
B. Pressure altitude = 24,600 feet.
C. Desired BHP = 1550.
D. RPM setting = 2105 (full throttle).

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Figure A2-4. Brake Horsepower — RPM Schedule — High Blower — Normal Mixture

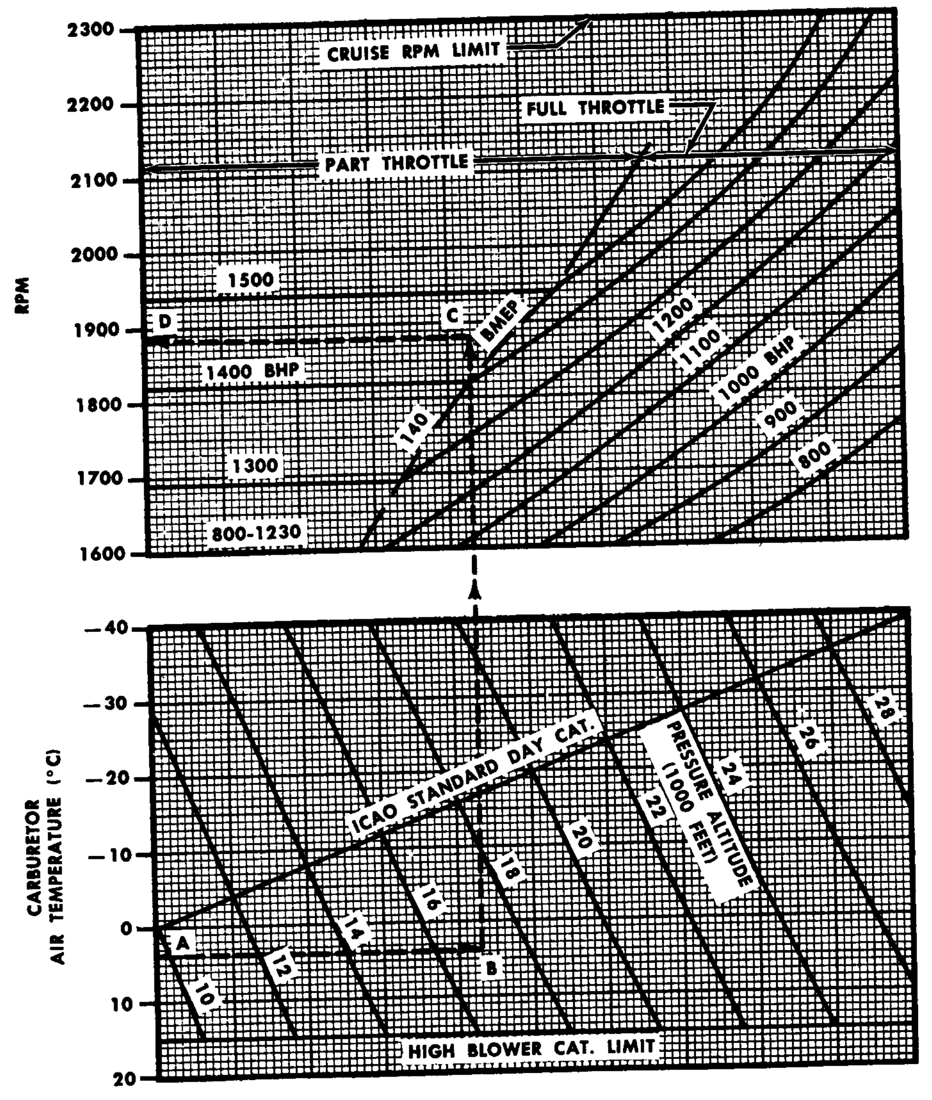
BRAKE HORSEPOWER — RPM SCHEDULE
HIGH BLOWER
MANUAL LEAN MIXTURE

MODEL: C-124C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-63A
FUEL GRADE: 115/145 & 100/130

NOTE:

1. This chart must be used in conjunction with the High Blower — MANUAL LEAN MIXTURE BHP-MAP. Schedule chart.
2. Carburetor air temperature =OAT.+5°C.
3. Method of obtaining desired brake horsepower outlined in Part 7 (Mission Planning, Cruise).
4. Refer to the Propeller Restriction chart (figure A5-1) for minimum RPM at gross weight and desired speed.
5. All data good for operation with fuel grade 115/145 and 100/130.



SAMPLE PROBLEM:

A. Indicated CAT.=4°C.
B. Pressure altitude=17,000 feet.
C. Desired BHP=1450.
D. RPM setting=1880 (part throttle).

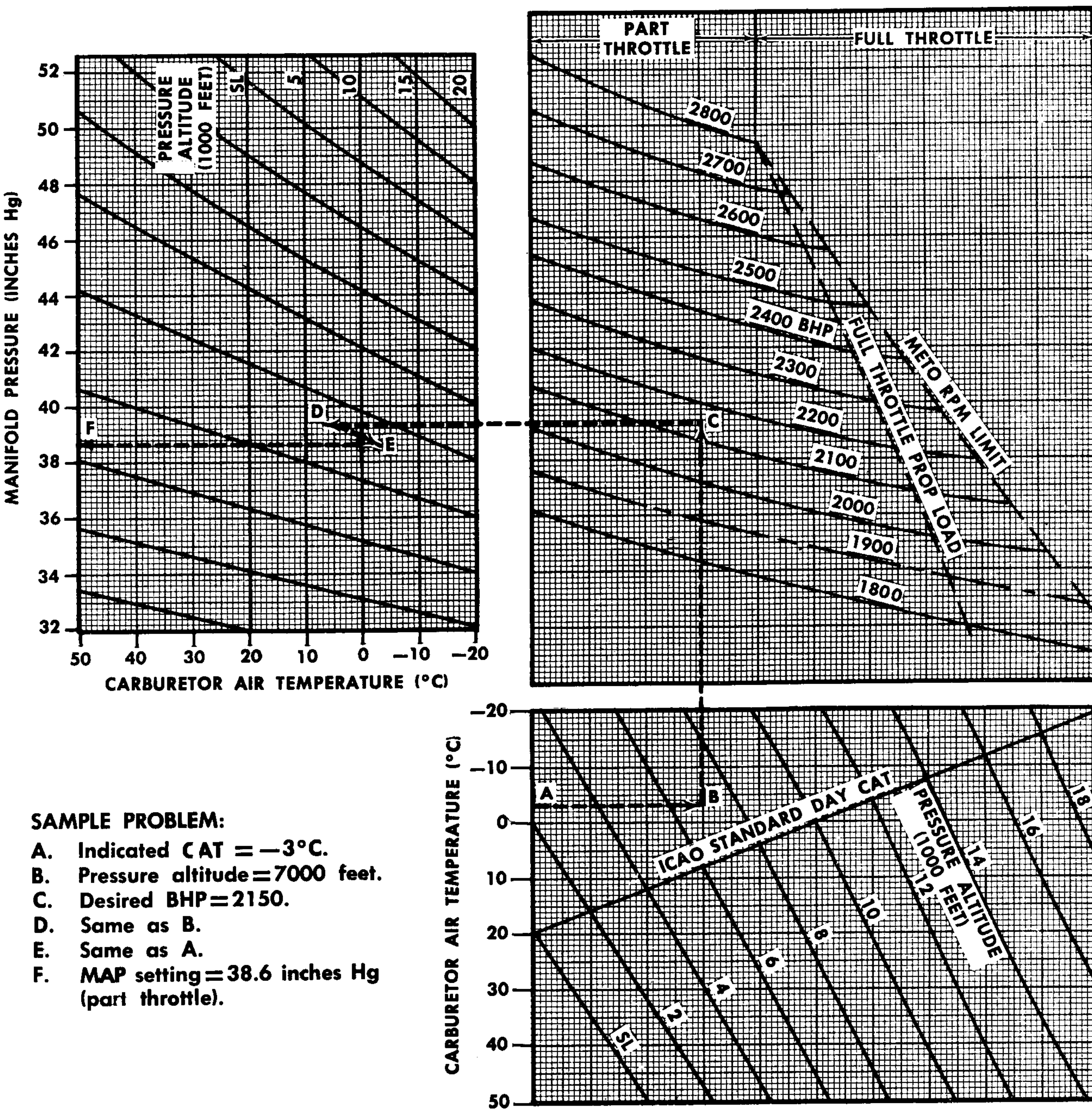
Figure A2-5. Brake Horsepower — RPM Schedule — High Blower — Manual Lean Mixture

BRAKE HORSEPOWER — MANIFOLD PRESSURE SCHEDULE
LOW BLOWER
NORMAL MIXTURE

MODEL: C-124C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: 4 P&W 4360-63A
FUEL GRADE: 115/145 & 100/130

NOTE:
1. This chart must be used in conjunction with the Low Blower — NORMAL MIXTURE BHP — RPM Schedule chart.
2. For operation with fuel grade 115/145 do not use data below 1900 BHP.
3. All data good for operation with fuel grade 100/130.
4. Carburetor air temperature = OAT +5°C.
5. Method of obtaining desired brake horsepower outlined in Part 7 (Mission Planning, Cruise)



SAMPLE PROBLEM:

A. Indicated CAT = −3°C.
B. Pressure altitude = 7000 feet.
C. Desired BHP = 2150.
D. Same as B.
E. Same as A.
F. MAP setting = 38.6 inches Hg (part throttle).

R1-539

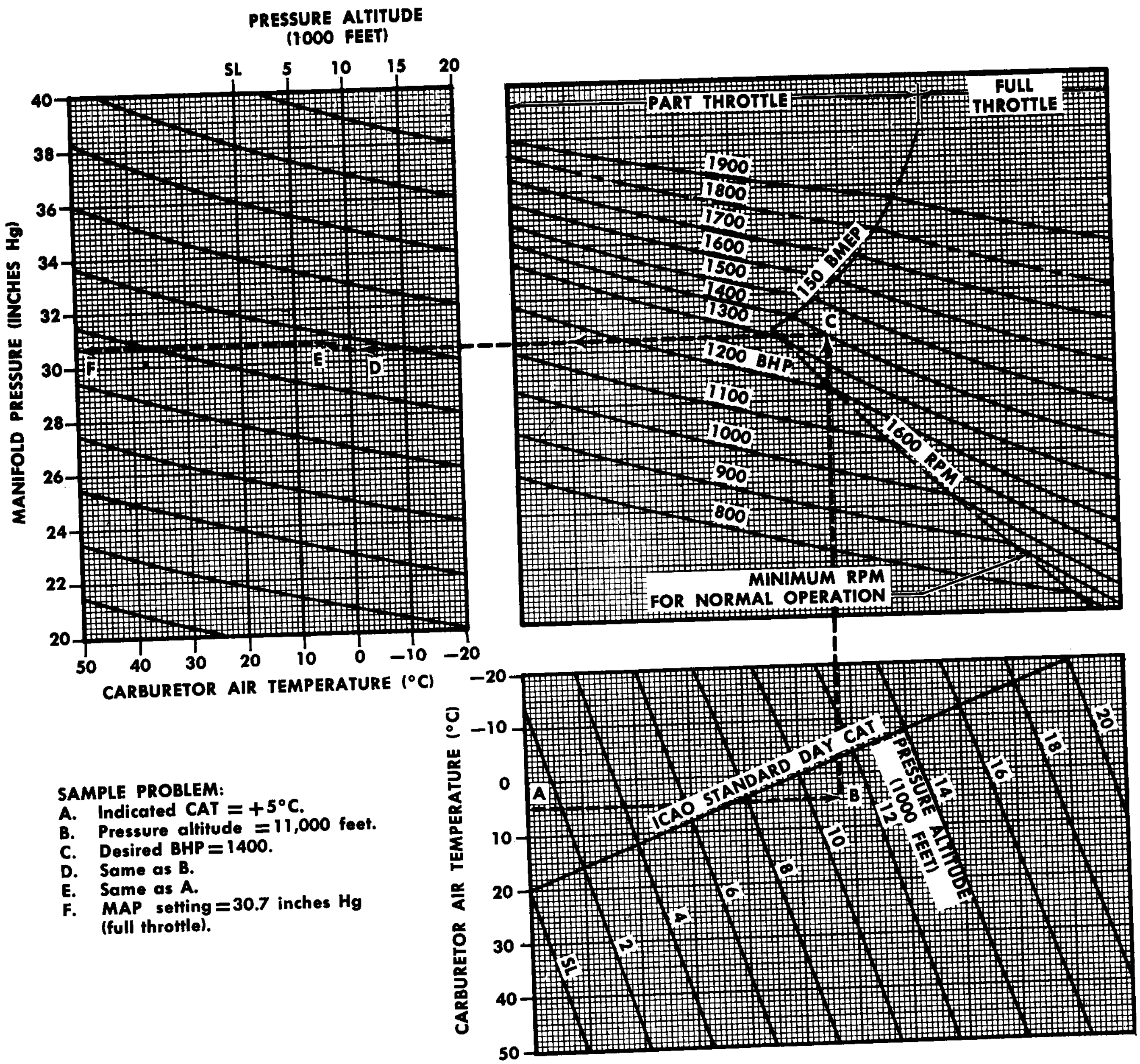
Figure A2-6. Brake Horsepower — Manifold Pressure Schedule — Low Blower — Normal Mixture

BRAKE HORSEPOWER — MANIFOLD PRESSURE SCHEDULE
LOW BLOWER
MANUAL LEAN MIXTURE

MODEL: C-124C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-63A
FUEL GRADE: 115/145 & 100/130

NOTE:
1. This chart must be used in conjunction with the Low Blower — MANUAL LEAN MIXTURE BHP — RPM Schedule chart.
2. All data good for operation with fuel grade 115/145.
3. For operation with fuel grade 100/130, do not use data above 1800 BHP.
4. Carburetor air temperature = OAT +5°C.
5. Method of obtaining desired brake horsepower outlined in Part 7 (Mission Planning, Cruise).



SAMPLE PROBLEM:
A. Indicated CAT = +5°C.
B. Pressure altitude = 11,000 feet.
C. Desired BHP = 1400.
D. Same as B.
E. Same as A.
F. MAP setting = 30.7 inches Hg (full throttle).

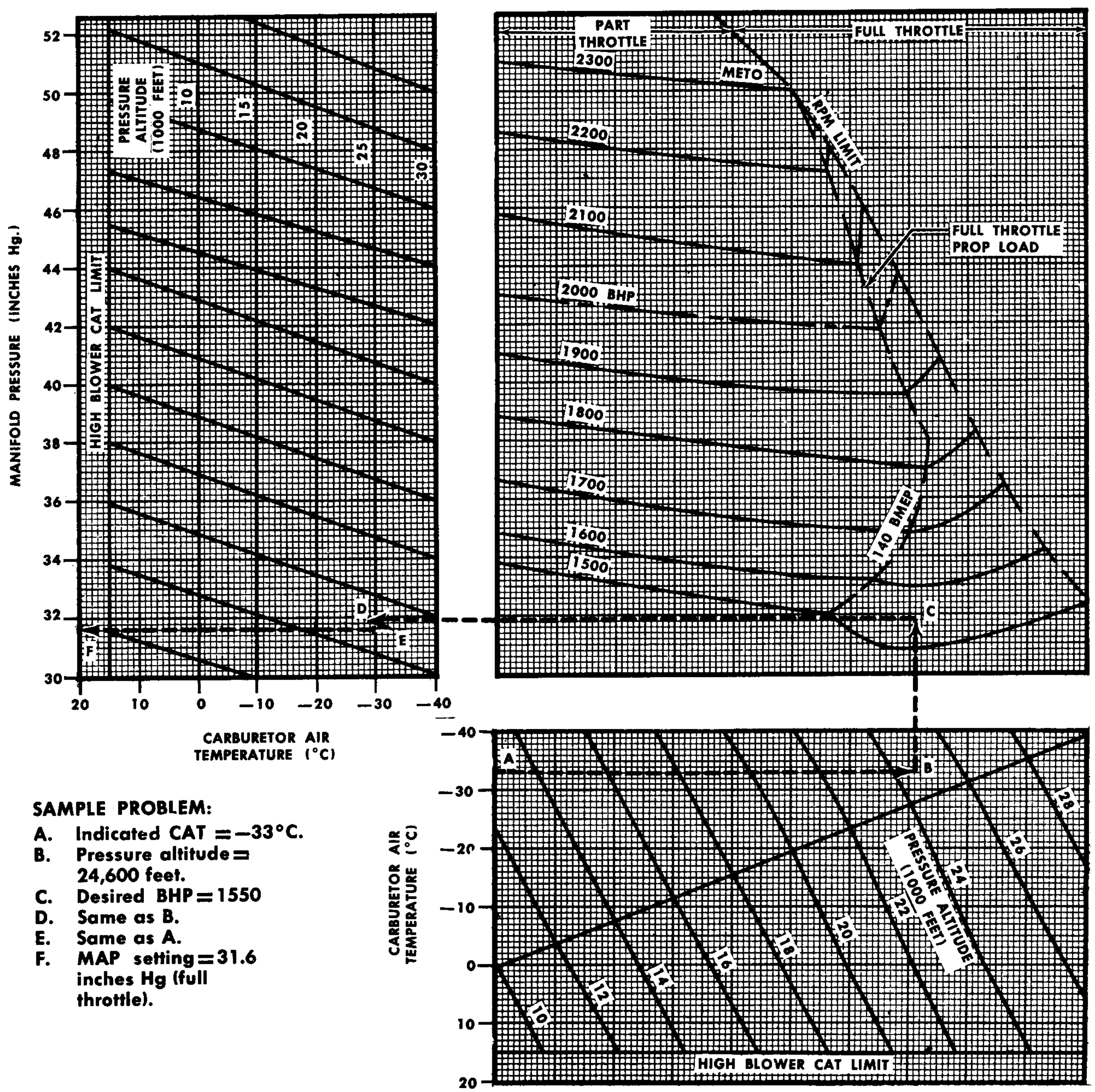
Figure A2-7. Brake Horsepower — Manifold Pressure Schedule — Low Blower — Manual Lean Mixture

BRAKE HORSEPOWER — MANIFOLD PRESSURE SCHEDULE
HIGH BLOWER
NORMAL MIXTURE

MODEL: C-124C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-63A
FUEL GRADE: 115/145 & 100/130

NOTE:
1. This chart must be used in conjunction with the High Blower — NORMAL MIXTURE BHP — RPM Schedule chart.
2. All data good for operation with fuel grade 115/145.
3. For operation with fuel grade 100/130, do not use data above 2000 BHP. If higher BHP operation is desired, lower CAT limits must be maintained. See alternate fuel grade operating limits table in Section V, T.O. 1C-124A-1 (Operating Limitations) for high blower METO BHP CAT limits.
4. Carburetor air temperature = OAT +5°C.
5. Method of obtaining desired brake horsepower outlined in Part 7 (Mission Planning, Cruise).



SAMPLE PROBLEM:
A. Indicated CAT = −33°C.
B. Pressure altitude = 24,600 feet.
C. Desired BHP = 1550
D. Same as B.
E. Same as A.
F. MAP setting = 31.6 inches Hg (full throttle).

R1-541

Figure A2-8. Brake Horsepower — Manifold Pressure Schedule — High Blower — Normal Mixture

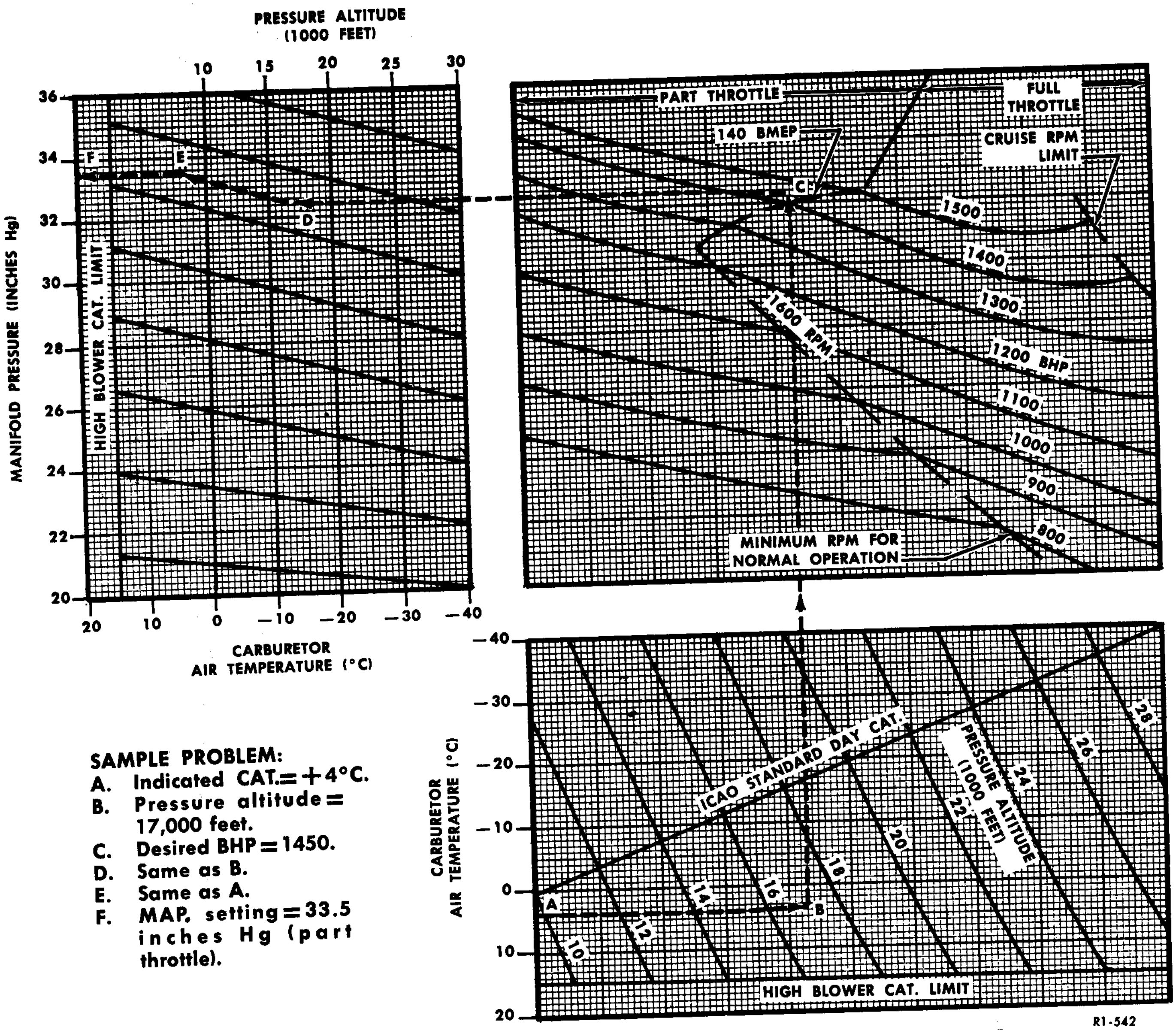
BRAKE HORSEPOWER — MANIFOLD PRESSURE SCHEDULE
HIGH BLOWER
MANUAL LEAN MIXTURE

MODEL: C-124C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-63A
FUEL GRADE: 115/145 & 100/130

NOTE:

1. This chart must be used in conjunction with the High Blower-MANUAL LEAN MIXTURE BHP-RPM Schedule chart.
2. Carburetor air temperature = OAT. + 5°C.
3. Method of obtaining desired brake horsepower outlined in part 7 (Mission Planning, Cruise).
4. All data good for operation with fuel grade 115/145 and 100/130.



SAMPLE PROBLEM:

- A. Indicated CAT. = +4°C.
- B. Pressure altitude = 17,000 feet.
- C. Desired BHP = 1450.
- D. Same as B.
- E. Same as A.
- F. MAP. setting = 33.5 inches Hg (part throttle).

R1-542

Figure A2-9. Brake Horsepower — Manifold Pressure Schedule — High Blower — Manual Lean Mixture

TORQUE PRESSURE VS RPM AND BHP

MODEL: C-124C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

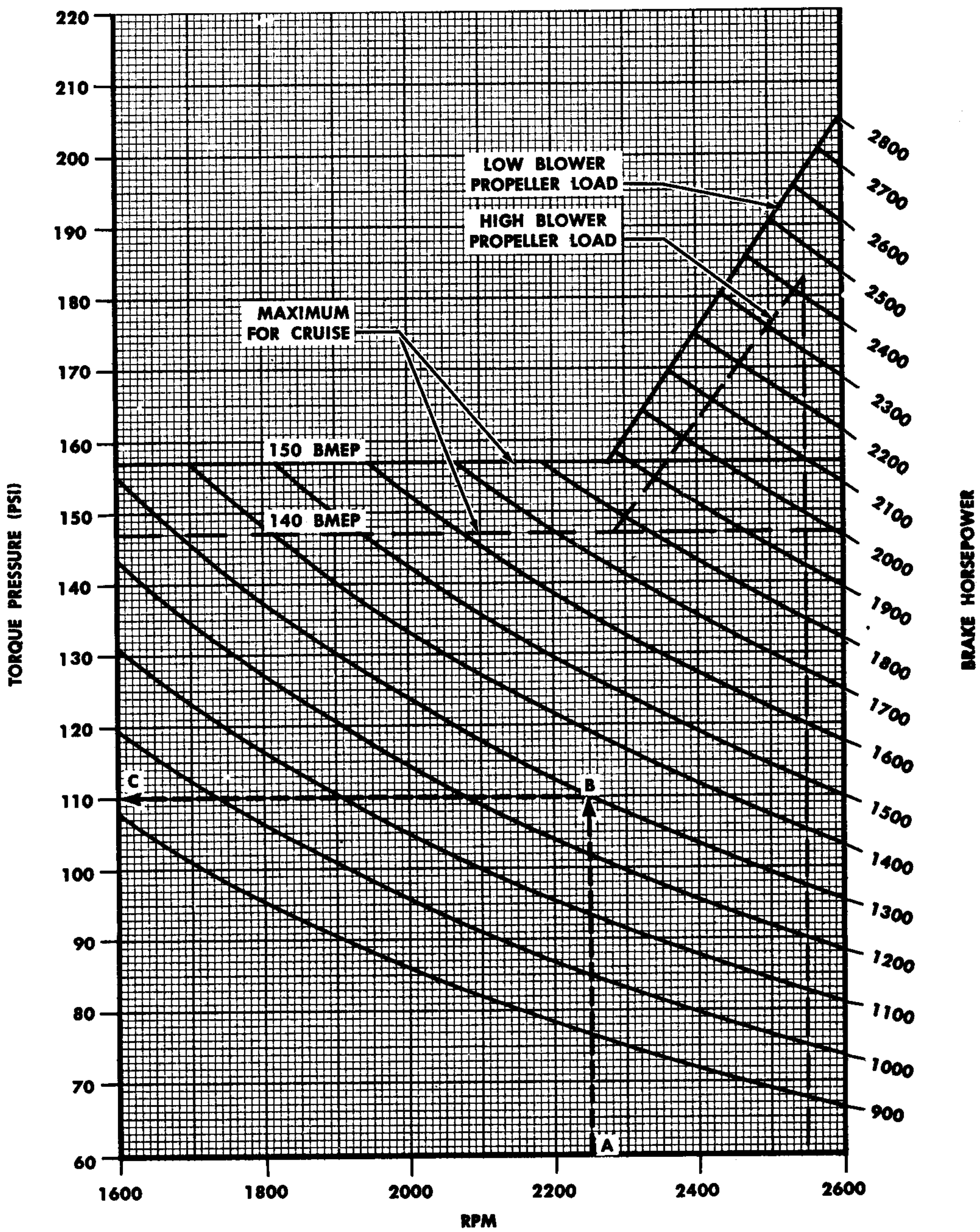
ENGINES: (4) P&W 4360-63A
FUEL GRADE: 115/145 & 100/130

$$TP = \frac{BHP}{0.00524 \times RPM}$$

$$BMEP = 0.9518 \times TP$$

$$BMEP = 181.65 \frac{BHP}{RPM}$$

SAMPLE PROBLEM:
A. RPM = 2250.
B. BHP = 1300.
C. Torque pressure = 110 PSI.



NOTE:
See Operating Limitations for R-4360-63A Engine with Alternate Grade 100/130 Fuel in Section V, T.O. 1C-124A-1.

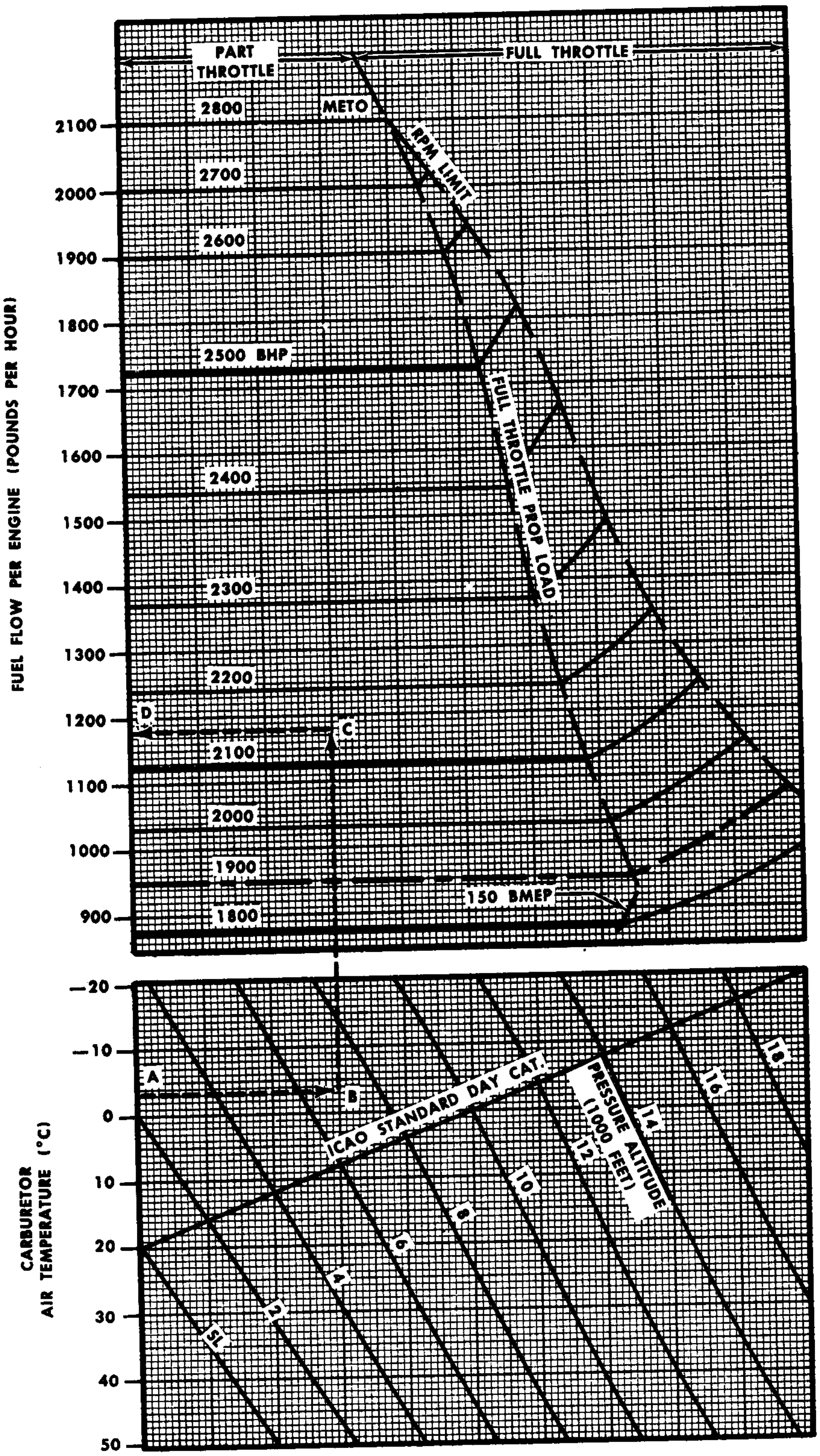
R1-514

Figure A2-10. Torque Pressure Vs RPM and BHP

FUEL FLOW
LOW BLOWER — NORMAL MIXTURE
FUEL GRADES 115/145 & 100/130

MODEL: C-124C
DATE: 7-15-60
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-63A



NOTE:

1. This chart must be used in conjunction with the Low Blower–NORMAL MIXTURE BHP-RPM schedule chart.
2. For operation with fuel grade 115/145 do not use data below the dash-dot line (— - — -).
3. All data good for operation with fuel grade 100/130.
4. Valid at all speeds.
5. Carburetor air temperature = OAT. + 5°C.
6. Method of obtaining desired brake horsepower outlined in Part 7 (Mission Planning, Cruise).

SAMPLE PROBLEM:

A. Indicated CAT. = −3°C.
B. Pressure altitude = 7000 feet.
C. Desired BHP = 2150.
D. Fuel flow per engine = 1180 pounds per hour.

R1-506

Figure A2-11. Fuel Flow — Low Blower — Normal Mixture — Fuel Grade 115/145 and 100/130

FUEL FLOW
LOW BLOWER — MANUAL LEAN MIXTURE
FUEL GRADES 115/145 & 100/130

MODEL: C-124C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-63A
FUEL GRADE: 115/145 & 110/130

NOTE:

1. This chart must be used in conjunction with the Low Blower — MANUAL LEAN MIXTURE BHP-RPM Schedule chart.
2. All data good for operation with fuel grade 115/145.
3. For operation with fuel grade 100/130, do not use data above 1800 BHP.
4. Valid at all speeds.
5. Carburetor air temperature = OAT. + 5°C.
6. Method of obtaining desired brake horsepower outlined in Part 7 (Mission Planning, Cruise).

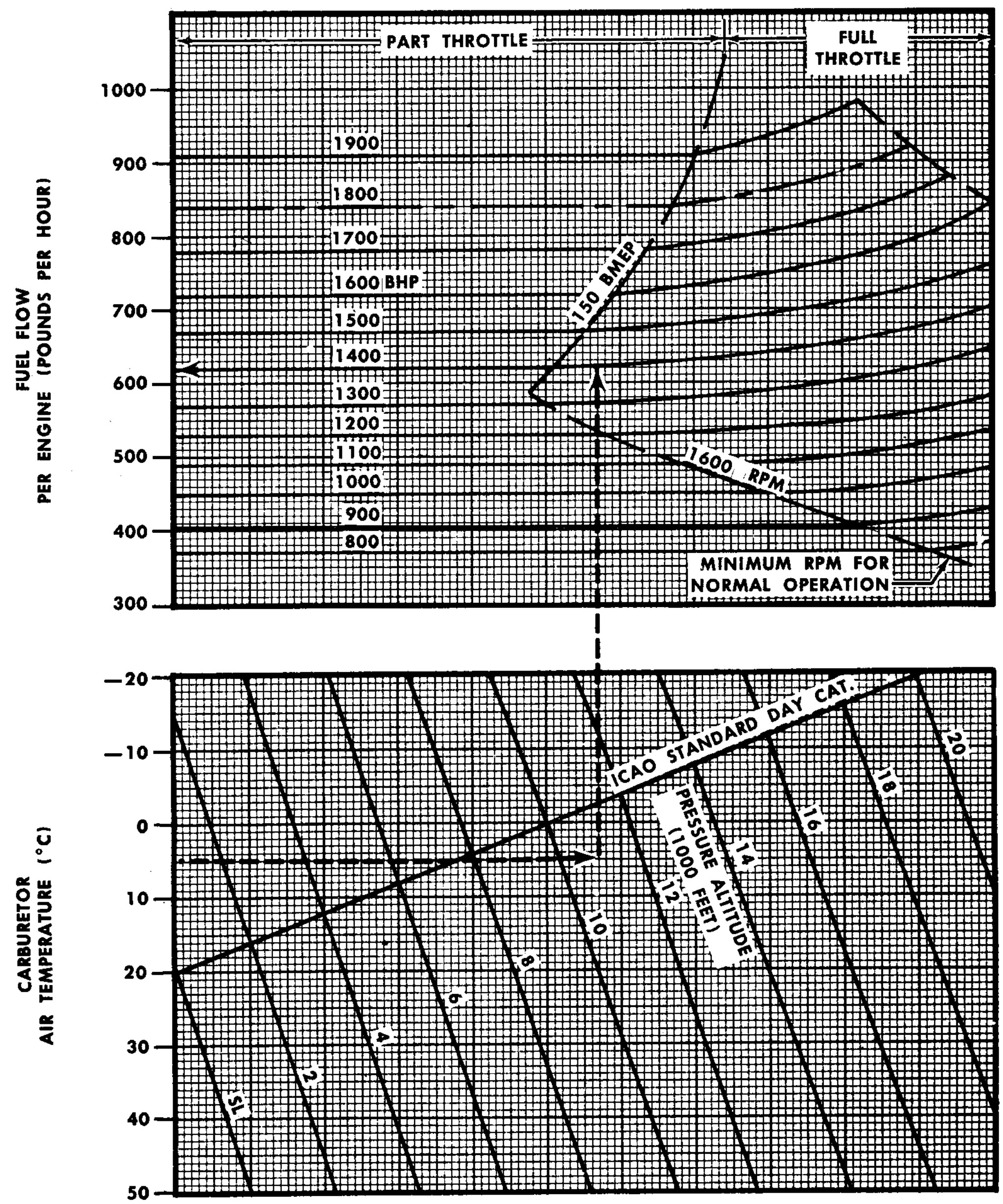


Figure A2-12. Fuel Flow — Low Blower — Manual Lean Mixture — Fuel Grades 115/145 and 100/130

R1-507

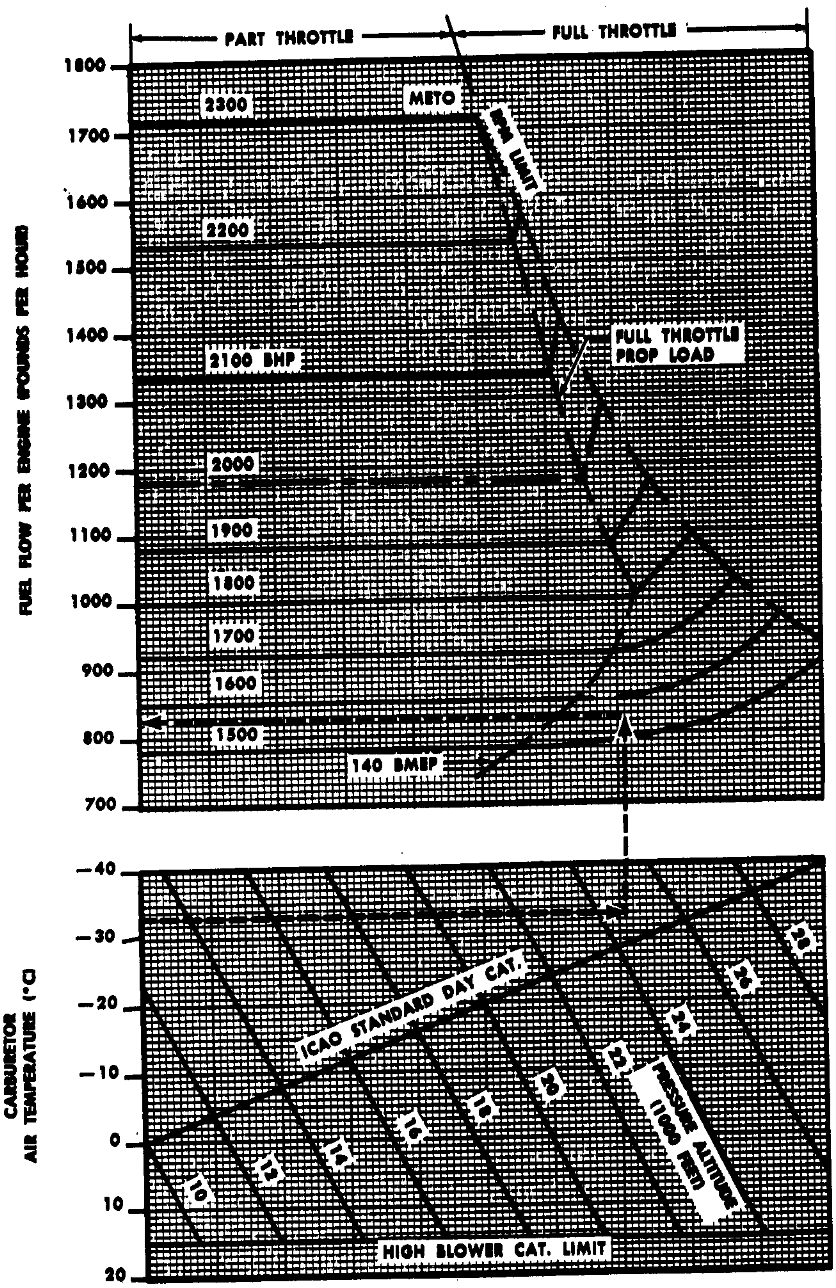
MODEL: C-124C
DATE: 7-15-60
DATA BASIS: FLIGHT TEST

FUEL FLOW
HIGH BLOWER — NORMAL MIXTURE
FUEL GRADES 115/145 & 100/130

ENGINES: (4) P&W 4360-63A

NOTE:

1. This chart must be used in conjunction with the High Blower-NORMAL MIXTURE BHP-RPM Schedule chart.
2. All data good for operation with fuel grade 115/145.
3. For operation with fuel grade 100/130, do not use data above the dash-dot line (— · —). If higher BHP operation is desired, lower CAT. limits must be maintained. See alternate fuel grade operating limits table in Section V (Operating Limitations) for high blower METO BHP CAT. limits.
4. Valid at all speeds.
5. Carburetor air temperature = OAT. + 5°C.
6. Method of obtaining desired brake horsepower outlined in part 7 (Mission Planning, Cruise).



R1-508

Figure A2-13. Fuel Flow — High Blower — Normal Mixture — Fuel Grades 115/145 and 100/130

FUEL FLOW
HIGH BLOWER — MANUAL LEAN MIXTURE
FUEL GRADES 115/145 & 100/130

MODEL: C-124C
DATE: 7-15-60
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-63A

NOTE:

1. This chart must be used in conjunction with the High Blower — MANUAL LEAN MIXTURE BHP — RPM Schedule chart.
2. All data good for operation with fuel grades 115/145 & 100/130.
3. Valid at all speeds.
4. Carburetor air temperature = OAT. + 5°C.
5. Method of obtaining desired brake horsepower outlined in Part 7 (Mission Planning, Cruise).

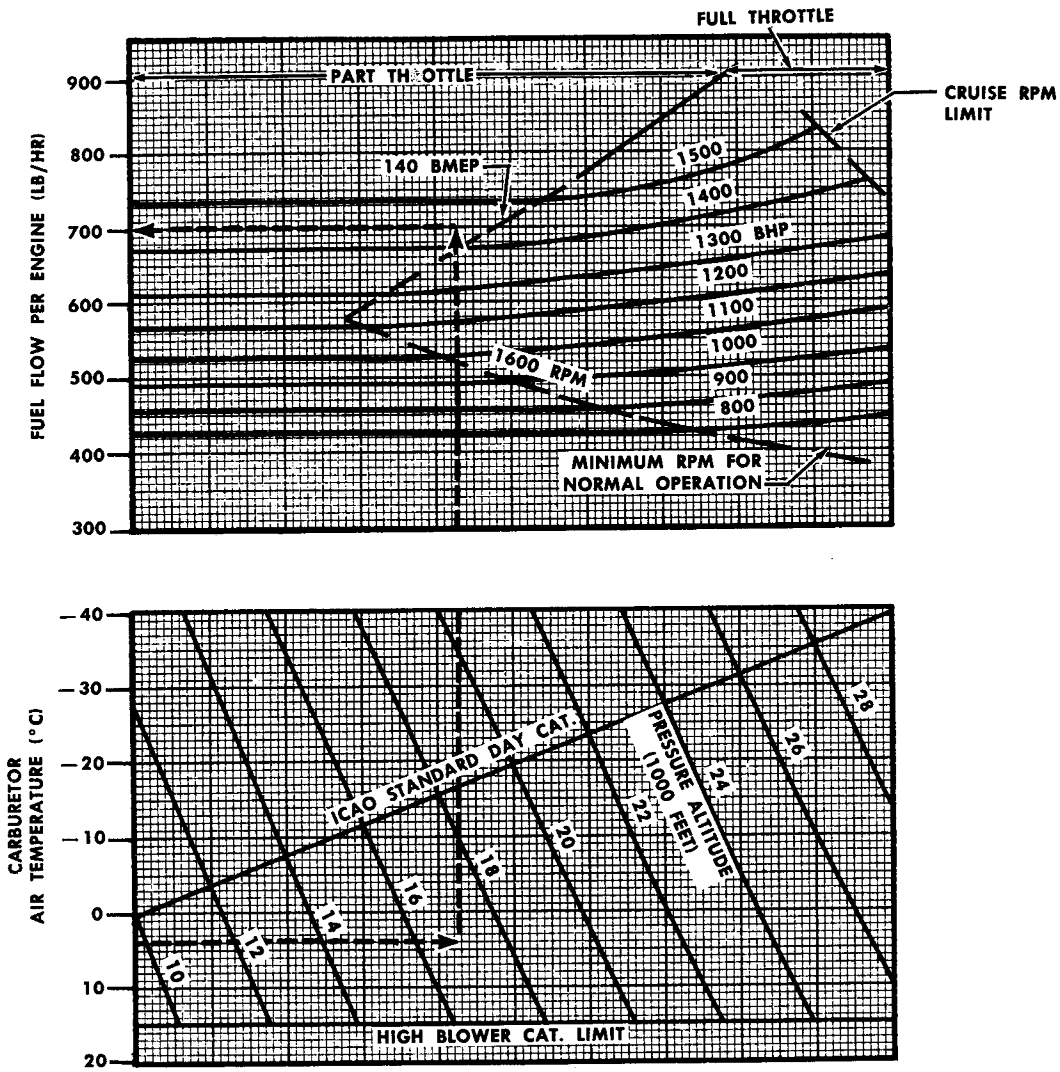


Figure A2-14. Fuel Flow — High Blower — Manual Lean Mixture — Fuel Grades 115/145 and 100/130

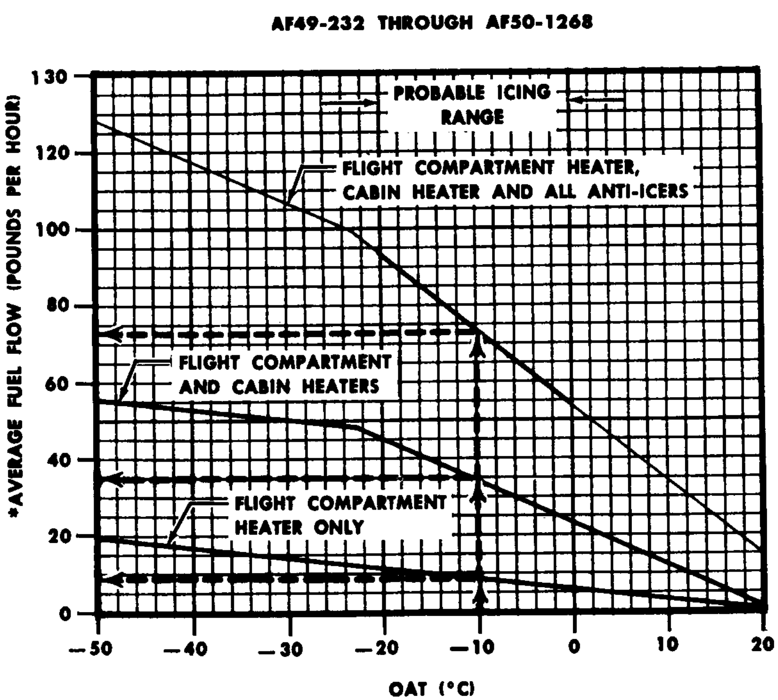
HEATER FUEL CONSUMPTION

MODEL: C-124A/C
DATE: 12-15-63
DATA BASIS: ESTIMATED

ENGINES: (4) P&W 4360-20WD/-63A
FUEL GRADE: 115/145 & 100/130

LEGEND:
——— T.O. 1C-124-336 INCORPORATED
– – – T.O. 1C-124-336 NOT INCORPORATED

NOTES:
1. Values of average fuel flow are based on 175 knots IAS cruise at 10,000 feet altitude.
*2. Add 10 pounds per hour for windshield heater.



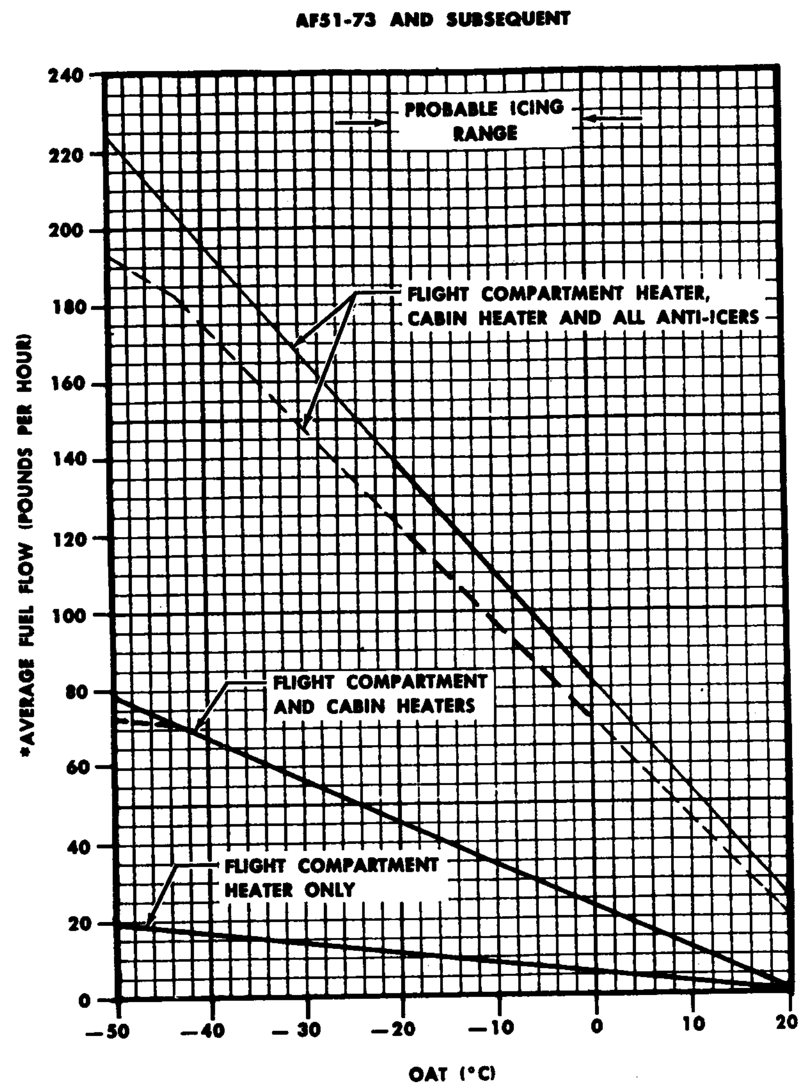


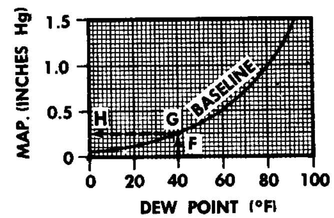
Figure A2-15. Heater Fuel Consumption

MAXIMUM BRAKE HORSEPOWER — WET

FUEL GRADE 115/145
2800 RPM

MODEL: C-124C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-63A
FUEL GRADE: 115/145



NOTE:
1. Maximum allowable MAP. of 62.5 inches Hg at sea level. (See note 2.)
2. Part throttle MAP may be increased up to 1.5 inches Hg due to existing vapor pressure.
3. Wet power operation is limited to OAT's above the freezing temperature of the water-alcohol mixture in use.
4. Installation loss assumed = 100 BHP.
5. Carburetor air temperature = OAT +5°C.
6. All data shown for low blower only.

SAMPLE PROBLEM 1:
A. Pressure altitude = 1000 feet.
B. CAT = +10°C; MAP = 62.2 inches Hg (part throttle).
C. Dew point correction baseline.
D. Dew point temperature = +40°F.
E. Humidity correction baseline (see note 2).
F. Same as D.
G. Humidity correction baseline.
H. Allowable MAP increase for humidify = +0.25 inches Hg. Corrected MAP = 62.2 +0.25 = 62.45 inches Hg.
J. Same as H.
K. Predicted power variation = 0%.
L. Predicted torque pressure = 251.5 PSI.
M. Predicted power = 3690 BHP.
N. Reject power variation = −5%.
O. Reject torque pressure = 239 PSI.

SAMPLE PROBLEM 2:
S. Pressure altitude = 3250 feet.
T. CAT. = −25°C; MAP. = 61 inches Hg (full throttle).
U. Dew point correction baseline. For this CAT dew point is less than 0°F.
V. MAP correction baseline.
W. MAP correction = −2.1 inches Hg. Corrected MAP for 3800 BHP limit (259 PSI torque) = 61 − 2.1 = 58.9 inches Hg.
X. Predicted power variation = 0%. Predicted torque pressure = 259 PSI limit. Predicted power = 3800 BHP limit.
Y. Reject power variation = −5%.
Z. Reject torque pressure = 246 PSI.

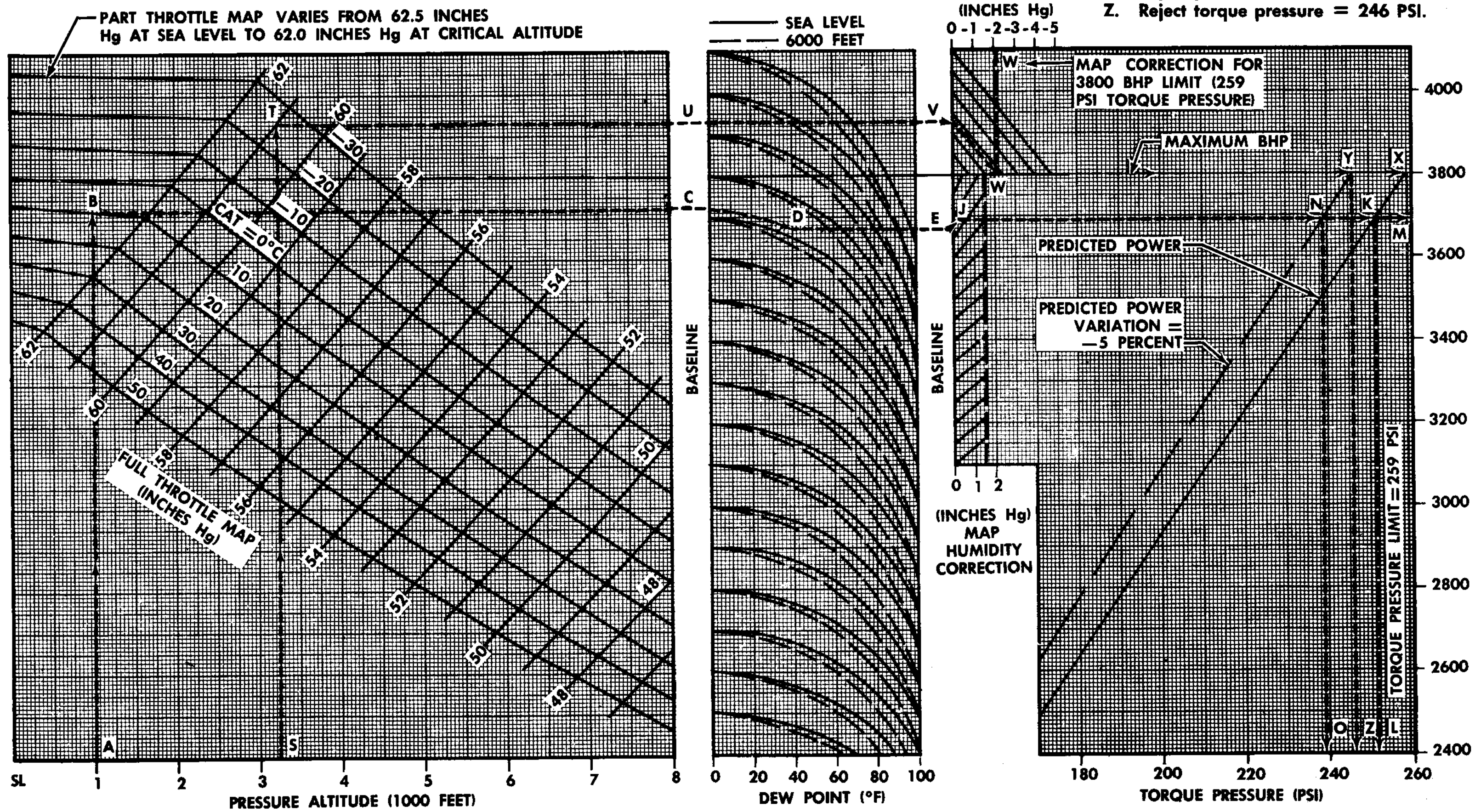


Figure A2-16. Maximum Brake Horsepower — Wet (Sheet 1 of 3)

MAXIMUM BRAKE HORSEPOWER — WET

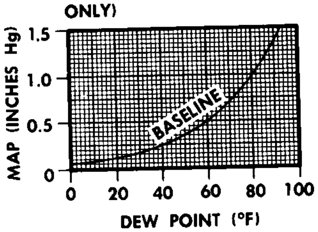
FUEL GRADE 100/130
2800 RPM

MODEL: C-124C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-63A
FUEL GRADE: 100/130

NOTE:

1. Maximum allowable MAP of 58.5 inches Hg at sea level (See note 2).
2. Part throttle MAP may be increased up to 1.5 inches Hg due to existing vapor pressure.
3. Wet power operation is limited to OAT's above the freezing temperature of the water-alcohol mixture in use.
4. Installation loss assumed = 100 BHP.
5. Carburetor air temperature = OAT +5°C.
6. All data shown for low blower only (High blower for high altitude not practical).



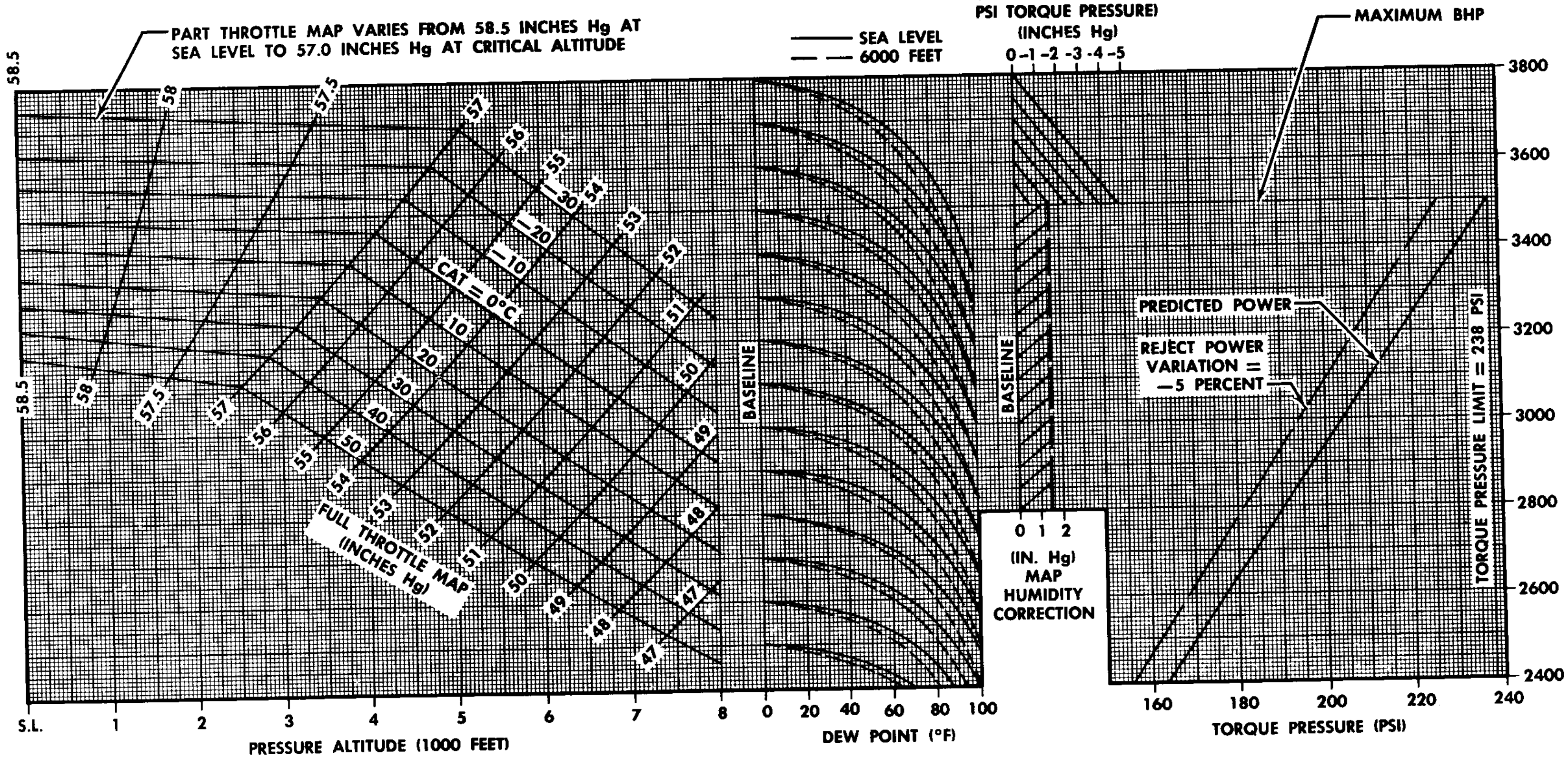


Figure A2-16. Maximum Brake Horsepower — Wet (Sheet 2 of 3)

ENGINES: (4) P&W 4360-63A
FUEL GRADE: 115/145 & 100/130

MAXIMUM BRAKE HORSEPOWER — WET

2800 RPM
FUEL GRADE: 115/145 & 100/130

MODEL: C-124C
DATE: 12-15-63
DATA BASIS: ESTIMATED

NOTE:
1. Wet power operation is limited to OAT's above the freezing temperature of the water-alcohol mixture in use.
2. Installation loss assumed = 100 BHP.
3. Carburetor air temperature = OAT. + 5°C.
4. All data shown for low blower only (High blower for high altitude not practical).

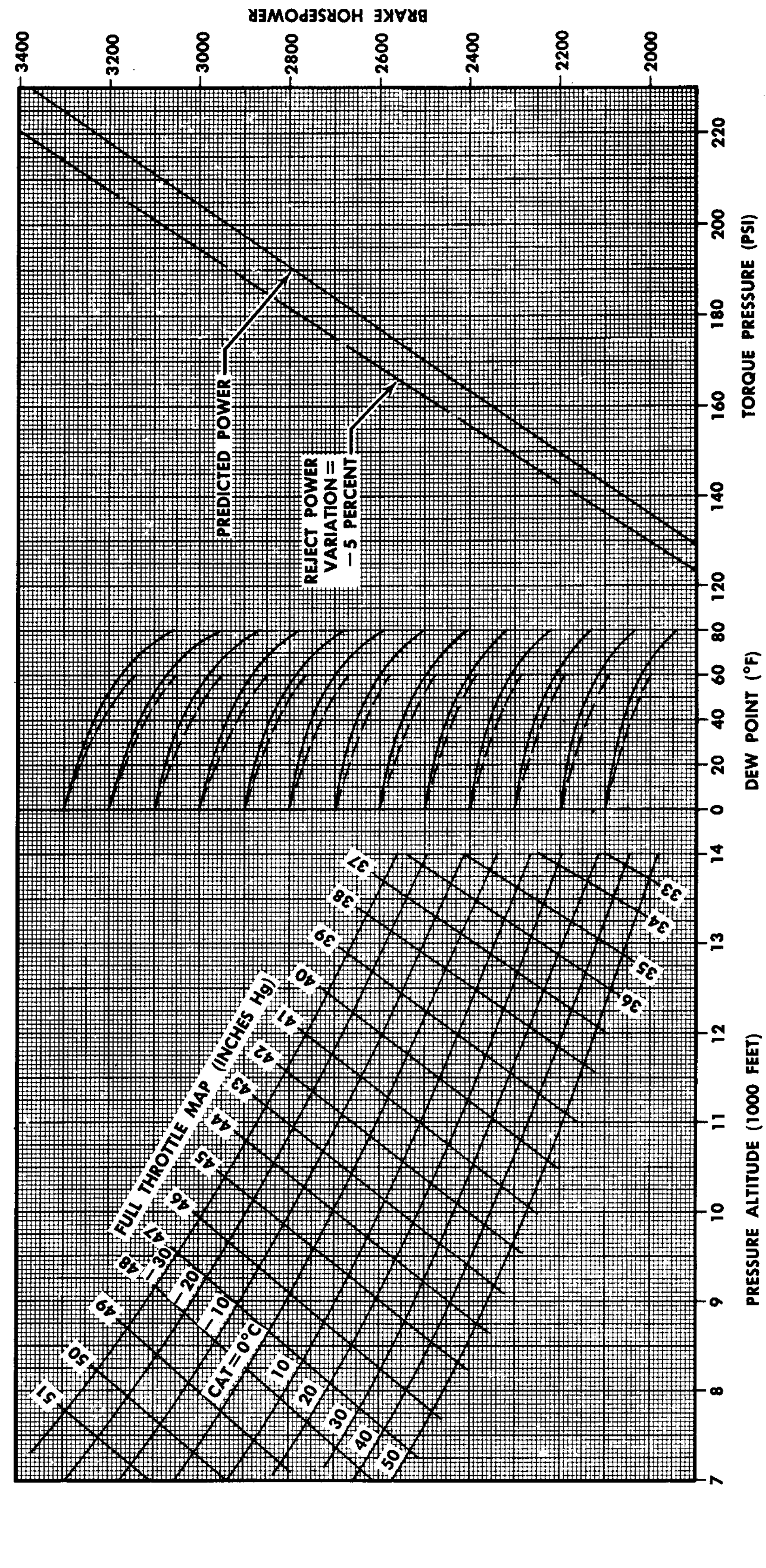


Figure A2-16. Maximum Brake Horsepower — Wet (Sheet 3 of 3)

MAXIMUM BRAKE HORSEPOWER—DRY

FUEL GRADE 115/145—2800 RPM

MODEL: C-124C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-63A
FUEL GRADE: 115/145

NOTE:

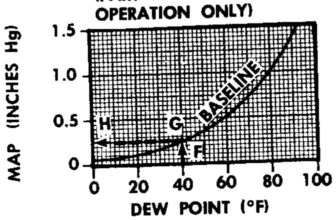
1. Maximum allowable MAP of 63.0 inches Hg at sea level. (See note 2.)
2. Part throttle MAP may be increased up to 1.5 inches Hg due to existing vapor pressure.
3. Installation loss assumed=100 BHP.
4. Carburetor air temperature=OAT +5°C.
5. All data shown for low blower only.

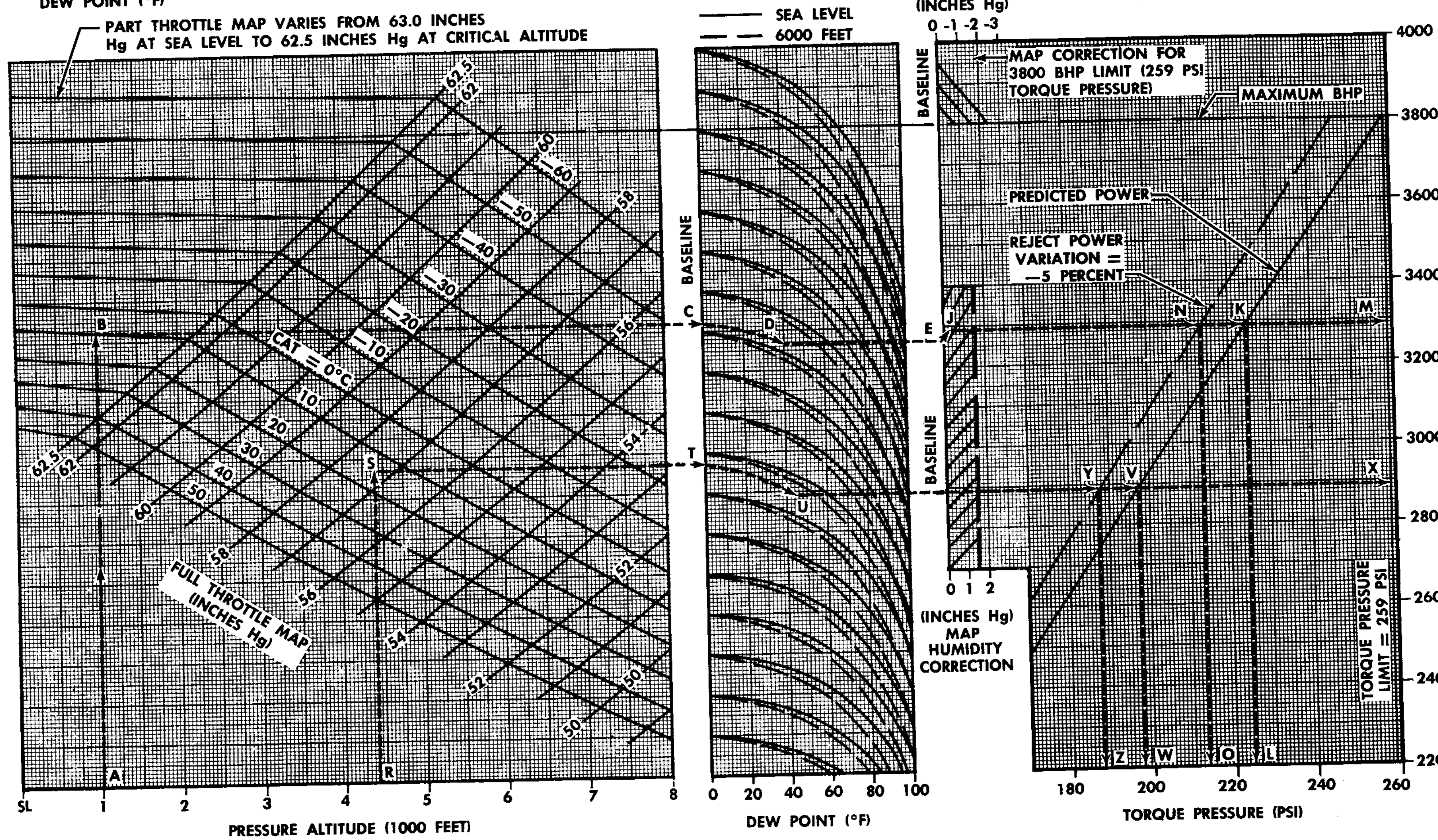
SAMPLE PROBLEM 1:

A. Pressure altitude=1000 feet.
B. CAT = +10°C; MAP =62.75 inches Hg (part throttle).
C. Dew point correction baseline.
D. Dew point temperature= +40°F.
E. Humidity correction baseline (see note 2).
F. Same as D.
G. Humidity correction baseline.
H. Allowable MAP increase for humidity= +0.25 inches Hg. Corrected MAP =62.75 +0.25=63.0 inches Hg.
J. Same as H.
K. Predicted power variation=0%.
L. Predicted torque pressure=224.5 PSI.
M. Predicted power=3290 BHP.
N. Reject power variation=−5%.
O. Reject torque pressure=213.5 PSI.

SAMPLE PROBLEM 2:

R. Pressure altitude=4400 feet.
S. CAT = +15°C; MAP =57.3 inches Hg (full throttle).
T. Dew point correction baseline.
U. Dew point temperature= +45°F.
V. Predicted power variation=0%.
W. Predicted torque pressure=197.5 PSI.
X. Predicted power=2890 BHP.
Y. Reject power variation= −5%.
Z. Reject torque pressure=187.5 PSI.





R1-581

Figure A2-17. Maximum Brake Horsepower — Dry (Sheet 1 of 3)

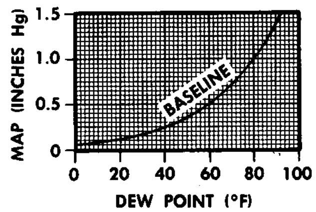
MAXIMUM BRAKE HORSEPOWER — DRY

FUEL GRADE 100/130
2800 RPM

MODEL: C-124C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-63A
FUEL GRADE: 100/130

NOTE:
1. Maximum allowable MAP of 60 inches Hg at sea level (See note 2).
2. Part throttle MAP may be increased up to 1.5 inches Hg due to existing vapor pressure.
3. Installation loss assumed = 100 BHP.
4. Carburetor air temperature = OAT +5°C.
5. All data shown for low blower only (High blower for high altitude not practical).



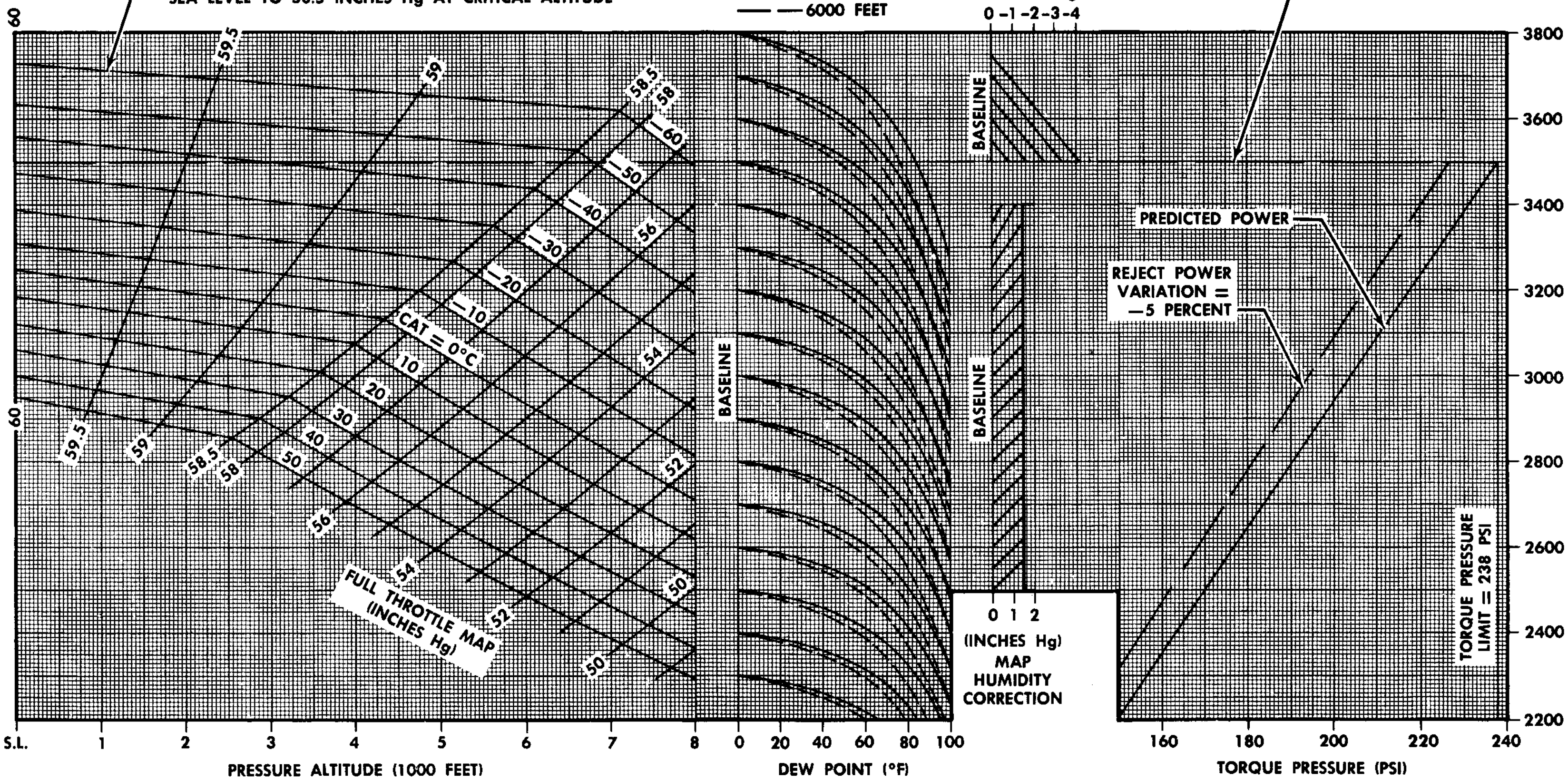
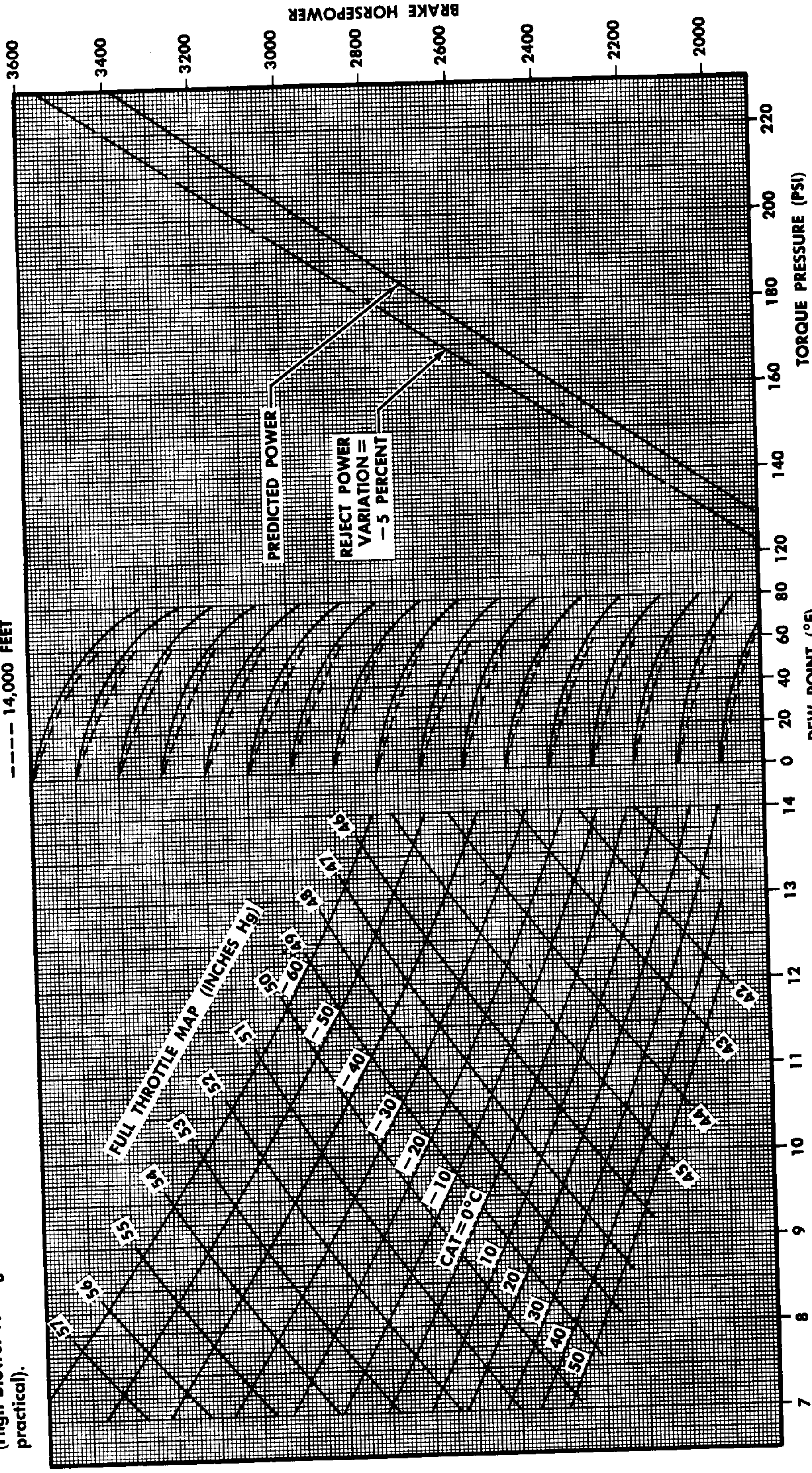


Figure A2-17. Maximum Brake Horsepower — Dry (Sheet 2 of 3)

ENGINES: (4) P&W 4360-63A
FUEL GRADE 115/145 & 100/130

MAXIMUM BRAKE HORSEPOWER — DRY
FUEL GRADE 115/145 & 100/130
2800 RPM



NOTE:
1. Installation loss assumed = 100 BHP.
2. Carburetor air temperature = OAT + 5°C.
3. All data shown for low blower only (High Blower for high altitude not practical).

MODEL: C-124C
DATE: 12-15-63
DATA BASIS: ESTIMATED

R1-582

Figure A2-17. Maximum Brake Horsepower — Dry (Sheet 3 of 3)

EFFECT OF HUMIDITY ON MAX POWER

MODEL: C-124C
DATE: 7-15-60
DATA BASIS: CALCULATED

ENGINES: (4) P&W 4360-63A

SAMPLE PROBLEM:

A. Vapor pressure = .20 inches Hg.
B. Dew point = 34° F.
C. Altitude = 7000 feet.

OR D. Specific humidity = 0.0056.

E. Max dry power.
F. Percent loss in max horsepower = 1.8%.

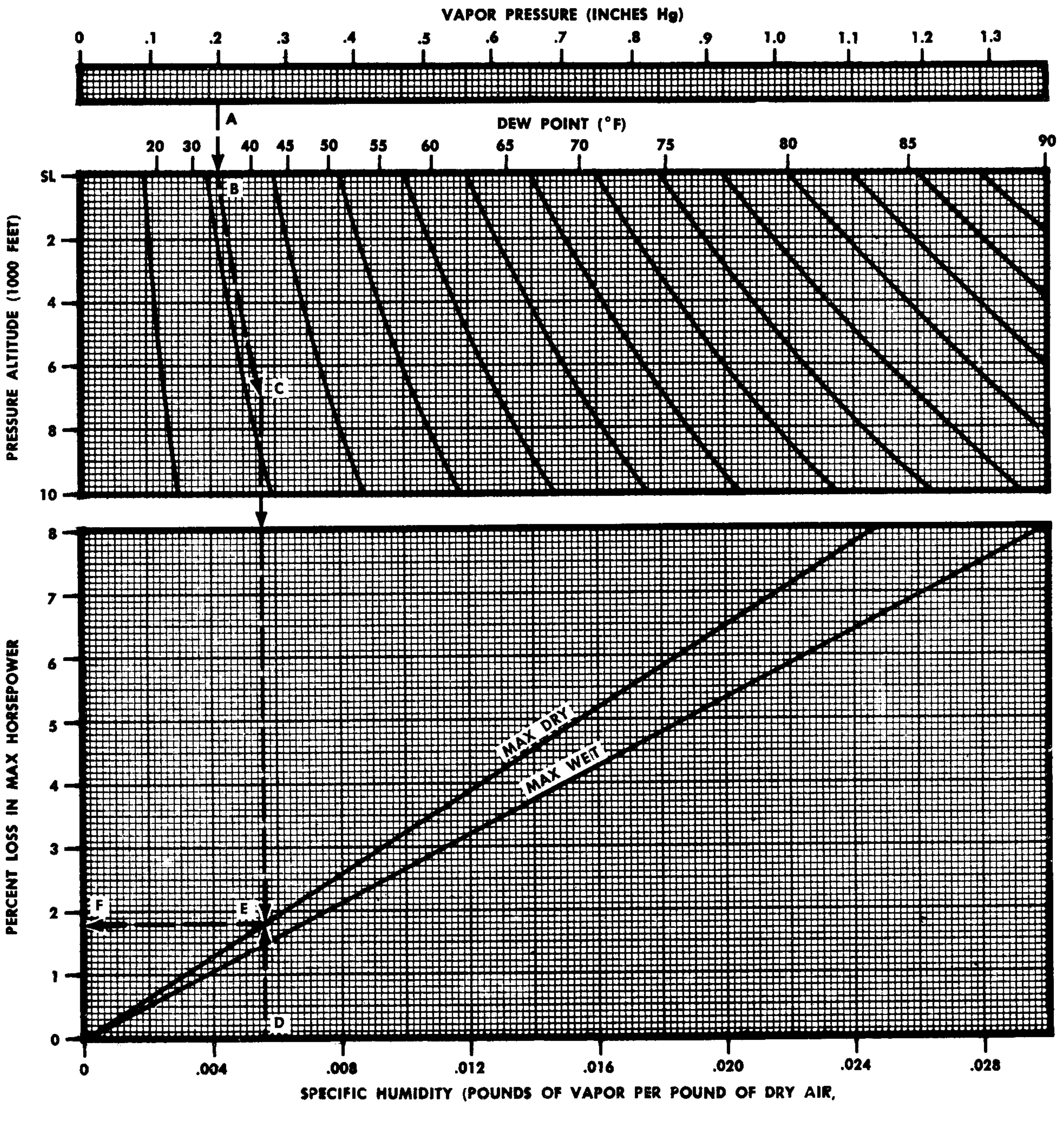


Figure A2-18. Effect of Humidity on Max Power

PART III

TAKEOFF

TABLE OF CONTENTS

LIST OF CHARTS

TAKEOFF PERFORMANCE.

Data in this section provides all the informa-tion necessary to predict the takeoff per-formance and field length requirements for C-124C aircraft. Data are based on the par-tial span wing flap configuration (AF51-5173 and subsequent). Where necessary, correc-tion factors are included to obtain perform-ance data for aircraft with full span wing flaps (AF49-243 through AF51-182). Wing flap deflections of 20 degrees, 10 degrees and zero degrees have been used in the pres-entation. It has been determined from flight tests that 20 degrees wing flaps give the most desirable over-all operation during take-off, providing the best compromise between takeoff ground requirements and climbout characteristics. If the takeoff weight under some circumstances is limited because of climbout characteristics with wing flaps 20 degrees, and sufficient runway is available, data are provided for takeoff planning with wing flaps 10 degrees.

Data for zero degrees wing flaps takeoff (ground run, gross weight limited by critical field length and refusal speed charts) and a three-engine takeoff ground run chart with wing flaps 20 degrees are provided only to facilitate takeoff planning in the event an emergency fly away is necessary, or in the event takeoff is required because mainte-nance or repair facilities are not available. Consideration should be given, in the selection of the takeoff gross weight for three-engine takeoff, to the possibility of a second engine becoming inoperative. The two-engine emergency climb charts should be checked to insure a reasonable climb capability in this configuration. The three-engine takeoff chart is based on one outboard engine inoperative, propeller feathered, with power on the opposite engine varied from idle at brake release to full power at 60 knots IAS.

All data presented in this part are based on takeoff at 105 percent of power-off stall speed. It should be noted that, at max power, the power-on stall speed is approximately 10 knots lower than the power-off stall speed. However, operation at speeds less than 105 percent of power-off stall speed is not recommended. A sample problem appears on each chart to illustrate its use.

GROUND EFFECT.

Ground effect, in general, refers to a reduction in the overall drag of an airplane when operated in close proximity to the ground. The degree of drag reduction will vary with the distance of the wing or supporting surface from the ground, being greatest when the wing is at ground level, and will have, for all practical purposes, disappeared when the wing is one-half the wing span above the ground. The reduction in drag is also greatest at low velocities and becomes a lesser reduction as velocity increases. All of the takeoff charts pertaining to the ground roll consider the reduction in drag due to ground effect. The only inflight data which includes ground effect are the climbout factor charts and the two-engine operation in ground effect charts.

APPLICATION OF WINDS TO TAKEOFF AND LANDING DATA.

Wind Direction and Velocity.

Winds usually are measured at some fixed point on the airfield and, within instrumentation limits, are valid for the geographical point where measured. However, if the airfield is located in an area of variable terrain the possibility exists that other various portions of the airfield winds of greater or lesser magnitude and direction may be experienced. Likewise, wind shear can result in varying wind as altitude is gained or lost on climbouts and landing approach patterns.

Because of these variables, it is recommended that the winds be applied in accordance with the Wind Summary charts.

Accounting for Wind.

The conservative approach is to accept the benefits of headwinds as an increased safety margin. Therefore, headwinds should only be considered when necessary for mission accomplishment. It is important to remember that if this approach is used, no corrections for headwind should be made to any distance or speed except when computing acceleration check. Always apply tailwinds. When headwinds or tailwinds are applied, all distances and speeds except takeoff speed and ground minimum control speed must be corrected during takeoff planning. Always apply the crosswind component and headwind gust increment to the takeoff speed, threshold speed and landing speed.

In planning a mission using winds, one of the first problems will be the determination of takeoff speed. There are three basic wind induced reasons for adjusting takeoff speed. Each condition must be investigated and the higher values used for takeoff. Then since the takeoff velocity is adjusted, the distances for ground roll, critical field length, refusal, etc., which are presented for a no wind takeoff velocity must be corrected to the higher velocity.

The crosswind component chart provides the first adjustment to takeoff velocity. This chart is designed to provide information as to whether

TYPE OF WIND	HOW TO OBTAIN COMPONENT	USE OF WIND COMPONENT
HEADWIND	Runway Component Enter wind component chart with steady wind value.	Apply 100% of component to acceleration check. Apply 50% of component to all takeoff and landing distances. Do not apply headwinds for terrain clearance.
TAILWIND	Runway Component Enter wind component chart with steady wind value plus the gust increment.	Apply 100% of component to acceleration check. Apply 150% of component to all takeoff and landing distances. Apply 150% of component for terrain clearance.
CROSSWIND	Crosswind Component Enter wind component chart with steady wind value plus the gust increment.	Adjust ground minimum control speed for 100% of component. Check necessity of increased takeoff and landing speeds.
GUSTS	Gust Increment Reported wind in excess of steady wind value.	Increase takeoff speed, threshold speed, and landing speed by the full gust increment not to exceed 10 knots.

Figure A3-1A. Wind Summary

directional control, using aerodynamic controls alone, is available at liftoff. If the no wind takeoff speed, crosswind relationship is such that this mode of control could be achieved, the takeoff velocity is increased as explained on the chart. The steady wind is used for this calculation.

Due to the omnidirectional characteristics of gusty winds, a possibility exists of a gust from head-on that will give a high airspeed reading. Trouble can then arise if liftoff is made and the gust decays. Therefore, the takeoff speed should be increased by the full gust increment not to exceed 10 knots.

With multi-engine aircraft a third correction can exist. That is the minimum speed at which directional control can be maintained in flight. This value should be determined from appropriate appendix chart and compared with takeoff velocity, which should not be less than the control speed.

DISCUSSION OF CHARTS.

TAKEOFF TERMS, DEFINITION AND RELATIONSHIP CHART.

The Takeoff Terms —Definition and Relationship chart (figure A3-1) illustrates the relationship of the terms used on the takeoff charts. Curve No. 1 represents the normal four-engine acceleration path. It shows the distance which has been traversed at any engine failure speed. It is similar to a line on the takeoff acceleration chart (figure A3-21) and is used in conjunction with the refusal speed (C) to establish the refusal distance (D), the acceleration check distance (E) and the acceleration check speed (F). Four-engine takeoff speed (I) and distance (J) are included to show their relationship to the other points discussed here.

Curve No. 2 represents the sum of the distances required to accelerate on four engines to engine failure speed and then to stop.

Curve No. 3 represents the sum of the distances required to accelerate on four engines to engine failure speed and then to continue to accelerate on three engines to takeoff speed. By definition, the intersection of Curves 2 and 3 depicts the critical field length (A) and the critical engine failure speed (B). The intersection of the vertical line representing runway length (H) and Curve 2 depicts refusal speed (C). The intersection of the same vertical line and Curve 3 establishes the minimum engine failure speed (G) from which the takeoff may be continued with the remaining three engines. If the gross weight is heavy enough such that the critical field length is greater than the runway length, speeds (C) and (G) will occur in reverse order. In this case, if an engine fails between speeds (C) and (G), the aircraft can neither stop within nor take off from the remaining runway. Therefore, takeoff gross weight should be limited by critical field length (figures A3-7 through A3-9).

TAKEOFF AND LANDING CROSSWIND CHART.

The Takeoff and Landing Crosswind chart (figure A3-2) presents runway and crosswind components in knots for runway wind angles of zero to 90 degrees for headwinds and 90 to 180 degrees for tailwinds, and for wind speeds up to 60 knots. The minimum nose-wheel lift-off or touchdown speed is presented for wing flap deflections from zero to 45 degrees. Two sample problems appear on the chart to illustrate its use.

TAKEOFF FACTOR CHART.

The Takeoff Factor chart (figure A3-3) is used to simplify the determination of takeoff performance. The takeoff factor is determined from the parameters of density altitude and torque pressure. It is recommended that the reject torque pressure, as determined from the Maximum Brake Horsepower charts (figures A2-16 and A2-17), be used to determine the takeoff factor.

The Takeoff Factor chart is for use with 20, 10 or zero degrees flaps, four- or three-engine operation, and wet or dry power.

The takeoff factor is used to determine gross weight limited by climb performance, gross weight limited by critical field length, refusal speed, takeoff ground run, and gross weight limited by climbout over obstacle.

GROSS WEIGHT LIMITED BY CLIMB PERFORMANCE CHARTS.

The Gross Weight Limited by Climb Performance charts for wing flaps 20, 10, and zero degrees (figures A3-4 through A3-6) show maximum gross weights at which a rate of climb of 100 FPM may be maintained for three-engine operation at any reasonable takeoff factor and torque pressure. The maximum gross weight for 50 FPM rate of climb may be determined by adding the weight shown on each chart. For aircraft with full span wing flaps (AF49-243 through AF51-182) use the following correction factors to obtain corrected gross weight:

Wing flaps = 20 degrees: Subtract 700 pounds.

Wing flaps = 10 degrees: Subtract 1000 pounds.

Wing flaps = zero degrees: No correction necessary.

The charts are based on takeoff power and takeoff speed with gear up, propeller on inoperative engine feathered, and wing flaps at takeoff setting and do not include ground effect. For some conditions a gross weight may be obtained which will exceed the structural limitations on the aircraft. See figure 5-3 of Section V, T.O. 1C-124A-1 for these structural gross weight limitations.

EFFECT OF RUNWAY SLOPE ON CRITICAL FIELD LENGTH.

The Effect of Runway Slope on Critical Field Length chart (figure A3-6) is included to allow correction of the gross weight limited by critical field length for the effect of runway slope. Corrections can be made for slopes from 12 percent (uphill) to -12 (downhill). The chart is used for wing flap settings of 20 degrees, 10 degrees and zero degrees. Since the gross weight limited by critical field length is based on actual runway length, correction for slope must be applied to the actual runway length before entering the critical field length charts.

GROSS WEIGHT LIMITED BY CRITICAL FIELD LENGTH CHARTS.

The Gross Weight Limited by Critical Field Length charts (figures A3-8 through A3-10) illustrate the takeoff performance when an engine failure occurs during the takeoff ground run. These data are presented to establish a takeoff gross weight that will be safe at a given field, under given atmospheric conditions if an engine fails. If the actual gross weight is equal to the gross weight limited by critical field length for the given conditions, the airplane may be stopped after engine failure or a three-engine takeoff may be completed safely, within the available runway length. If an engine failure occurs before the critical engine failure speed is reached, stopping distance is less than the remaining runway length, and the takeoff should be aborted. If the engine failure occurs after the critical engine failure speed is reached, three-engine takeoff distance is less than the remaining runway length (stopping distance is greater than the remaining runway length) and the takeoff should be continued on three engines. The actual gross weight should NEVER be greater than the gross weight limited by critical field length. The critical engine failure speed may be obtained from the refusal speed charts (figures A3-11 through A3-13) by using critical field length for the runway length. The charts are based on aircraft performance with partial span wing flaps. To obtain gross weight limited by critical field length for aircraft with full span wing flaps (AF49-243 through AF51-182), multiply actual field length by 0.99 for wing flap settings of either 20 degrees or 10 degrees (figures A3-8 and A3-9). No correction is necessary for zero degrees flap setting.

The gross weight limited by critical field length charts are based on the following assumptions:

1. Takeoff speed is 105 percent of power-off stall speed.
2. Normal acceleration on four engines to the engine failure speed.
3. Drag after engine failure is equal to drag prior to engine failure plus drag of a windmilling propeller on an inoperative outboard engine, plus the drag of rudder and aileron deflection required to maintain directional control.
4. When the airplane is stopped, a reaction distance corresponding to 3 seconds at engine failure speed is added to the stopping distance to allow time for making the decision to stop, and the application of all necessary controls.
5. Deceleration distance is based on maximum braking plus two-engine reverse thrust.

REFUSAL SPEED CHARTS.

The usual situation during operation of C-124C aircraft is to have an actual runway length greater than the critical field length for the given conditions. Since it is always desirable to safety stop an airplane within the limits of the runway in the event of an engine failure, rather than risk a three-engine takeoff and go-around, the Refusal Speed charts (figures A3-11 through A3-13) are presented to allow the decision to stop to be made at the highest speed possible, not to exceed takeoff speed, and still allow a safe stop. If critical field length and runway length are the same, then refusal speed and critical engine failure speed are identical. If, however, the runway length is greater than critical field length, then the refusal speed may be considerably higher than critical engine failure speed. Therefore, the refusal speed is of primary importance during a takeoff operation. It must be remembered, however, that the validity of the refusal speed is dependent upon a normal four-engine acceleration of the aircraft. If the acceleration is low, the aircraft will have used more runway than predicted in reaching the refusal speed; and insufficient runway will remain in which to stop the airplane. For this reason, use of acceleration check speeds or times is necessary to insure a safe takeoff. The validity of the refusal speed is also dependent upon factors which affect the deceleration of the aircraft. The effects of runway slopes less than 3 percent are negligible for refusal speed. For large runway slopes, the refusal speed may be approximated by using the appropriate downhill or uphill slope correction grid on the refusal speed charts. A correction grid for the effect of winds is also included on the refusal speed charts. Examples are included on each of the charts to illustrate the methods of using the charts with various runway slope conditions. Figure A3-11 is used for the downhill slope example, figure A3-10 for uphill slope, and figure A3-12 for zero slope. To obtain a more accurate refusal speed under combinations of adverse conditions such as runway slope and poor braking RCR, The Distance to Stop For Aborted Takeoff chart (figure A3-22) may be used in conjunction with the Takeoff Acceleration chart (figure A3-21). An example of this method of determining refusal speed is included in Part 7, Mission Planning. The effect of wing flap configuration on refusal speed is negligible and no correction is necessary for aircraft with full span wing flaps.

TAKEOFF GROUND RUN CHARTS.

Field length requirements for takeoff can be determined from figures A3-14 through A3-18. These charts present takeoff ground run for wing flap deflections of 20, 10 and zero degrees with four engines operating, a runway slope correction (figure A3-18) to takeoff ground run, and takeoff ground run with 20 degrees wing flaps deflection for three-engine operation (figure A3-17). For aircraft with full span wing flaps (AF49-243 through AF51-182) multiply takeoff ground run by 0.98 to obtain corrected ground run with wing flaps at either 20 or 10 degrees. No correction is necessary for wing flaps at zero degrees.

TAKEOFF, CLIMBOUT, AND FLAP RETRACTION SPEEDS CHART.

The Takeoff, Climbout and Flap Retraction Speeds charts (figures A3-19 and A3-20) are presented for various aircraft gross weights, for both full span and partial span wing flap configurations. The indicated airspeeds shown are recommended for takeoff and climbout with 20, 10 and zero degrees flaps. Also, the minimum IAS for flap retraction from any flap deflection is given. Flap retraction speed is based on 110 percent of the power-off stalling speed with flaps retracted. Cutoff lines are shown on the chart for minimum directional control speed with one or two engines inoperative. For these conditions the propellers on inoperative engines are windmilling, wing flaps 20, 10 or zero degrees, and max power is being developed by the remaining engines.

TAKEOFF ACCELERATION CHART.

The Takeoff Acceleration chart (figure A3-21) is presented to determine if the airplane acceleration is normal and can be expected to reach the refusal speed at the proper distance down the runway. The velocity which the aircraft should obtain at a given time or distance from brake release may be determined at a particular check point following a guide line from the point where the takeoff speed intersects the distance required for takeoff to a velocity lower than takeoff. If the airspeed at this check point is low, then the airplane is not accelerating properly.

Note

All refusal speeds and field lengths are valid only if the airplane acceleration is normal. Therefore, acceleration checks are necessary to insure safe takeoff operations.

DISTANCE TO STOP FOR ABORTED TAKEOFF CHART.

The Distance to Stop For Aborted Takeoff chart (figure A3-22) presents the distance to stop from a given speed assuming one propeller windmilling, the opposite engine at IDLE, brakes, and two-engines maximum reverse thrust. The chart takes under consideration and corrects for the following variables: (1) Wind, (2) Runway Slope, (3) Density Altitude, (4) Unusual Runway Conditions, (5) Gross Weight. The unusual runway conditions taken into account are dry hard runway surfaces, dry turf, wet concrete or macadam, snow or wet grass, and ice.

Note

Utilizing braking force only, the aircraft will slide downhill on runways of slope greater than 11. 0 percent for wet concrete or macadam, 8. 0 percent for snow or wet grass, and 4. 8 percent for ice.

CLIMBOUT FACTOR CHARTS.

The Climbout Factor charts (figures A3-23 and A3-24) are used in conjunction with the Gross Weight Limited by Climbout Over Obstacle chart (figure A3-13). Charts are included for three-engine climbout with wing flaps 20 and 10 degrees. Ground effect has been included and the recommended cowl flap angle of 9 degrees is used. When terrain clearance is of primary concern, the climbout speed is maintained at 105 percent of power-off stalling speed for maximum angle of climb.

For each configuration two charts are presented. The first is for obstacle heights of zero to 200 feet and horizontal distances from 1, 000 to 12, 000 feet (based on critical field length). This chart also has a tailwind correction plot. The second chart is for a range of zero to 800 feet in height and 3, 000 to 24, 000 feet horizontally and does not have a wind correction.

Distance from brake release to takeoff is based on critical field length for a hard, dry runway surface, zero wind, zero slope, and part span flap configuration. Any increase in critical field length will move the lift off point closer to the obstacle. To correct for the effect of runway slope, first determine the change in critical field length due to runway slope. Enter the chart with the obstacle distance, decreased by the amount of increase in critical field length. The increase in critical field length due to a slippery runway surface should also be subtracted from the distance to the obstacle. For aircraft with full span wing flaps (AF49-243 through AF51-182) the critical field length is increased one percent and that increase should be subtracted from the distance from brake release to the obstacle before entering the chart.

An aircraft will have better climb performance in the clean configuration. Therefore, if an obstacle exists a considerable distance out on the climbout flight and space is available, it is recommended that the pilot circle, climb, and clean up the aircraft before continuing the flight.

GROSS WEIGHT LIMITED BY CLIMBOUT OVER OBSTACLE CHART.

The Gross Weight Limited by Climbout Over Obstacle chart (figure A3-25) provides the maximum allowable takeoff gross weight as limited by climbout over an obstacle for three-engine operation. The limit weight is determined by the takeoff factor (figure A3-3) and a climbout factor (figures A3-23 and A3-24). The Gross Weight Limited by Climbout Over Obstacle chart is valid for 20 or 10 degrees wing flaps and wet or dry power.

TAKEOFF TERMS — DEFINITION AND RELATIONSHIP

SAMPLE PROBLEM:

A. Critical field length.
B. Critical engine failure speed.
C. Refusal speed.
D. Refusal distance.
E. Acceleration check distance.
F. Acceleration check speed.
G. Minimum engine failure speed for continued takeoff.
H. Runway length.
I. Takeoff speed.
J. Four-engine takeoff distance.

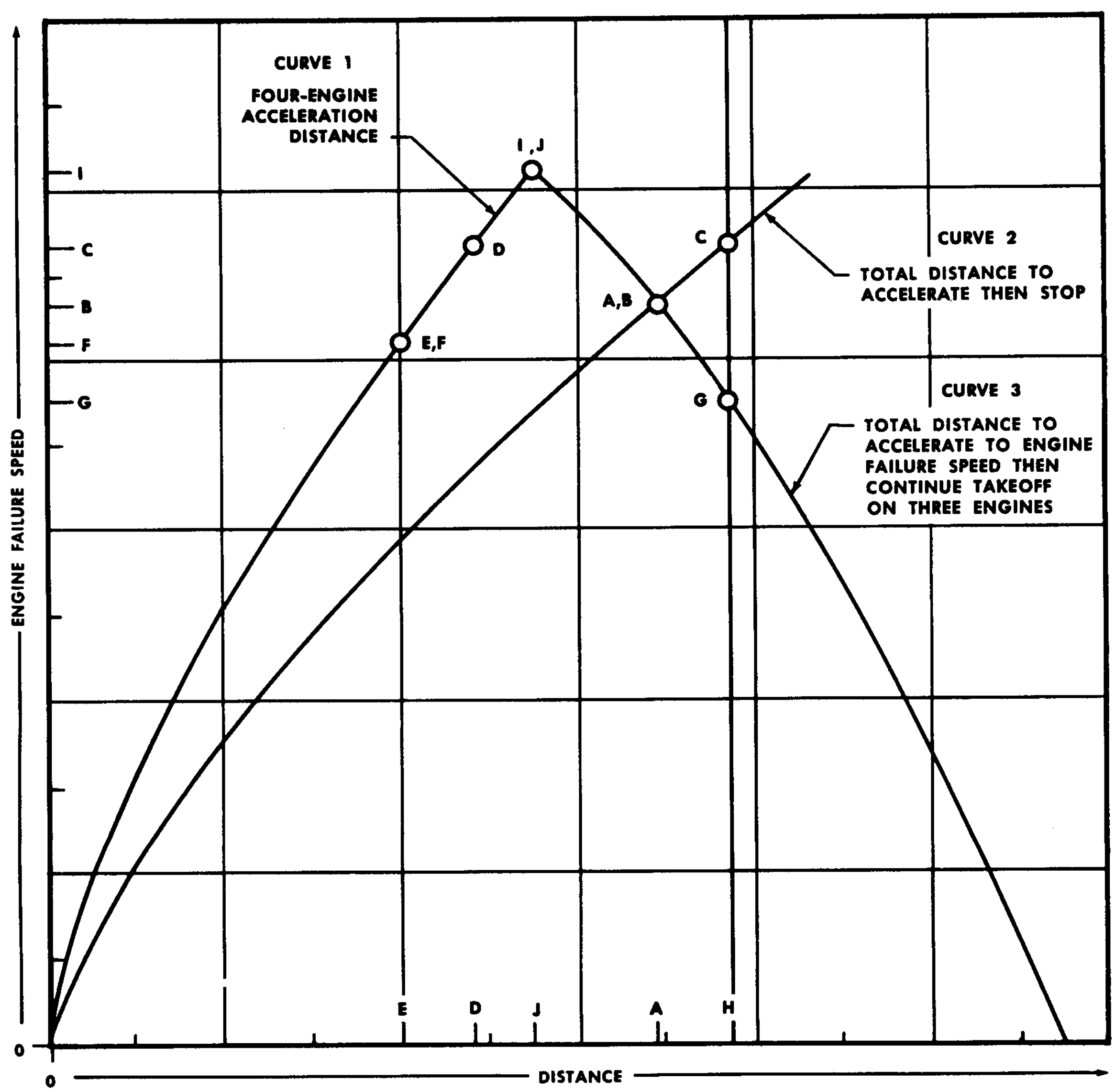


Figure A3-1. Takeoff Terms — Definitions and Relationship

TAKEOFF AND LANDING CROSSWIND CHART

MODEL: C-124C
DATE: 6-15-62
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-63A

SAMPLE PROBLEM NO. 1:
Takeoff on runway 1 (10 degrees).
Wind = 23 knots from 72 degrees (magnetic) with gusts to 33 knots.

A. Runway wind angle = 72 — 10 = 62°.
B. Wind velocity with gusts = 33 knots.
C. Crosswind component = 29 knots.
D. Wing flaps = 20 degrees.
E. Minimum nose wheel lift-off speed = 108 knots.
F. Steady wind velocity = 23 knots.
G. Headwind component = 11 knots.

SAMPLE PROBLEM NO. 2:
Takeoff on runway 1 (10 degrees).
Wind = 23 knots from 252 degrees (magnetic) with gusts to 33 knots.

A. Runway wind angle = 360 — (225 — 10) = 118°.
B. Wind velocity with gusts = 33 knots.
C. Crosswind component = 29 knots.
D. Wing flaps = 20 degrees.
E. Minimum nose wheel lift-off speed = 108 knots.
F. Steady wind velocity = 23 knots.
G. Tailwind component = 11 knots.

NOTE:
1. Flap and gear placard speeds must be observed.
2. For crosswind component, use maximum gust velocity.

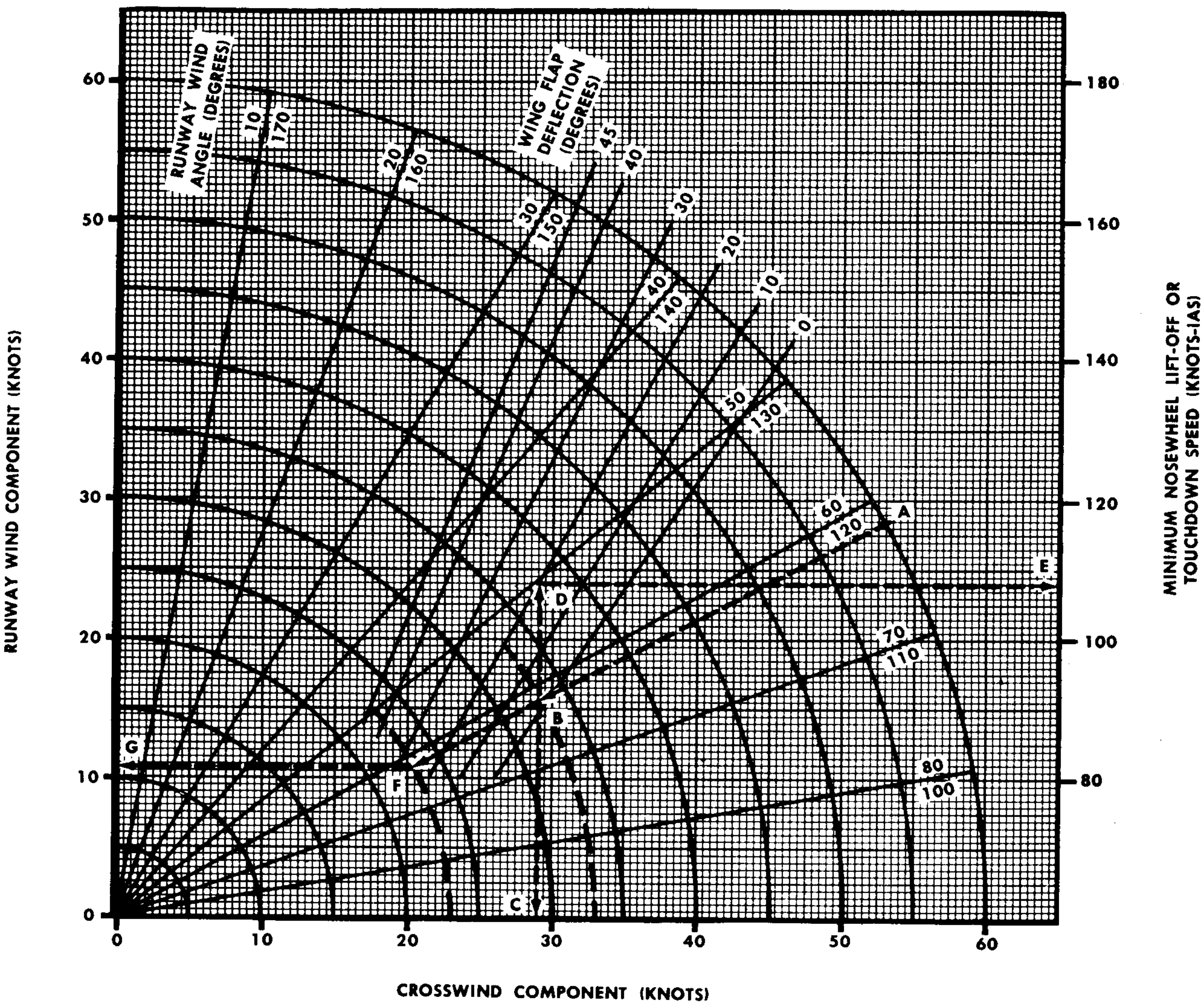


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Figure A3-2. Takeoff and Landing Crosswind Chart

TAKEOFF FACTOR

MODEL: C-124C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-63A
FUEL GRADE: 115/145 & 100/130

NOTE:

1. Valid for 20, 10 or zero degree flaps, four or three-engine operation, wet or dry power.
2. Use takeoff factor to determine gross weight limited by climb performance, gross weight limited by critical field length, refusal speed, takeoff ground run, and gross weight limited by climb-out over obstacle.

SAMPLE PROBLEM:

A. Density altitude = 2500 feet.
B. Torque pressure = 220 psi.
C. Takeoff factor = 3.9.

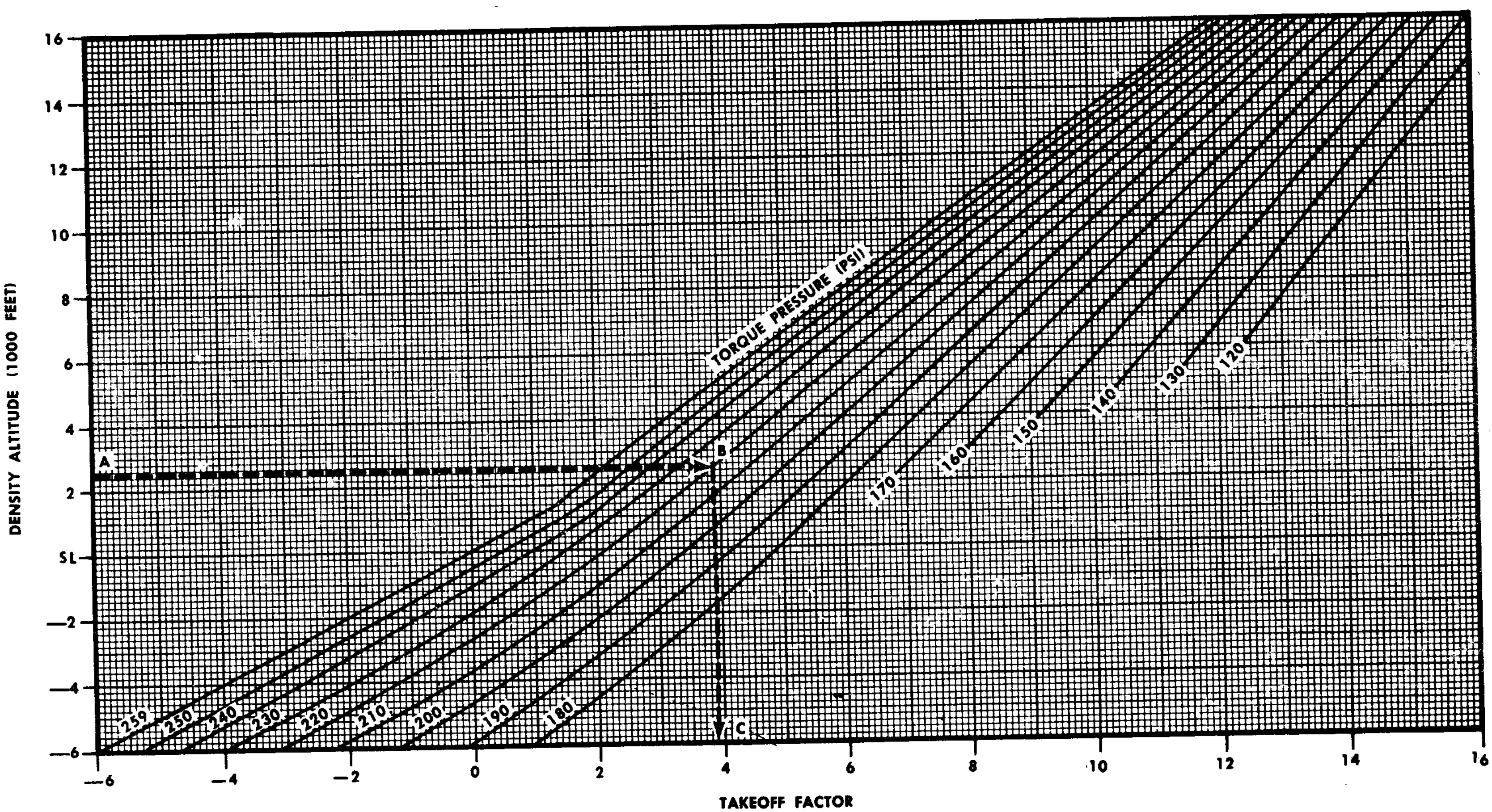

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Figure A3-3. Takeoff Factor

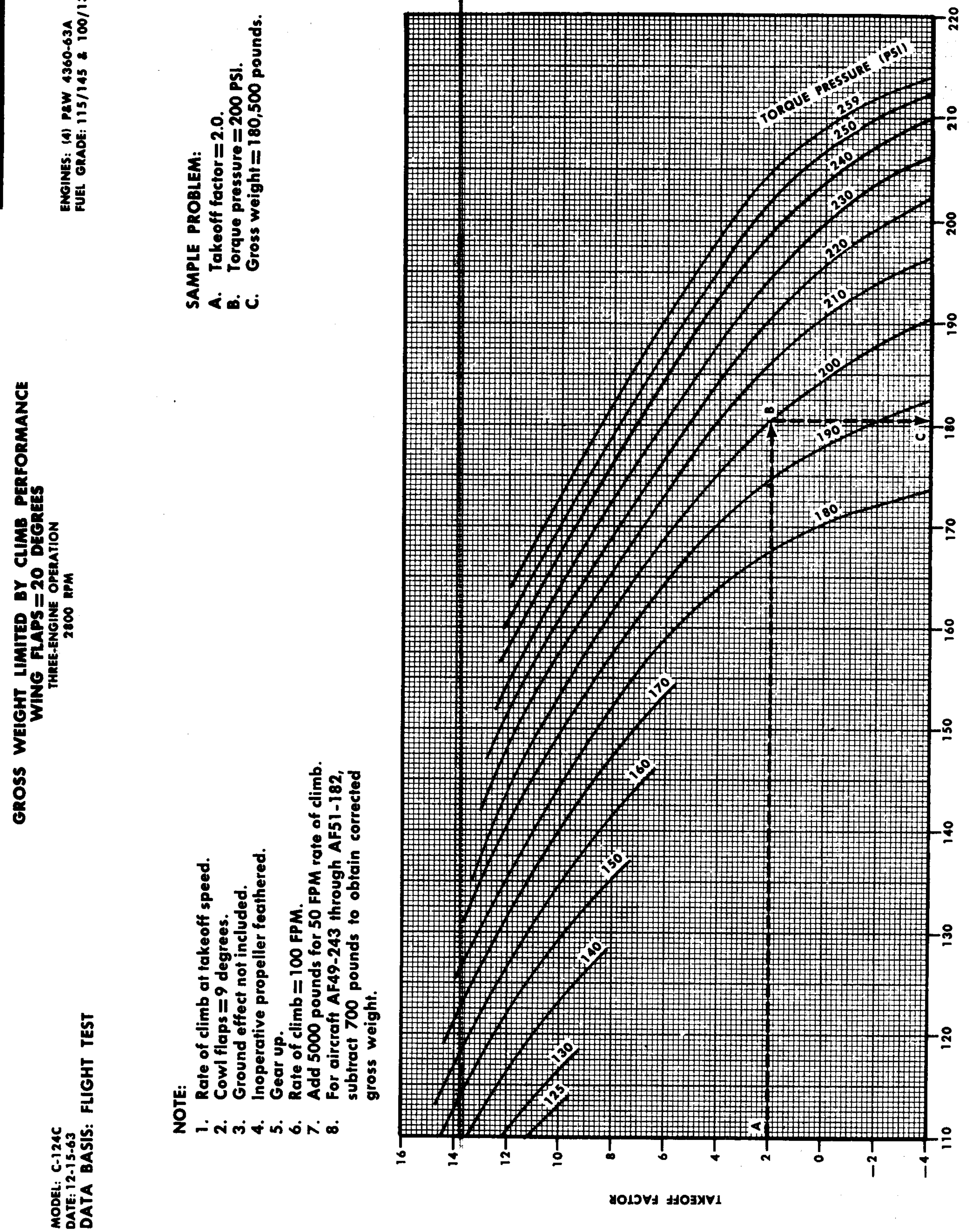


Figure A3-4. Gross Weight Limited by Climb Performance — Wing Flaps = 20 Degrees — Three-Engine Operation

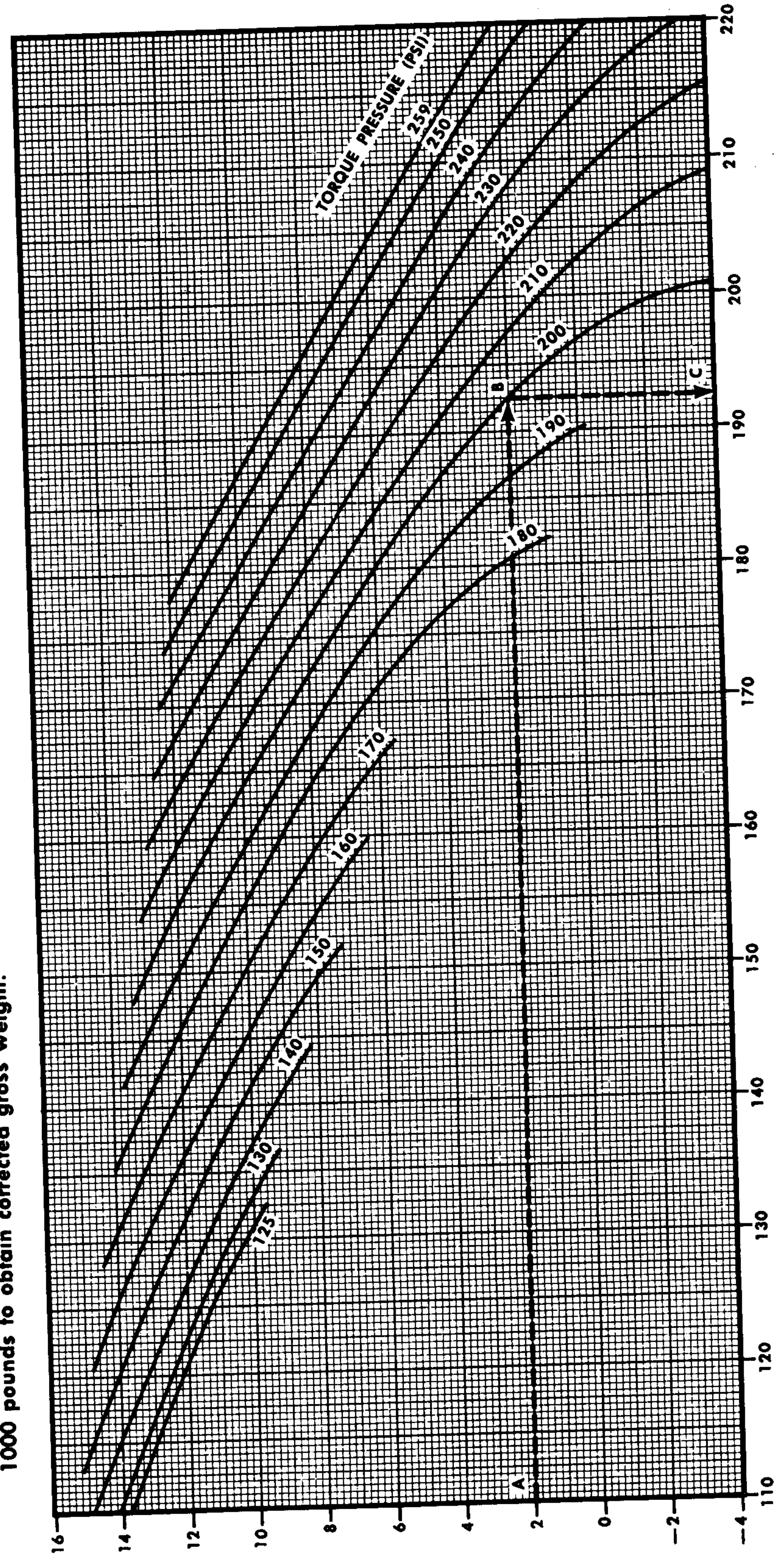
MODEL: C-124C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

GROSS WEIGHT LIMITED BY CLIMB PERFORMANCE
WING FLAPS = 10 DEGREES
2800 RPM
THREE-ENGINE OPERATION

ENGINES: (4) P&W 4360-63A
FUEL GRADE: 115/145 & 100/130

NOTE:
1. Rate of climb at takeoff speed.
2. Cowl flaps = 9 degrees.
3. Ground effect not included.
4. Inoperative propeller feathered.
5. Gear up.
6. Rate of climb = 100 FPM.
7. Add 6000 pounds for 50 FPM rate of climb.
8. For Aircraft AF49-243 through AF51-182, subtract 1000 pounds to obtain corrected gross weight.

SAMPLE PROBLEM:
A. Takeoff factor = 2.0.
B. Torque pressure = 200 PSI.
C. Gross weight = 192,500 pounds.



R1-520

Figure A3-5. Gross Weight Limited by Climb Performance — Wing Flaps = 10 Degrees — Three-Engine Operation

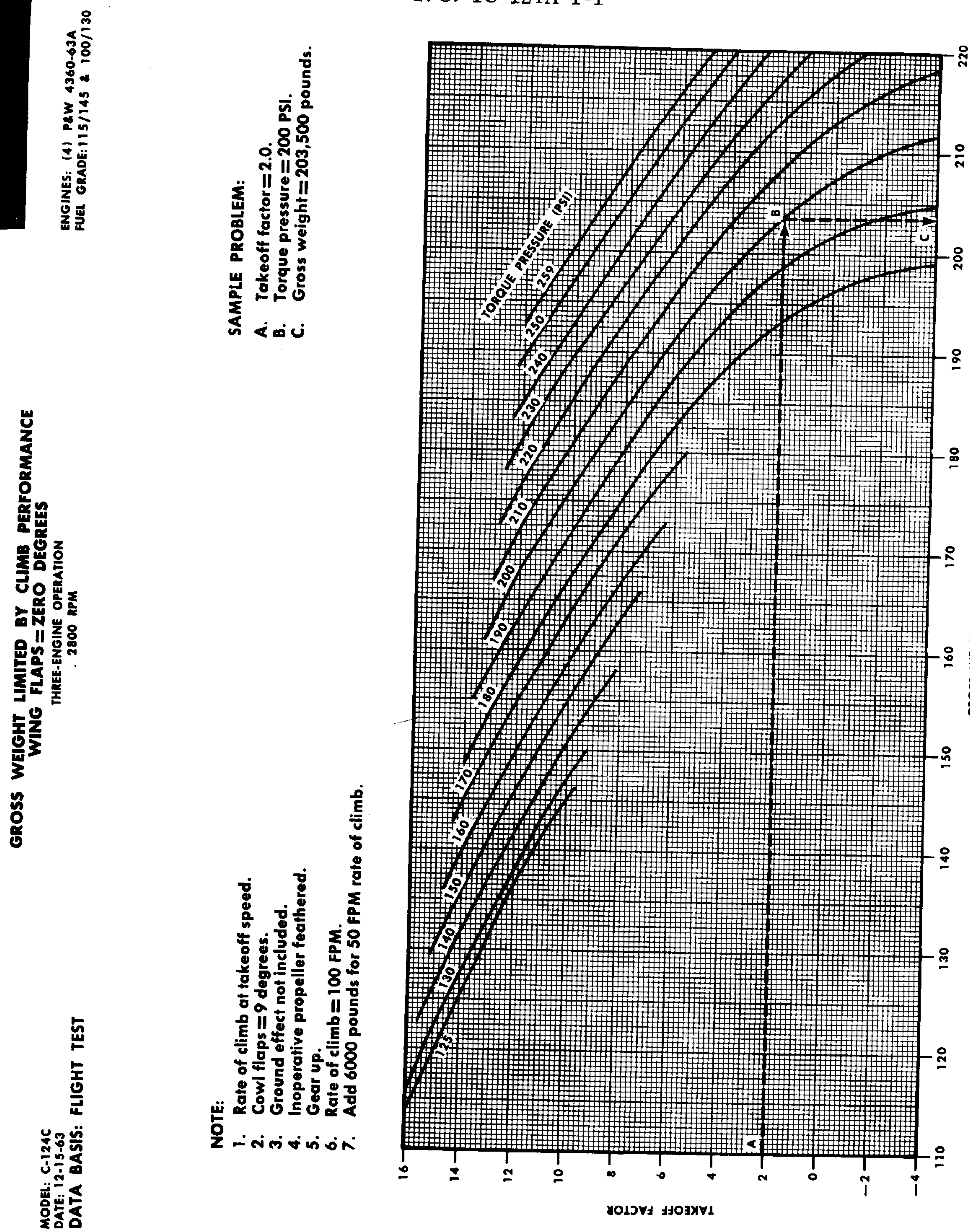


Figure A3-6. Gross Weight Limited by Climb Performance — Wing Flaps = Zero Degrees — Three-Engine Operation

EFFECT OF RUNWAY SLOPE ON CRITICAL FIELD LENGTH

MODEL: C-124A/C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-20WD/-63A
FUEL GRADE: 115/145 & 100/130

NOTE:

1. Runway Slope (percent) $= \frac{\text{Elevation Difference}}{\text{Runway Length}} \times 100.$
2. Wing flaps = 20, 10, or 0 degrees.
3. Use the corrected actual field length to enter the Critical Field Length Charts.

SAMPLE PROBLEM:

A. Actual field length = 3000 feet.
B. Runway slope = −6 percent (downhill).
C. Corrected actual field length to enter Critical Field Length Charts = 4000 feet.

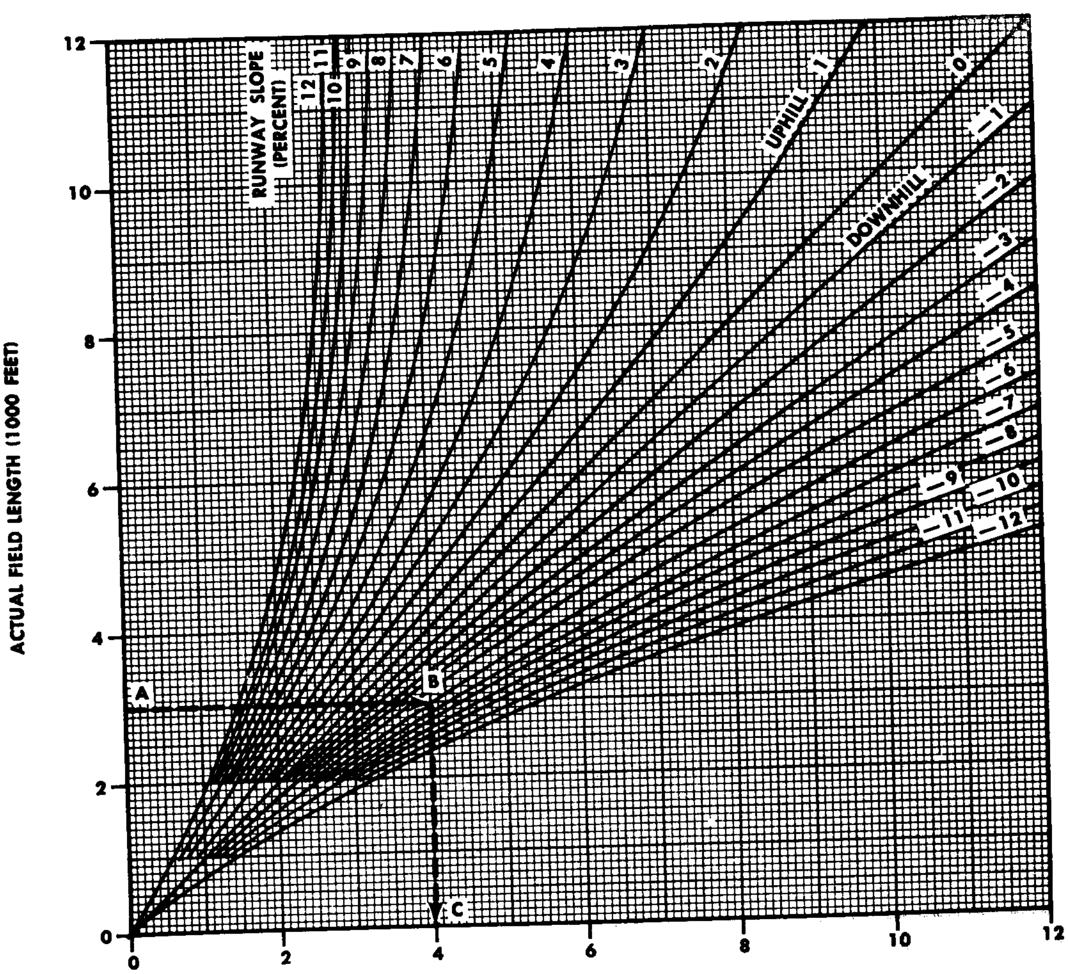


Figure A3-7. Effect of Runway Slope on Critical Field Length

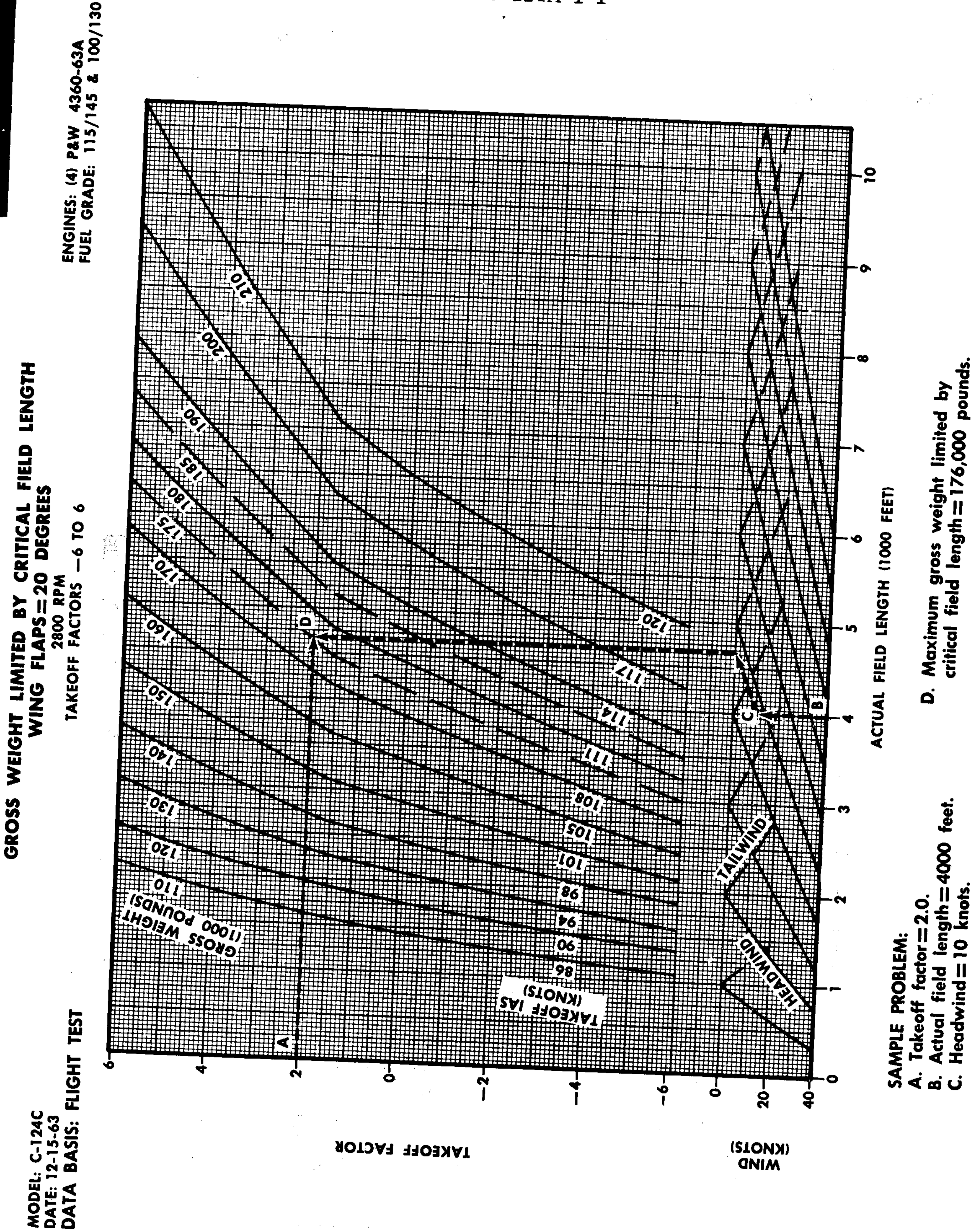
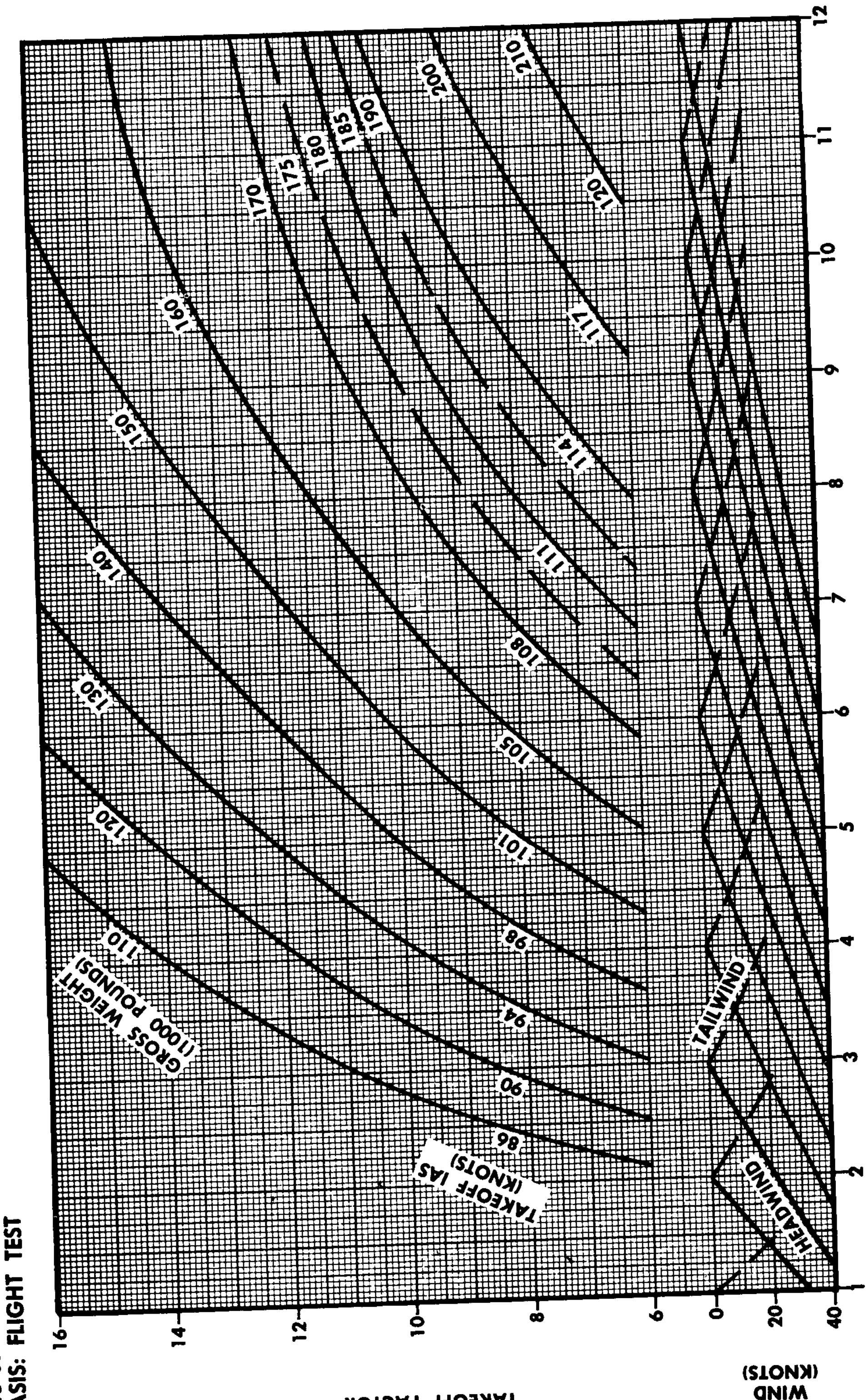


Figure A3-8. Gross Weight Limited by Critical Field Length — Wing Flaps = 20 Degrees (Sheet 1 of 2)

GROSS WEIGHT LIMITED BY CRITICAL FIELD LENGTH
WING FLAPS=20 DEGREES
2800 RPM
TAKEOFF FACTORS 6 TO 16

ENGINES: (4) P&W 4360-63A
FUEL GRADE: 115/145 & 100/130



NOTE:
1. V_{TO} =105 percent power-off stall speed.
2. Hard runway surface.
3. Cowl flaps=9 degrees.
4. Inoperative propeller windmilling.
5. Refer to Part 3, Appendix, for gross weight limited by climb performance.
6. Refer to Section V, T.O. 1C-124A-1, for structural limitations.
7. See Refusal Speed chart for critical engine failure speed.
8. Stop with brakes plus two-engine maximum reverse thrust.
9. For aircraft with full span wing flaps (AF49-243 through AF51-182, multiply actual field length by 0.99 to obtain corrected gross weight.

MODEL: C-124C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

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Figure A3-8. Gross Weight Limited by Critical Field Length — Wing Flaps = 20 Degrees (Sheet 2 of 2)

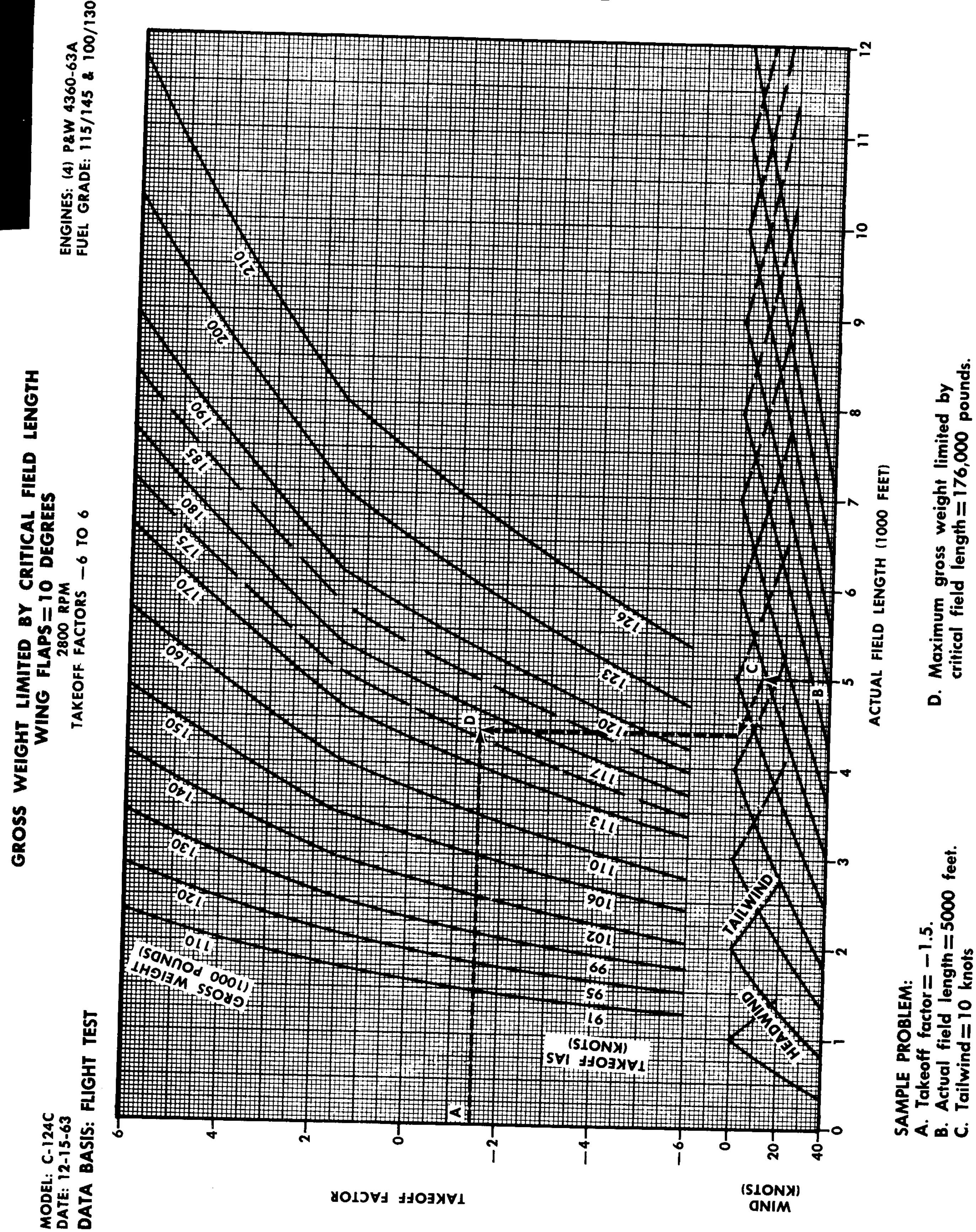


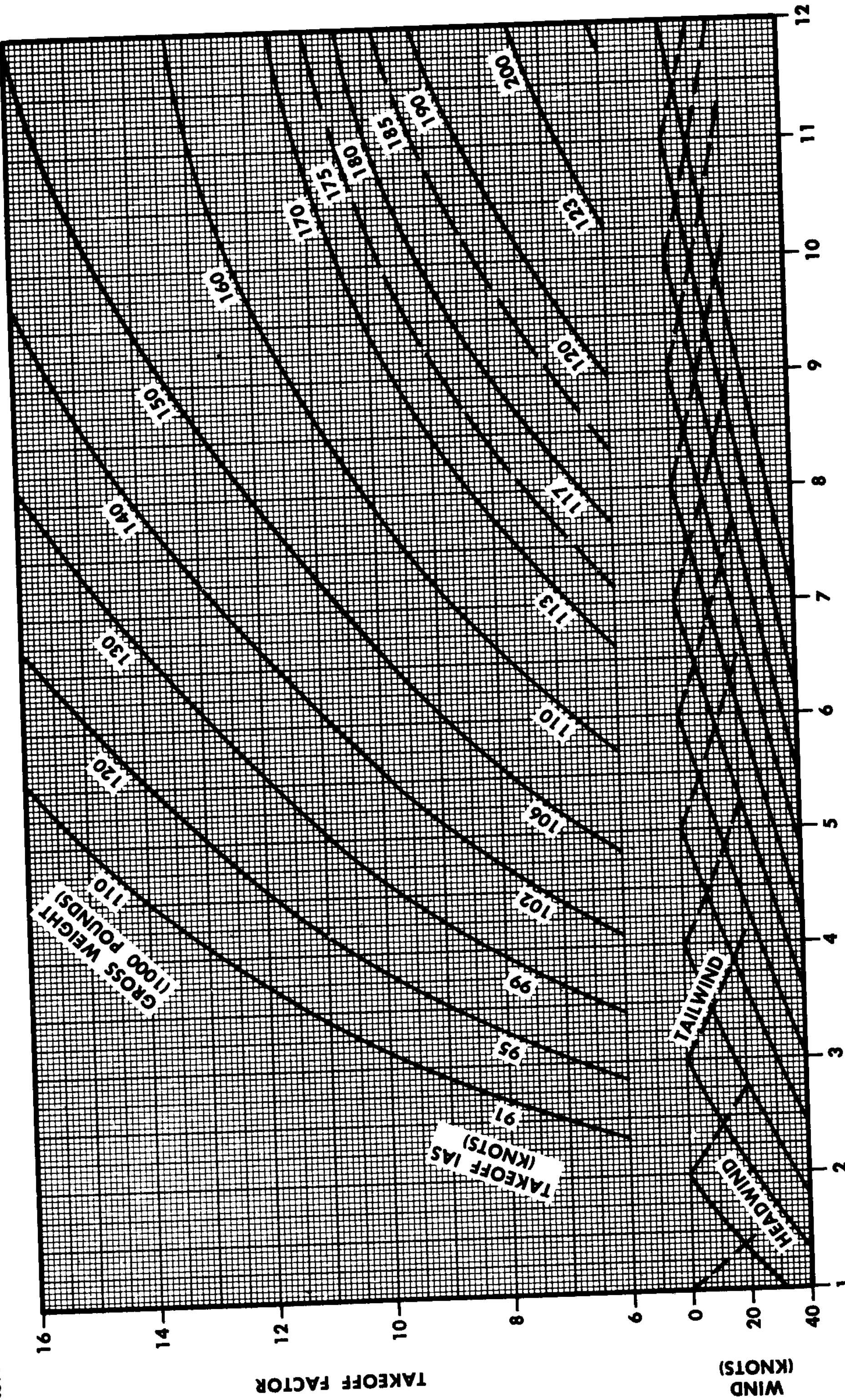
Figure A3-9. Gross Weight Limited by Critical Field Length — Wing Flaps = 10 Degrees (Sheet 1 of 2)

MODEL: C-124C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

GROSS WEIGHT LIMITED BY CRITICAL FIELD LENGTH
WING FLAPS=10 DEGREES

2800 RPM
TAKEOFF FACTORS 6 TO 16

ENGINES: (4) P&W4360-63A
FUEL GRADE: 115/145 & 100/130



NOTE:
1. $V_{TO}=105$ percent power-off stall speed.
2. Hard runway surface.
3. Cowl flaps=9 degrees.
4. Inoperative propeller windmilling.
5. Refer to Part 3, Appendix, for gross weight limited by climb performance.
6. Refer to Section V, T.O. 1C-124A-1, for structural limitations.
7. See Refusal Speed chart for critical engine failure speed.
8. Stop with brakes plus two-engine maximum reverse thrust.
9. For aircraft with full span wing flaps (AF49-243 through AF51-182), multiply actual field length by 0.99 to obtain corrected gross weight.

Figure A3-9. Gross Weight Limited by Critical Field Length — Wing Flaps = 10 Degrees (Sheet 2 of 2)

R1-624

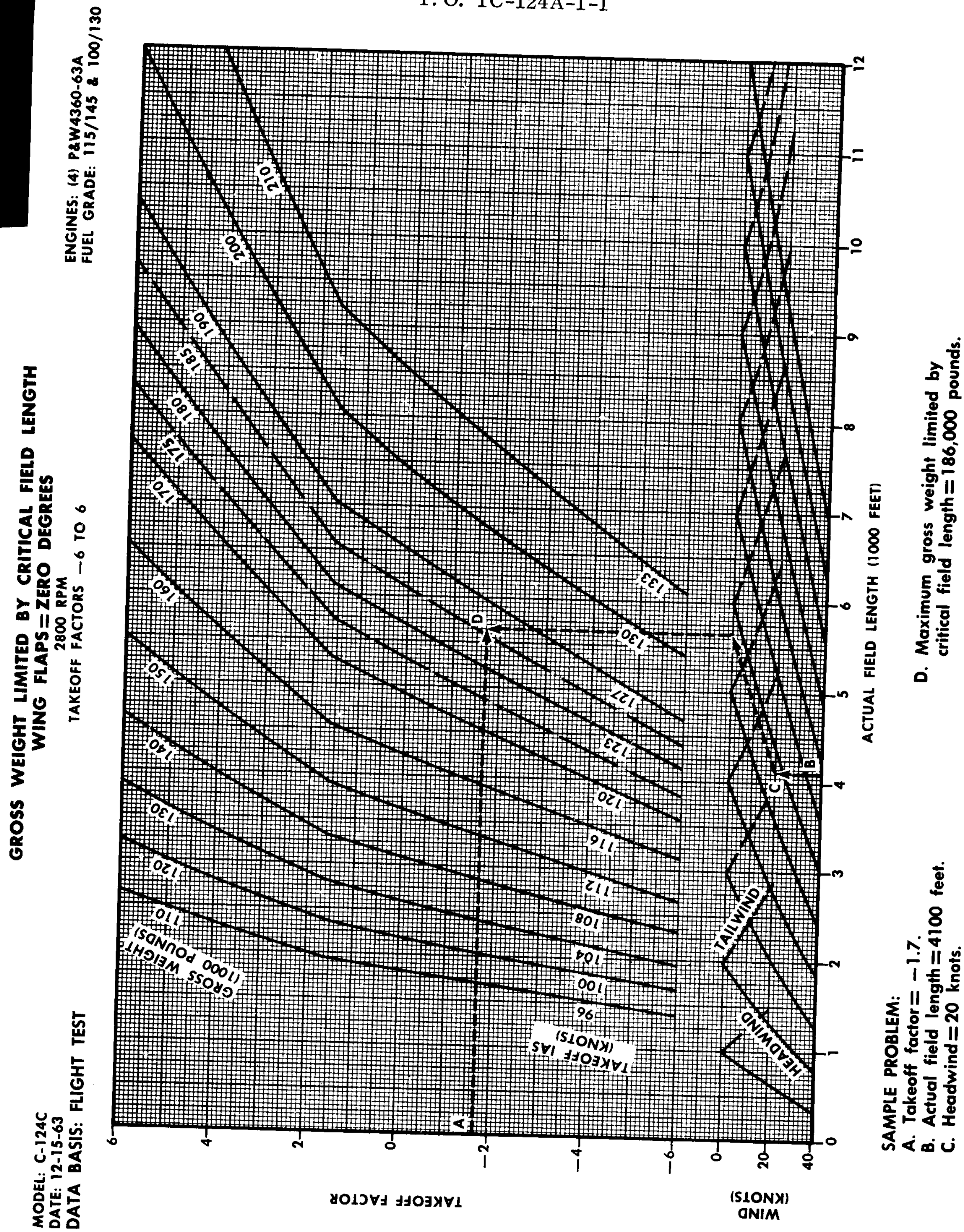
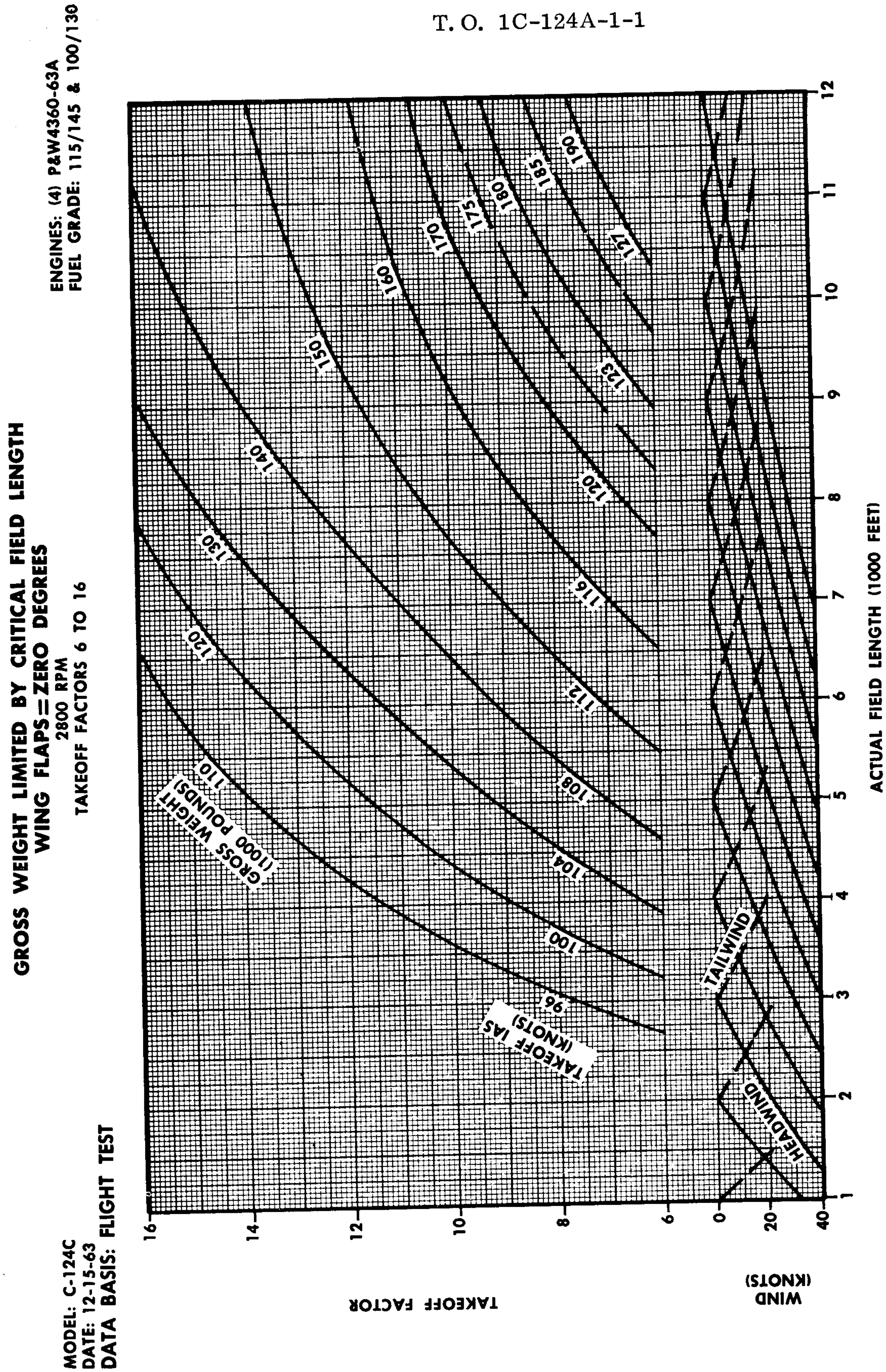


Figure A3-10. Gross Weight Limited by Critical Field Length — Wing Flaps = Zero Degrees (Sheet 1 of 2)



NOTE:
1. V_{TO} = 105 percent power-off stall speed.
2. Hard runway surface.
3. Cowl flaps = 9 degrees.
4. Inoperative propeller windmilling.
5. Refer to Part 3, Appendix, for gross weight limited by climb performance.
6. Refer to Section V, T.O. 1C-124A-1, for structural limitations.
7. See Refusal Speed chart for critical engine failure speed.
8. Stop with brakes plus two-engine maximum reverse thrust.

R1-626

Figure A3-10. Gross Weight Limited By Critical Field Length — Wing Flaps = Zero Degrees (Sheet 2 of 2)

REFUSAL SPEED — WING FLAPS = 20 DEGREES

2800 RPM

MODEL: C-124C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-63A
FUEL GRADE: 115/145 & 100/130

NOTE:
1. Hard runway surface.
2. Cowl flaps = 9 degrees.
3. Inoperative propeller windmilling.
4. Stop with brakes plus two-engine maximum reverse thrust.
5. To obtain critical engine failure speed, use runway length equal to critical field length.
6. No correction necessary for aircraft with full span wing flaps.

SAMPLE PROBLEM:
A. Takeoff factor = 2.0.
B. Runway length = 4000 feet.
C. Runway slope = −6 percent.
D. Gross weight = 176,000 pounds.
E. No wind refusal IAS = 83 knots.
F. Headwind = 25 knots.
G. Refusal IAS = 103 knots.

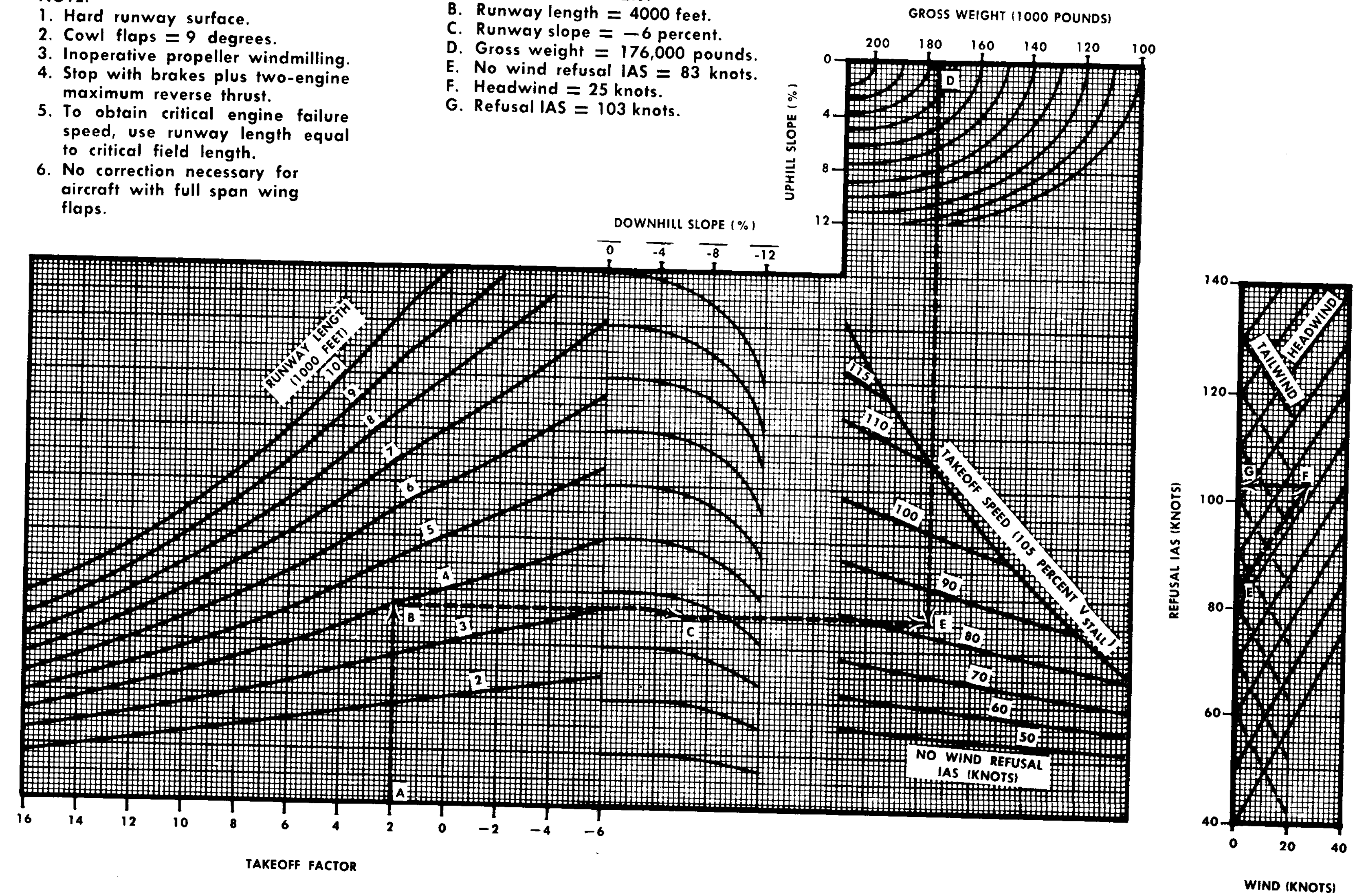


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Figure A3-11. Refusal Speed—Wing Flaps = 20 Degrees

MODEL: C-124C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

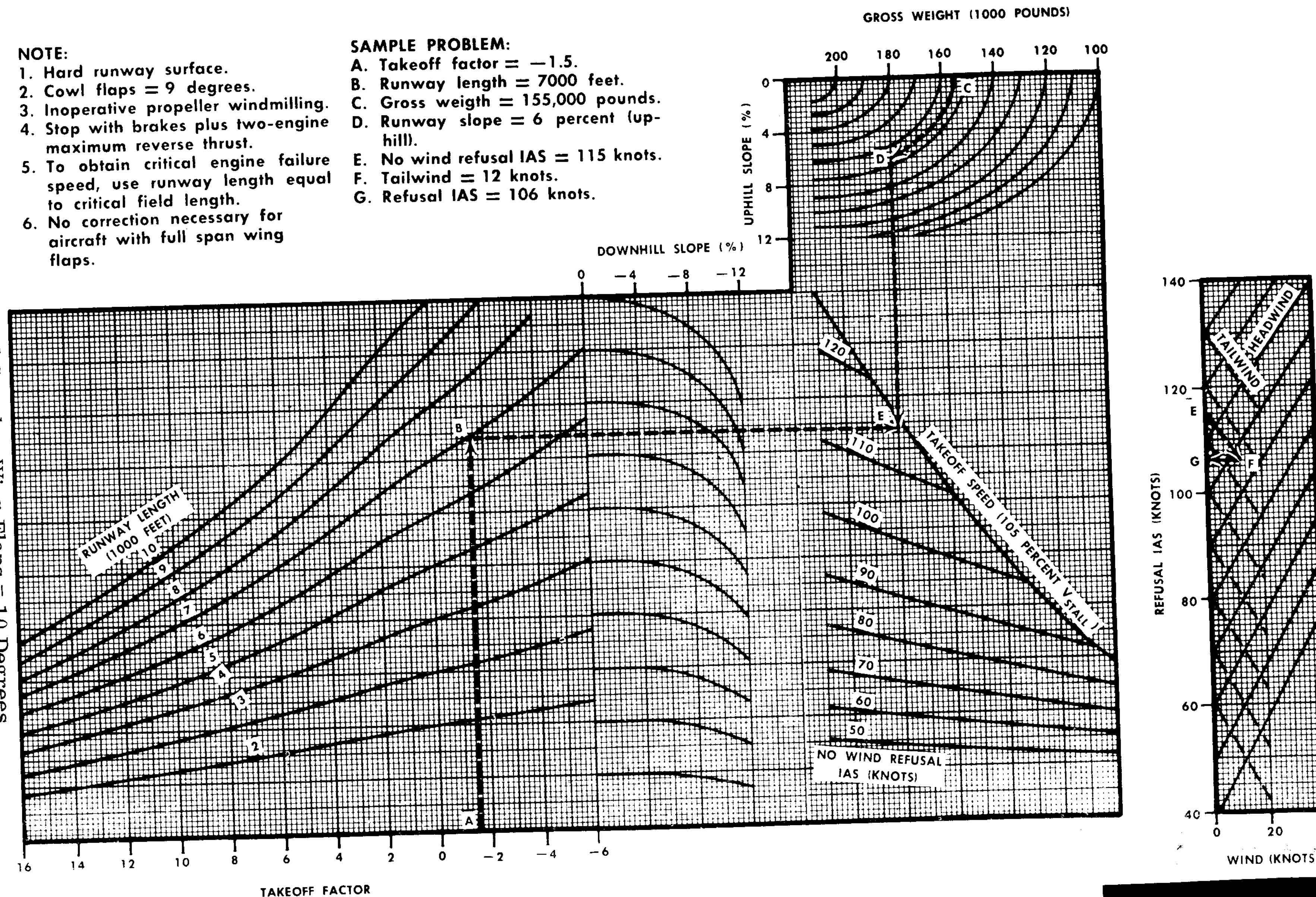
REFUSAL SPEED — WING FLAPS = 10 DEGREES

2800 RPM

ENGINES: (4) P&W 4360-63A
FUEL GRADE: 115/145 & 100/130

NOTE:
1. Hard runway surface.
2. Cowl flaps = 9 degrees.
3. Inoperative propeller windmilling.
4. Stop with brakes plus two-engine maximum reverse thrust.
5. To obtain critical engine failure speed, use runway length equal to critical field length.
6. No correction necessary for aircraft with full span wing flaps.

SAMPLE PROBLEM:
A. Takeoff factor = −1.5.
B. Runway length = 7000 feet.
C. Gross weigth = 155,000 pounds.
D. Runway slope = 6 percent (uphill).
E. No wind refusal IAS = 115 knots.
F. Tailwind = 12 knots.
G. Refusal IAS = 106 knots.



R1-617

Figure A3-12. Refusal Speed—Wing Flaps = 10 Degrees

REFUSAL SPEED — WING FLAPS = ZERO DEGREES

2800 RPM

MODEL: C-124C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-63A
FUEL GRADE: 115/145 & 100/130

NOTE:
1. Hard runway surface.
2. Cowl flaps = 9 degrees.
3. Inoperative propeller windmilling.
4. Stop with brakes plus two-engine maximum reverse thrust.
5. To obtain critical engine failure speed, use runway length equal to critical field length.

SAMPLE PROBLEM:
A. Takeoff factor = −1.7.
B. Runway length = 4100 feet.
C. Runway slope = 0 percent.
D. Gross weight = 185,000 pounds.
E. No wind refusal IAS = 91 knots.
F. Headwind = 15 knots.
G. Refusal IAS = 103 knots.

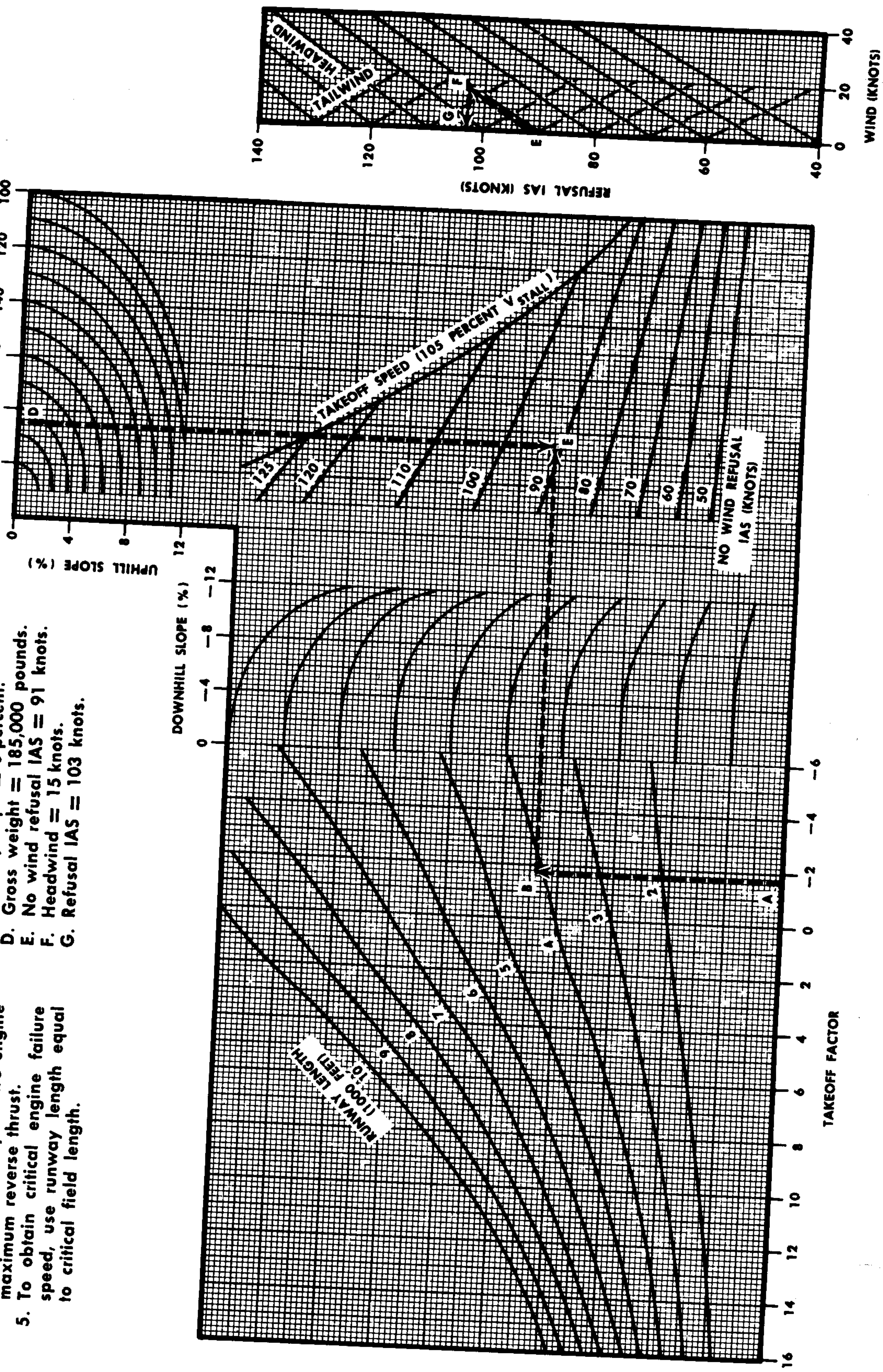


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Figure A3-13. Refusal Speed—Wing Flaps = Zero Degrees

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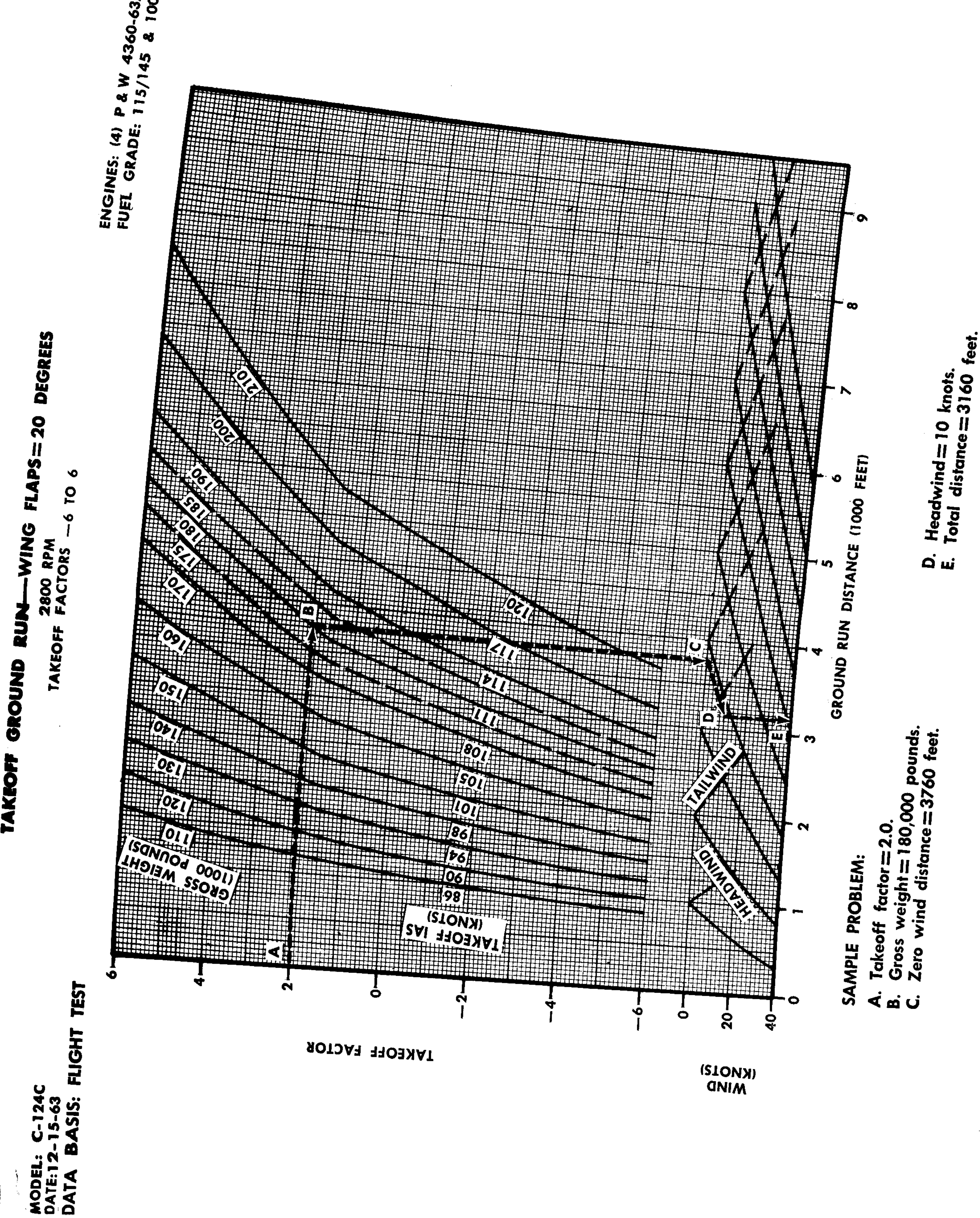


Figure A3-14. Takeoff Ground Run—Wing Flaps = 20 Degrees (Sheet 1 of 2)

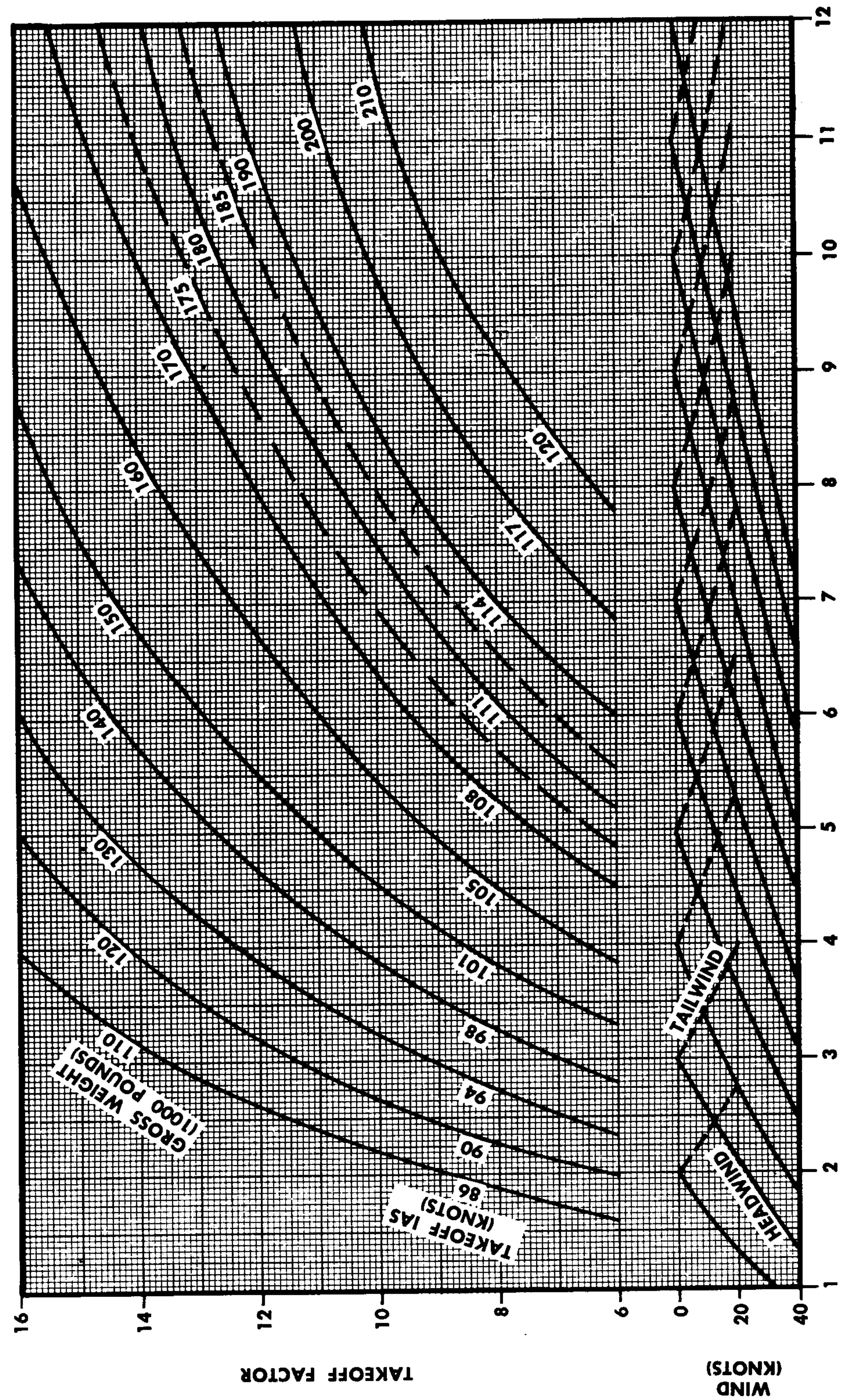
TAKEOFF GROUND RUN — WING FLAPS = 20 DEGREES

2800 RPM

TAKEOFF FACTORS 6 TO 16

MODEL: C-124C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W4360-63A
FUEL GRADE: 115/145 & 100/130



NOTE:
1. V_{TO} = 105 percent power-off stall speed.
2. Hard runway surface.
3. Cowl flaps = 9 degrees.
4. Refer to Part 3, Appendix, for gross weight limited by climb performance.
5. Refer to Section V, T.O. 124A-1 for structural limitations.
6. For aircraft AF49-243 through AF51-182, multiply ground run distance by 0.98.

R1-523

Figure A3-14. Takeoff Ground Run—Wing Flaps = 20 Degrees (Sheet 2 of 2)

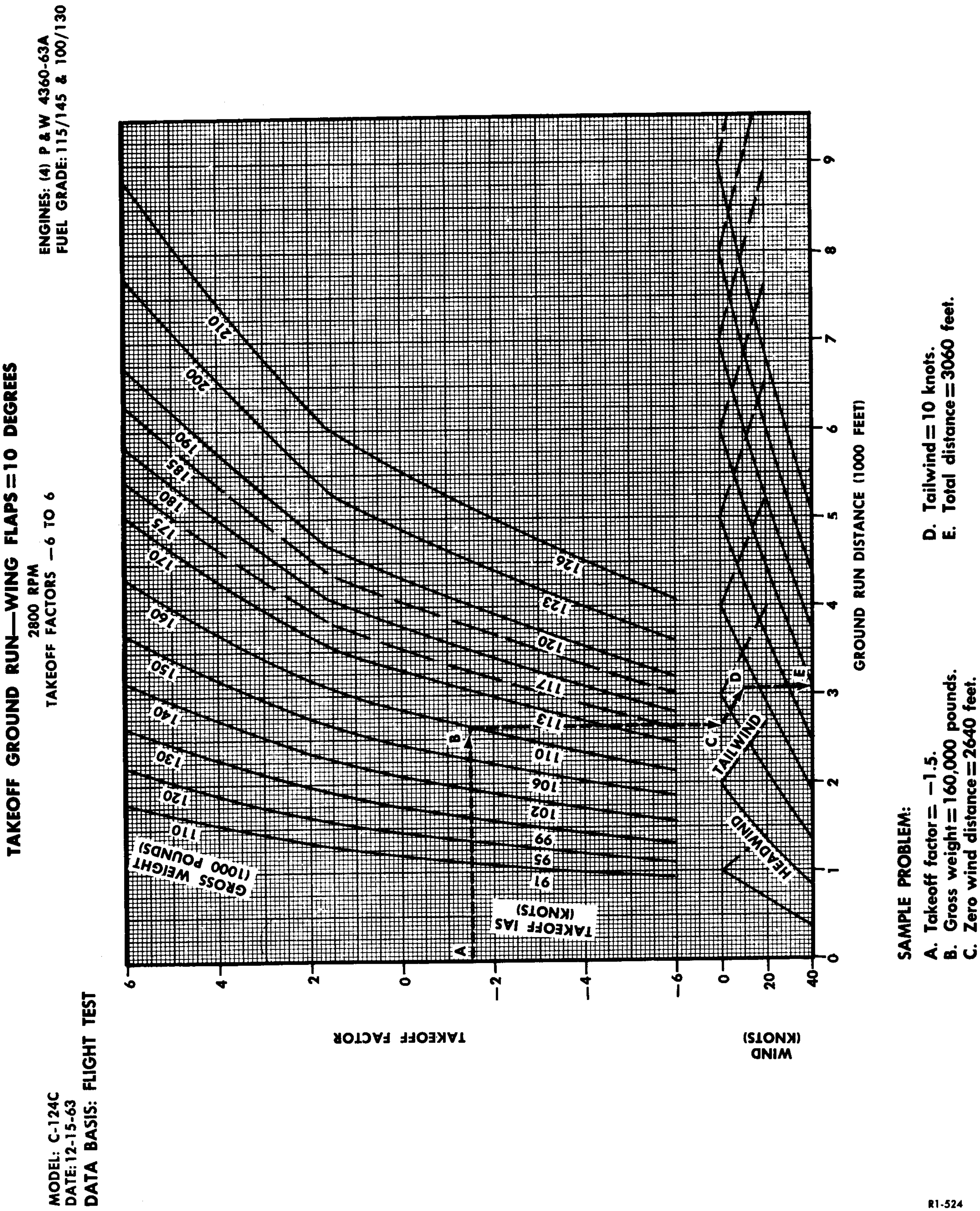


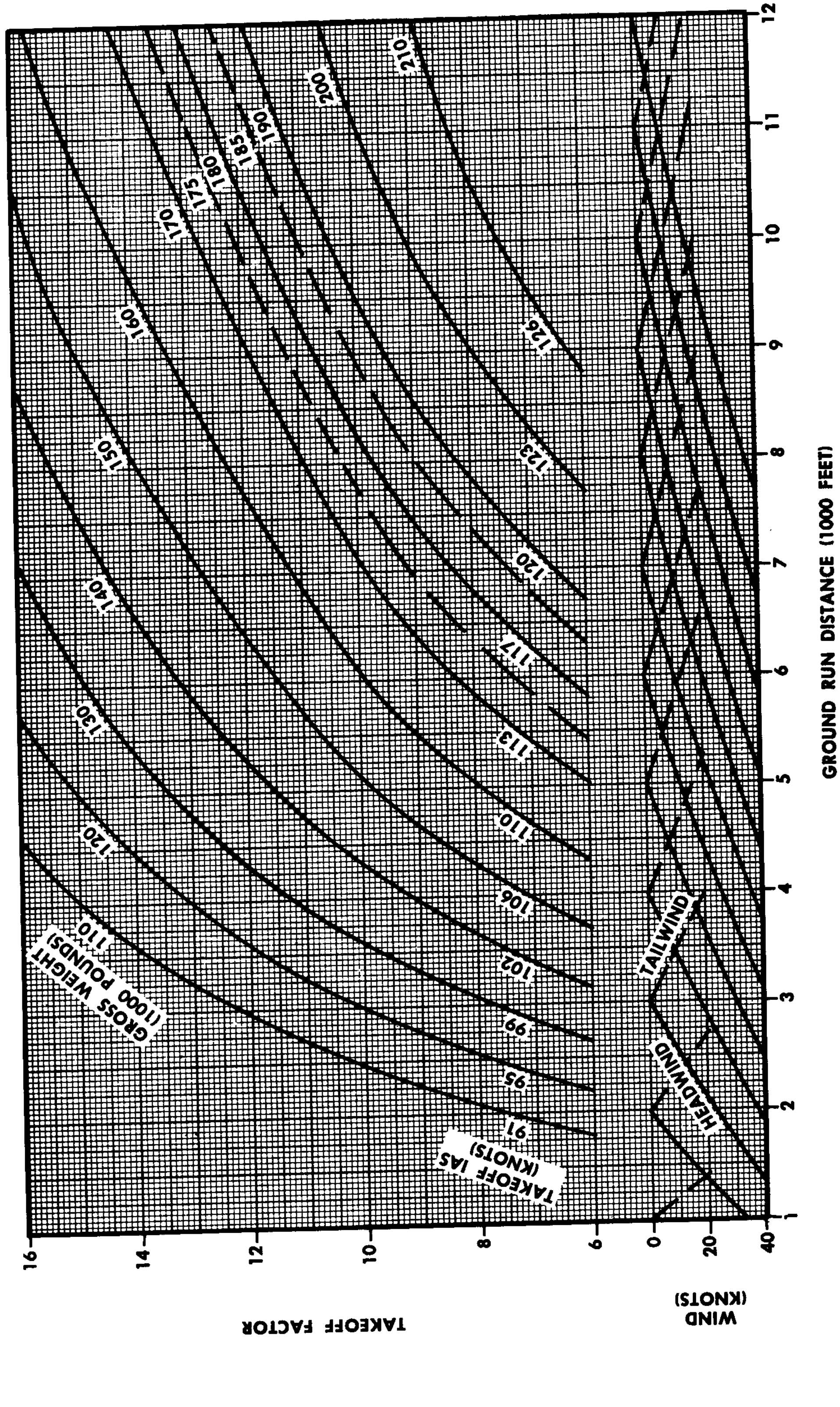
Figure A3-15. Takeoff Ground Run—Wing Flaps = 10 Degrees (Sheet 1 of 2)

TAKEOFF GROUND RUN — WING FLAPS = 10 DEGREES

2800 RPM
TAKEOFF FACTOR 6 TO 16

MODEL: C-124C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W4360-63A
FUEL GRADE: 115/145 & 100/130



NOTE:
1. V_{TO} = 105 percent power-off stall speed.
2. Hard runway surface.
3 Cowl flaps = 9 degrees.
4. Refer to Part 3, Appendix, for gross weight limited by climb performance.
5. Refer to Section V, T.O. 124A-1 for structural limitations.
6. For aircraft AF49-243 through AF51-182, multiply ground run distance by 0.98.

R1-525

Figure A3-15. Takeoff Ground Run — Wing Flaps = 10 Degrees (Sheet 2 of 2)

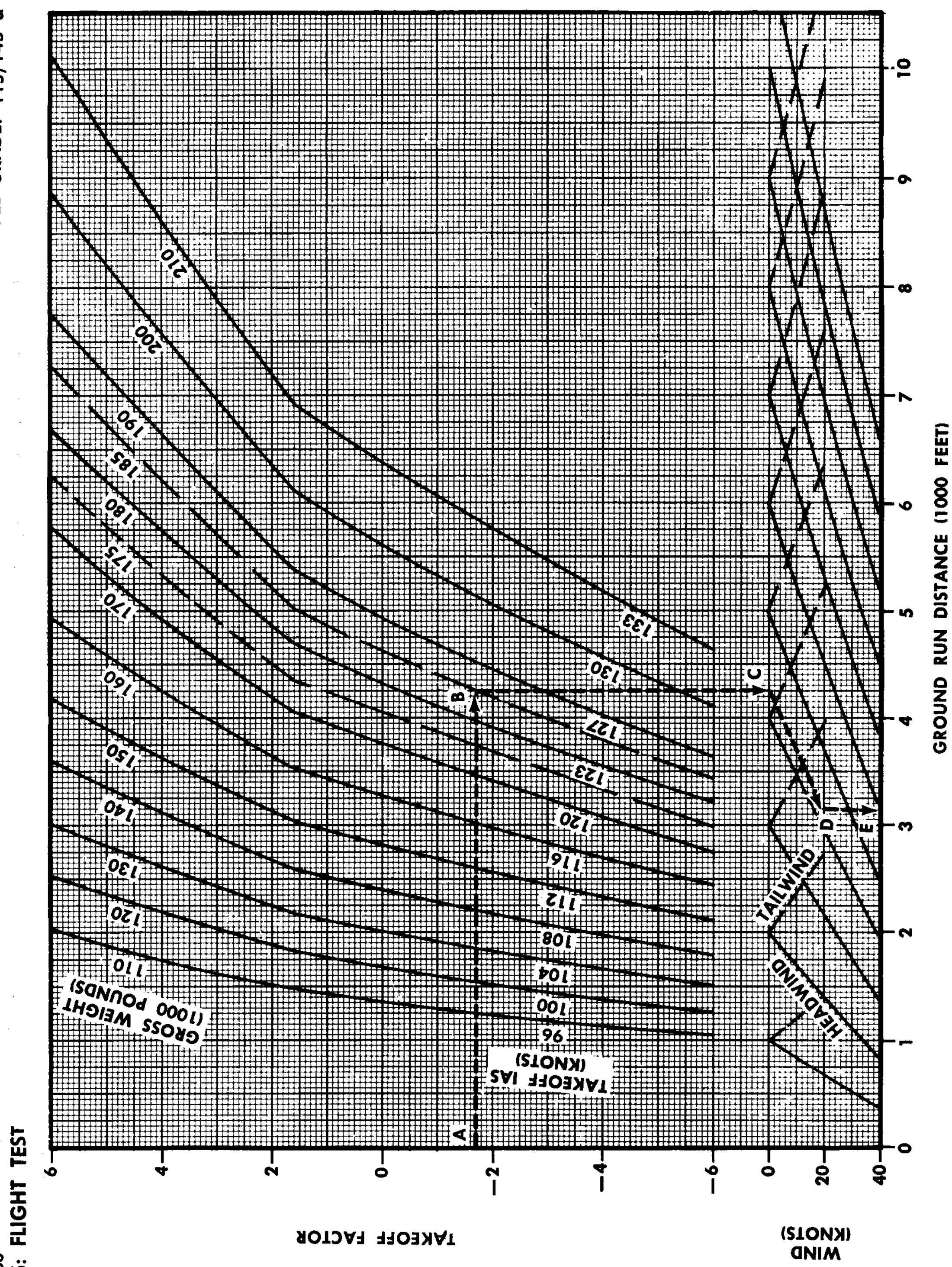
TAKEOFF GROUND RUN—WING FLAPS=ZERO DEGREES

2800 RPM

TAKEOFF FACTORS —6 TO 6

ENGINES: (4) P & W 4360-63A

FUEL GRADE: 115/145 & 100/130



SAMPLE PROBLEM:

A. Takeoff factor= —1.7.

B. Gross weight=185,000 pounds.

C. Zero wind distance=4250 feet.

D. Headwind=20 knots.

E. Total distance=3150 feet.

MODEL: C-124C

DATE: 12-15-63

DATA BASIS: FLIGHT TEST

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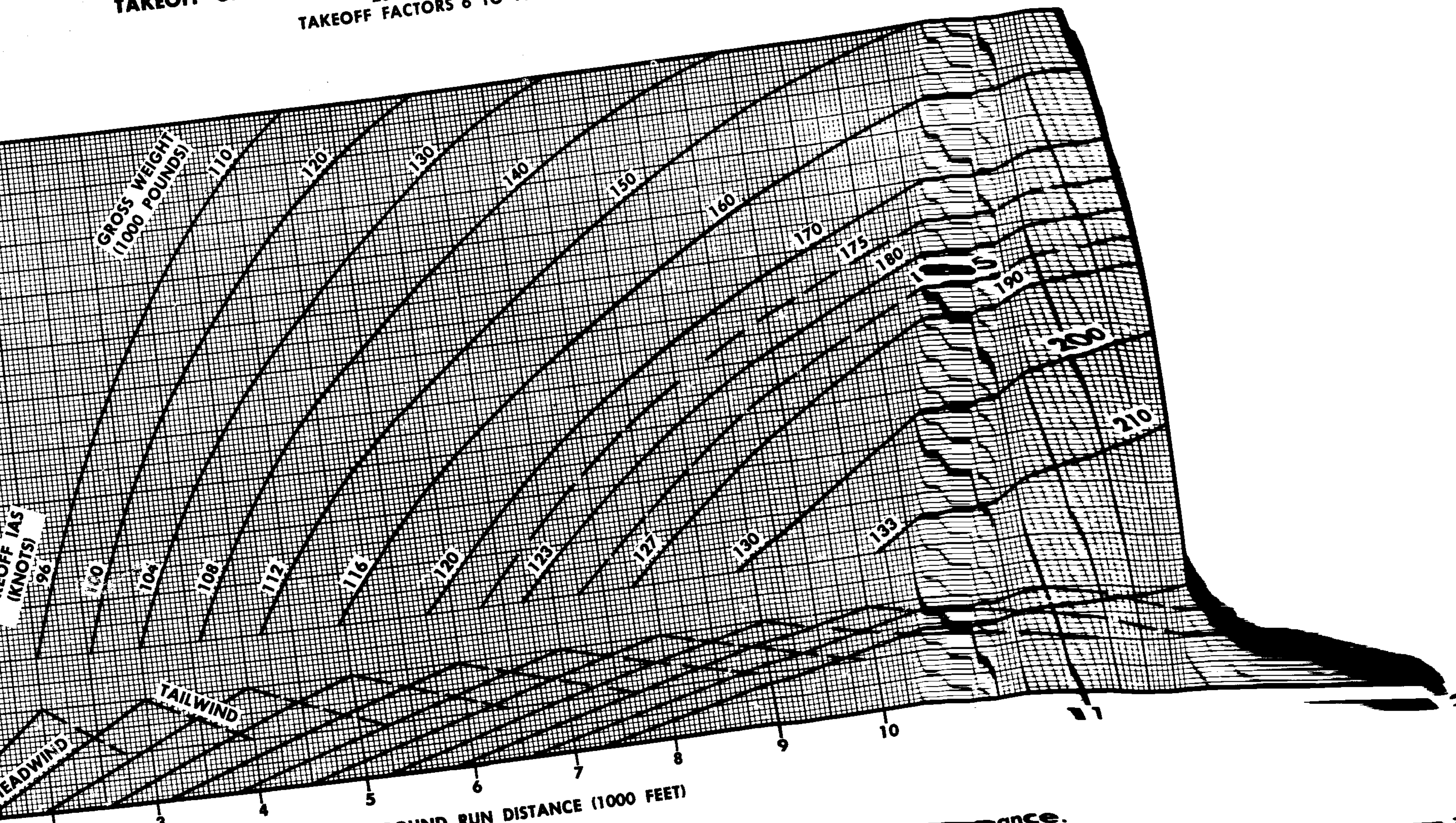
Figure A3-16. Takeoff Ground Run—Wing Flaps = Zero Degrees (Sheet 1 of 2)

ON

TAKEOFF GROUND RUN — WING FLAPS = ZERO DEGREES

2800 RPM
TAKEOFF FACTORS 6 TO 16

ENGINES: (4) &W4360-63A
FUEL GRADE: 15/145 & 100 30



NOTE:

V_{TO} = 105 percent power-off stall speed.

Hard runway surface.

Cowl flaps = 9 degrees.

Refer to Part 3, Appendix for gross weight limited by climb performance.

5. Refer to Section V, T.O. 1C-124A-1 for structural limitations.

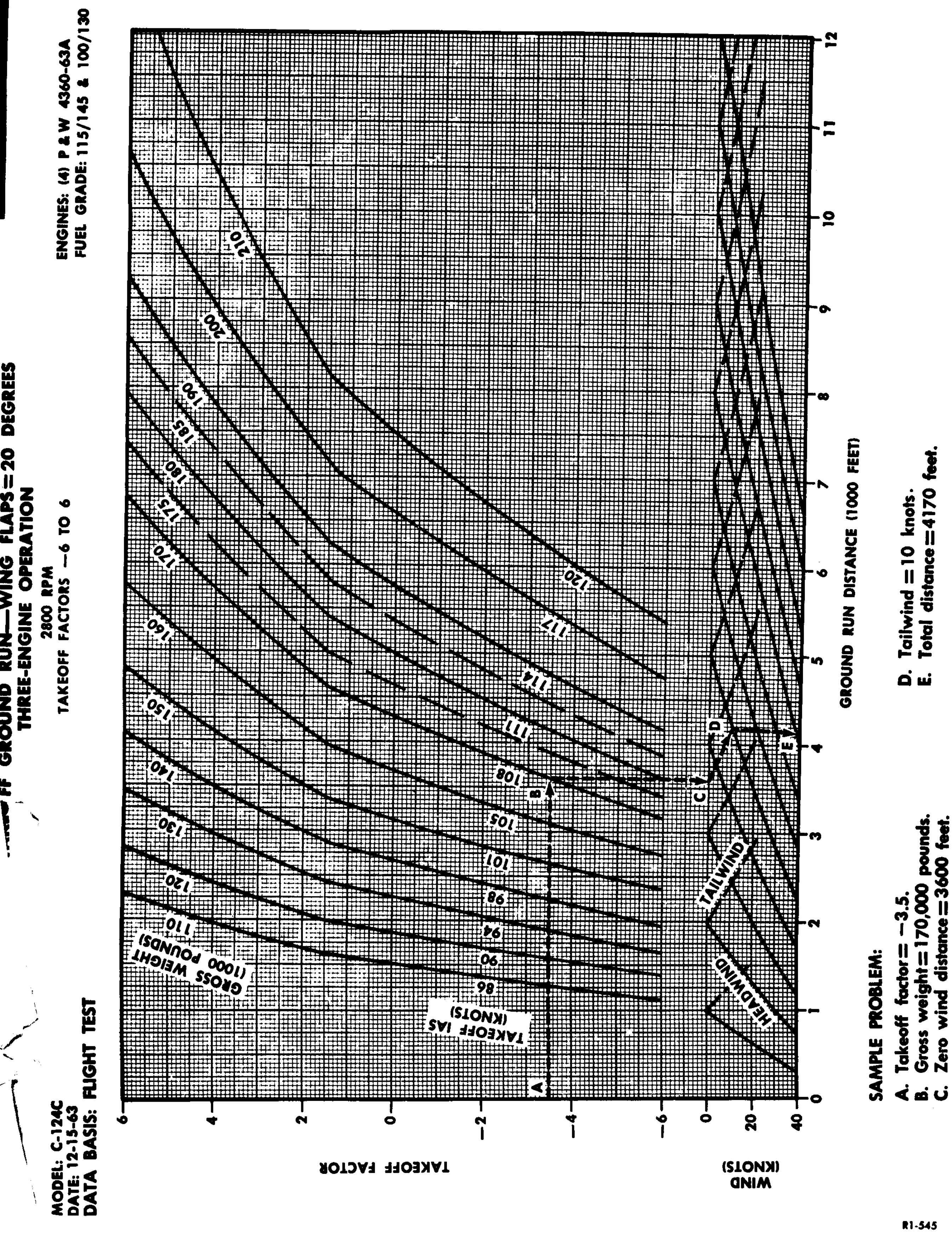
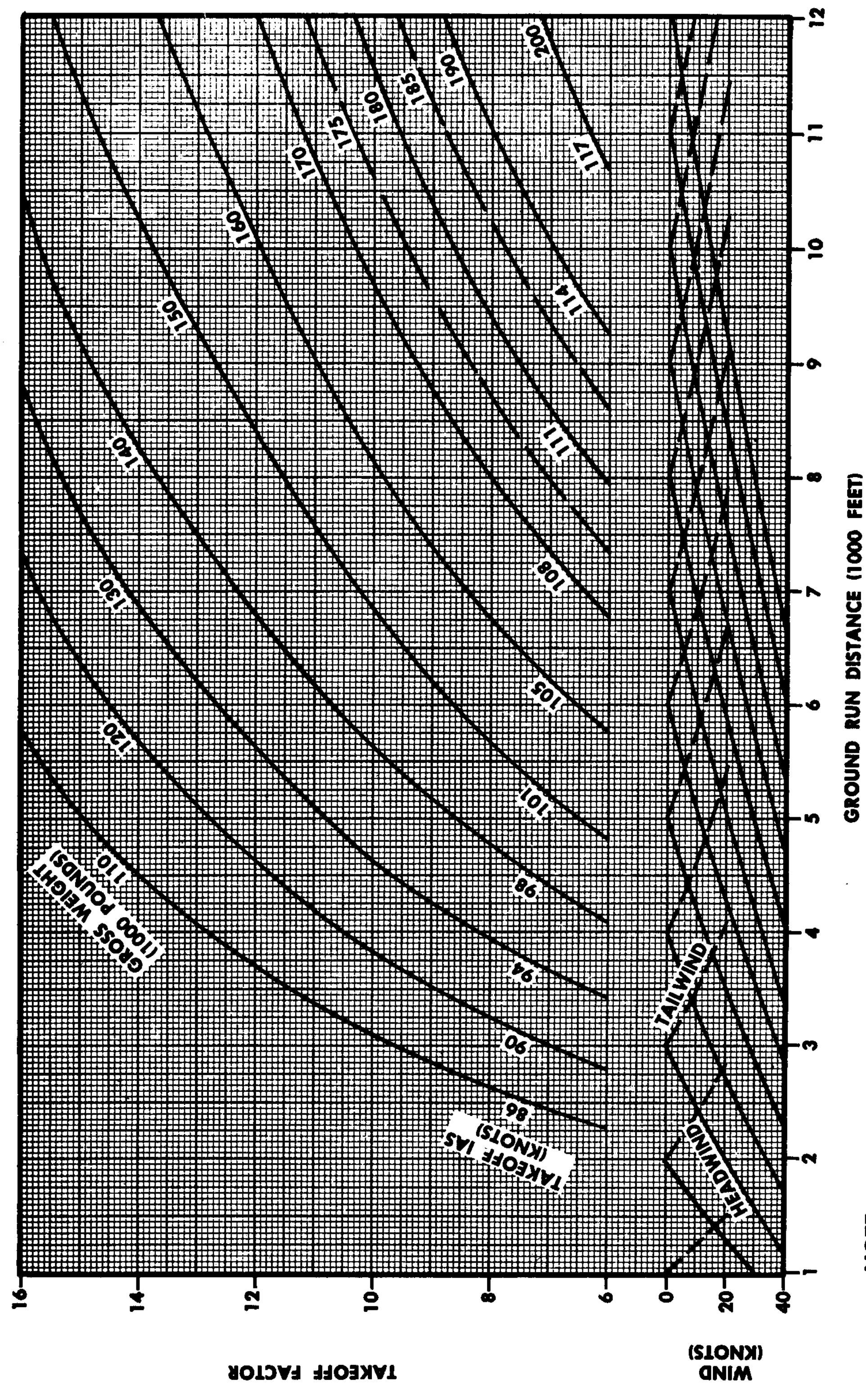


Figure A3-17. Takeoff Ground Run—Wing Flaps = 20 Degrees — Three-Engine Operation (Sheet 1 of 2)

TAKEOFF GROUND RUN — WING FLAPS=20 DEGREES
THREE-ENGINE OPERATION
2800 RPM
TAKEOFF FACTORS 6 TO 16

MODEL: C-124C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W4360-63A
FUEL GRADE: 115/145 & 100/130



NOTE:
1. V_{TO}=105 percent power-off stall speed.
2. Hard runway surface.
3. Cowl flaps=9 degrees.
4. Inoperative propeller feathered.
5. Refer to Part 4, Appendix, for two-engine emergency climb performance.
6. Power on assymetric operating engine varies from idle at brake release to full power at 60 knots.
7. Refer to section V, T.O. 124A-1 for structural limitations.
8. For aircraft AF49-243 through AF51-182, multiply ground run distance by 0.98.

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Figure A3-17. Takeoff Ground Run — Wing Flaps = 20 Degrees — Three-Engine Operation (Sheet 2 of 2)

EFFECT OF RUNWAY SLOPE ON TAKEOFF DISTANCE

MODEL: C-124A/C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-20WD/-63A
FUEL GRADE: 115/145 & 100/130

NOTE:
Runway Slope (percent) = $\frac{\text{Elevation Difference}}{\text{Runway Length}} \times 100$

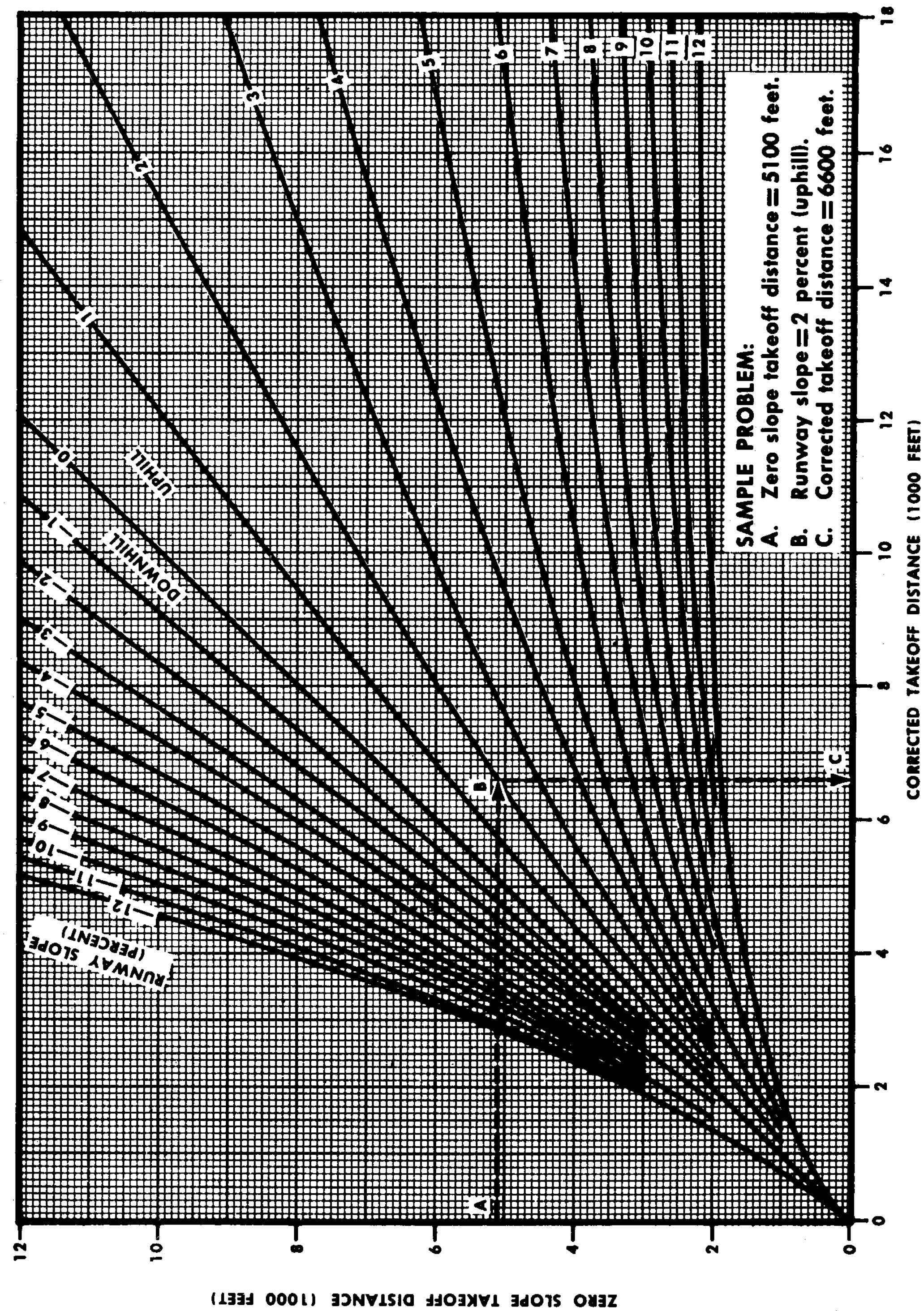
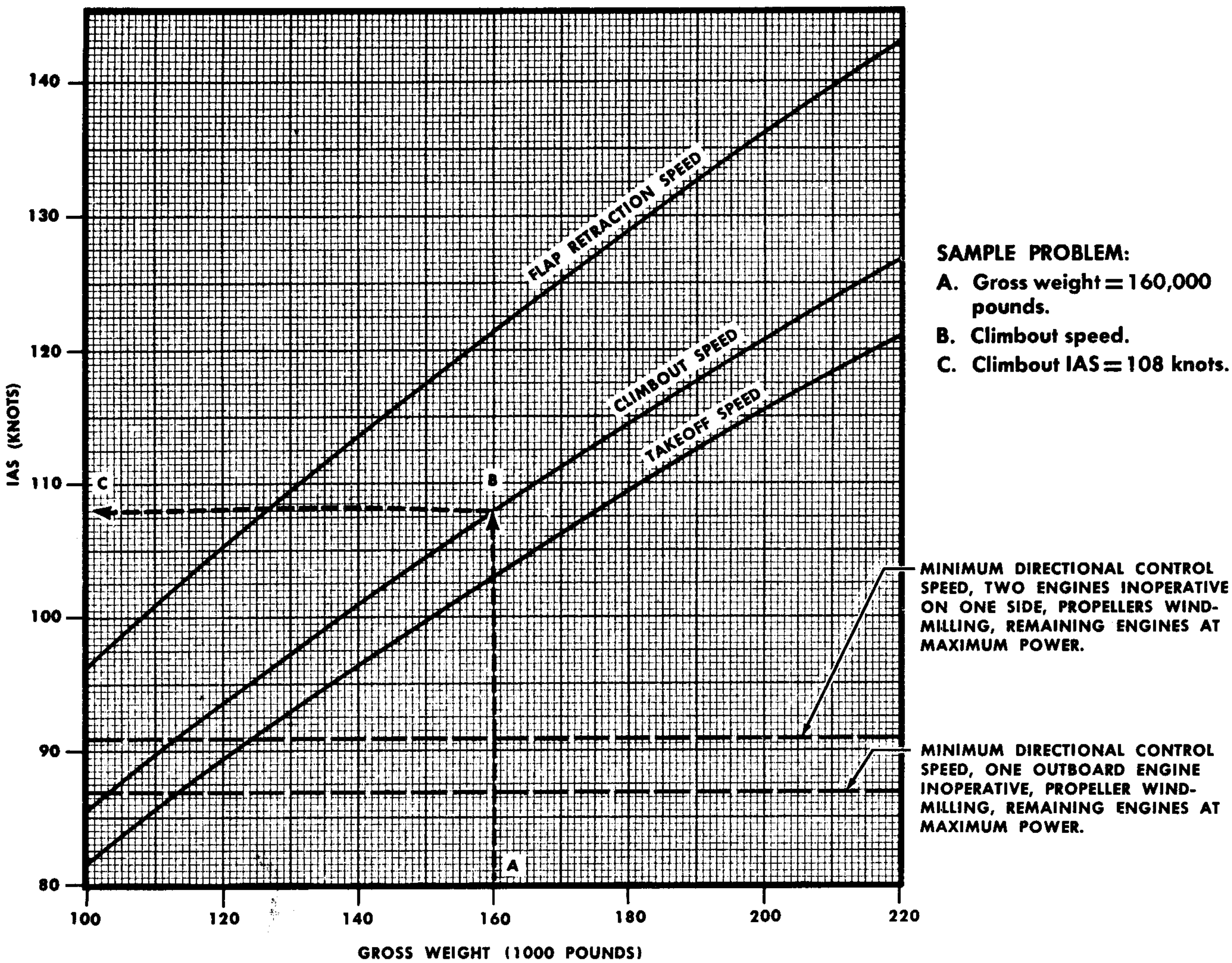


Figure A3-18. Effect of Runway Slope on Takeoff Distance

TAKEOFF, CLIMBOUT, AND FLAP RETRACTION SPEEDS
WING FLAPS = 20 DEGREES
AF49-232 THROUGH AF51-182
FULL SPAN FLAP CONFIGURATION

MODEL: C-124A/C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-20WD/-63A
FUEL GRADE: 115/145 & 100/130



SAMPLE PROBLEM:

A. Gross weight = 160,000 pounds.
B. Climbout speed.
C. Climbout IAS = 108 knots.

NOTE:

1. Flap retraction speed based on 110 percent of power-off stall speed with flaps retracted.
2. Takeoff speed based on 105 percent of power-off stall speed, climbout speed based on 110 percent of power-off stall speed.
3. Multiply speeds by 1.06 to obtain takeoff and climbout speeds with wing flaps equal 10 degrees.
4. Multiply speeds by 1.13 to obtain takeoff and climbout speeds with wing flaps equal zero degrees.

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Figure A3-19. Takeoff, Climbout, and Flap Retraction Speed—Wing Flaps = 20 Degrees —AF49-243 through AF51-182

TAKEOFF, CLIMBOUT AND FLAP RETRACTION SPEEDS
WING FLAPS = 20 DEGREES
AF51-5173 AND SUBSEQUENT
PARTIAL SPAN FLAPS CONFIGURATION

MODEL: C-124C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-63A
FUEL GRADE: 115/145 & 100/130

NOTE:

1. Flap retraction speed based on 110 percent of power-off stall speed with flaps retracted.
2. Takeoff speed based on 105 percent of power-off stall speed; climbout speed based on 110 percent of power-off stall speed.
3. Multiply takeoff and climbout speeds by 1.05 to obtain speeds with wing flaps equal 10 degrees.
4. Multiply takeoff and climbout speeds by 1.12 to obtain speeds with wing flaps equal zero degrees.

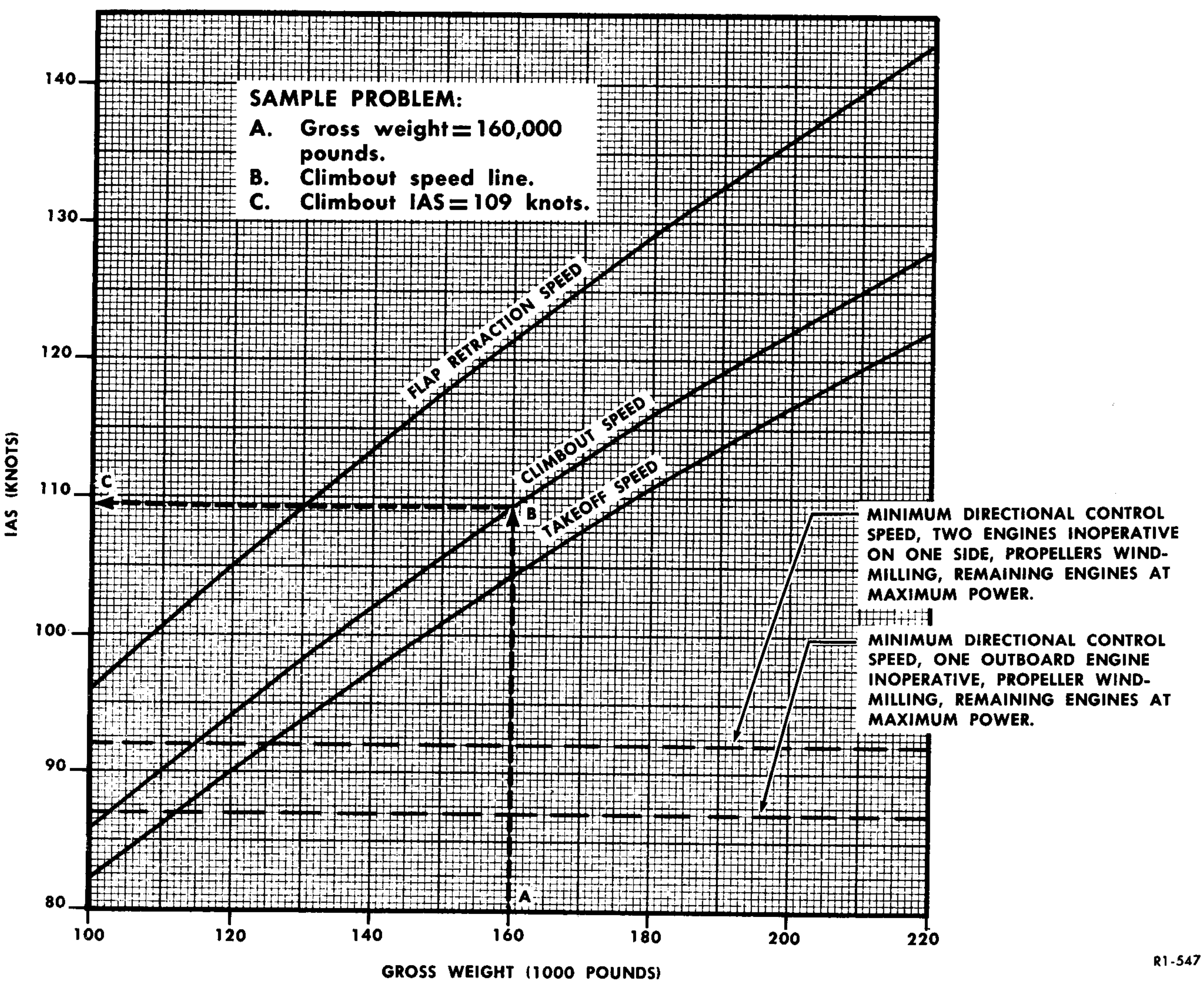


Figure A3-20. Takeoff, Climbout and Flap Retraction Speeds—Wing Flaps = 20 Degrees —AF51-5173 and Subsequent

TAKEOFF ACCELERATION

MODEL: C-124 A/C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-20WD/-63A
FUEL GRADE: 115/145 & 100/130

NOTE:

1. Enter chart with takeoff ground run (corrected for wind and slope) and takeoff speed. Follow wind correction guide lines to velocity of wind.
2. Time values are correct as presented for sea level Standard Day only. For other altitudes and temperatures, divide by $1/\sqrt{\sigma}$ to obtain true time.

SAMPLE PROBLEM:

A. Ground run (corrected for wind and slope) = 5300 feet.
B. Takeoff IAS = 117 knots.
C. Headwind = 10 knots.
D. Point that determines acceleration guide line.
E. Refusal IAS (corrected for wind and slope) = 112 Knots.
F. Same as C.
G. Acceleration guide line.
H. Refusal distance = 4600 feet.
I. Acceleration check distance = 4000 feet.
J. Acceleration guide line. Time = 43 seconds. Acceleration check time corrected for altitude (4000 feet) and OAT (27°C) = $t \div 1/\sqrt{\sigma} = 43 \div 1.098 = 39$ seconds.
K. Same as C.
L. Acceleration check IAS = 107 knots.

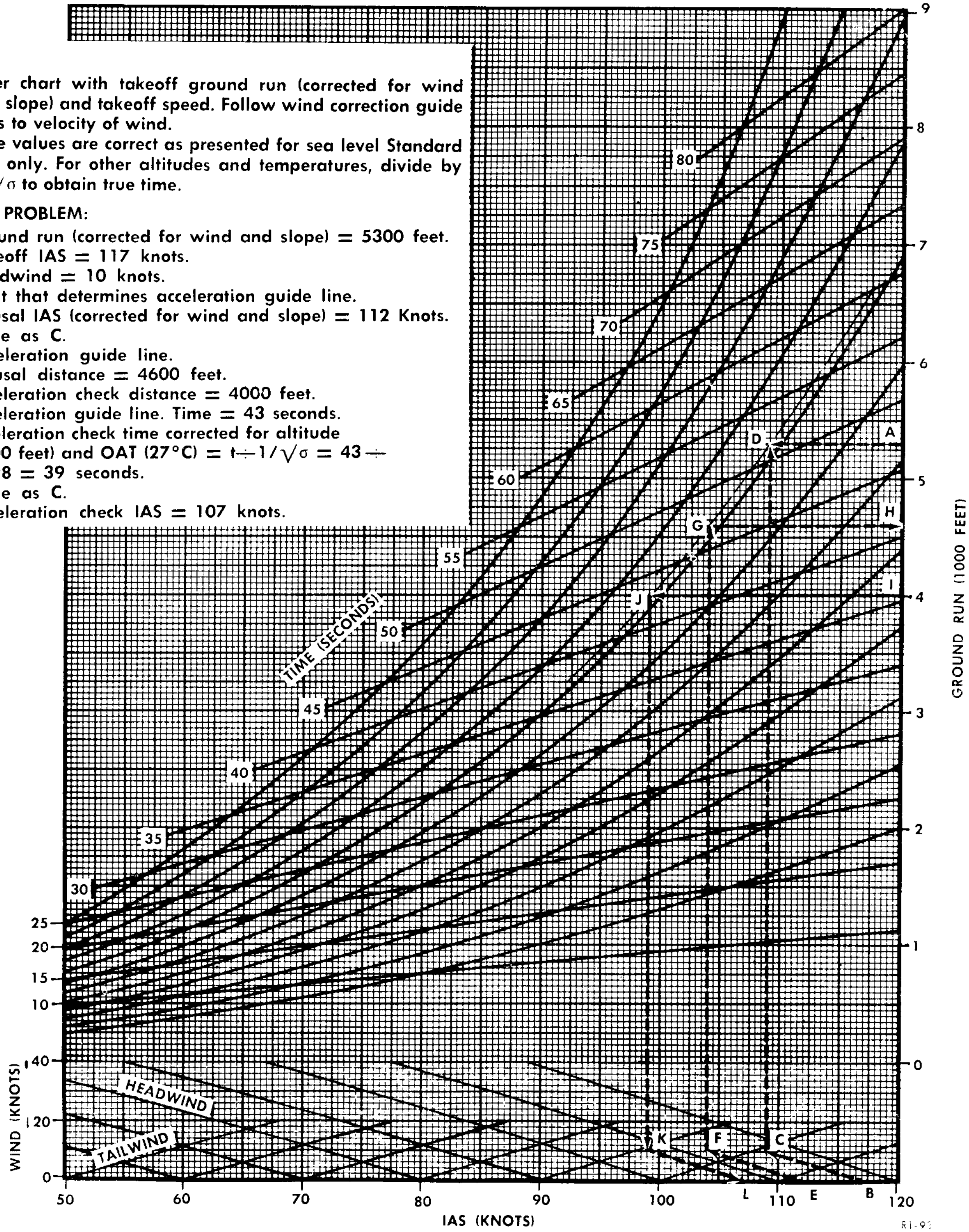


Figure A3-21. Takeoff Acceleration

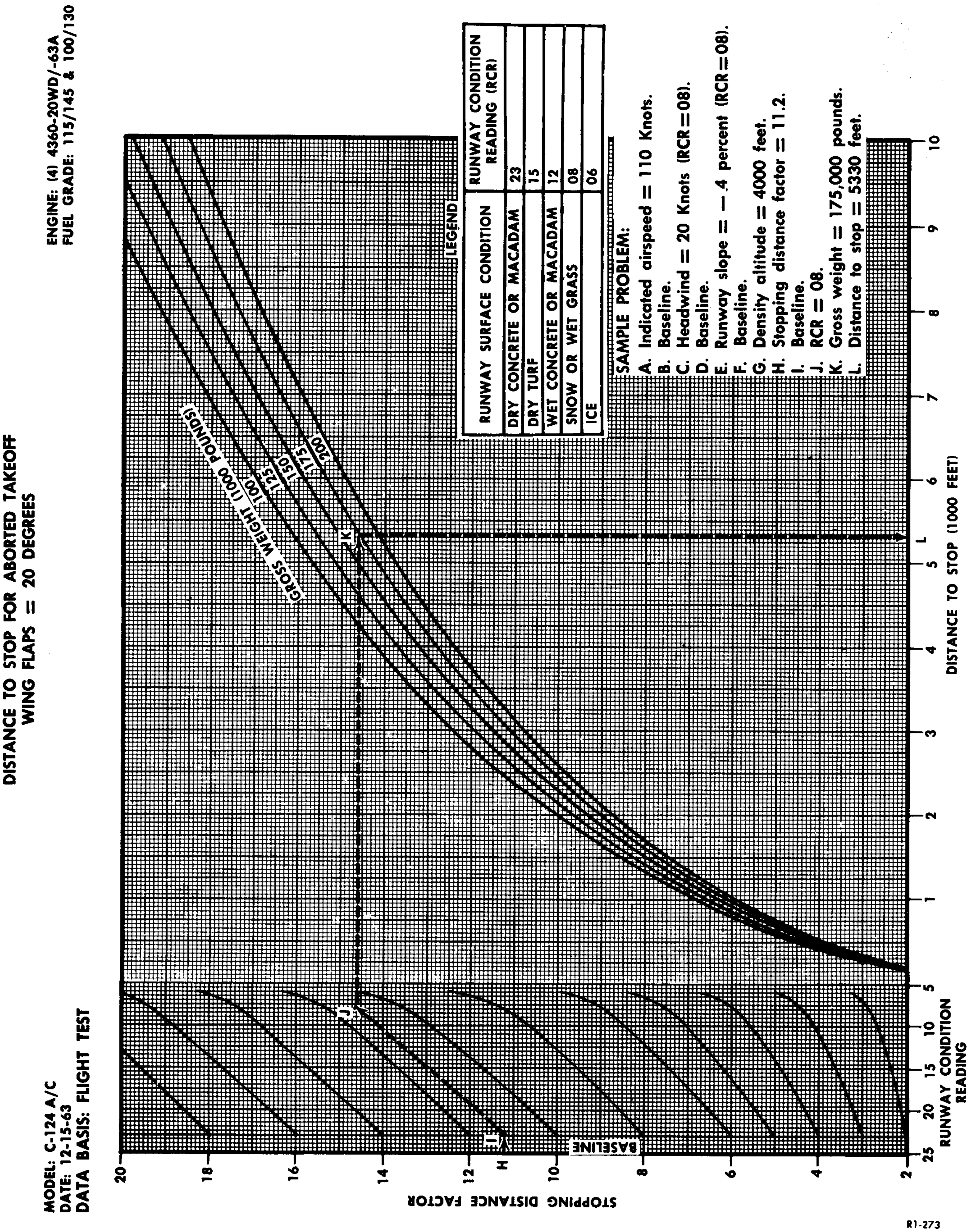


Figure A3-22. Distance to Stop for Aborted Takeoff — Wing Flaps = 20 Degrees (Sheet 1 of 2)

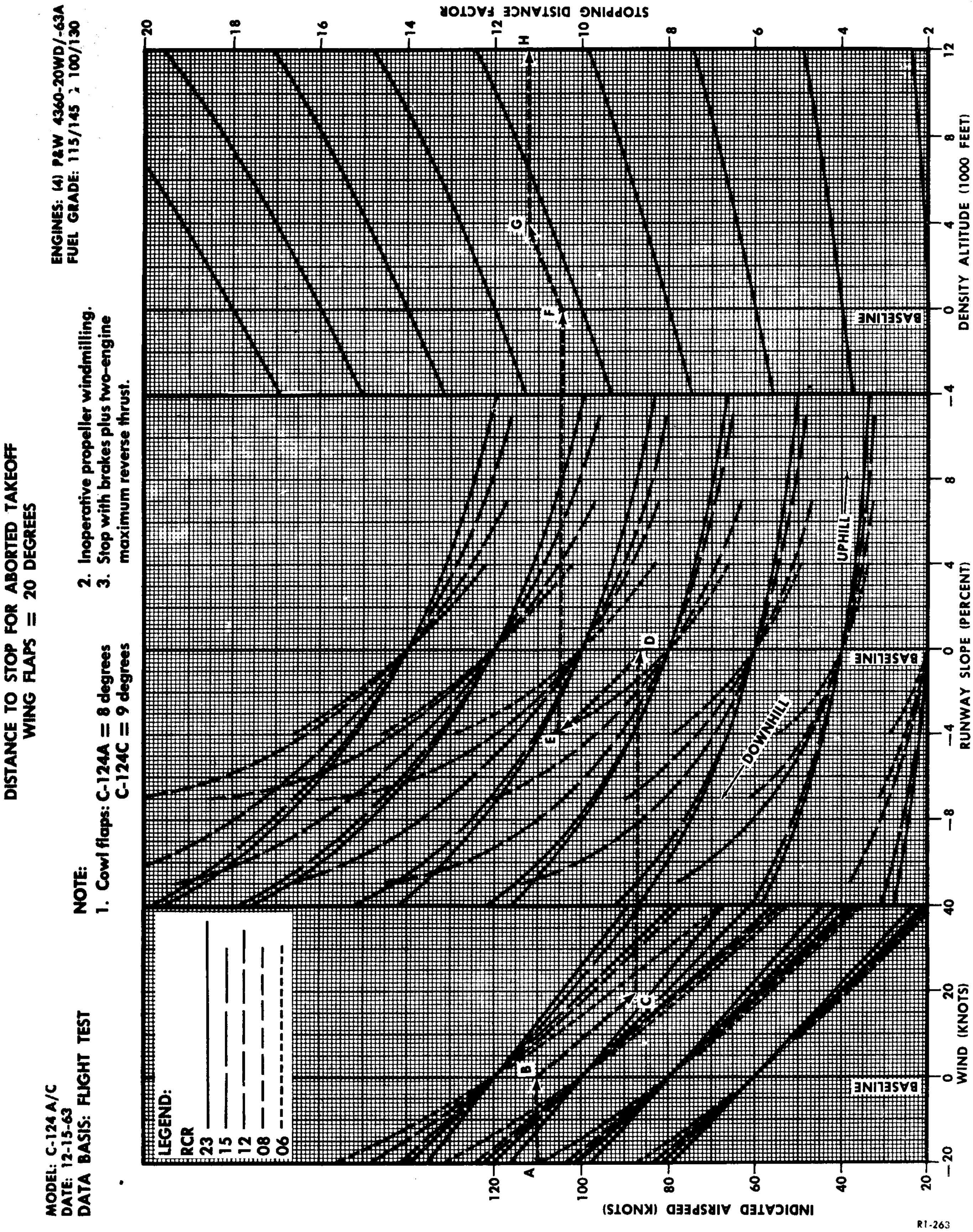


Figure A3-22. Distance to Stop for Aborted Takeoff—Wing Flaps = 20 Degrees (Sheet 2 of 2)

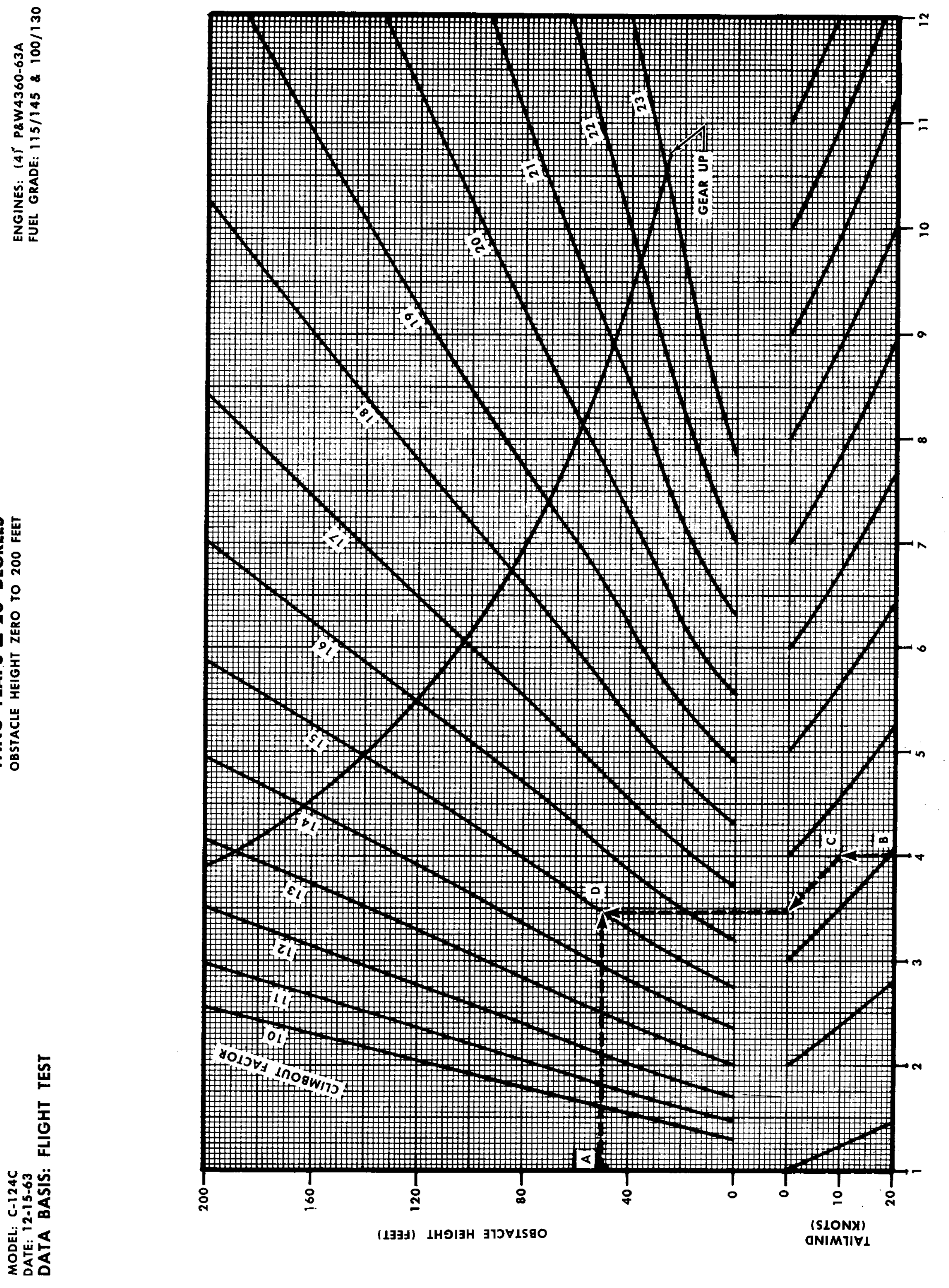


Figure A3-23. Climbout Factor — Three-Engine — Wing Flaps = 20 Degrees (Sheet 1 of 2)

CLIMBOUT FACTOR—THREE-ENGINE—WING FLAPS = 20 DEGREES

OBSTACLE HEIGHT ZERO TO 800 FEET

MODEL: C-124C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W4360-63A
FUEL GRADE: 115/145 & 100/130

NOTE:

1. V_{climb} = 105 percent power-off stall speed.
2. Cowl flaps = 9 degrees.
3. Ground effect included.
4. Inoperative propeller feathered.
5. Distance from brake release to takeoff is based on critical field length for a hard, dry runway surface, zero wind, zero slope, and part span flaps configuration. To account for other conditions, see Discussion Of Charts, this Part.

SAMPLE PROBLEM:

A. Obstacle height = 50 feet.
B. Obstacle distance from brake release = 4000 feet.
C. Tailwind = 10 knots.
D. Climbout factor = 15.0.

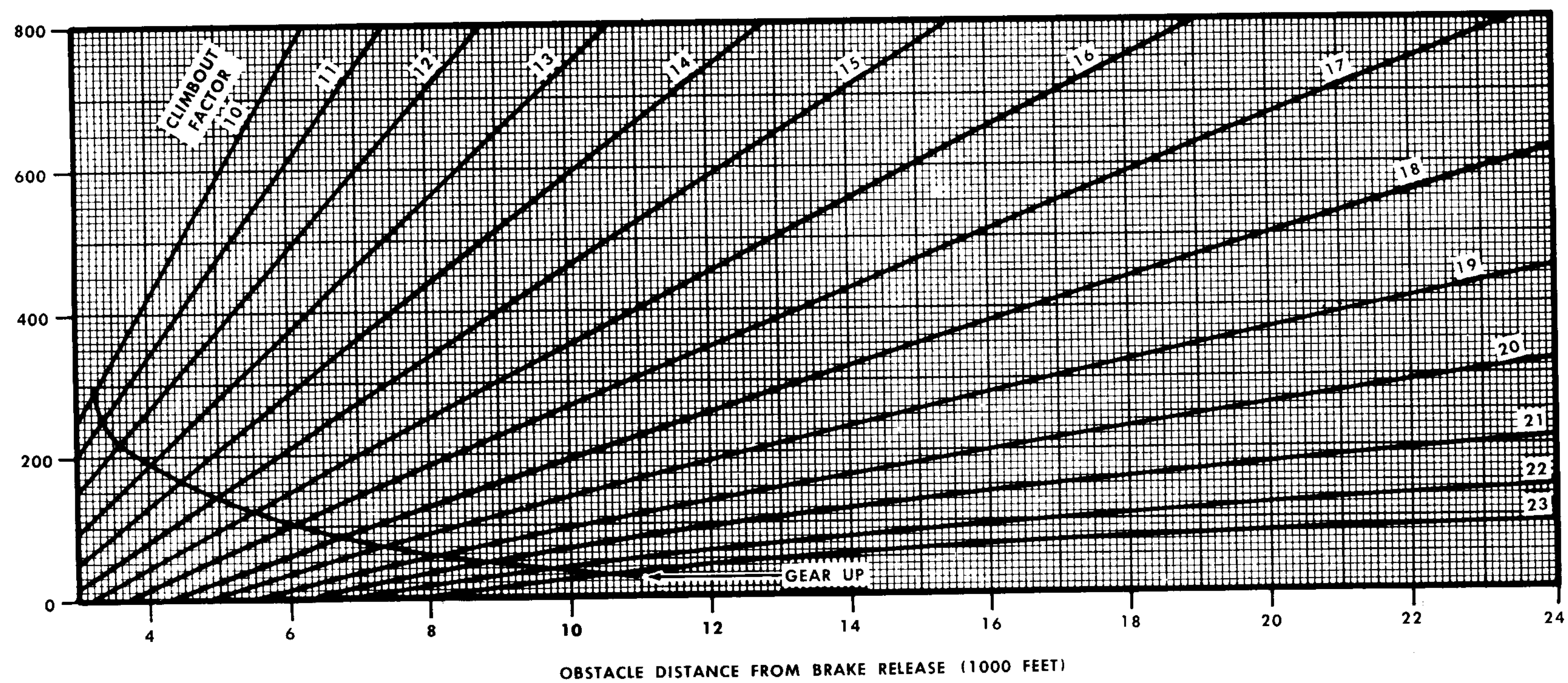


Figure A3-23. Climbout Factor — Three-Engine — Wing Flaps = 20 Degrees (Sheet 2 of 2)

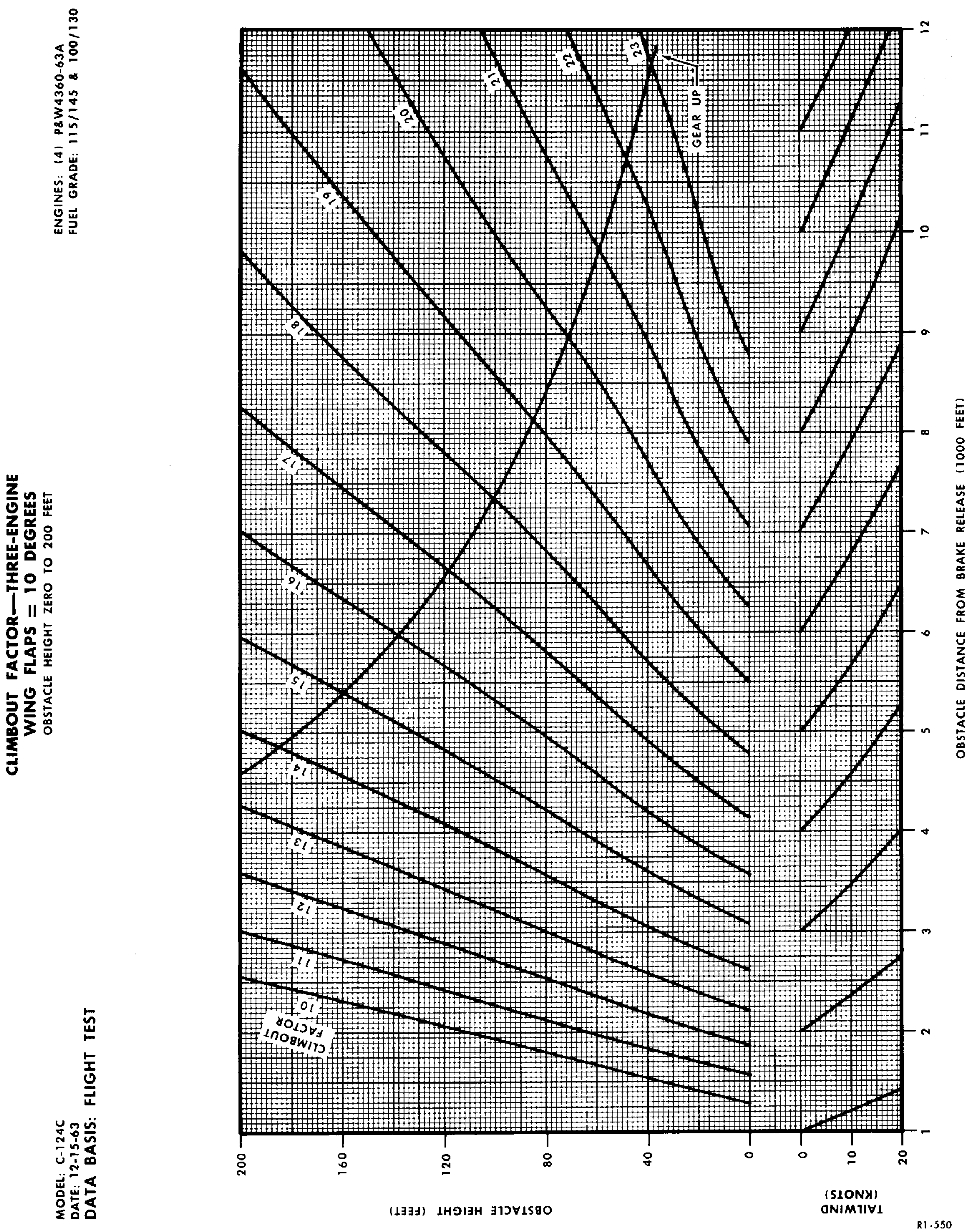


Figure A3-24. Climbout Factor — Three-Engine — Wing Flaps = 10 Degrees (Sheet 1 of 2)

CLIMBOUT FACTOR—THREE-ENGINE—WING FLAPS = 10 DEGREES

OBSTACLE HEIGHT ZERO TO 800 FEET

MODEL: C-124C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

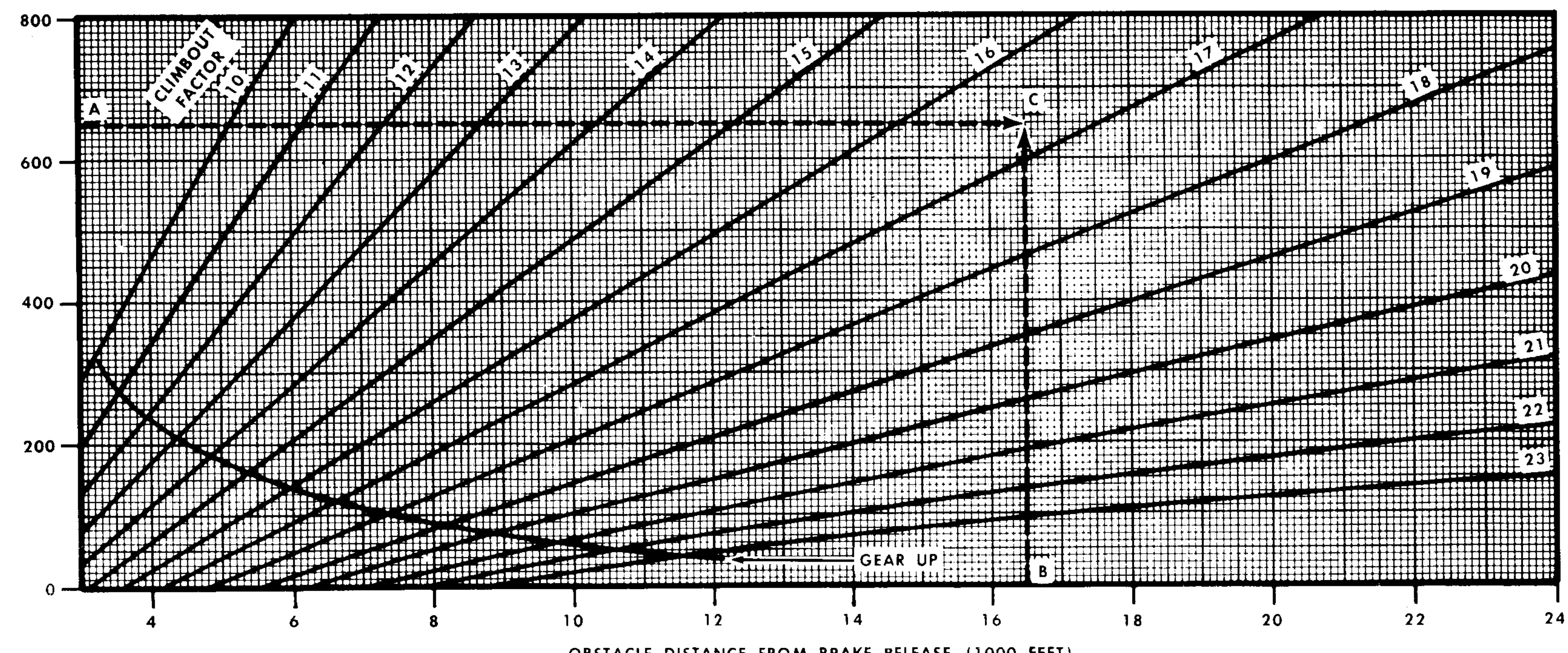
ENGINES: (4) P&W4360-63A
FUEL GRADE: 115/145 & 100/130

NOTE:

1. V_{climb} = 105 percent power-off stall speed.
2. Cowl flaps = 9 degrees.
3. Ground effect included.
4. Inoperative propeller feathered.
5. Distance from brake release to takeoff is based on critical field length for a hard, dry runway surface, zero wind, zero slope, and part span flaps configuration. To account for other conditions, see Discussion Of Charts, this Part.

SAMPLE PROBLEM:

A. Obstacle height = 650 feet.
B. Obstacle distance from brake release = 16,500 feet.
C. Climbout factor = 16.6.



R1-551

Figure A3-24. Climbout Factor — Three-Engine — Wing Flaps = 10 Degrees (Sheet 2 of 2)

GROSS WEIGHT LIMITED BY CLIMBOUT OVER OBSTACLE

MODEL: C-124C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-63A
FUEL GRADE: 115/145 & 100/130

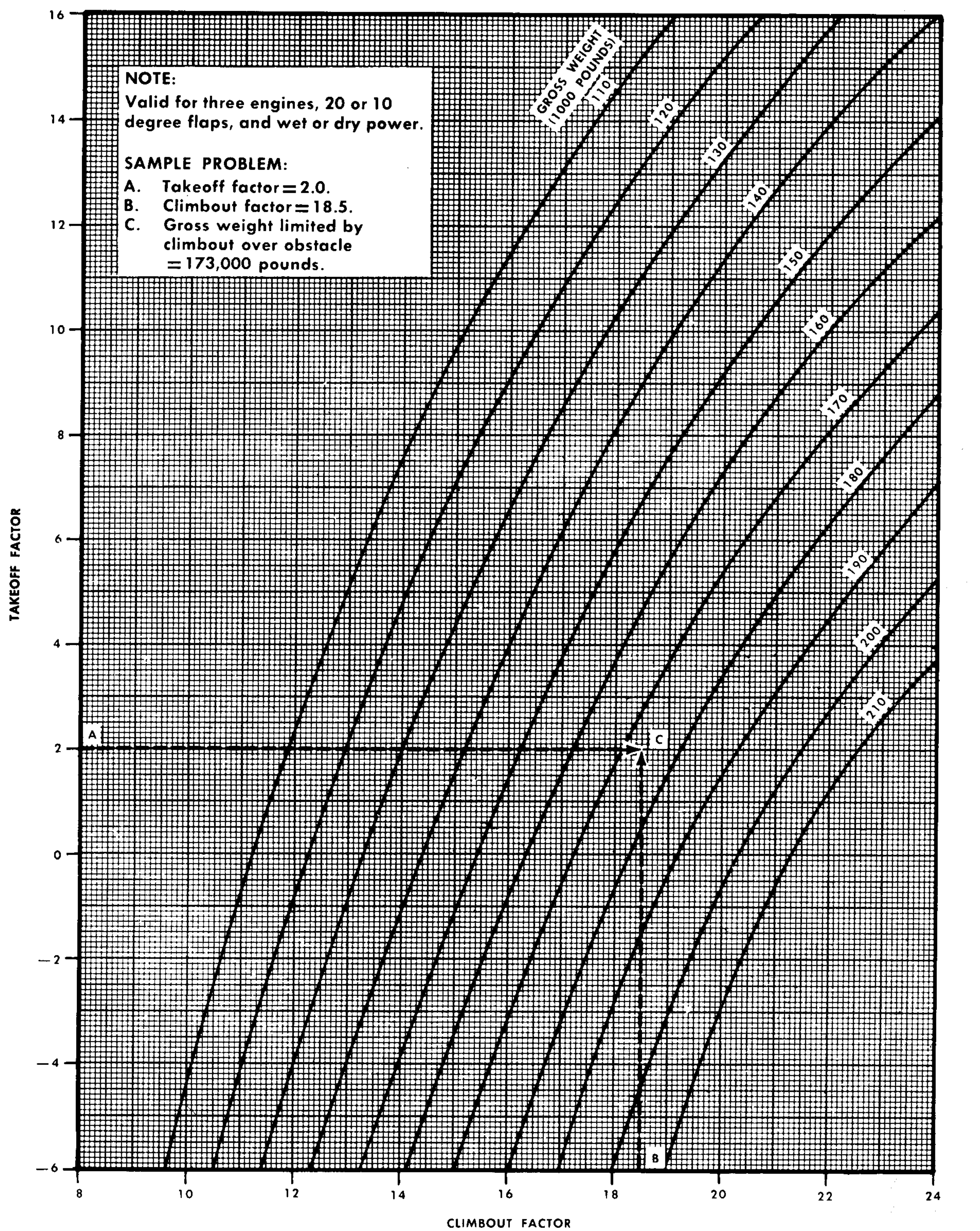


Figure A3-25. Gross Weight Limited By Climbout Over Obstacle

PART IV

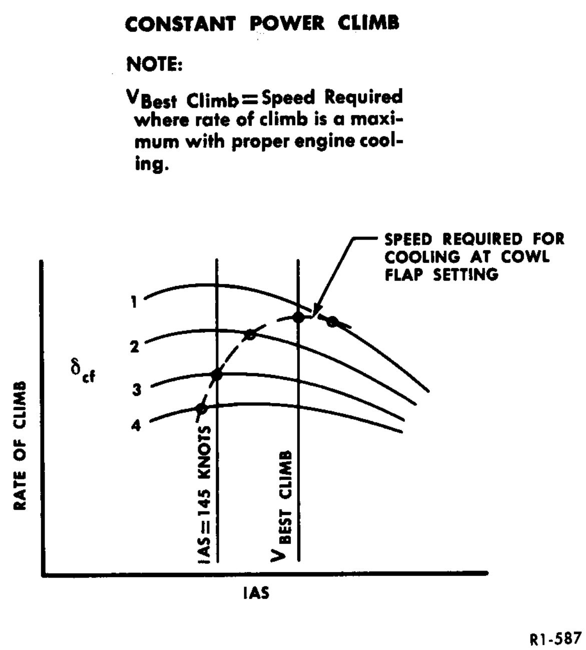
CLIMB

TABLE OF CONTENTS

LIST OF CHARTS

CLIMB PERFORMANCE.

The climb performance presented has been determined from flight test data and has been modified to provide for proper engine cooling. From the climb data, it was determined that the highest rate of climb at 185,000 pounds gross weight without cooling consideration is obtained at approximately 145 knots IAS, as shown on the following sketch.



However, when engine cooling requirements are considered, speed for best climb shifts. The dashed line on the preceding plot represents the speed required for cooling purposes at each cowl flap setting, and the maximum point on this line determines the optimum rate of climb and the best climbing speed. The cowl flap openings designated for the climb performance are sufficient to maintain the appropriate cylinder head temperature. Refer to T.O. 1C-124A-1, Section V for desired operating limits.

BLOWER SHIFT.

The altitudes indicated on the climb charts, at which the blower should be made, on determined by the point at which the limiting power in high blower is available. These altitudes vary with power setting, fuel grade, and temperature. When the shift altitude is reached, reduce manifold pressure 3 to 4 inches Hg, then shift to high blower, adjust RPM from 2600 to 2550 RPM if at METO power, then re-adjust the throttle to the power level indicated on the individual climb charts.

DISCUSSION OF CHARTS.

NORMAL CLIMB CHARTS.

The Climb charts (figures A4-1 through A4-10) are presented for engine operation in normal mixture. These charts are used to predict time and fuel to climb and the horizontal distance traveled during climb. Auxiliary curves on each chart indicate the best climb speed and the required cowl flap angle to give proper cooling. Several combinations of number of engines operating, engine RPM, atmospheric conditions, and fuel grade have been chosen to cover normal climb operations. A sample problem is given on each chart to illustrate the use of the data. To obtain data for atmospheric conditions between ICAO Standard Day and Army Hot Day, compute all data (EAS, cowl flap position, and time, distance, and fuel to climb) for both standard day and hot day conditions, and interpolate for the variation from standard day (Army Hot Day = Standard Day + 23° C).

The charts have been constructed for the following climb power schedule with the manifold pressures, RPM's, and torque pressures indicated on the individual charts. Climb at constant MAP (shown as limit MAP on charts) in part throttle low blower to full throttle, then full throttle low blower to blower shift altitude. Shift to high blower as previously described in this writeup and adjust the power to the limit torque pressure indicated on the charts. Continue climbing at constant torque pressure in part throttle high blower to full throttle, then full throttle high blower. In METO power, the RPM must be changed from 2600 RPM in low blower to 2550 RPM after the shift to high blower.

The reduced power climb performance of 2350 RPM is included to show the capabilities of the aircraft at an alternate power setting suitable for climb on normal missions. This power setting is permissible and desirable when the gross weight is not excessively high and when all four engines are operating. Reduced power results in longer engine life and lowers the vibration level of the aircraft and engine accessories during climb.

CEILINGS CHART.

The Ceilings chart (figure A4-11) presents emergency ceilings (100 FPM rate of climb capability) and cruise ceiling (300 FPM) for four, three, and two engines at METO power. The ceilings are based on speed and cowl flap settings for best climb and any inoperative propellers feathered.

EMERGENCY CLIMB CHARTS.

The Emergency Climb charts (figures A4-12 through A4-25) show rates of climb at different indicated airspeeds for various configurations with four, three, and two engines operating. A correction plot is included on each chart to permit the determination of rate of climb for various torque pressures and density altitudes. The emergency climb data serves fundamentally as an indication of the speed for best rate of climb, which occurs at the peak of each curve, and general level of climb capability and is not applicable to takeoff climbout characteristics since the effect of climbing near the ground is not included.

For aircraft with full span wing flaps (AF49-243 through AF51-182), full flap deflection is 40 degrees. Add 200 FPM to data for configurations E and F (wing flaps = 45 degrees) to obtain emergency climb performance with wing flaps full down.

EMERGENCY TWO-ENGINE CLIMB CHART.

The Emergency Two-Engine Climb Chart (figure A4-26) supplements the information presented on the Emergency Climb — Two-Engine Charts (figure A4-22 through A4-25). The chart shows the rate of climb and speed for maximum rate of climb in the clean configuration (Wing flaps = zero degrees and landing gear up) for gross weights from 110, 000 to 180, 000 pounds, with corrections for various density altitudes and torque pressures. Data are based on climb at maximum RPM, cowl flaps open to 9 degrees, oil cooler doors full open, and propellers feathered on the inoperative engines. Ground effect is not included on this chart.

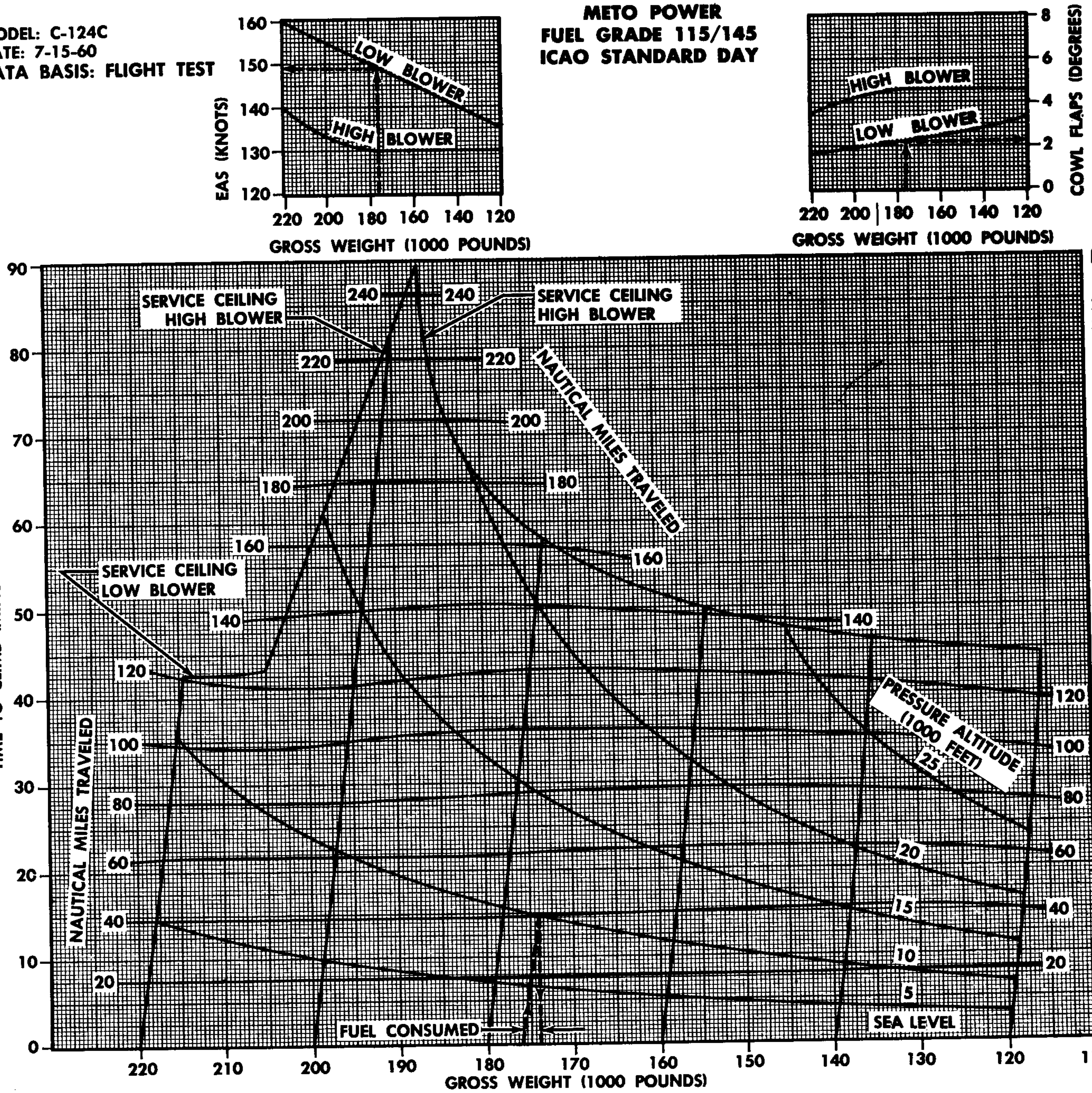
RECOMMENDED SPEED FOR BEST RATE OF CLIMB AND BEST ANGLE OF CLIMB CHART.

The recommended speed for best rate of climb and best angle of climb at maximum wet power can be determined from figure A4-27. Speed for best rate of climb is presented for three-engine operation with landing gear up and wing flaps at either zero or 20 degrees, and with landing gear down and wing flaps at 20 degrees. The recommended speed for best angle of climb is presented for two-, three-, or four-engine operation for 105 percent of power-off stall speed with wing flaps at 20 degrees, for partial span wing flap configuration. For aircraft with full span wing flaps (AF49-243 through AF51-182) subtract one knot to obtain corrected airspeed. The best rate of climb is experienced when the increase in altitude per unit of time is a maximum value. The best angle of climb is experienced when the increase in altitude per unit of horizontal distance is a maximum value. The best angle of climb curve is based on 105 percent of the power-off stall speed, since the best angle of climb occurs at this speed or below. During takeoff, when an obstacle must be cleared, the velocity for best angle of climb will enable the aircraft to attain the highest altitude in the shortest horizontal distance.

MODEL: C-124C
DATE: 7-15-60
DATA BASIS: FLIGHT TEST

CLIMB CHART—FOUR-ENGINE
METO POWER
FUEL GRADE 115/145
ICAO STANDARD DAY

ENGINES: (4) P&W 4360-63A



NOTE:
1. No wind.
2. NORMAL MIXTURE.
3. Sea level to 12,000 feet:
   Low Blower —2600 RPM.
   Limit: MAP.=50 inches Hg.
4. Above 12,000 feet:
   High Blower —2550 RPM.
   Limit: Torque pressure=175 PSI.

SAMPLE PROBLEM:
Gross weight at beginning of climb=176,000 pounds.
Climb from sea level to 10,000 feet.
Cowl flaps=2.2 degrees.
Climbing EAS=149 knots.
Time to climb=14.7 minutes.
Distance to climb=40 nautical miles.
Gross weight at end of climb=174,000 pounds.
Fuel consumed during climb=176,000−174,000=2000 pounds.

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Figure A4-1. Climb Chart — Four-Engine — METO Power — Fuel Grade 115/145 — ICAO Standard Day

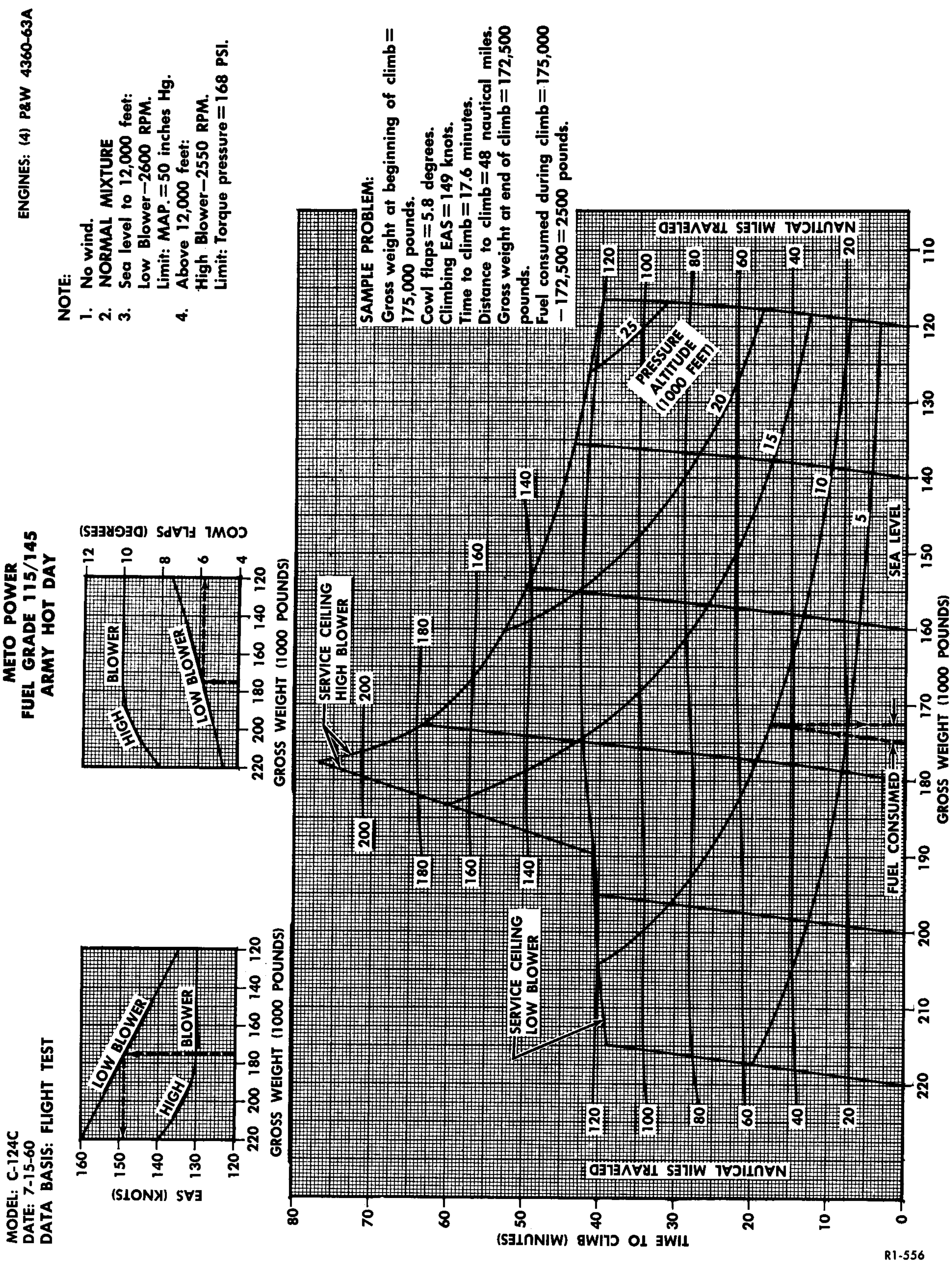


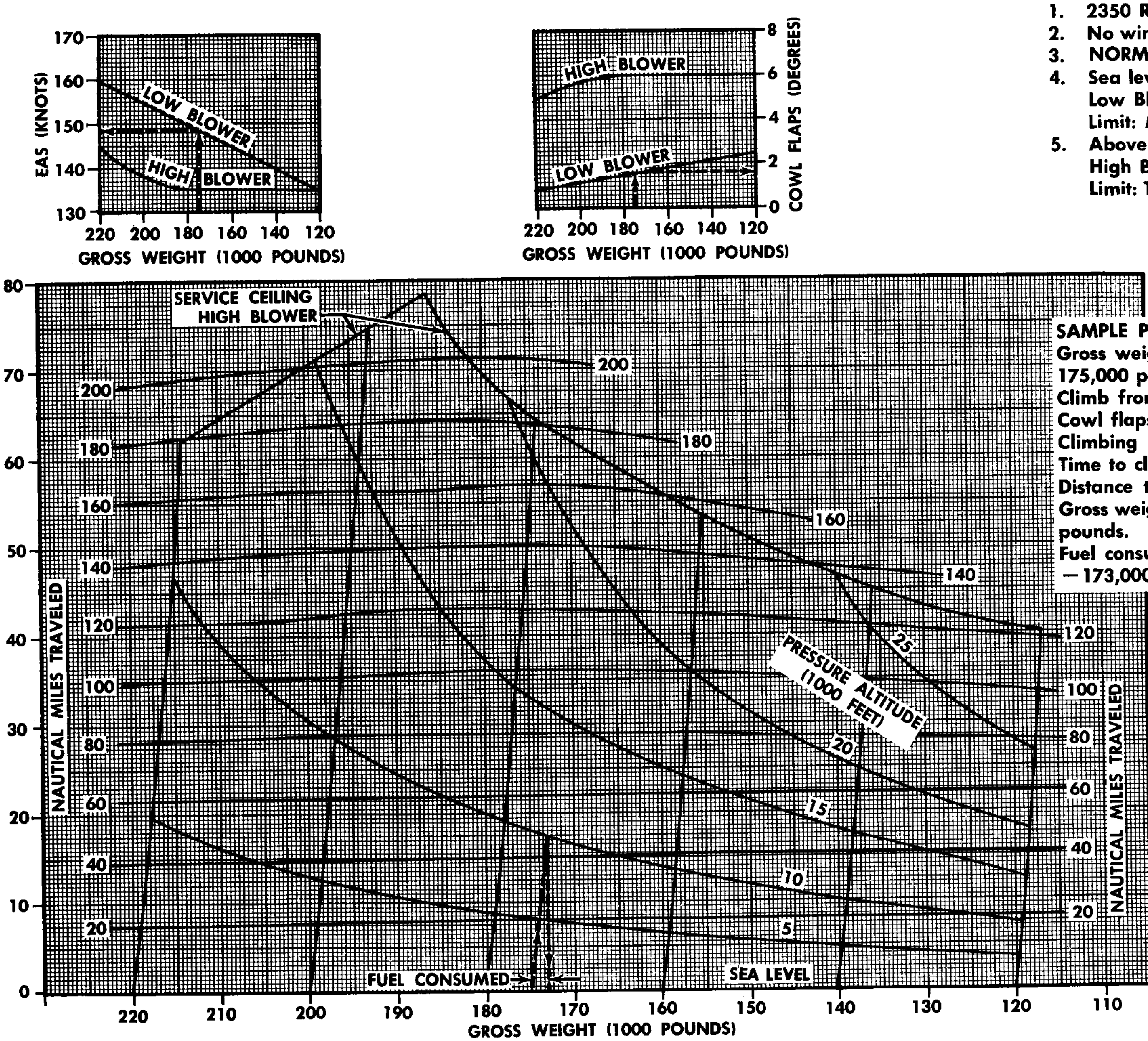
Figure A4-2 Climb Chart—Four-Engine—METO Power—Fuel Grade 115/145—Army Hot Day

MODEL C-124C
DATE: 7-15-60
DATA BASIS: FLIGHT TEST

CLIMB CHART—FOUR-ENGINE
REDUCED POWER
FUEL GRADE 115/145
ICAO STANDARD DAY

ENGINES: (4) P&W 4360-63A

NOTE:
1. 2350 RPM.
2. No wind.
3. NORMAL MIXTURE.
4. Sea level to 10,400 feet:
   Low Blower.
   Limit: MAP. = 45 inches Hg.
5. Above 10,400 feet:
   High Blower.
   Limit: Torque pressure = 183 PSI.



SAMPLE PROBLEM:
Gross weight at beginning of climb = 175,000 pounds.
Climb from sea level to 10,000 feet.
Cowl flaps = 1.6 degrees.
Climbing EAS = 148.5 knots.
Time to climb = 17.4 minutes.
Distance to climb = 47 nautical miles.
Gross weight at end of climb = 173,000 pounds.
Fuel consumed during climb = 175,000 − 173,000 = 2000 pounds.

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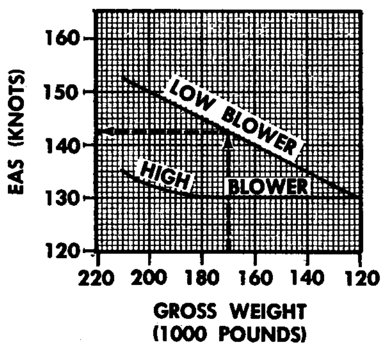
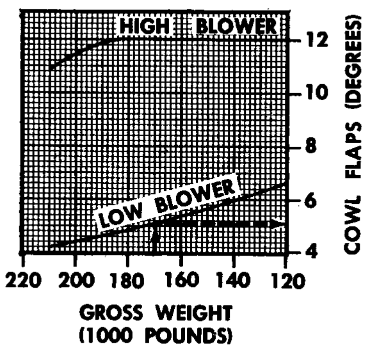
Figure A4-3. Climb Chart —Four-Engine —Reduced Power — Fuel Grade 115/145 —ICAO Standard Day

CLIMB CHART—FOUR-ENGINE REDUCED POWER FUEL GRADE 115/145 ARMY HOT DAY

MODEL: C-124C
DATE: 7-15-60
DATA BASIS: FLIGHT TEST

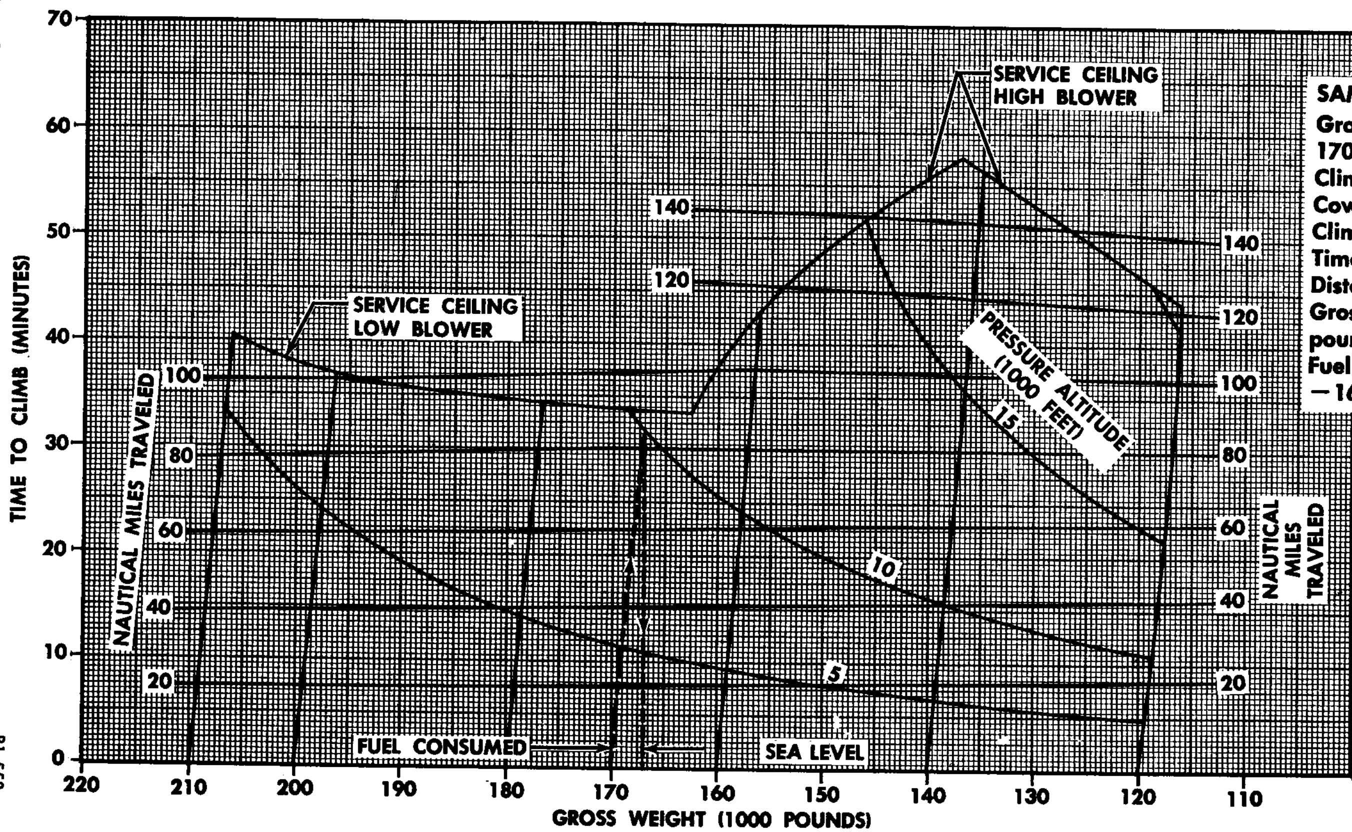
ENGINES: (4) P&W 4360-63A





NOTE:

1. 2350 RPM.
2. No-wind.
3. NORMAL MIXTURE
4. Sea level to 10,000 feet:
   Low Blower.
   Limit: MAP.=45 inches Hg.
5. Above 10,000 feet:
   High Blower.
   Limit: Torque pressure=176 PSI.



SAMPLE PROBLEM:
Gross weight at beginning of climb=170,000 pounds.
Climb from sea level to 10,000 feet.
Cowl flaps=5.1 degrees.
Climbing EAS=142.5 knots.
Time to climb=32 minutes.
Distance to climb=85 nautical miles.
Gross weight at end of climb=167,000 pounds.
Fuel consumed during climb=170,000 −167,000=3000 pounds.

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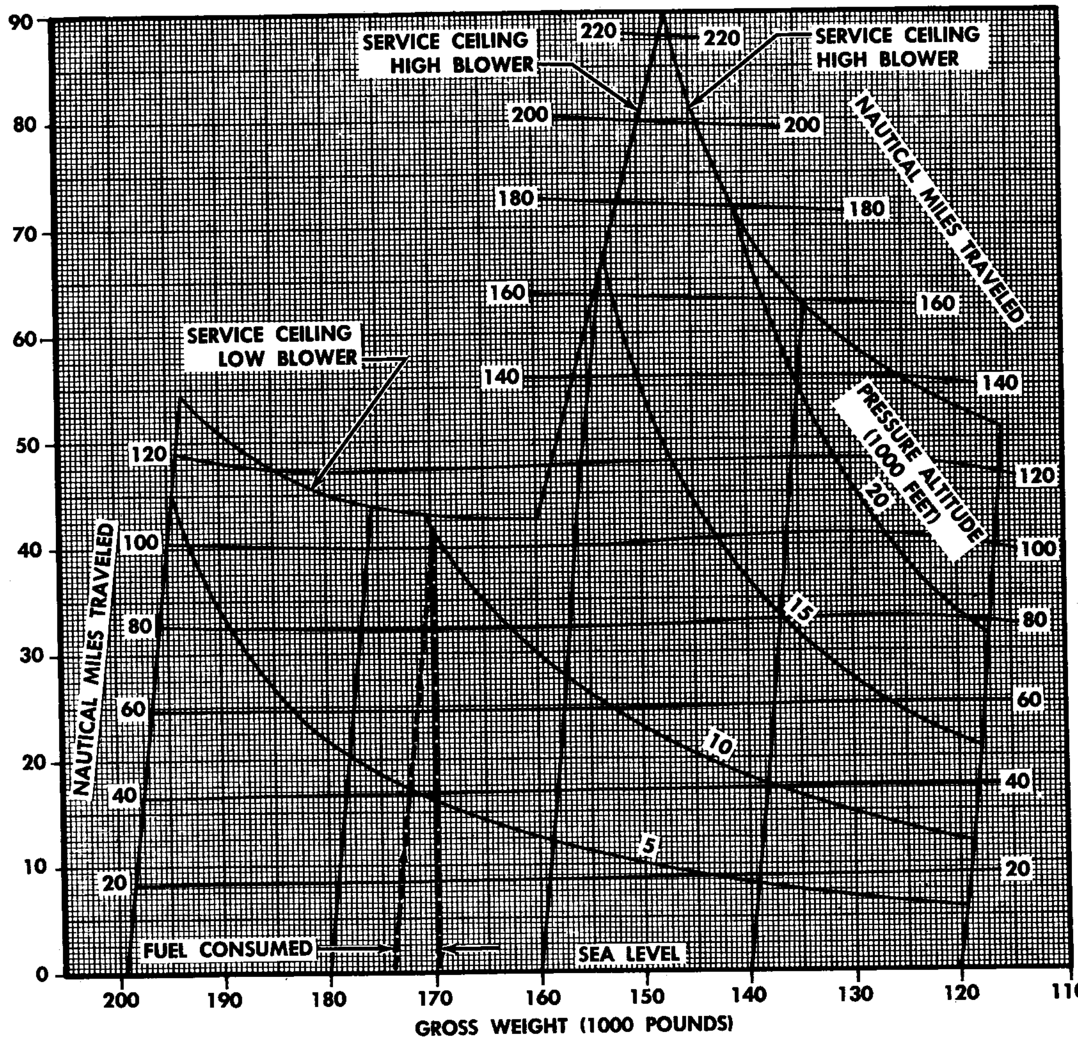
Figure A4-4. Climb Chart — Four-Engine — Reduced Power — Fuel Grade 115/145 — Army Hot Day

MODEL: C-124C
DATE: 7-15-60
DATA BASIS: FLIGHT TEST

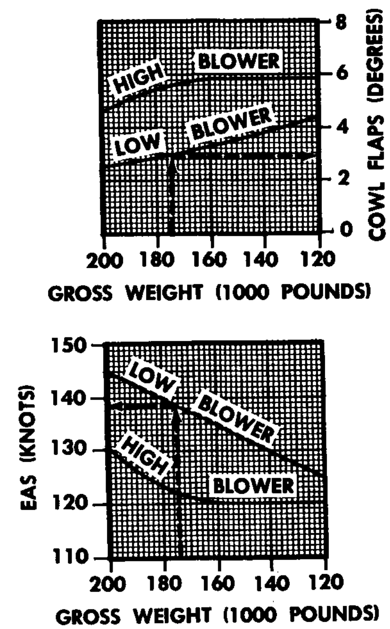
CLIMB CHART—THREE-ENGINE
METO POWER
FUEL GRADE 115/145
ICAO STANDARD DAY

ENGINES: (4) P&W 4360-63A

NOTE:
1. No wind.
2. NORMAL MIXTURE.
3. Sea level to 12,000 feet:
   Low Blower—2600 RPM.
   Limit: MAP.=50 inches Hg.
4. Above 12,000 feet:
   High Blower—2550 RPM.
   Limit: Torque pressure=175 PSI.



SAMPLE PROBLEM:
Gross weight at beginning of climb=174,000 pounds.
Climb from sea level to 10,000 feet.
Cowl flaps=2.9 degrees.
Climbing EAS=138.5 knots.
Time to climb=41.5 minutes.
Distance to climb=104 nautical miles.
Gross weight at end of climb=169,750 pounds.
Fuel consumed during climb=174,000 −169,750=4250 pounds.



R1-559

Figure A4-5. Climb Chart—Three-Engine—METO Power—Fuel Grade 115/145—ICAO Standard Day

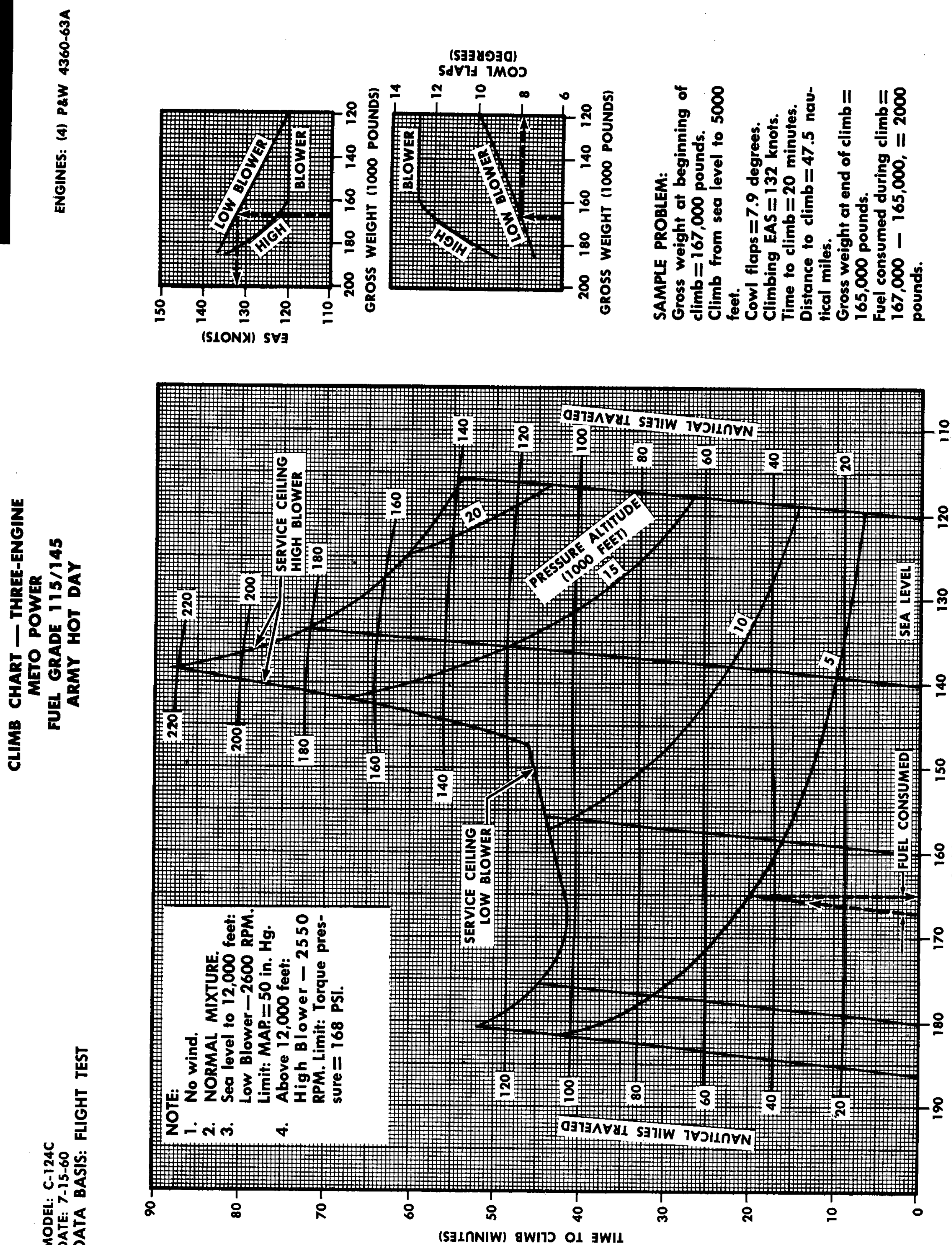


Figure A4-6. Climb Chart — Three-Engine — METO Power — Fuel Grade 115/145 — Army Hot Day

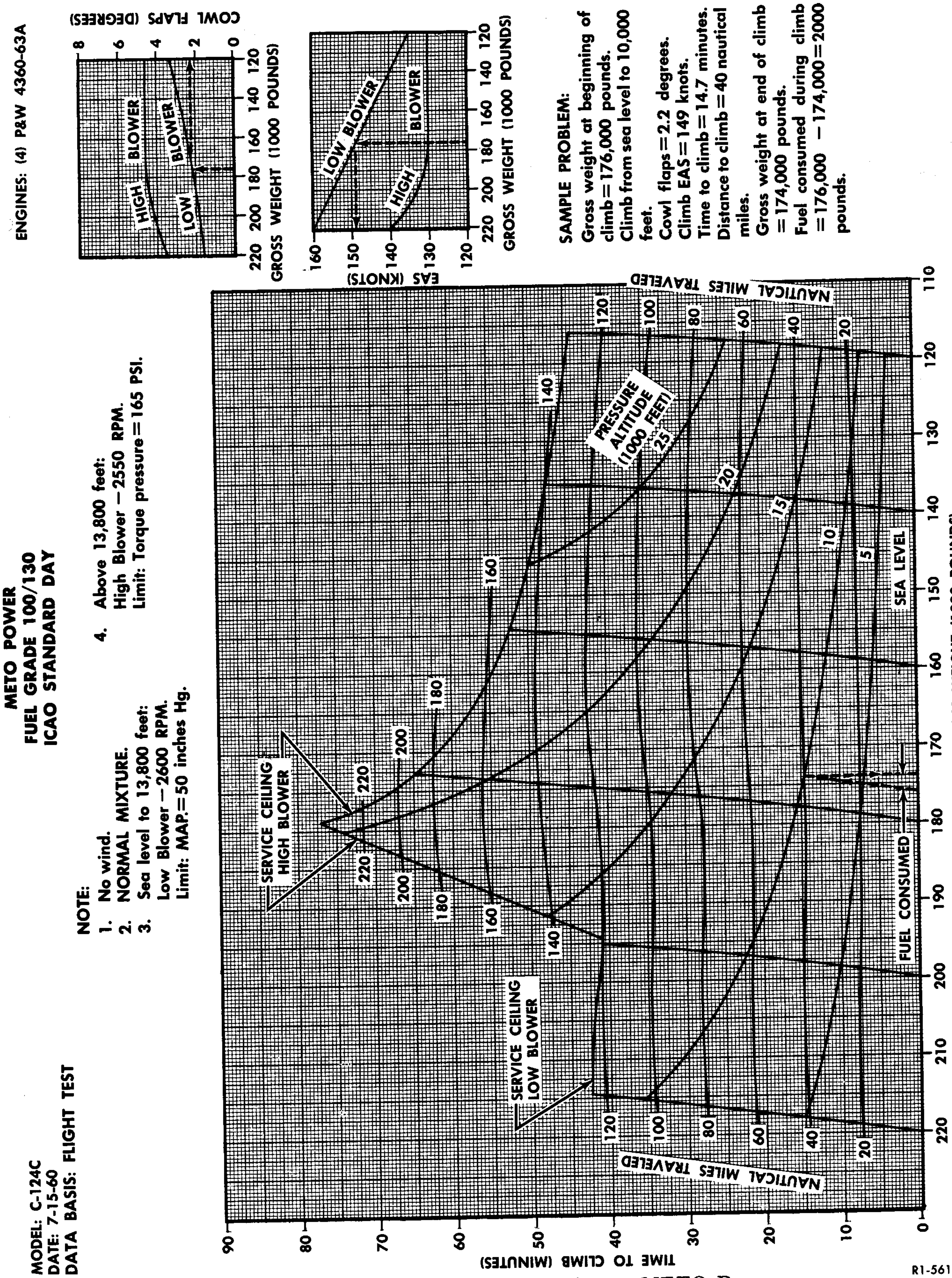


Figure A4-7. Climb Chart—Four-Engine—METO Power—Fuel Grade 100/130—ICAO Standard Day

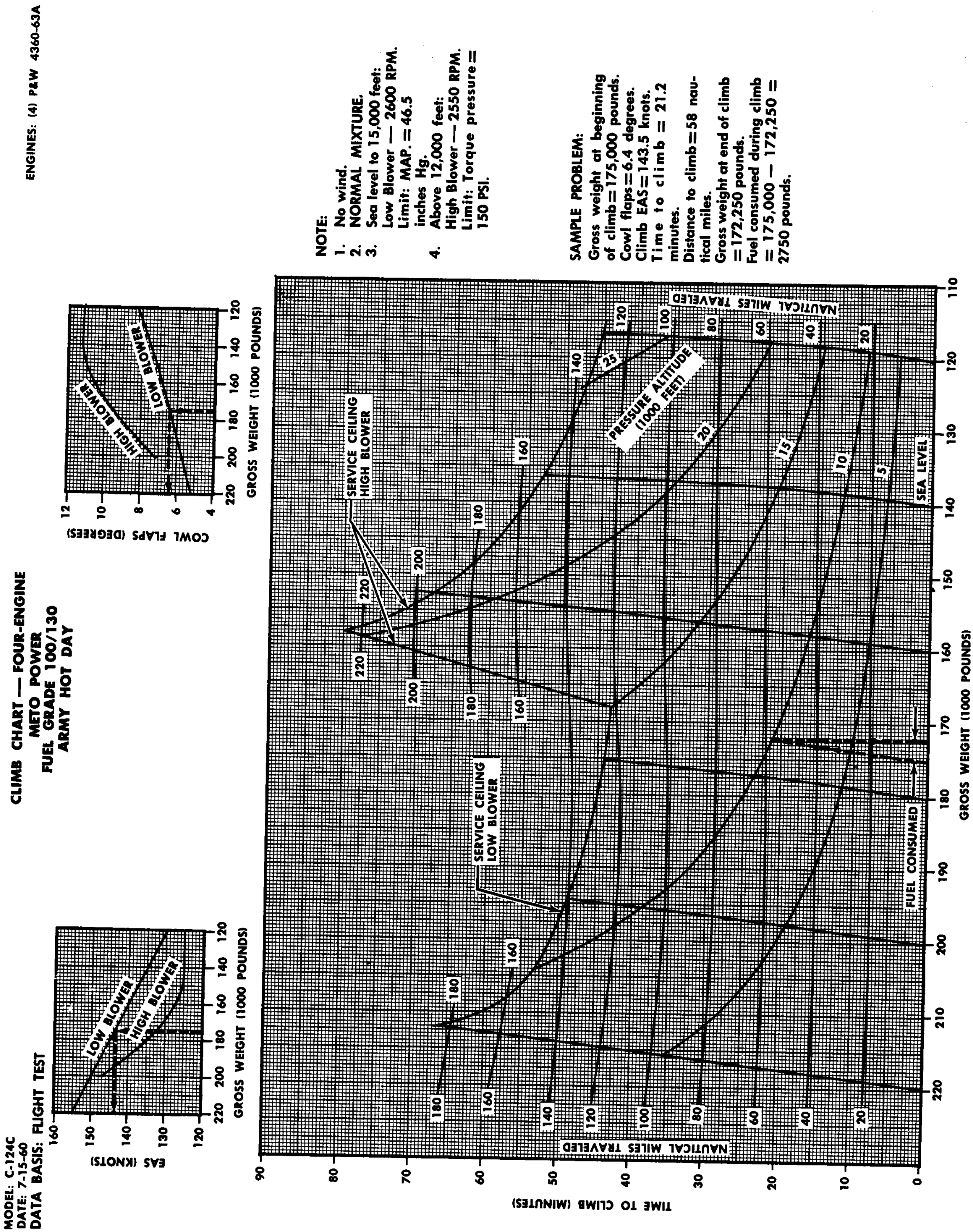


Figure A4-8. Climb Chart — Four-Engine — METO Power — Fuel Grade 100/130 — Army Hot Day

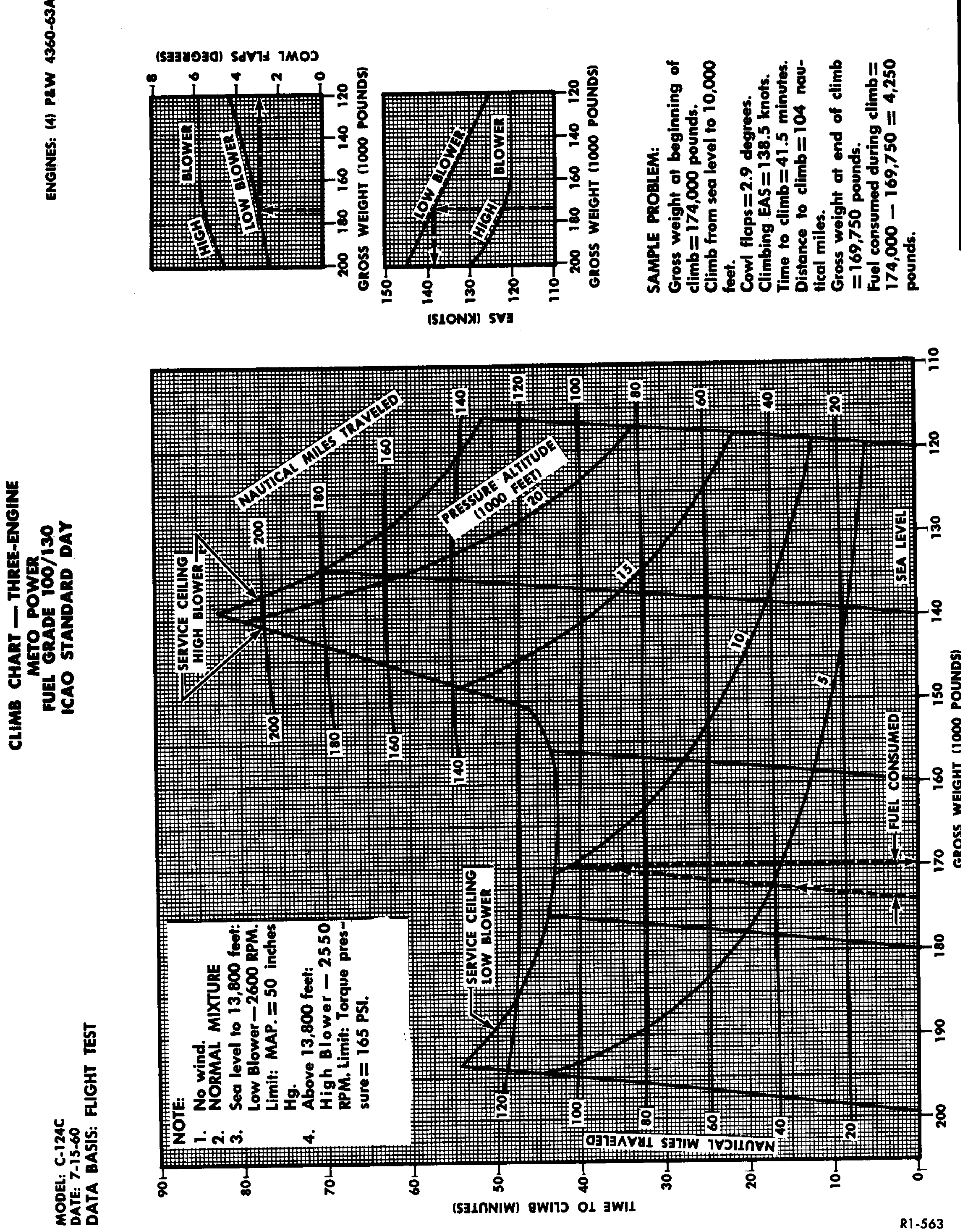
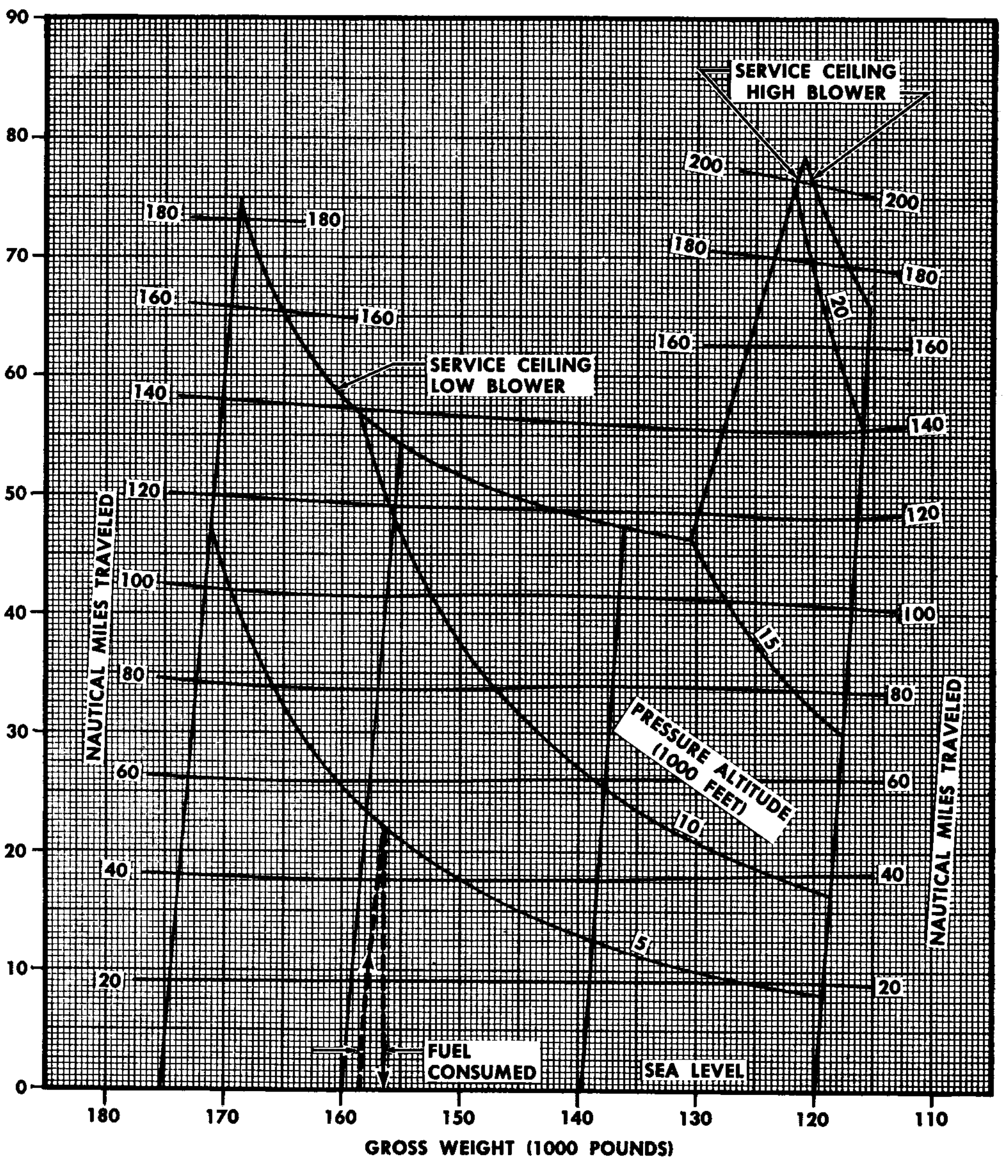


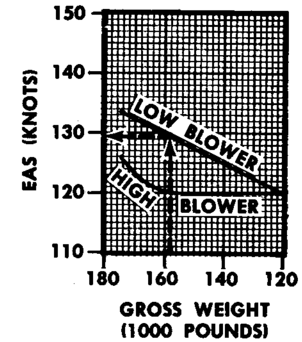
Figure A4-9. Climb Chart — Three-Engine — METO Power — Fuel Grade 100/130 — ICAO Standard Day

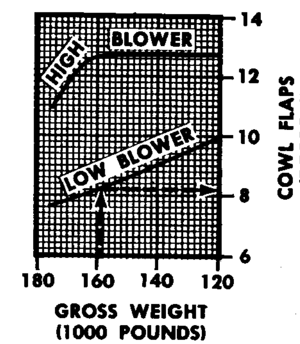
CLIMB CHART — THREE-ENGINE
METO POWER
FUEL GRADE 100/130
ARMY HOT DAY

MODEL: C-124C
DATE: 7-15-60
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-63A







NOTE:
1. No wind.
2. NORMAL MIXTURE
3. Sea level to 15,000 feet:
   Low Blower—2600 RPM.
   Limit: 46.5 in. Hg.
4. Above 15,000 feet:
   High Blower—2550 RPM.
   Limit: Torque pressure=150 PSI.

SAMPLE PROBLEM:
Gross weight at beginning of climb= 158,500 pounds.
Climb from sea level to 5000 feet.
Cowl flaps=8.2 degrees.
Climbing EAS=129.5 knots.
Time to climb=22 minutes.
Distance to climb=51 nautical miles.
Gross weight at end of climb= 156,500 pounds.
Fuel consumed during climb= 158,500—156,500=2000 pounds.

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Figure A4-10. Climb Chart—Three-Engine—METO Power—Fuel Grade 100/130—Army Hot Day

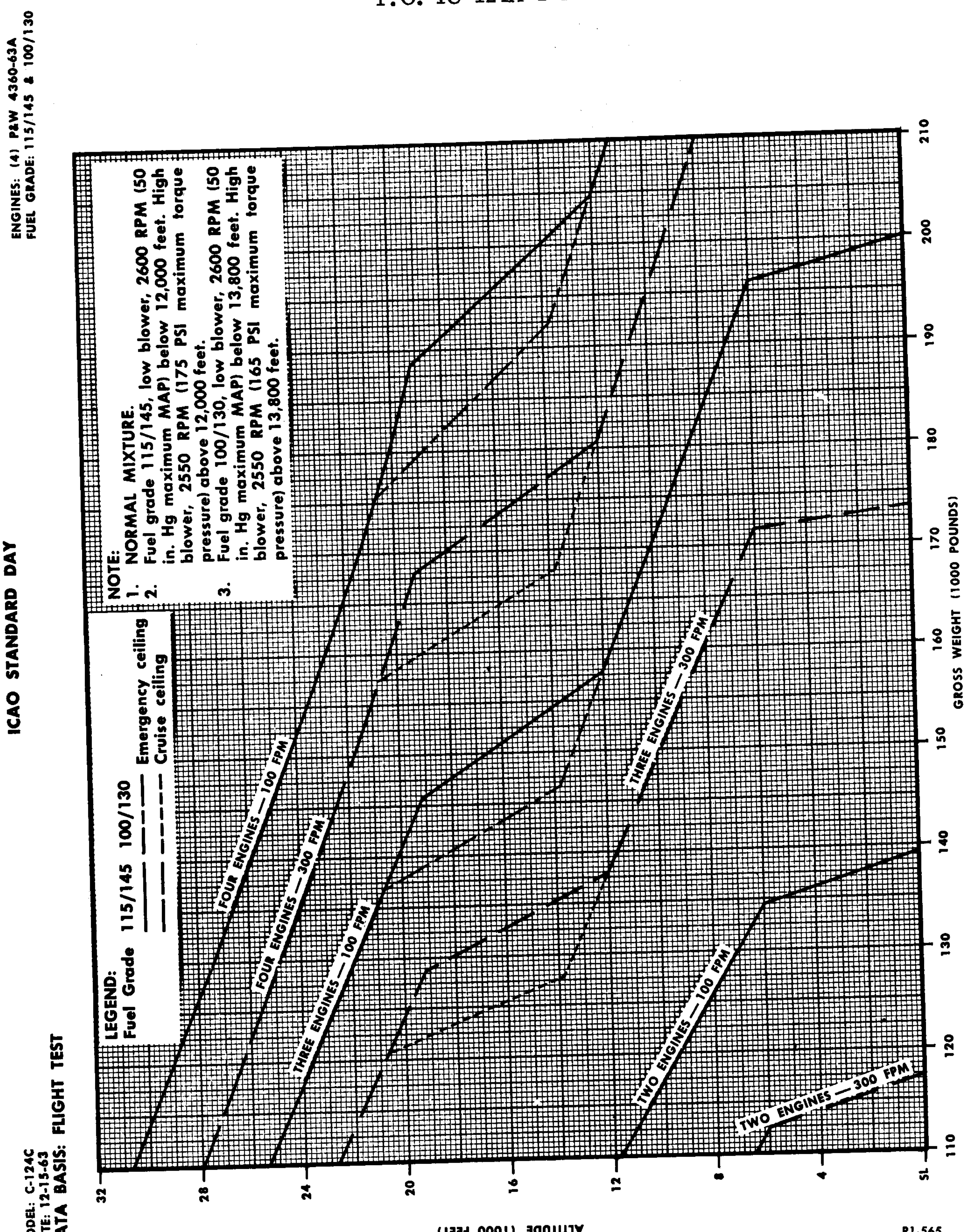


Figure A4-11. Ceilings — METO Power — ICAO Standard Day

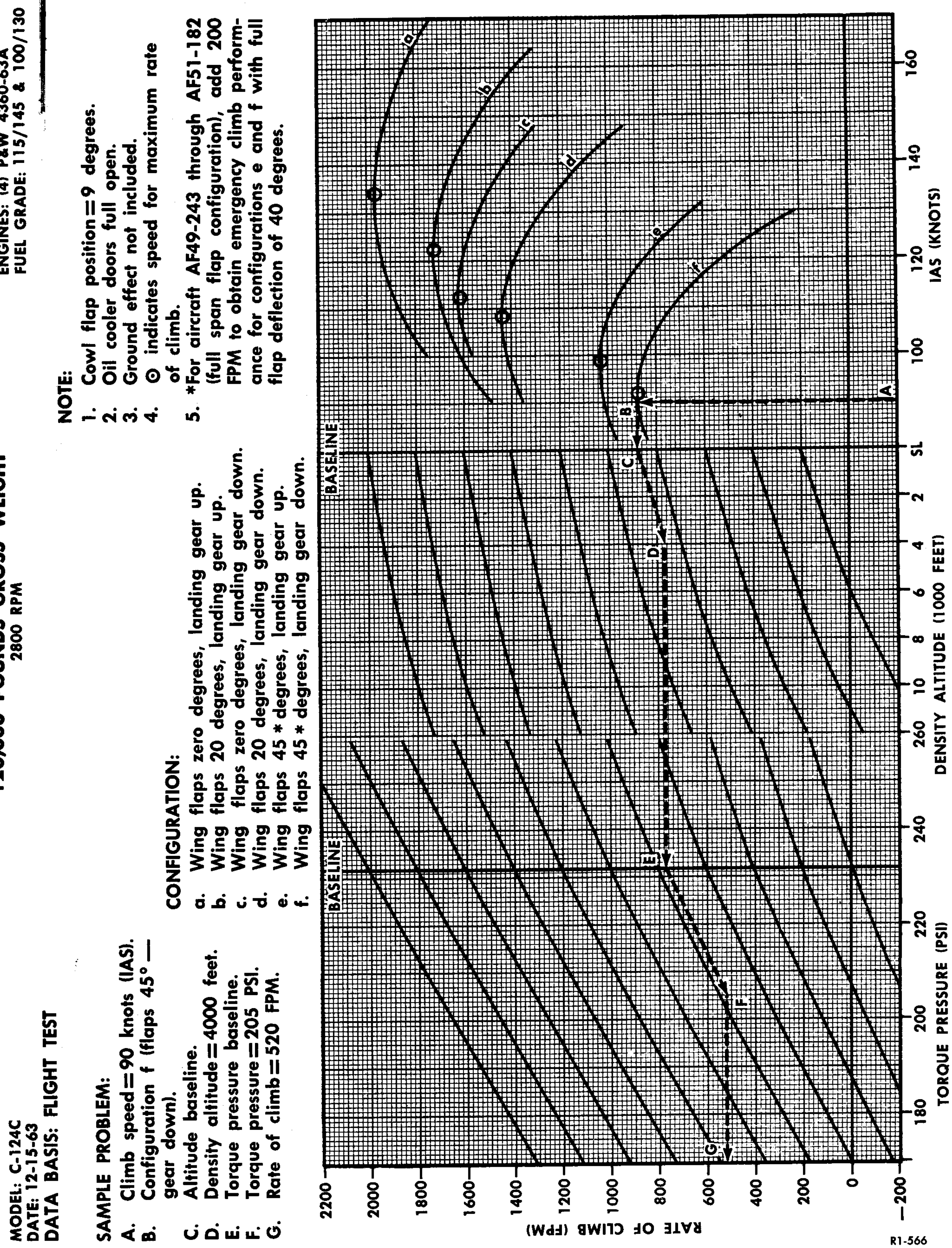


Figure A4-12. Emergency Climb — Four-Engine — 120,000 Pounds Gross Weight

MODEL: C-124C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

EMERGENCY CLIMB — FOUR-ENGINE
140,000 POUNDS GROSS WEIGHT
2800 RPM

ENGINES: (4) P&W 4360-63A
FUEL GRADE: 115/145 & 100/130

SAMPLE PROBLEM:

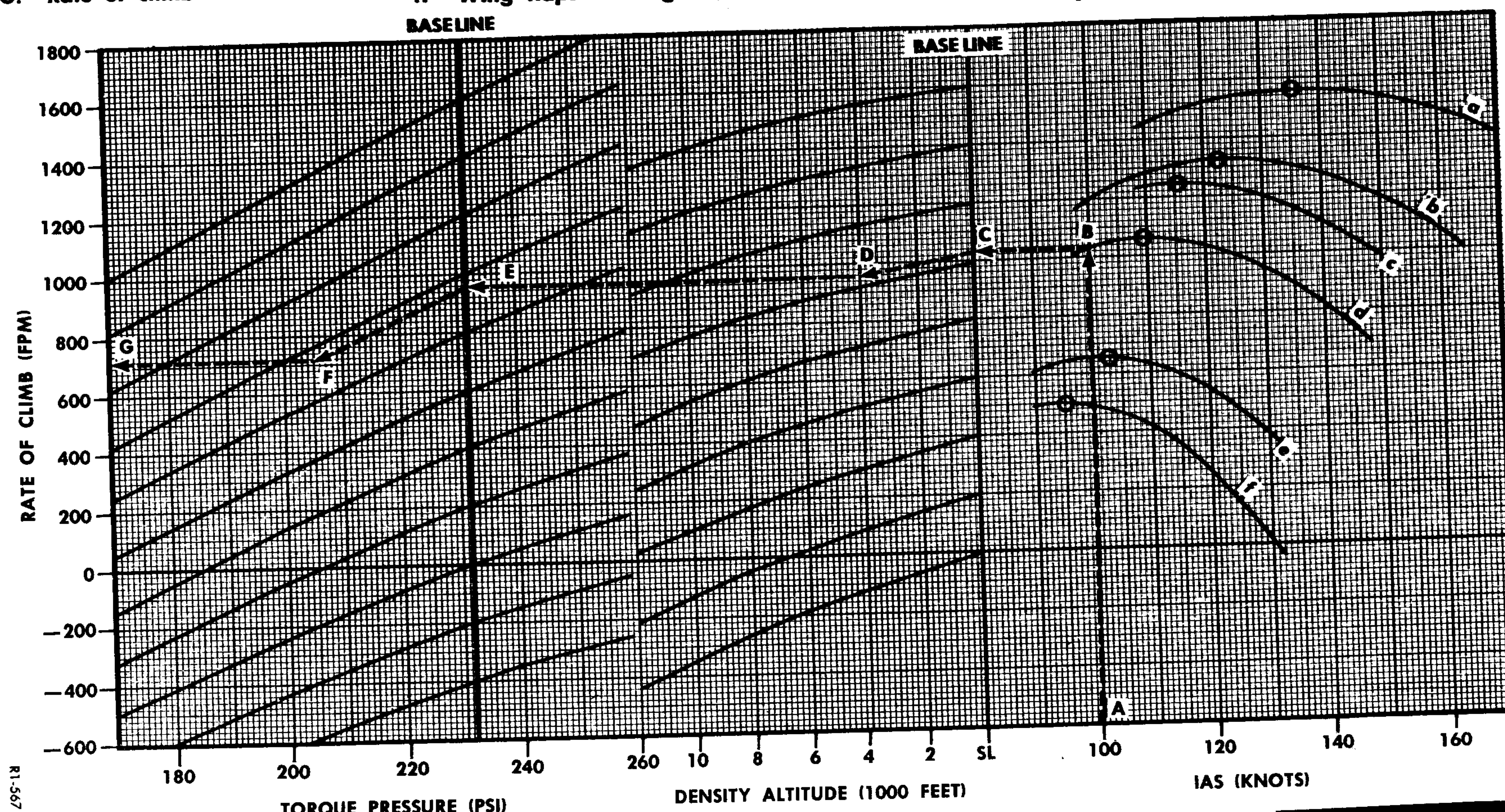
A. Climb speed = 100 knots (IAS).
B. Configuration d (flaps 20° — gear down).
C. Altitude baseline.
D. Density altitude = 4000 feet.
E. Torque pressure baseline
F. Torque pressure = 205 PSI.
G. Rate of climb = 715 FPM.

CONFIGURATION:

a. Wing flaps zero degrees, landing gear up.
b. Wing flaps 20 degrees, landing gear up.
c. Wing flaps zero degrees, landing gear down.
d. Wing flaps 20 degrees, landing gear down.
e. Wing flaps 45* degrees, landing gear up.
f. Wing flaps 45* degrees, landing gear down.

NOTE:

1. Cowl flap position = 9 degrees.
2. Oil cooler doors full open.
3. Ground effect not included.
4. ⊙ indicates speed for maximum rate of climb.
5. *For aircraft AF49-243 through AF51-182 (full span flap configuration), add 200 FPM to obtain emergency climb performance for configurations e and f with full flap deflection of 40 degrees.



R1-567

Figure A4-13. Emergency Climb — Four-Engine — 140,000 Pounds Gross Weight

MODEL: C-124C
DATE 12-15-63
DATA BASIS: FLIGHT TEST

EMERGENCY CLIMB — FOUR-ENGINE
160,000 POUNDS GROSS WEIGHT
2800 RPM

ENGINES: (4) P&W 4360-63A
FUEL GRADE: 115/145 & 100/130

SAMPLE PROBLEM:

A. Climb speed=110 knots (IAS).
B. Configuration d (flaps 20° — gear down).
C. Altitude baseline.
D. Density altitude=4000 feet.
E. Torque pressure baseline.
F. Torque pressure=205 PSI.
G. Rate of climb=485 FPM.

CONFIGURATION:

a. Wing flaps zero degrees, landing gear up.
b. Wing flaps 20 degrees, landing gear up.
c. Wing flaps zero degrees, landing gear down.
d. Wing flaps 20 degrees, landing gear down.
e. Wing flaps 45*degrees, landing gear up.
f. Wing flaps 45*degrees, landing gear down.

NOTE:

1. Cowl flap position=9 degrees.
2. Oil cooler doors full open.
3. Ground effect not included.
4. O indicates speed for maximum rate of climb.
5. *For aircraft AF49-243 through AF51-182 (full span flap configuration), add 200 FPM to obtain emergency climb performance for configurations e and f with full flap deflection of 40 degrees.

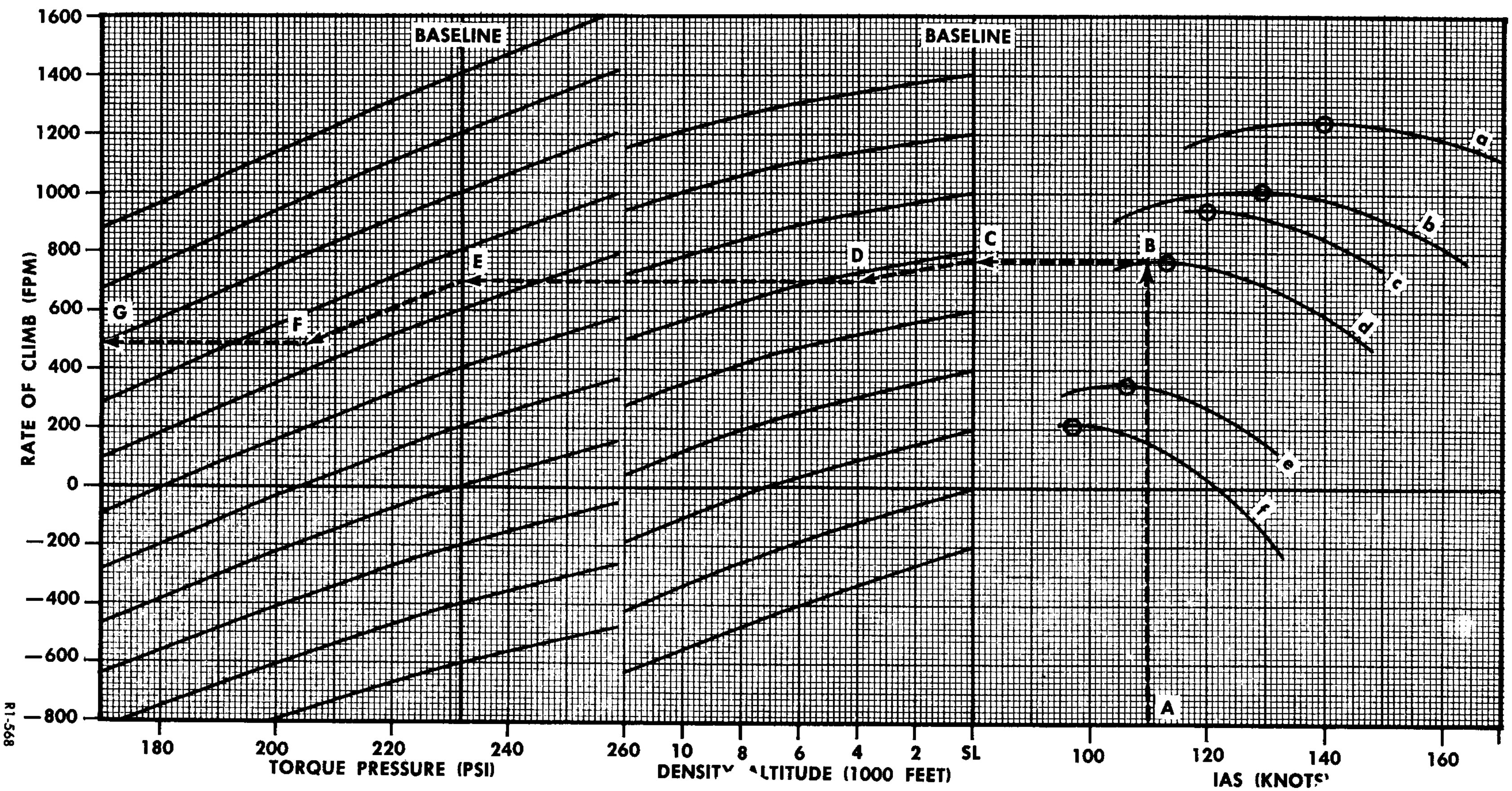


Figure A4-14. Emergency Climb — Four-Engine — 160,000 Pounds Gross Weight

EMERGENCY CLIMB — FOUR-ENGINE 180,000 POUNDS GROSS WEIGHT

2800 RPM

MODEL: C-124C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-63A
FUEL GRADE: 115/145 & 100/130

SAMPLE PROBLEM:

A. Climb speed=115 knots (IAS).
B. Configuration b (flaps 20° — gear up).
C. Altitude baseline.
D. Density altitude=4000 feet.
E. Torque pressure baseline.
F. Torque pressure=205 PSI.
G. Rate of climb=455 FPM.

CONFIGURATION:

a. Wing flaps zero degrees, landing gear up.
b. Wing flaps 20 degrees, landing gear up.
c. Wing flaps zero degrees, landing gear down.
d. Wing flaps 20 degrees, landing gear down.
e. Wing flaps 45* degrees, landing gear up.
f. Wing flaps 45* degrees, landing gear down.

NOTE:

1. Cowl flap position=9 degrees.
2. Oil cooler doors full open.
3. Ground effect not included.
4. ⊙ indicates speed for maximum rate of climb.
5. *For aircraft AF49-243 through AF51-182 (full span flap configuration), add 200 FPM to obtain emergency climb performance for configurations e and f with full flap deflection of 40 degrees.

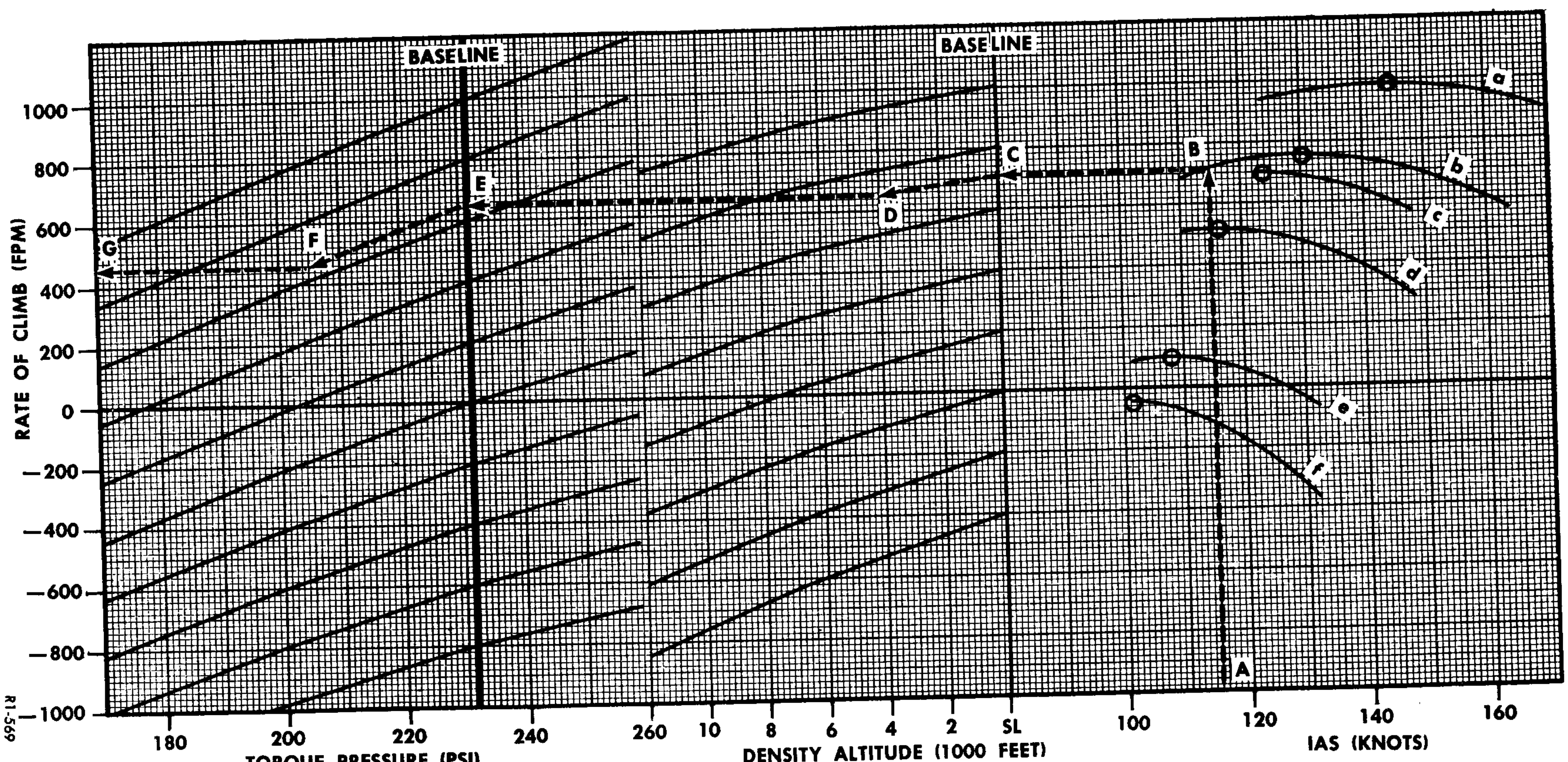


Figure A4-15. Emergency Climb — Four-Engine — 180,000 Pounds Gross Weight

EMERGENCY CLIMB — FOUR-ENGINE
200,000 POUNDS GROSS WEIGHT
2800 RPM

MODEL: C-124C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-63A
FUEL GRADE: 115/145 & 100/130

SAMPLE PROBLEM:

A. Climb speed = 120 knots (IAS).
B. Configuration b (flaps 20° — gear up).
C. Altitude baseline.
D. Density altitude = 2000 feet.
E. Torque pressure baseline.
F. Torque pressure = 240 PSI.
G. Rate of climb = 525 FPM.

CONFIGURATION:

a. Wing flaps zero degrees, landing gear up.
b. Wing flaps 20 degrees, landing gear up.
c. Wing flaps zero degrees, landing gear down.
d. Wing flaps 20 degrees, landing gear down.
e. Wing flaps 45*degrees, landing gear up.
f. Wing flaps 45*degrees, landing gear down.

NOTE:

1. Cowl flap position = 9 degrees.
2. Oil cooler doors full open.
3. Ground effect not included.
4. ⊙ indicates speed for maximum rate of climb.
5. *For aircraft AF49-243 through AF51-182 (full span flap configuration), add 200 FPM to obtain emergency climb performance for configurations e and f with full flap deflection of 40 degrees.

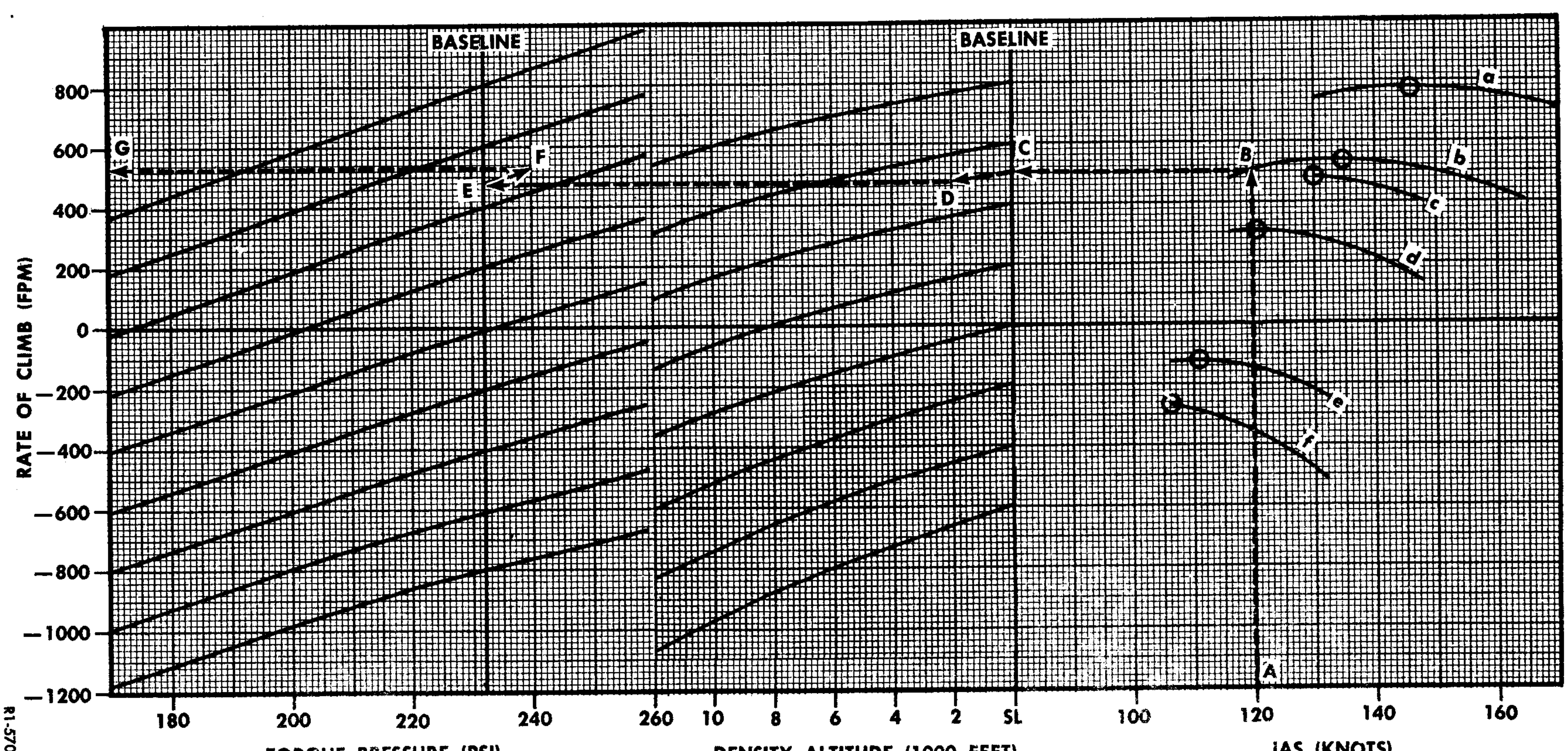


Figure A4-16. Emergency Climb — Four-Engine — 200,000 Pounds Gross Weight

EMERGENCY CLIMB — THREE-ENGINE
120,000 POUNDS GROSS WEIGHT
2800 RPM

MODEL: C-124C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-63A
FUEL GRADE: 115/145 & 100/130

SAMPLE PROBLEM:
A. Climb speed=95 knots (IAS).
B. Configuration d (flaps 20° — gear down).
C. Altitude baseline.
D. Density altitude=4000 feet.
E. Torque pressure baseline.
F. Torque pressure=205 PSI.
G. Rate of climb=535 FPM.

CONFIGURATION:
ONE PROPELLER FEATHERED
a. Wing flaps zero degrees, landing gear up.
b. Wing flaps 20 degrees, landing gear up.
c. Wing flaps zero degrees, landing gear down.
d. Wing flaps 20 degrees, landing gear down.
e. Wing flaps 45*degrees, landing gear up.
f. Wing flaps 45*degrees, landing gear down.
ONE PROPELLER WINDMILLING
d_w. Wing flaps 20 degrees, landing gear down.

NOTE:
1. Cowl flap position=9 degrees.
2. Oil cooler doors full open.
3. Ground effect not included.
4. ⊙ indicates speed for maximum rate of climb.
6. *For aircraft AF49-243 through AF51-182 (full span flap configuration), add 200 FPM to obtain emergency climb performance for configurations e and f with full flap deflection of 40 degrees.

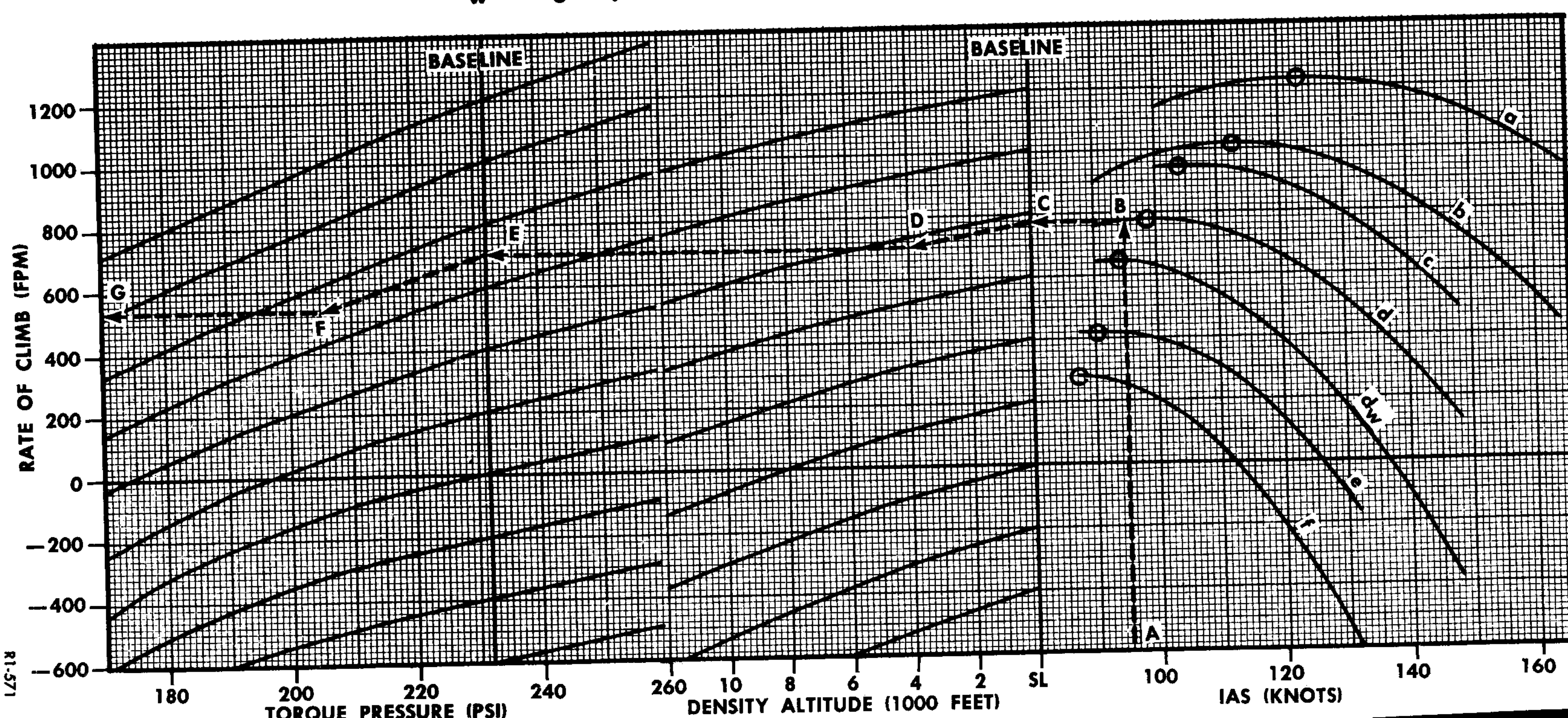


Figure A4-17. Emergency Climb — Three-Engine — 120,000 Pounds Gross Weight

EMERGENCY CLIMB — THREE-ENGINE
140,000 POUNDS GROSS WEIGHT
2800 RPM

MODEL: C-124C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-63A
FUEL GRADE: 115/145 & 100/130

SAMPLE PROBLEM:
A. Climb speed=100 knots (IAS).
B. Configuration d (flaps 20° — gear down).
C. Altitude baseline.
D. Density altitude=4000 feet.
E. Torque pressure baseline.
F. Torque pressure=205 PSI.
G. Rate of Climb=290 FPM.

CONFIGURATION:
ONE PROPELLER FEATHERED
a. Wing flaps zero degrees, landing gear up.
b. Wing flaps 20 degrees, landing gear up.
c. Wing flaps zero degrees, landing gear down.
d. Wing flaps 20 degrees, landing gear down.
e. Wing flaps 45*degrees, landing gear up.
f. Wing flaps 45*degrees, landing gear down.
ONE PROPELLER WINDMILLING
dw — Wing flaps 20 degrees, landing gear down.

NOTE:
1. Cowl flap position=9 degrees.
2. Oil cooler doors full open.
3. Ground effect not included.
4. ⊙ indicates speed for maximum rate of climb.
5. *For aircraft AF49-243 through AF51-182 (full span flap configuration), add 200 FPM to obtain emergency climb performance for configurations e and f with full flap deflection of 40 degrees.

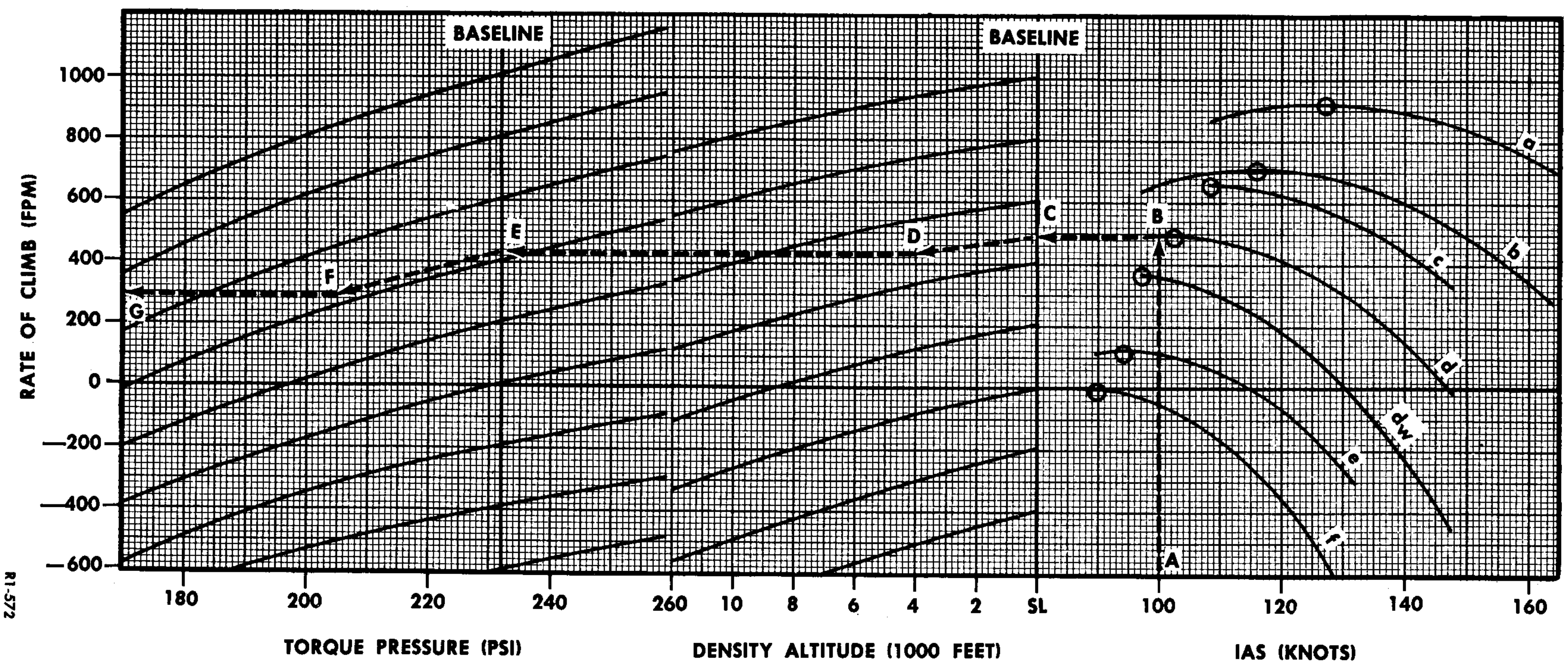


Figure A4-18. Emergency Climb — Three-Engine — 140,000 Pounds Gross Weight

EMERGENCY CLIMB — THREE-ENGINE 160,000 POUNDS GROSS WEIGHT
2800 RPM

MODEL: C-124C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-63A
FUEL GRADE: 115/145 & 100/130

SAMPLE PROBLEM:
A. Climb speed=110 knots (IAS).
B. Configuration b (flaps 20° — gear up).
C. Altitude baseline.
D. Density altitude=4,000 feet.
E. Torque pressure baseline.
F. Torque pressure=205 PSI.
G. Rate of climb=230 FPM.

CONFIGURATION:
ONE PROPELLER FEATHERED
a. Wing flaps zero degrees, landing gear up.
b. Wing flaps 20 degrees, landing gear up.
c. Wing flaps zero degrees, landing gear down.
d. Wing flaps 20 degrees, landing gear down.
e. Wing flaps 45*degrees, landing gear up.
f. Wing flaps 45*degrees, landing gear down.
ONE PROPELLER WINDMILLING
dw. Wing flaps 20 degrees, landing gear down.

NOTE:
1. Cowl flap position=9 degrees.
2. Oil cooler doors full open.
3. Ground effect not included.
4. ⊙ indicates speed for maximum rate of climb.
5. *For aircraft AF49-243 through AF51-182 (full span flap configuration), add 200 FPM to obtain emergency climb performance for configurations e and f with full flap deflection of 40 degrees.

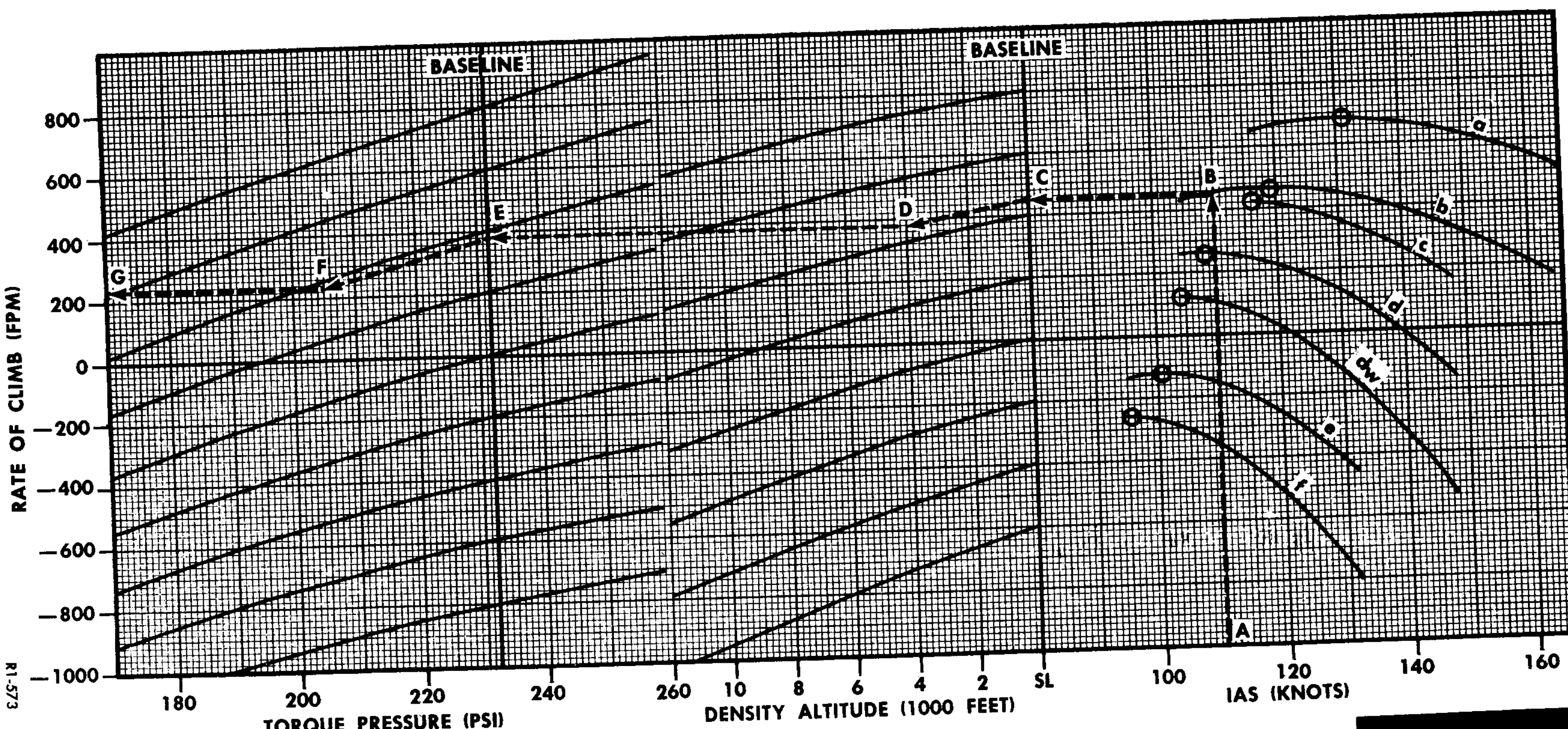


Figure A4-19. Emergency Climb — Three-Engine — 160,000 Pounds Gross Weight

EMERGENCY CLIMB — THREE-ENGINE
180,000 POUNDS GROSS WEIGHT
2800 RPM

MODEL: C-124C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-63A
FUEL GRADE: 115/145 & 100/130

SAMPLE PROBLEM:

A. Climb speed = 115 knots (IAS).
B. Configuration b (flaps 20° — gear up).
C. Altitude baseline.
D. Density altitude = 2000 feet.
E. Torque pressure baseline.
F. Torque pressure = 240 PSI.
G. Rate of climb = 260 FPM.

CONFIGURATION:

ONE PROPELLER FEATHERED

a. Wing flaps zero degrees, landing gear up.
b. Wing flaps 20 degrees, landing gear up.
c. Wing flaps zero degrees, landing gear down.
d. Wing flaps 20 degrees, landing gear down.
e. Wing flaps 45*degrees, landing gear up.
f. Wing flaps 45*degrees, landing gear down.

ONE PROPELLER WINDMILLING

dw. Wing flaps 20 degrees, landing gear down.

NOTE:

1. Cowl flap position = 9 degrees.
2. Oil cooler doors full open.
3. Ground effect not included.
4. ⊙ indicates speed for maximum rate of climb.
5. *For aircraft AF49-243 through AF51-182 (full span flap configuration), add 200 FPM to obtain emergency climb performance for configurations e and f with full flap deflection of 40 degrees.

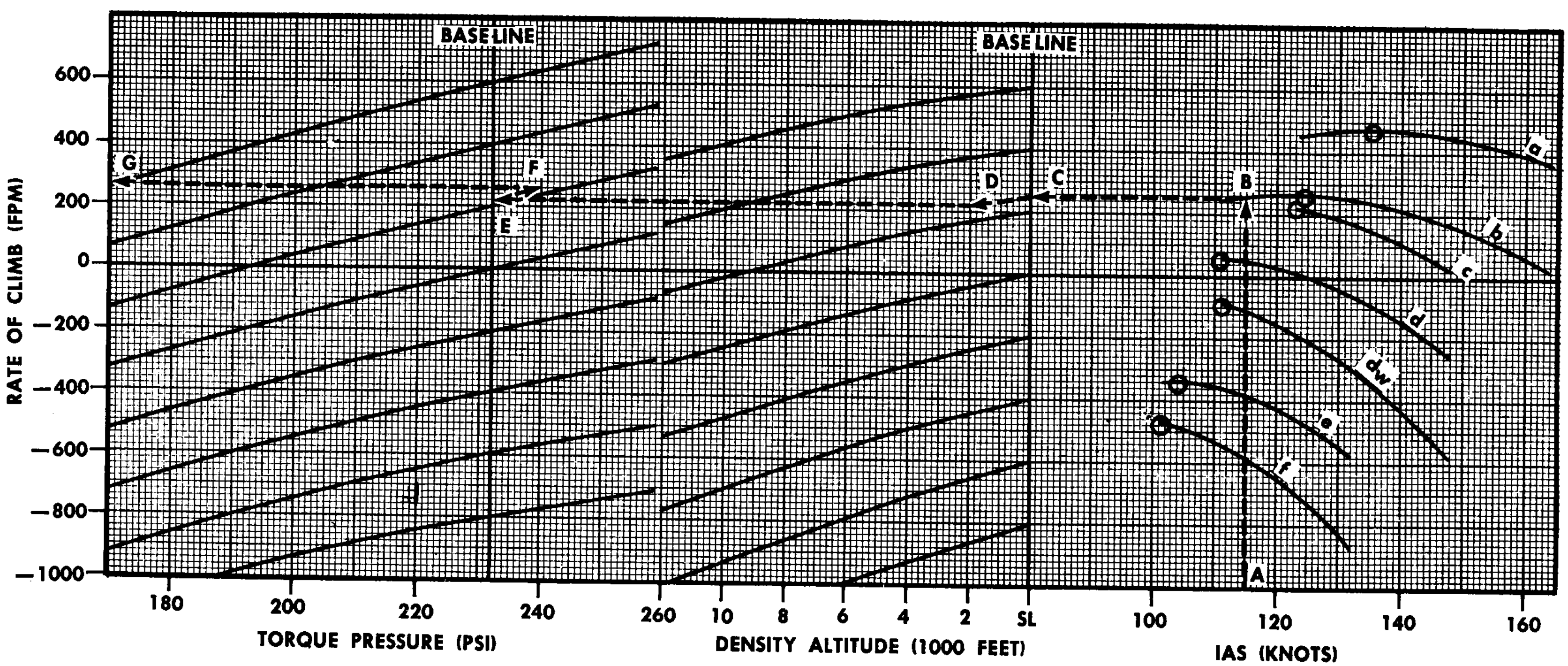


Figure A4-20. Emergency Climb — Three-Engine — 180,000 Pounds Gross Weight

EMERGENCY CLIMB — THREE-ENGINE
200,000 POUNDS GROSS WEIGHT
2800 RPM

MODEL: C-124C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-63A
FUEL GRADE: 115/145 & 100/130

SAMPLE PROBLEM:

A. Climb speed = 120 knots (IAS).
B. Configuration b (flaps 20° — gear up).
C. Altitude baseline.
D. Density altitude = 2000 feet.
E. Torque pressure baseline.
F. Torque pressure = 240 PSI.
G. Rate of climb = 90 FPM.

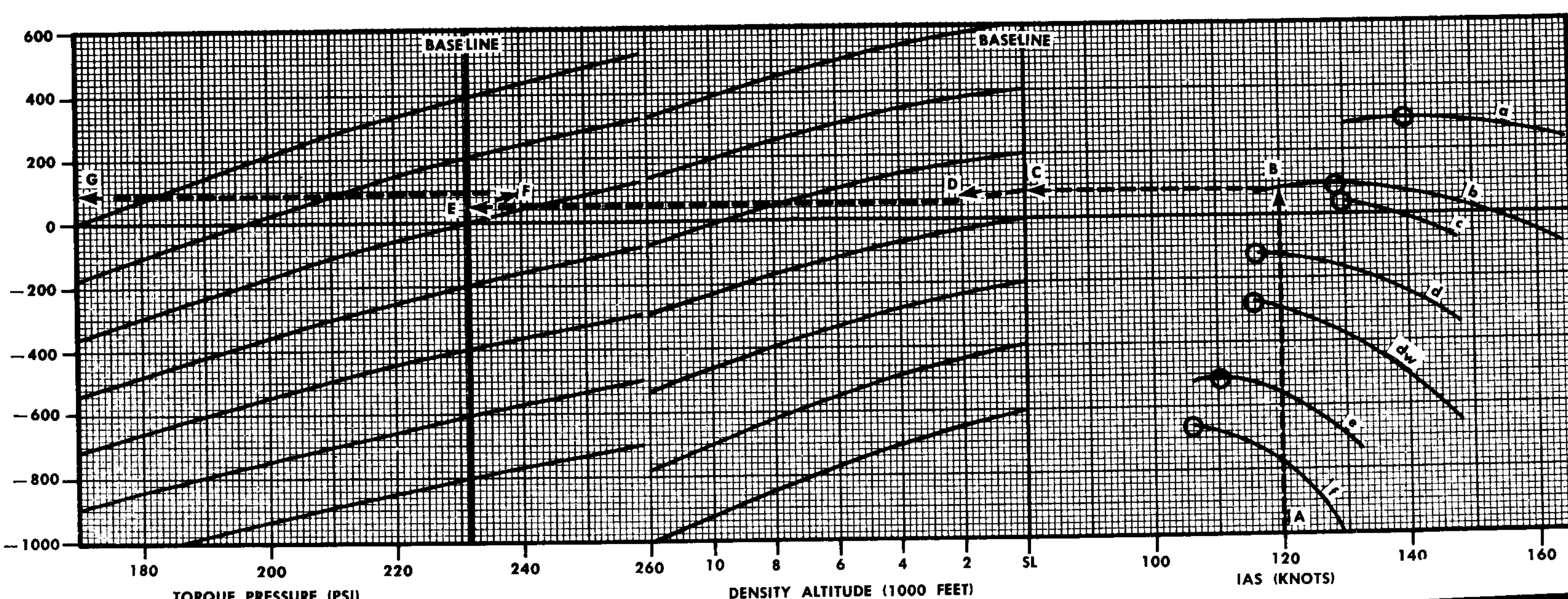
CONFIGURATION:

ONE PROPELLER FEATHERED
a. Wing flaps zero degrees, landing gear up.
b. Wing flaps 20 degrees, landing gear up.
c. Wing flaps zero degrees, landing gear down.
d. Wing flaps 20 degrees, landing gear down.
e. Wing flaps 45*degrees, landing gear up.
f. Wing flaps 45*degrees, landing gear down.

ONE PROPELLER WINDMILLING
dw. Wing flaps 20 degrees, landing gear down.

NOTE:

1. Cowl flap position = 9 degrees.
2. Oil cooler doors full open.
3. Ground effect not included.
4. ⊙ indicates speed for maximum rate of climb.
5. *For aircraft AF49-243 through AF51-182 (full span flap configuration), add 200 FPM to obtain emergency climb performance for configurations e and f with full flap deflection of 40 degrees.



R1-575

Figure A4-21. Emergency Climb — Three-Engine — 200,000 Pounds Gross Weight

EMERGENCY CLIMB — TWO ENGINE
120,000 POUNDS GROSS WEIGHT
2800 RPM

MODEL: C-124C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-63A
FUEL GRADE: 115/145 & 100/130

SAMPLE PROBLEM:

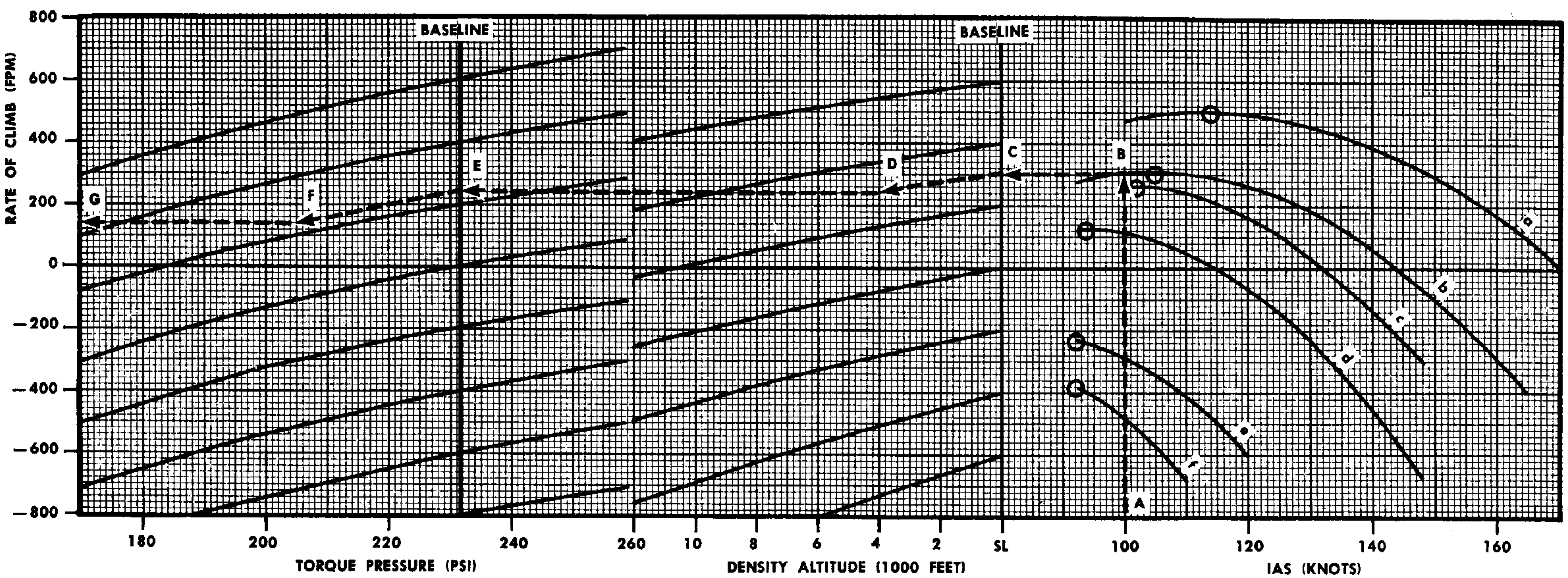
A. Climb speed = 100 knots (IAS).
B. Configuration b (flaps 20° — gear up).
C. Altitude baseline.
D. Density altitude = 4000 feet.
E. Torque pressure baseline.
F. Torque pressure = 205 PSI.
G. Rate of climb = 140 FPM.

NOTE:

1. Cowl flap position = 9 degrees.
2. Oil cooler doors full open.
3. Ground effect not included.
4. Two propellers feathered.
5. ʘ indicates speed for maximum rate of climb.
6.* For aircraft AF49-243 through AF51-182 (full span flap configuration), add 200 FPM to obtain emergency climb performance for configurations e and f with full flap deflection of 40 degrees.

CONFIGURATION:

a. Wing flaps zero degrees, landing gear up.
b. Wing flaps 20 degrees, landing gear up.
c. Wing flaps zero degrees, landing gear down.
d. Wing flaps 20 degrees, landing gear down.
e. Wing flaps 45*degrees, landing gear up.
f. Wing flaps 45*degrees, landing gear down.



R1-576

Figure A4-22. Emergency Climb — Two-Engine — 120,000 Pounds Gross Weight

EMERGENCY CLIMB — TWO-ENGINE
140,000 POUNDS GROSS WEIGHT
2800 RPM

MODEL: C-124C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-63A
FUEL GRADE: 115/145 & 100/130

SAMPLE PROBLEM:
A. Climb speed=115 knots (IAS).
B. Configuration a (Flaps 0° — Gear Up).
C. Altitude baseline.
D. Density altitude=4000 feet.
E. Torque pressure baseline.
F. Torque pressure=220 PSI.
G. Rate of climb=180 FPM.

NOTE:
1. Cowl flap position=9 degrees.
2. Oil cooler doors full open.
3. Ground effect not included.
4. Two propellers feathered.
5. ⊙ indicates speed for maximum rate of climb.
6.* For aircraft AF49-243 through AF51-182 (full span flap configuration), add 200 FPM to obtain emergency climb performance for configurations e and f with full flap deflection of 40 degrees.

CONFIGURATION:
a. Wing flaps zero degrees, landing gear up.
b. Wing flaps 20 degrees, landing gear up.
c. Wing flaps zero degrees, landing gear down.
d. Wing flaps 20 degrees, landing gear down.
e. Wing flaps 45 *degrees, landing gear up.
f. Wing flaps 45 *degrees, landing gear down.

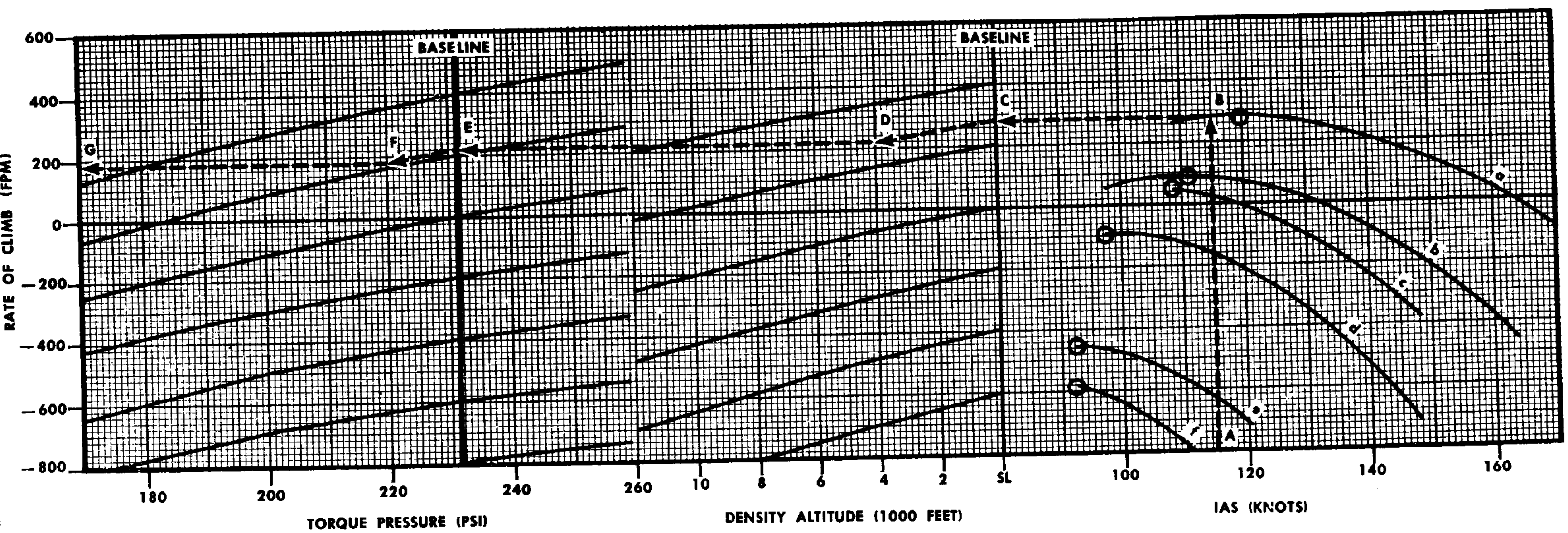


Figure A4-23. Emergency Climb — Two-Engine — 140,000 Pounds Gross Weight — 2800 RPM

EMERGENCY CLIMB — TWO-ENGINE
160,000 POUNDS GROSS WEIGHT
2800 RPM

MODEL: C-124C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-63A
FUEL GRADE: 115/145 & 100/130

SAMPLE PROBLEM:
A. Climb speed = 120 knots (IAS).
B. Configuration a (flaps zero degrees — gear up).
C. Altitude base
D. Density altitude = 2000 feet.
E. Torque pressure baseline.
F. Torque pressure = 240 PSI.
G. Rate of climb = 100 FPM.

CONFIGURATION:
a. Wing flaps zero degrees, landing gear up.
b. Wing flaps 20 degrees, landing gear up.
c. Wing flaps zero degrees, landing gear down.
d. Wing flaps 20 degrees, landing gear down.
e. Wing flaps 45* degrees, landing gear up.

NOTE:
1. Cowl flap position = 9 degrees.
2. Oil cooler door full open.
3. Ground effect not included.
4. Two propellers feathered.
5. ⊙ indicates speed for maximum rate of climb.
6. *For aircraft AF49-243 through AF51-182 (full span flap configuration), add 200 FPM to obtain emergency climb performance for configuration e with full flap deflection of 40 degrees.

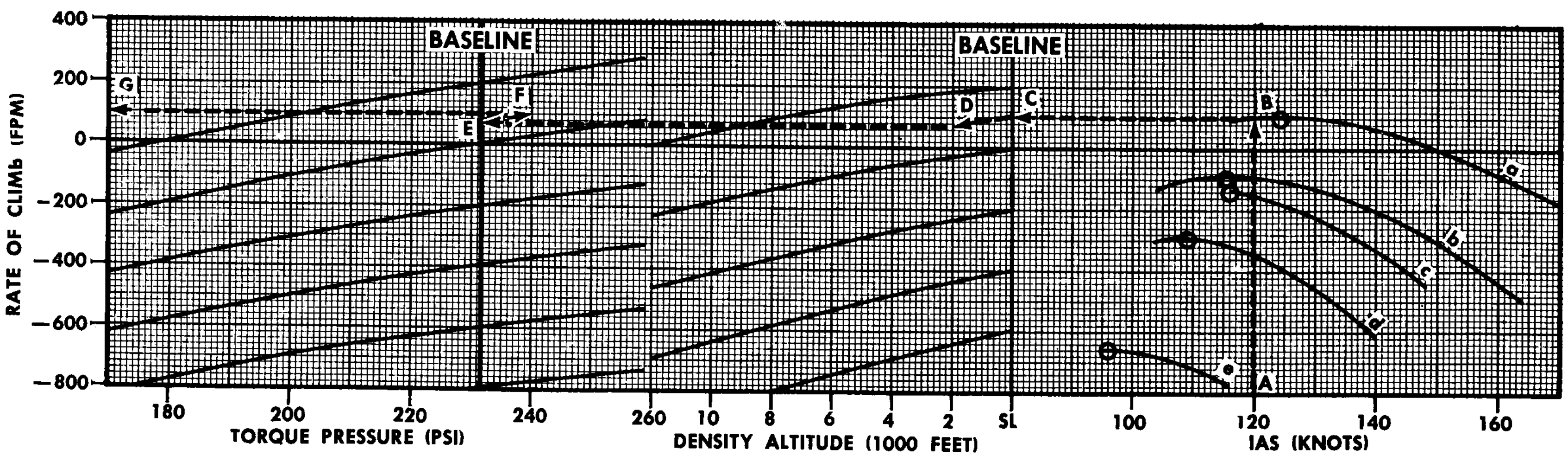


Figure A4-24. Emergency Climb — Two-Engine — 160,000 Pounds Gross Weight — 2800 RPM

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EMERGENCY CLIMB — TWO-ENGINE
180,000 POUNDS GROSS WEIGHT
2800 RPM

MODEL: C-124C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-63A
FUEL GRADE: 115/145 & 100/130

NOTE:
1. Cowl flap position=9 degrees.
2. Oil cooler doors full open.
3. Ground effect not included.
4. Two propellers feathered.
5. ⊙ indicates speed for maximum rate of climb.

CONFIGURATION:
a. Wing flaps zero degrees, landing gear up.
b. Wing flaps 20 degrees, landing gear up.
c. Wing flaps zero degrees, landing gear down.
d. Wing flaps 20 degrees, landing gear down.

SAMPLE PROBLEM:
A. Climb speed=125 knots (IAS).
B. Configuration a (flaps zero degrees — gear up).
C. Altitude baseline.
D. Density altitude=2000 feet.
E. Torque pressure baseline.
F. Torque pressure=250 PSI.
G. Rate of climb=—20 FPM (descent).

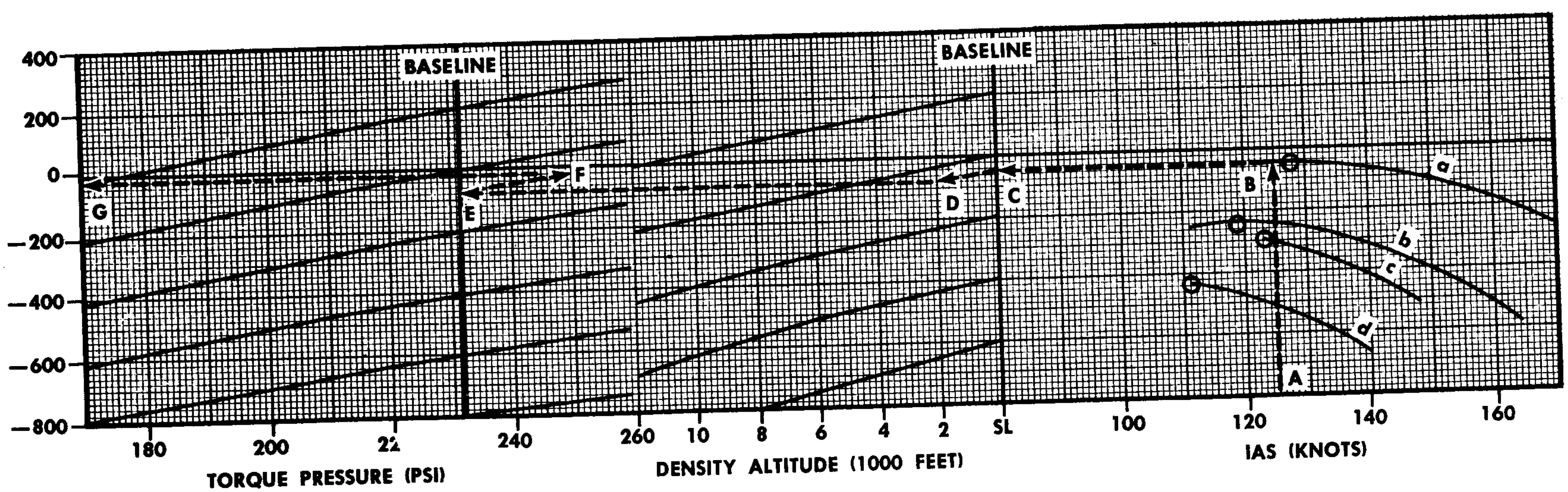


Figure A4-25. Emergency Climb — Two-Engine — 180,000 Pounds Gross Weight— 2800 RPM

EMERGENCY TWO-ENGINE CLIMB

MODEL: C-124C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-63A
FUEL GRADE: 115/145 & 100/130

NOTE:
1. 2800 RPM.
2. Wing flaps zero degrees, landing gear up.
3. Cowl flap position = 9 degrees.
4. Oil cooler doors full open.
5. Ground effect not included.
6. Two propellers feathered.

SAMPLE PROBLEM:
- A. Gross weight = 154,000 pounds.
- B. Speed for best rate of climb. = 123 Knots IAS.
- C. Density altitude = 3000 feet.
- D. Torque pressure = 230 PSI.
- E. Rate of climb = 100 FPM.

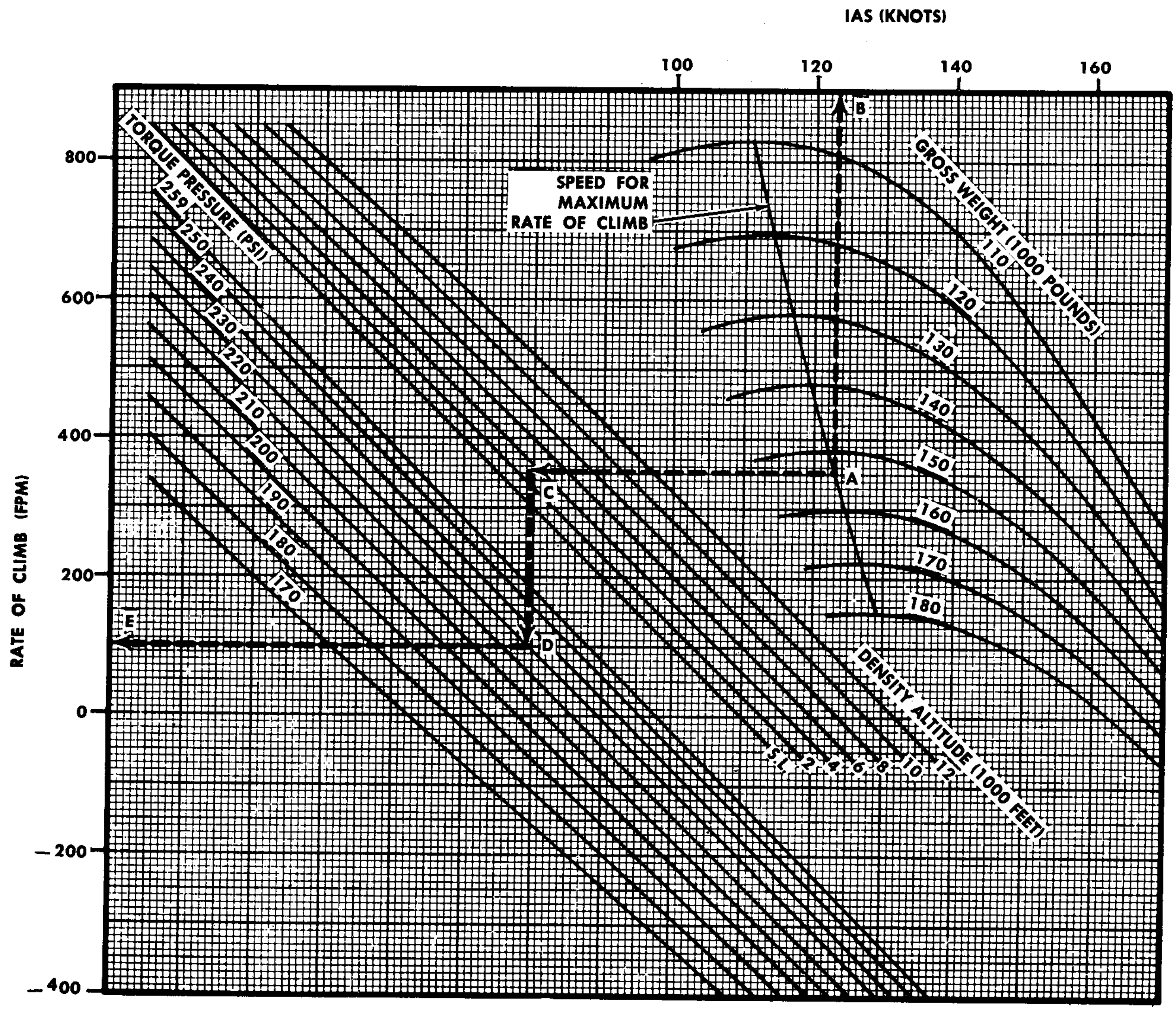


Figure A4-26. Emergency Two-Engine Climb

R1-585

RECOMMENDED SPEED FOR BEST RATE OF CLIMB AND BEST ANGLE OF CLIMB

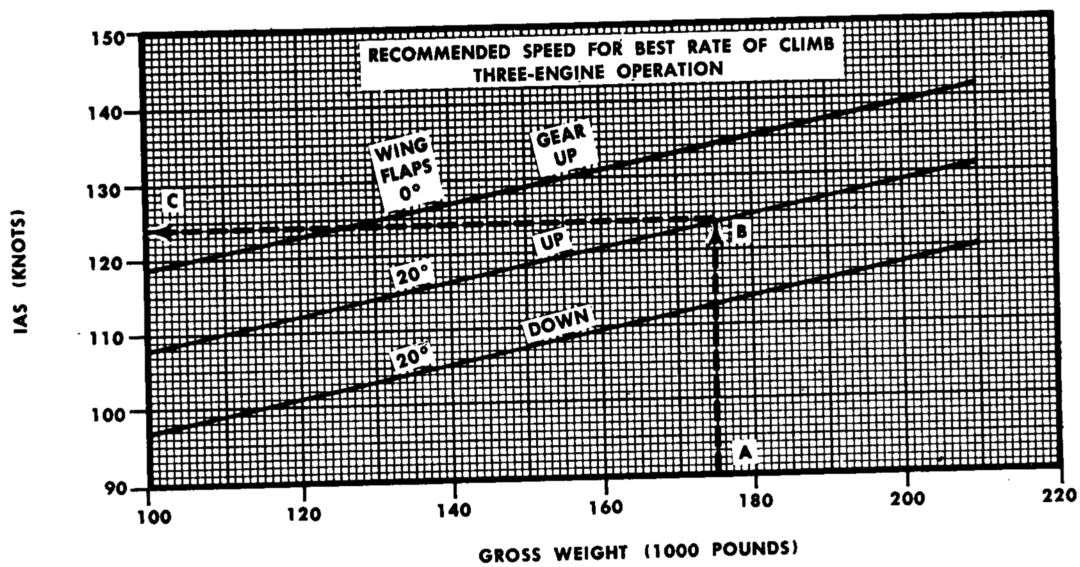
MAXIMUM POWER

MODEL: C-124C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-63A
FUEL GRADE: 115/145 & 100/130

SAMPLE PROBLEM:

A. GROSS WEIGHT = 175,000 pounds.
B. Wing flaps = 20 degrees, gear up.
C. Speed for best rate of climb = 124 knots IAS.
D. Speed for best angle of climb = 109 knots IAS.



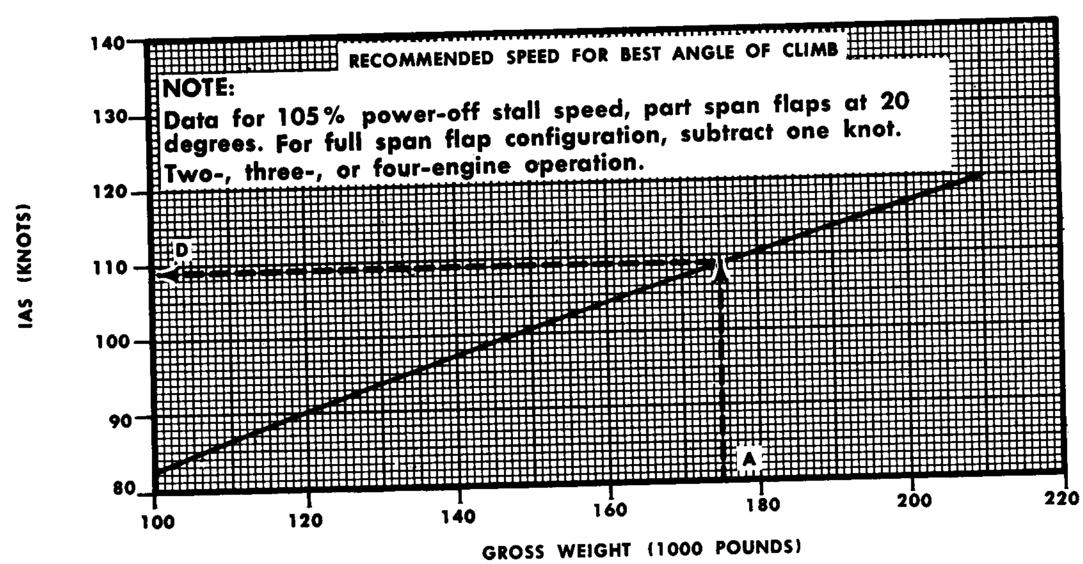


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Figure A4-27. Best Rate of Climb and Best Angle of Climb Speeds

PART V
RANGE

TABLE OF CONTENTS

LIST OF CHARTS

RANGE PERFORMANCE.

The range performance is presented for ICAO Standard Day atmospheric conditions. Any exceptions to this are presented in the DISCUSSION OF CHARTS. The data included are the Propeller Restriction chart (figure A5-1), Nautical Miles per Pound of Fuel charts (figures A5-2 through A5-14). Long-Range Prediction charts (figures A5-15 through A5-20), and Long-Range Summary charts (figures A5-21 through A5-23). Two-Engine Cruise Data with Ground Effect (figures A5-24 and A5-25) and a Cowl Flap Drag chart (figure A5-26) are also given.

Aircraft without external wing tip pod heaters (AF49-243 through AF50-1268) will require 10 BHP per engine less to obtain cruise performance as shown on the charts.

DISCUSSION OF CHARTS.

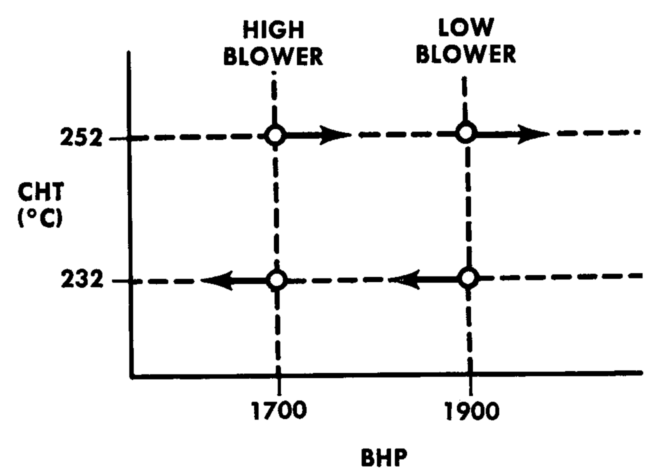
PROPELLER RESTRICTION CHART.

The Propeller Restriction chart (figure A5-1) is presented to show the undesirable RPM ranges to be avoided for certain gross weight — airspeed combinations. For all normal cruise operation, use of the range performance charts included herein will not permit operation in this restricted range. Where applicable, this cutoff is shown on the Nautical Miles per Pound of Fuel charts. In this case, it is also the maximum endurance line. If the range performance charts are not used, this chart should be entered prior to and during flight at the gross weight and desired speed to determine what RPM ranges should be avoided when setting power. A sample problem is included on the chart.

NAUTICAL MILES PER POUND OF FUEL CHARTS.

The Nautical Miles per Pound of Fuel charts (figures A5-2 through A5-14) show the nautical miles that can be traveled for each pound of fuel consumed and the airspeed that can be expected for various gross weights and altitudes when recommended operating conditions from the Power Schedule charts (Part 2) are followed. Note that data at 20,000 feet are presented for high blower operation. All other data are given for low blower operation. All charts are based on operation with fuel grade 115/145. Limits for operation with fuel grade 100/130 are included in notes on each chart where applicable. When operating with fuel grade 100/130, nautical miles per pound of fuel for BHP's between the Manual Lean limit for 100/130 grade fuel and the Manual Lean limit for 115/145 grade fuel must be computed from the Normal Mixture Fuel Flow charts in Part 2.

The charts have been calculated using cowl flaps position between zero degrees (trail) and full open, as necessary, to maintain cylinder head temperatures within desired operating limits (refer to T.O. 1C-124A-1, Section V). During cruise, if ambient conditions permit, it is desirable to operate CHT's between 220°C and 232°C for improved engine performance and reliability. When the operating cylinder head temperatures are equal to or lower than the values shown below and the minimum cowl flap position of zero degrees is maintained, the data as presented on the charts are correct. If the desired temperature is



maintained by closing the cowl flaps inside the trail position, the data on the charts are slightly conservative. In some instances of operation when the cowl flaps are full open, the temperature will exceed the desired values. The data are correct when this condition occurs. It may be possible to decrease excessive temperatures by reducing power or increasing airspeed. For maximum limit CHT's see T.O. 1C-124A-1, Section V (Operating Limitations).

If operating at cylinder head temperatures below the desired values, the added cowl flap angle required for the additional cooling to the lower temperature will require more BHP per engine. The Cowl Flap Drag chart (figure A5-26) is used in determining the change in BHP for any given change in cowl flap angle. The result of operating with less than the desired temperatures will be a reduction in the maximum gross weight at which the required cruising speed can be maintained at the same power, or, the necessity of adding power sufficient to maintain the same speed at the same gross weight.

The Nautical Miles per Pound of Fuel charts (figures A5-1, -2, -3, -5, and -7 through A5-14) are given for four-, three-, and two-engine operation at various altitudes for ICAO Standard Day conditions. Charts designating two or three-engine operation are based on propeller being feathered on the inoperative engine(s). The two remaining charts (figures A5-4 and A5-6) present specific range data between 160 and 180 knots EAS for 6,000; 7,000; 8,000; 9,000 and 11,000; 12,000; 13,000; 14,000 feet. These data are for ICAO Standard Day and are based upon the same criteria as the rest of the Nautical Miles per Pound of Fuel charts. All charts are presented for both Manual Lean and Normal mixture settings with two exceptions; two-engine operation at sea level and 5,000 feet is for Normal Mixture only, the power required being too high for Manual Lean operation.

Maximum endurance EAS has been chosen at a speed high enough for speed stability. Where low speed is limited because of the propeller restricted RPM's, maximum endurance becomes the same as the propeller restriction curve shown on the charts.

These charts are the basis for the long-range summary and prediction charts which are based on recommended cruise EAS. In addition to the recommended long-range operation, the Nautical Miles per Pound of Fuel charts are useful in scheduling missions at constant speed or constant power. RPM, manifold pressures and torque pressures necessary to obtain the cruise powers from the charts are determined from the BHP-RPM Schedules (figures A2-2 through A2-5). The BHP-MAP Schedules (figures A2-6 through A2-9), and Torque Pressure versus RPM and BHP (figure A2-10). These charts should be entered with the desired BHP selected from the Nautical Miles per Pound of Fuel charts as outlined in Part 7, Mission Planning.

LONG-RANGE PREDICTION CHARTS.

The Long-Range Prediction charts (figures A5-15 through A5-20) are used to predict distance traveled and elapsed time when operation is at the recommended EAS. The charts are presented for four-, three-, and two-engine operation at ICAO Standard Day atmospheric conditions.

LONG-RANGE SUMMARY CHARTS.

The Long-Range Summary charts (figures A5-21 through A5-23) are also presented for four-, three-, and two-engine operation at ICAO Standard Day atmospheric conditions. These charts summarize the nautical miles per pound of fuel, cruising speeds, and the required brake horsepower for various gross weights and altitudes at recommended EAS.

TWO-ENGINE CRUISE OPERATION IN GROUND EFFECT CHARTS.

The Maximum Gross Weight for Level Flight — Two-Engine Operation in Ground Effect chart (figure A5-24) presents data for the maximum weight for level flight versus height above the ground for two engine maximum dry power, METO power, and reduced climb power for ICAO Standard Day and Army Hot Day. At any gross weight, the power required to maintain level flight with ground effect can be determined.

The Required Speed for Two-Engine Operation in Ground Effect chart (figure A5-25) shows the airspeed required for level flight on two-engines with ground effect at the power setting required to maintain level flight obtained from figure A5-24.

COWL FLAP DRAG CHART.

The Cowl Flap Drag chart (figure A5-26) is provided to allow adjustment of cruise performance data if cowl flap angles other than those required to maintain the desired temperatures mentioned in a previous paragraph are used. If conditions arise where cooling to the proper cylinder head temperatures cannot be accomplished without decreasing airspeed as a result of opening the cowl flaps for more cooling, then more power will be required to regain and maintain the desired airspeed. By entering the Cowl Flap Drag chart with the original and new cowl flap angles and a given speed, the change in brake horsepower required can be obtained for any atmospheric conditions. This additional brake horsepower at the same cruising speed will result in less nautical miles per pound of fuel. This change can be approximated by entering the appropriate Nautical Miles per Pound of Fuel chart at the desired speed and new total brake horsepower per engine to obtain the new nautical miles per pound of fuel.

RECOMMENDED CONTINUOUS CRUISE OPERATION.

It is permissible to use up to METO power when necessary to obtain aircraft performance requirements. However, experience has shown that improved engine operation, engine reliability, and longer engine life can be expected if continuous cruise operation at powers above 1750 BHP in low blower and 1550 BHP in high blower is kept to a minimum. This recommendation is applicable when using fuel grade 115/145.

PROPELLER RESTRICTION
COMBINED RESTRICTIONS OF CURTISS
1056 AND 1060 3-BLADE 17-FOOT PROPELLERS

MODEL: C-124C
DATE: 7-15-60
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-63A

Notes:
1. The specified RPM's indicate the undesirable range of operation for gross weight airspeed combinations.
2. Do not operate any engines on the ground between 1250 and 1850 RPM, except to quickly pass through the speed range.

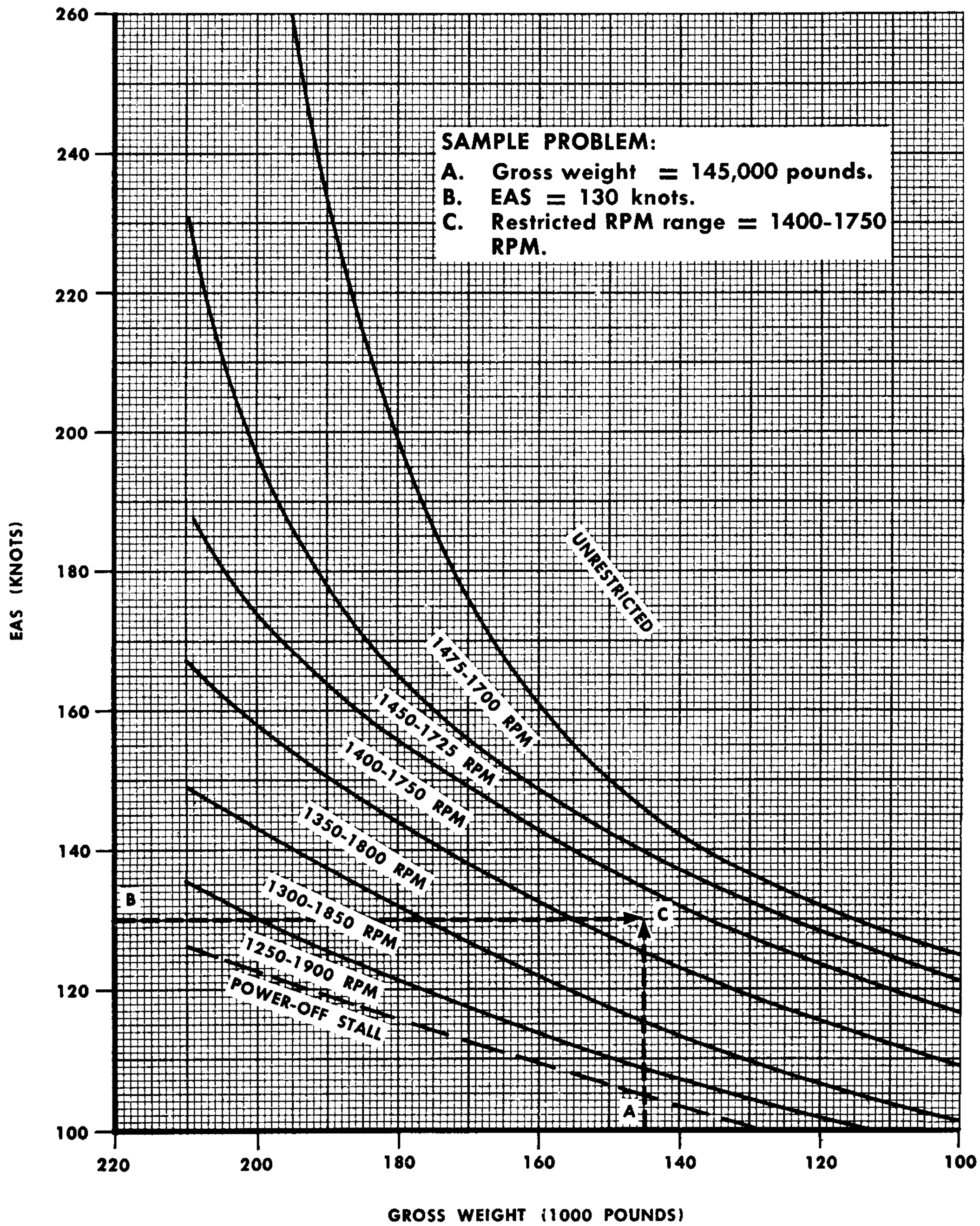


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Figure A5-1. Propeller Restriction

NAUTICAL MILES PER POUND OF FUEL
FOUR-ENGINE — SEA LEVEL

MODEL: C-124C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-63A
FUEL GRADE: 115/145 & 100/130

CONDITIONS:

1. Sea level pressure altitude.
2. $1/\sqrt{\sigma} = 1.000$.
3. Cowl flaps 0° except as noted.
4. Mixture: NORMAL above 1900 BHP, MANUAL LEAN below 1900 BHP.
5. With 100/130 grade fuel, do not exceed 1800 BHP in MANUAL LEAN mixture.
6. 110% of maximum range EAS is recommended for headwinds of over 45 knots.

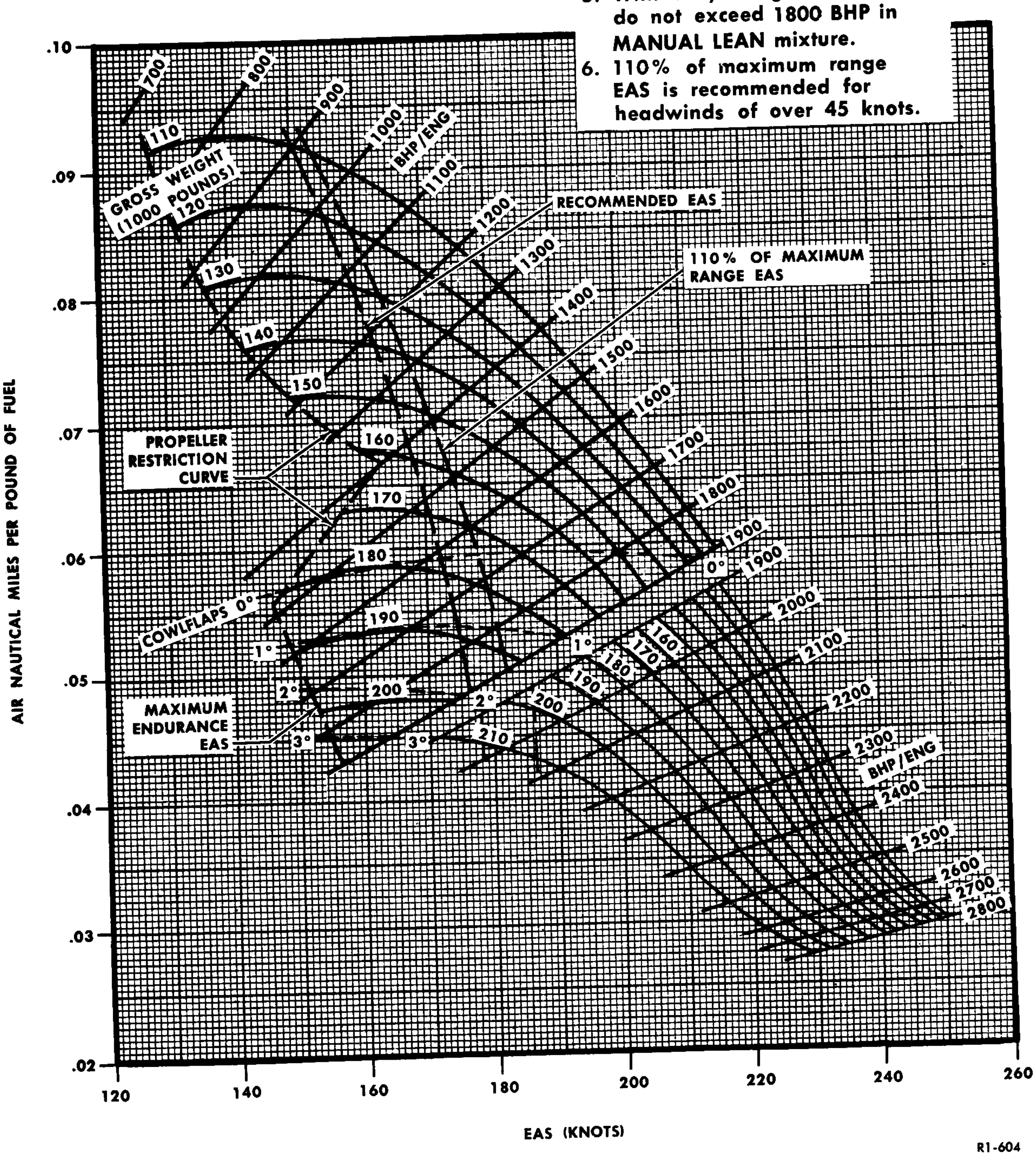

Figure A5-2. Nautical Miles Per Pound of Fuel — Four-Engine — Sea Level

NAUTICAL MILES PER POUND OF FUEL
FOUR-ENGINE — 5000 FEET

MODEL: C-124C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-63A
FUEL GRADE: 115/145 & 100/130

CONDITIONS:

1. 5000 feet pressure altitude.
2. $1/\sqrt{\sigma} = 1.0773$.
3. Cowl flaps 0° except as noted.
4. Mixture: NORMAL above 1900 BHP, MANUAL LEAN below 1900 BHP.
5. With 100/130 grade fuel, do not exceed 1800 BHP in MANUAL LEAN mixture.
6. 110 percent of maximum range EAS is recommended for headwinds of over 45 knots.

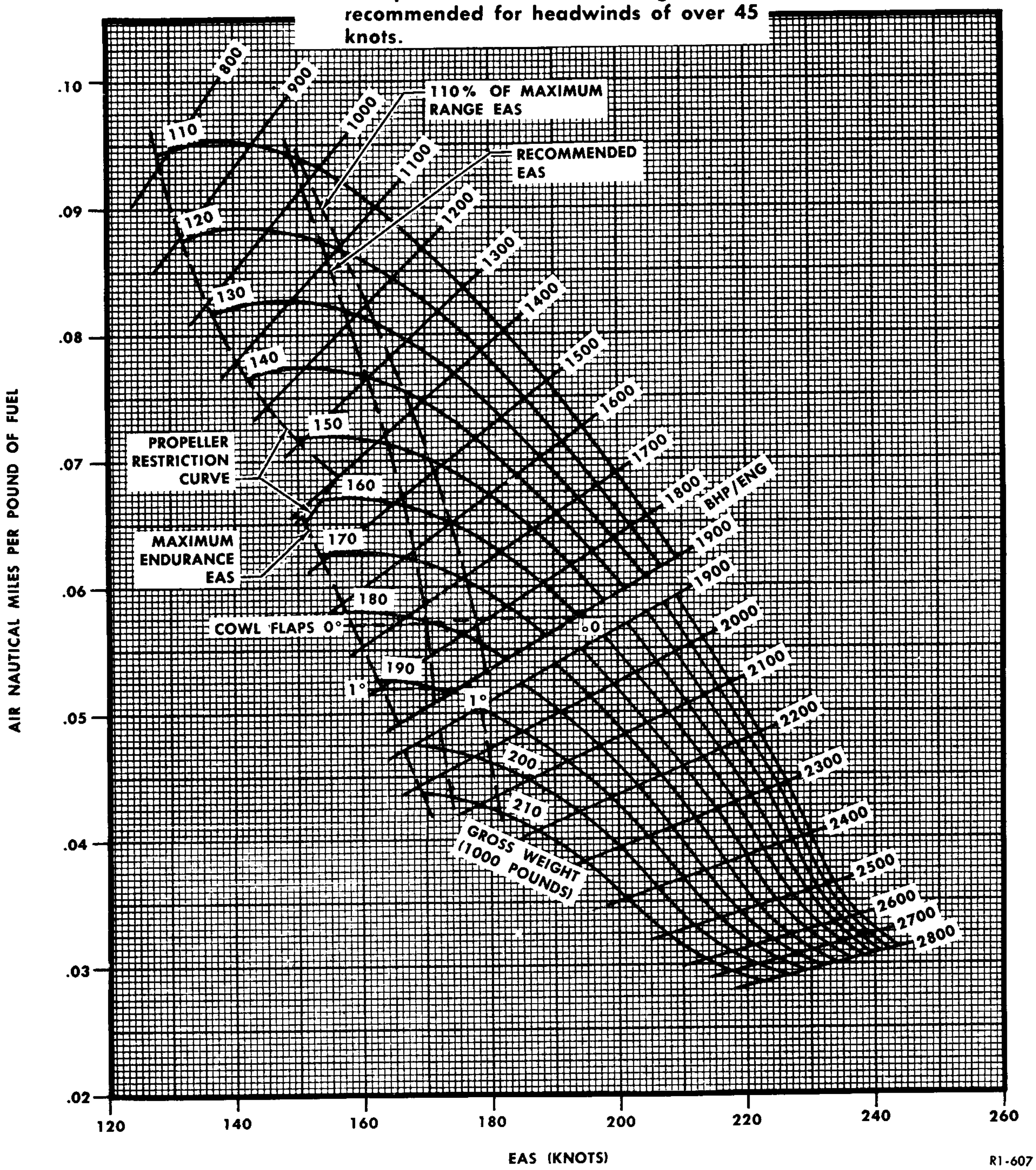

Figure A5-3. Nautical Miles Per Pound of Fuel — Four-Engine — 5000 Feet

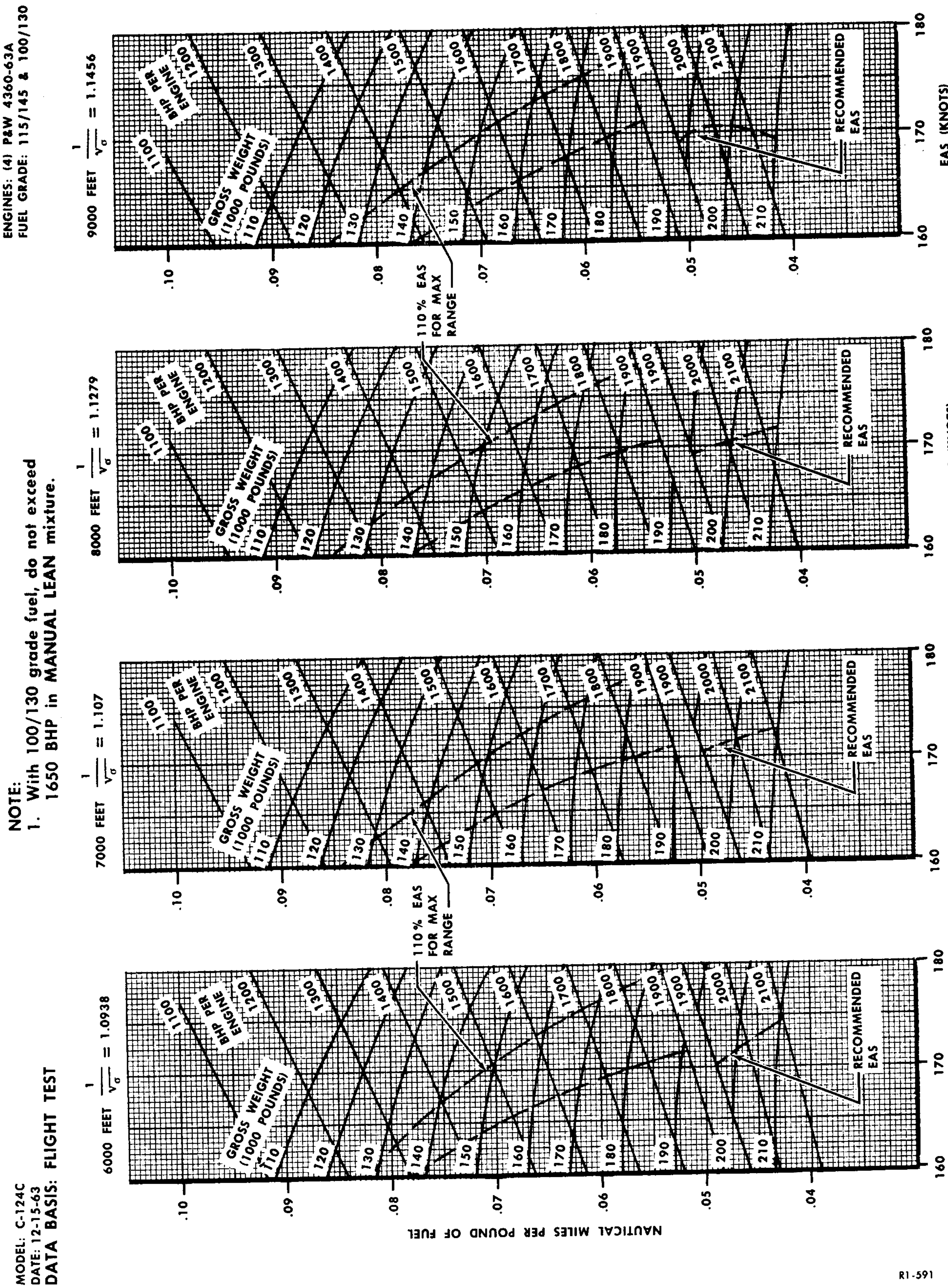

Figure A5-4. Nautical Miles Per Pound of Fuel — Four-Engine — 6000, 7000, 8000, 9000 Feet — ICAO Standard Day

NAUTICAL MILES PER POUND OF FUEL
FOUR-ENGINE — 10,000 FEET

MODEL: C-124C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-63A
FUEL GRADE: 115/145 & 100/130

CONDITIONS:

1. 10,000 feet pressure altitude.
2. $1/\sqrt{\sigma} = 1.1637$.
3. Cowl flaps 0°.
4. Mixture NORMAL above 1900 BHP, MANUAL LEAN below 1900 BHP.
5. With 100/130 grade fuel, do not exceed 1800 BHP in MANUAL LEAN mixture.
6. 110 percent of maximum range EAS is recommended for headwinds of over 45 knots.

SAMPLE PROBLEM:

A. Recommended EAS at gross weight = 160,000 pounds.
B. EAS = 165 knots.
C. Required BHP/eng = 1600.
D. Air nautical miles per pound of fuel = .0665.

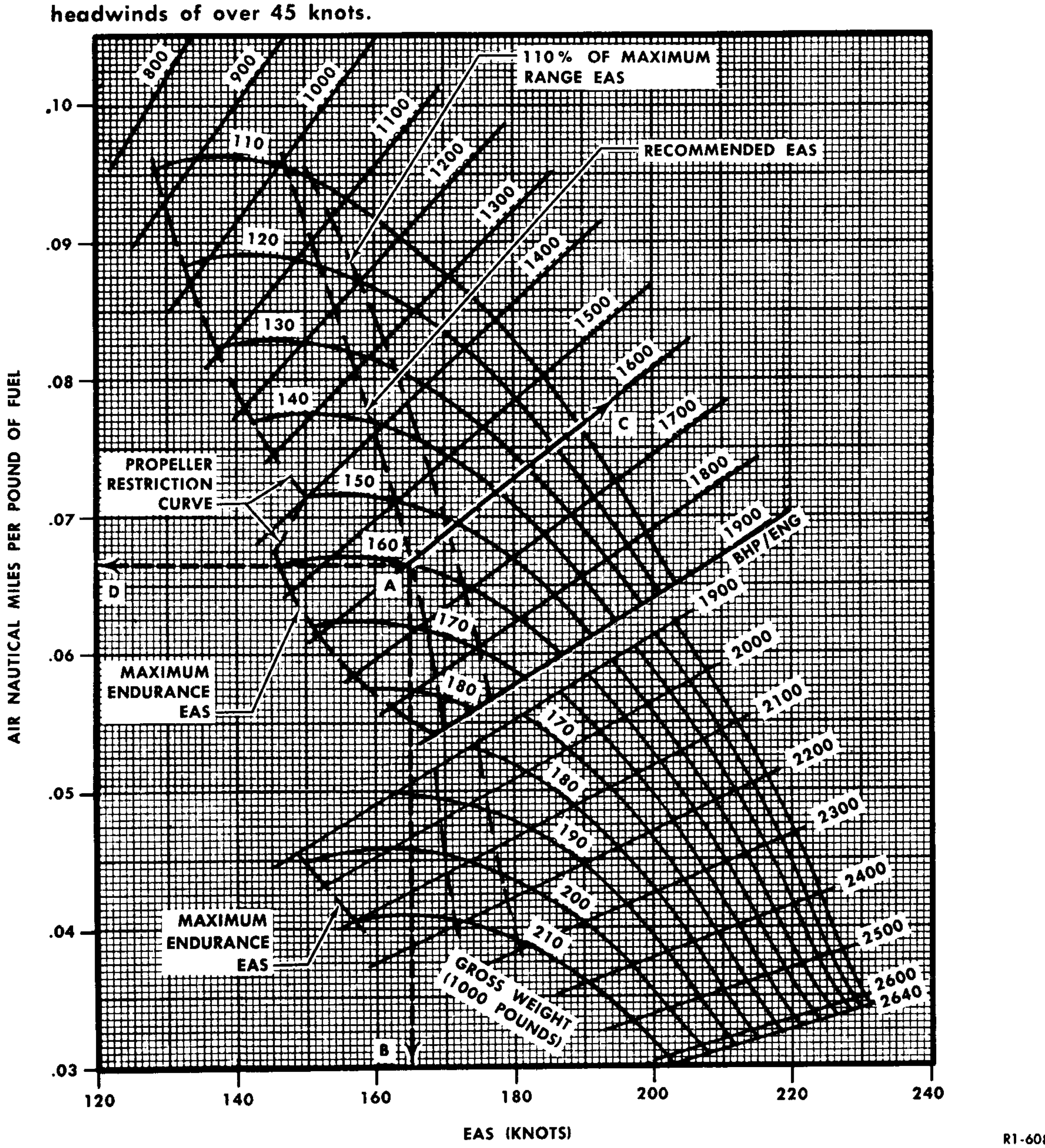

Figure A5-5. Nautical Miles Per Pound of Fuel — Four-Engine — 10,000 Feet

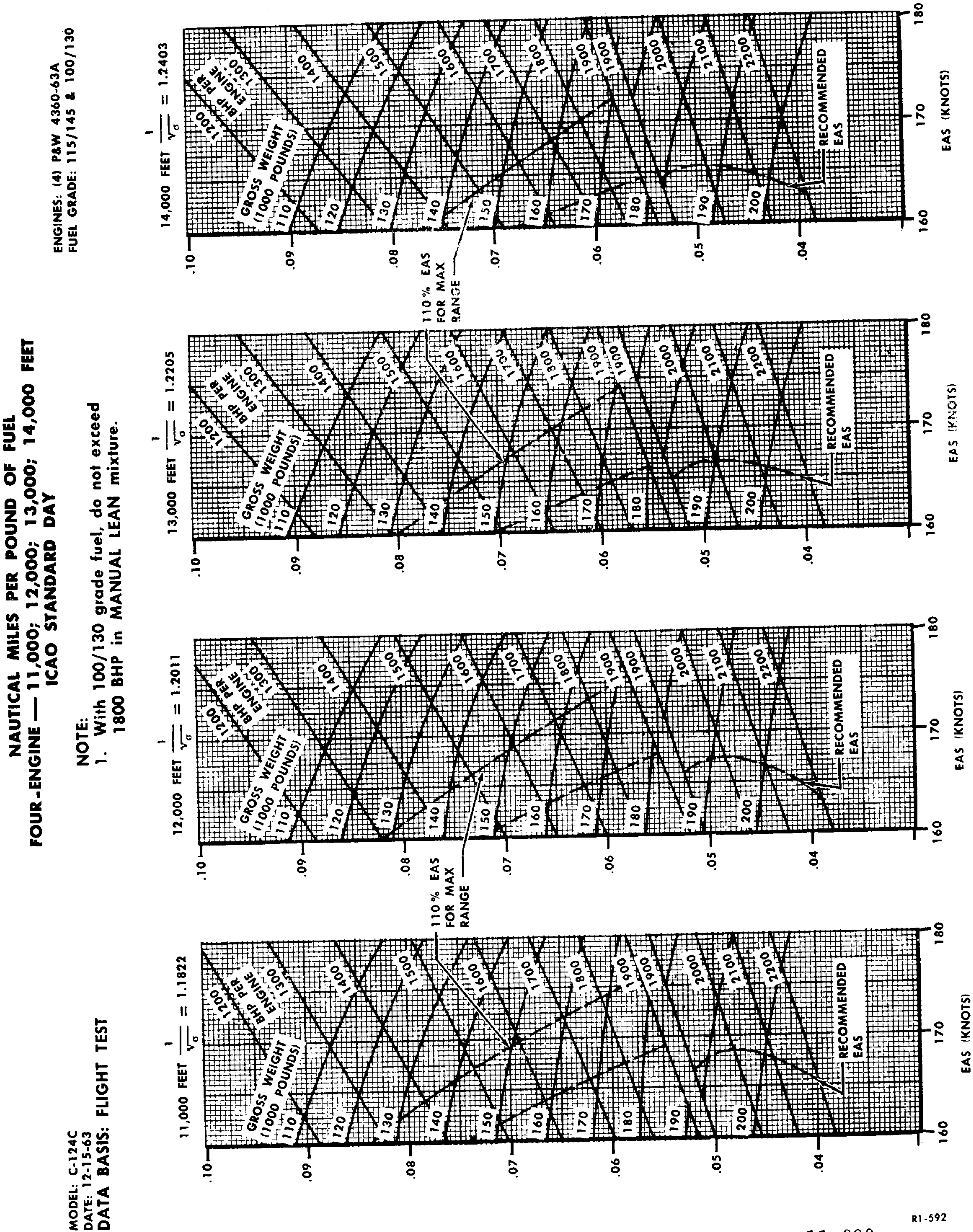

Figure A5-6. Nautical Miles Per Pound of Fuel — Four-Engine — 11,000, 12,000, 13,000, 14,000 Feet — ICAO Standard Day

NAUTICAL MILES PER POUND OF FUEL
FOUR-ENGINE — 15,000 FEET

MODEL: C-124C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-63A
FUEL GRADE: 115/145 & 100/130

CONDITIONS:
1. 15,000 feet pressure altitude.
2. $1/\sqrt{\sigma} = 1.2606$.
3. Cowl flaps 0°.
4. Mixture: NORMAL above 1900 BHP, MANUAL LEAN below 1900 BHP.
5. With 100/130 grade fuel, do not exceed 1800 BHP in MANUAL LEAN mixture.
6. 110 percent of maximum range EAS is recommended for headwinds of over 45 knots.

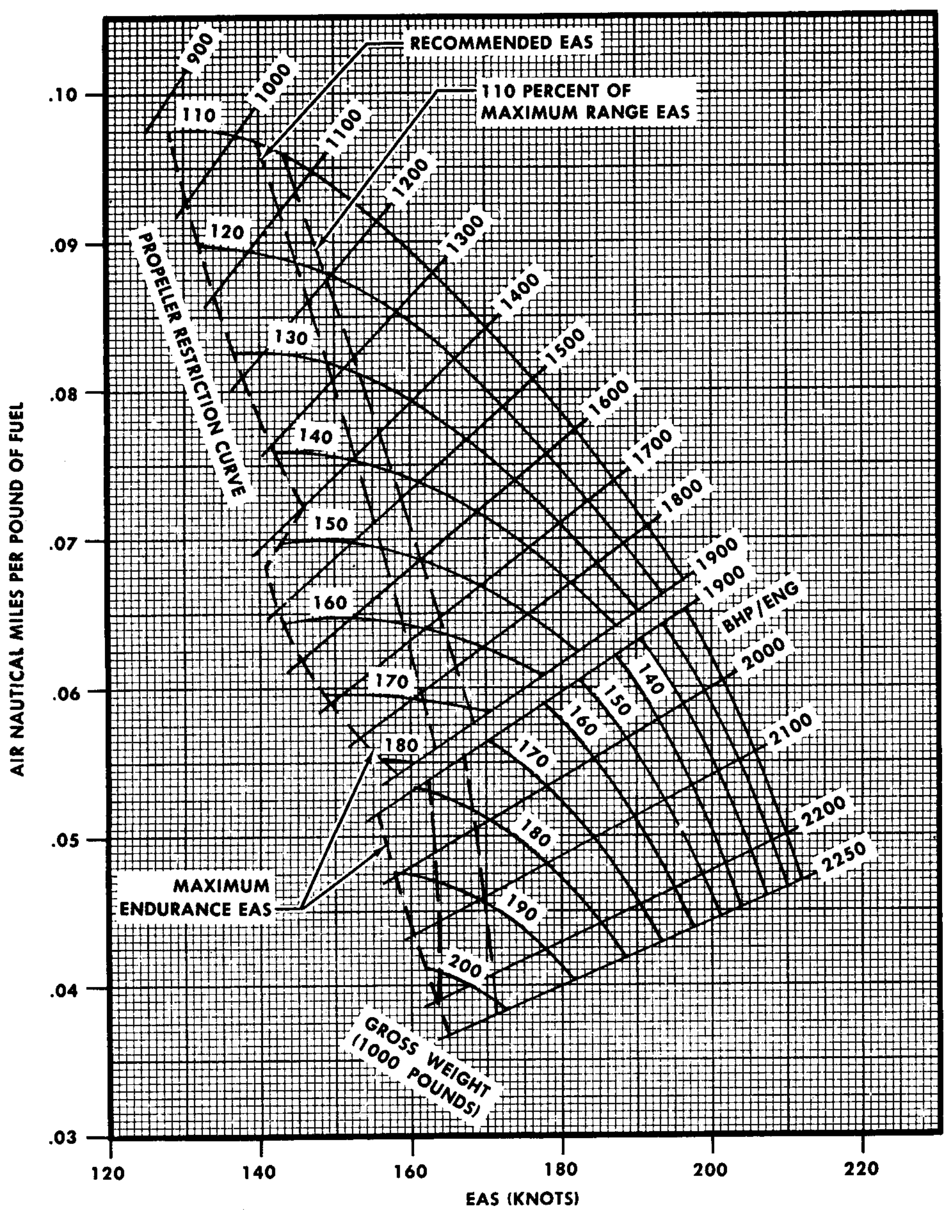

Figure A5-7. Nautical Miles Per Pound of Fuel — Four-Engine — 15,000 Feet

NAUTICAL MILES PER POUND OF FUEL
FOUR-ENGINE — 20,000 FEET

MODEL: C-124C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-63A
FUEL GRADE: 115/145 & 100/130

CONDITIONS:

1. 20,000 feet pressure altitude.
2. $1/\sqrt{\sigma} = 1.3700$.
3. Cowl flaps 0° except as noted.
4. Mixture: NORMAL above 1500 BHP, MANUAL LEAN below 1500 BHP.
5. With 100/130 grade fuel, see Section V, T.O. 1C-124A-1, Operating Limitations.
6. High Blower.
7. 110 percent of maximum range EAS is recommended for headwinds of over 45 knots.

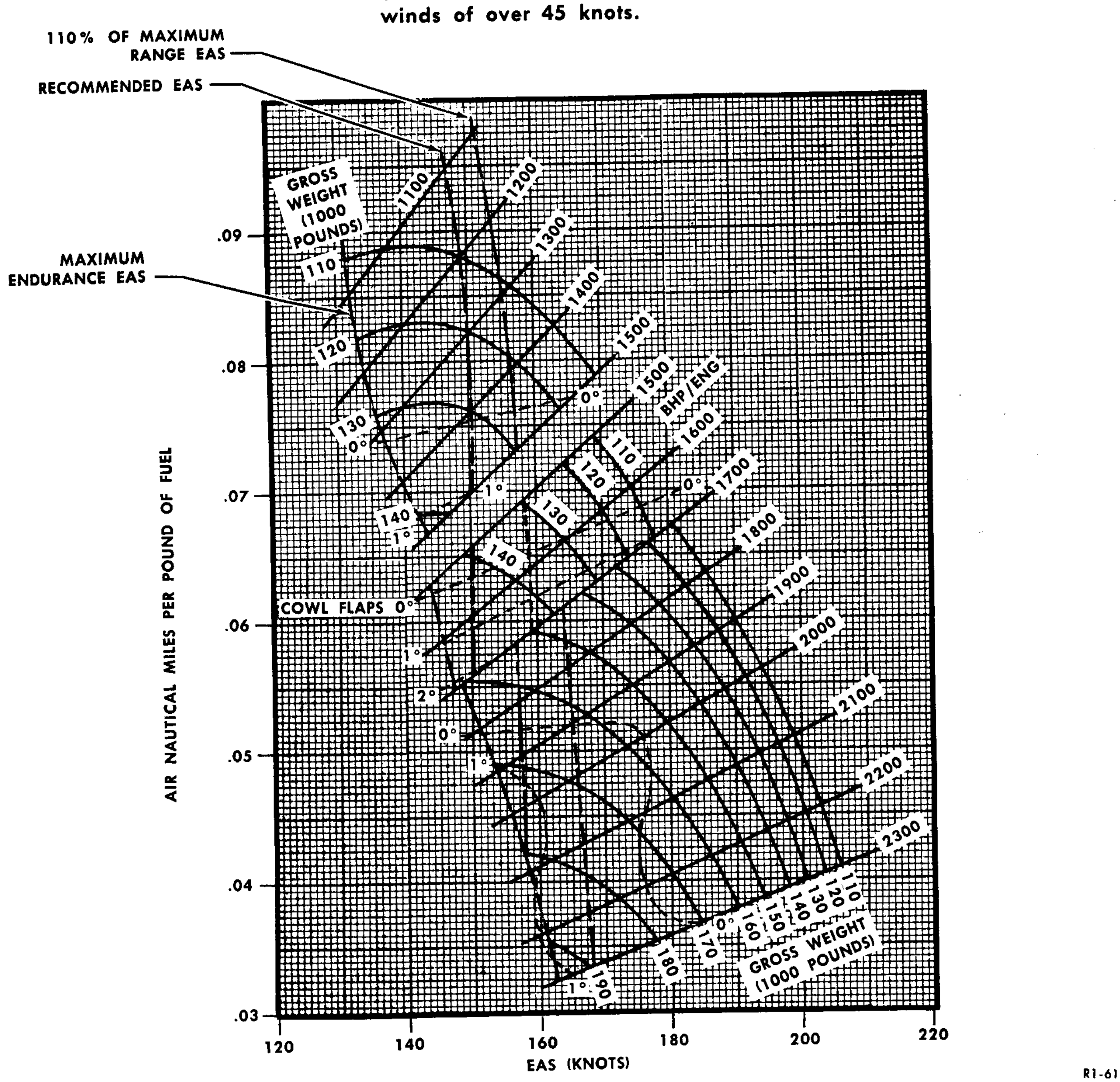

Figure A5-8. Nautical Miles Per Pound of Fuel — Four-Engine — 20,000 Feet

NAUTICAL MILES PER POUND OF FUEL
THREE-ENGINE — SEA LEVEL

MODEL: C-124C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-63A
FUEL GRADE: 115/145 & 100/130

CONDITIONS:
1. Sea level pressure altitude.
2. $1/\sqrt{\sigma} = 1.000$.
3. Cowl flaps 0° except as noted.
4. Mixture: NORMAL above 1900 BHP. MANUAL LEAN below 1900 BHP.
5. With 100/130 grade fuel, do not exceed 1800 BHP in MANUAL LEAN mixture.
6. 110 percent of maximum range EAS is recommended for headwinds over 45 knots.

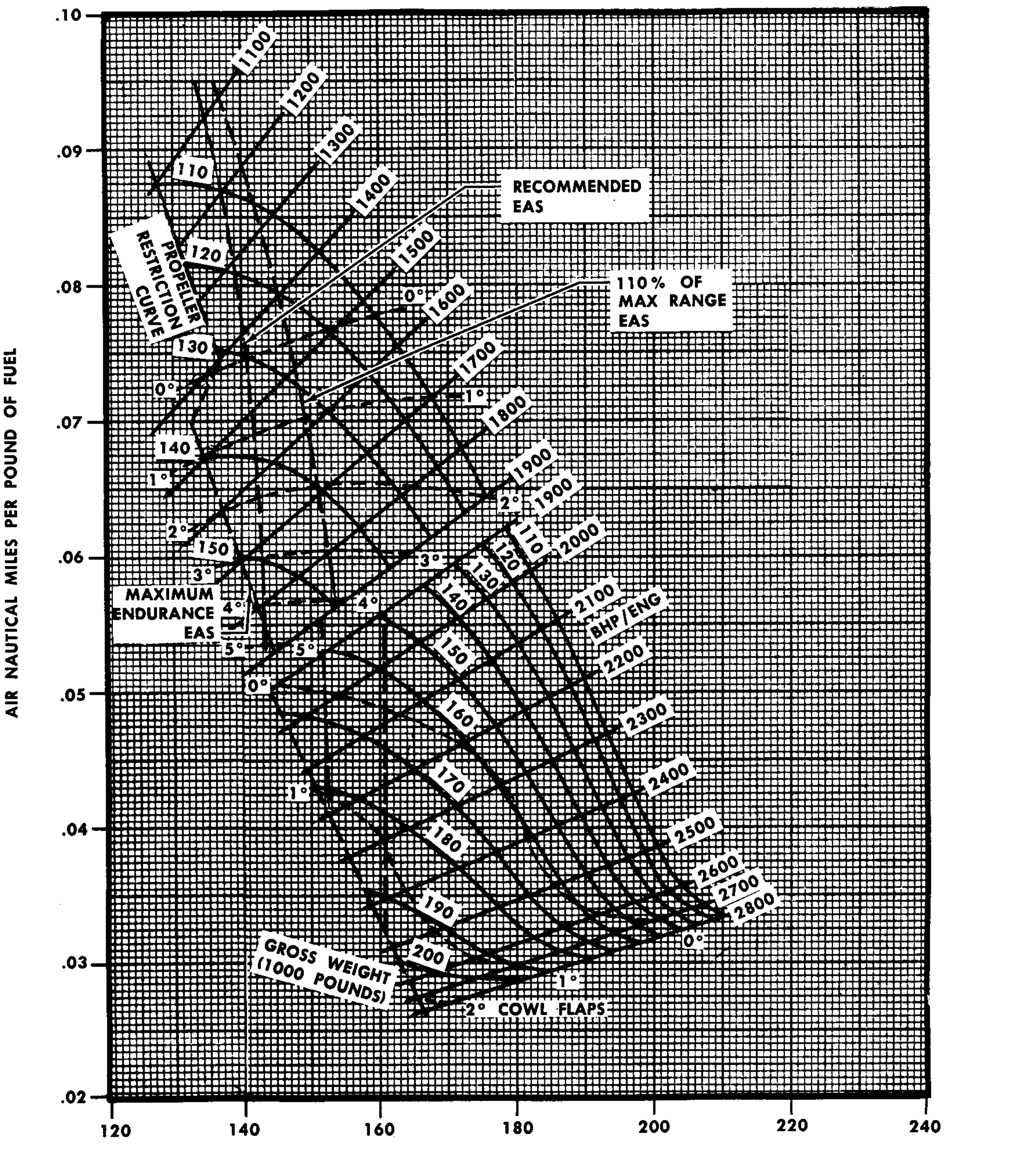

Figure A5-9. Nautical Miles Per Pound of Fuel — Three-Engine — Sea Level R1-605

NAUTICAL MILES PER POUND OF FUEL
THREE-ENGINE — 5000 FEET

MODEL: C-124C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-63A
FUEL GRADE: 115/145 & 100/130

CONDITIONS:

1. 5000 feet pressure altitude.
2. $1/\sqrt{\sigma} = 1.0773$.
3. Cowl flaps 0° except as noted.
4. Mixture: NORMAL above 1900 BHP, MANUAL LEAN below 1900 BHP.
5. With 100/130 grade fuel, do not exceed 1800 BHP in MANUAL LEAN mixture.
6. 110 percent of maximum range EAS is recommended for headwinds of over 45 knots.

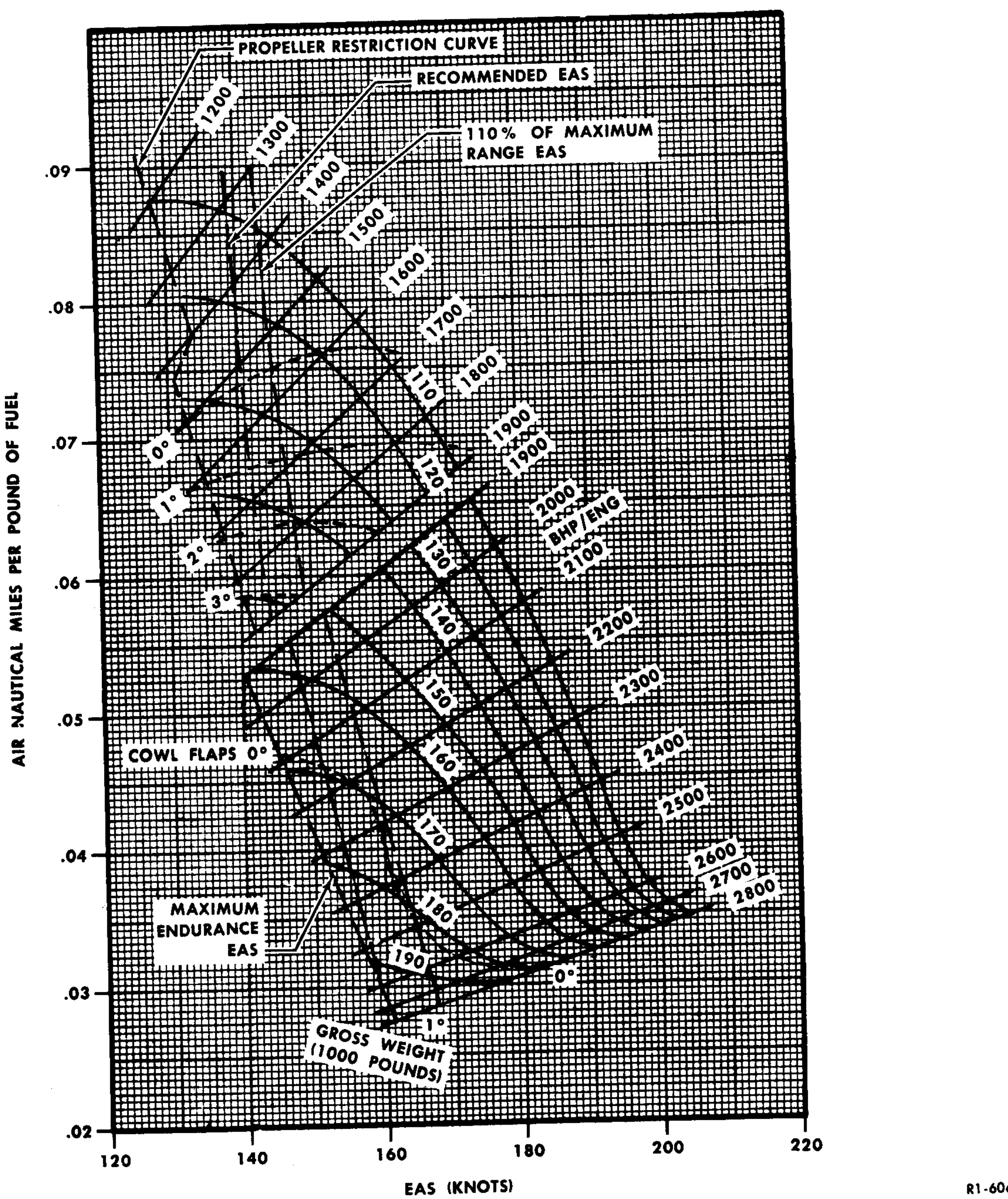

Figure A5-10. Nautical Miles Per Pound of Fuel — Three-Engine — 5000 Feet

NAUTICAL MILES PER POUND OF FUEL THREE-ENGINE — 10,000 FEET

MODEL: C-124C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-63A
FUEL GRADE: 115/145 & 100/130

CONDITIONS:

1. 10,000 feet pressure altitude.
2. $1/\sqrt{\sigma} = 1.1637$.
3. Cowl flaps 0° except as noted.
4. Mixture: NORMAL above 1900 BHP, MANUAL LEAN below 1900 BHP.
5. With 100/130 grade fuel, do not exceed 1800 BHP in MANUAL LEAN mixture.
6. 110 percent of maximum range EAS is recommended for headwinds of over 45 knots.

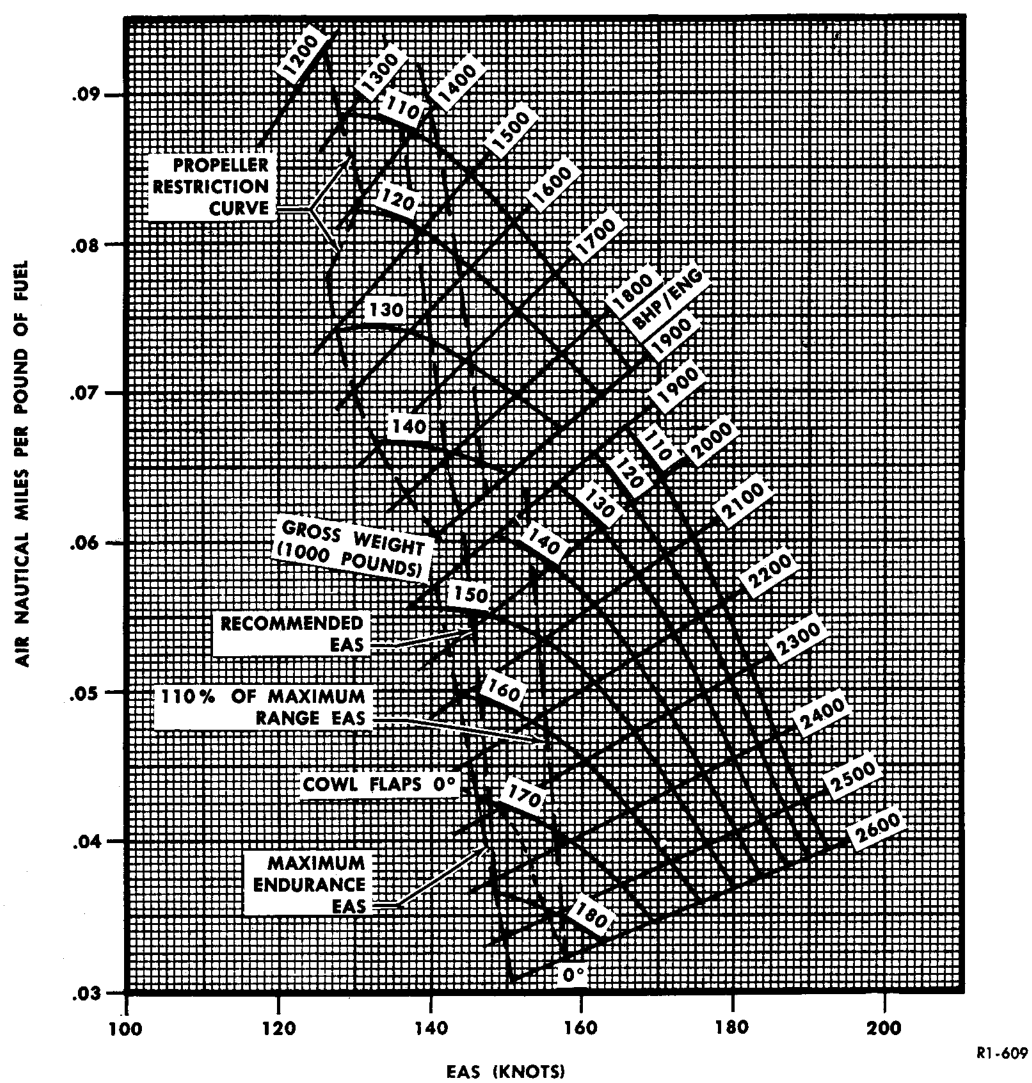

Figure A5-11. Nautical Miles Per Pound of Fuel — Three-Engine — 10,000 Feet

NAUTICAL MILES PER POUND OF FUEL
THREE-ENGINE — 15,000 FEET

MODEL: C-124C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-63A
FUEL GRADE: 115/145 & 100/130

CONDITIONS:
1. 15,000 feet pressure altitude.
2. $1/\sqrt{\sigma} = 1.2606$.
3. Cowl flaps 0°.
4. Mixture: NORMAL above 1900 BHP, MANUAL LEAN below 1900 BHP.
5. With 100/130 grade fuel, do not exceed 1800 BHP in MANUAL LEAN mixture.
6. 110 percent of maximum range EAS is recommended for headwinds of over 45 knots.

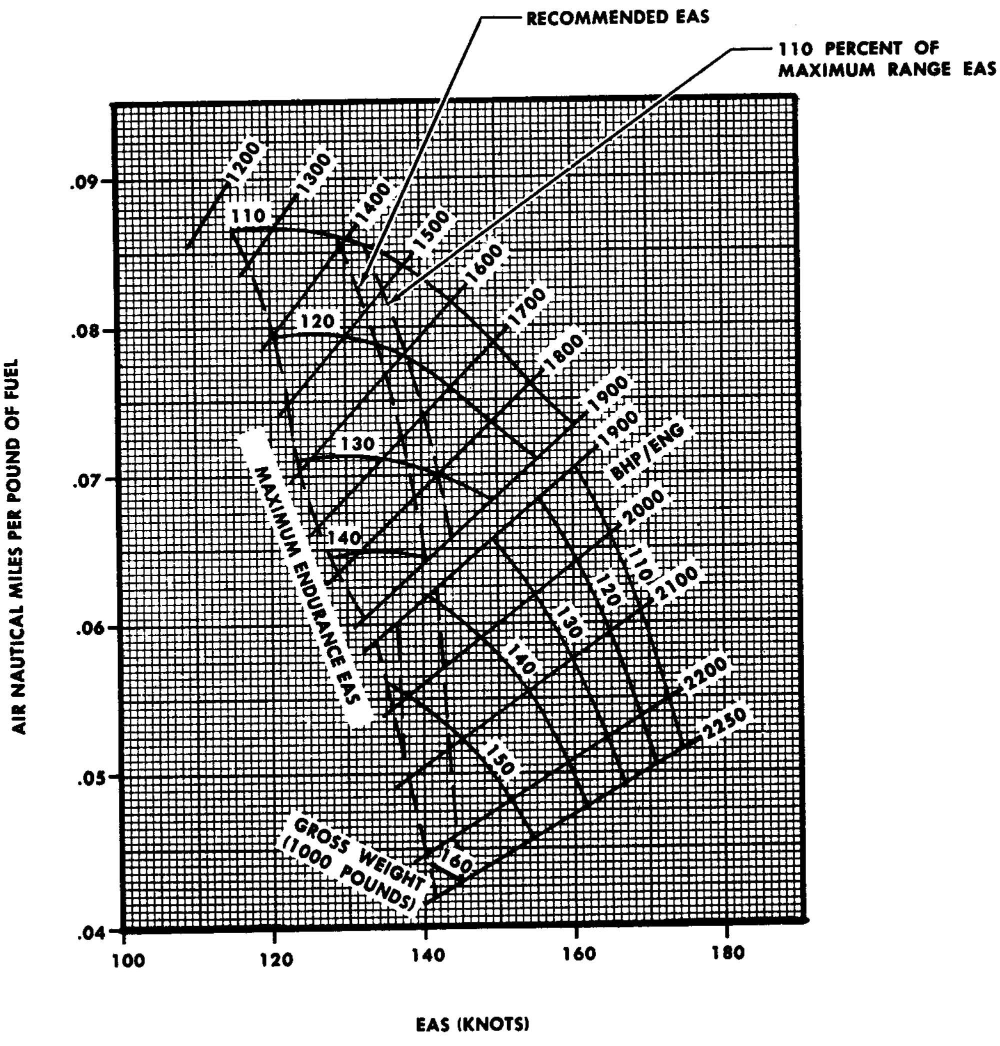

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Figure A5-12. Nautical Miles Per Pound of Fuel — Three-Engine — 15,000 Feet

NAUTICAL MILES PER POUND OF FUEL
TWO-ENGINE — SEA LEVEL

MODEL: C-124C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-63A
FUEL GRADE: 115/145 & 100/130

CONDITIONS:
1. Sea level pressure altitude.
2. $1/\sqrt{\sigma} = 1.000$.
3. Cowl flaps 0° except as noted.
4. Mixture: NORMAL.
5. 110 percent of maximum range EAS is recommended for headwinds over 45 knots.

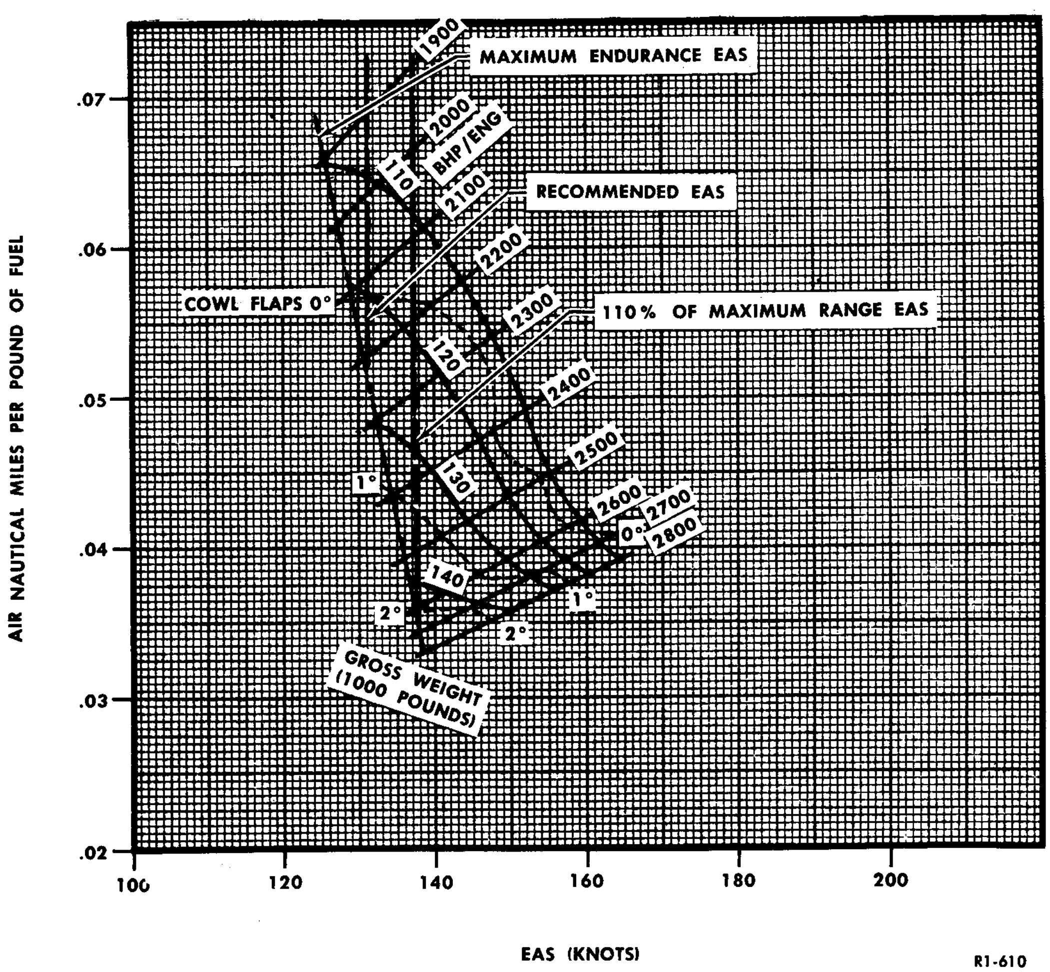

Figure A5-13. Nautical Miles Per Pound of Fuel — Two-Engine — Sea Level

NAUTICAL MILES PER POUND OF FUEL
TWO-ENGINE — 5000 FEET

MODEL: C-124C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-63A
FUEL GRADE: 115/145 & 100/130

CONDITIONS:

1. 5000 feet pressure altitude.
2. $1/\sqrt{\sigma} = 1.0773$.
3. Cowl flaps 0° except as noted.
4. Mixture: NORMAL.
5. 110 percent of maximum range EAS is recommended for headwinds of over 45 knots.

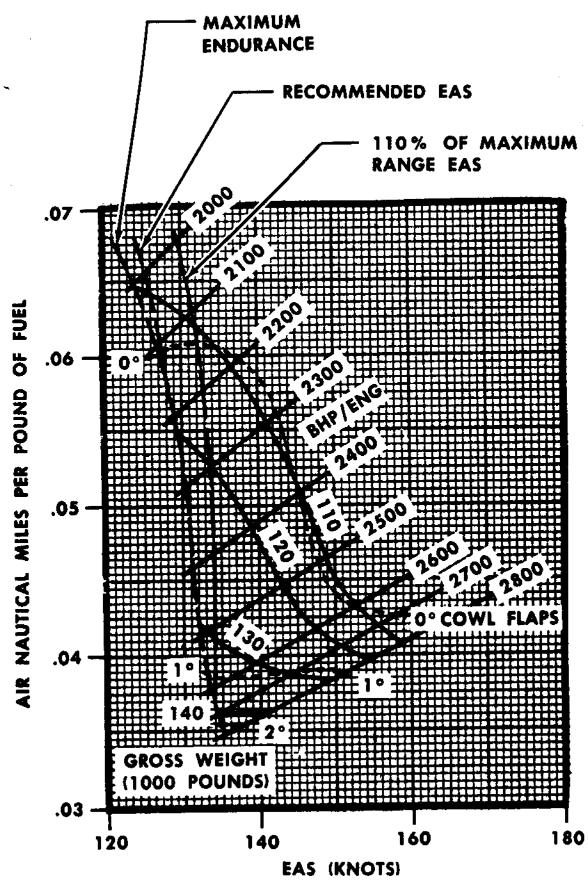

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Figure 5-14. Nautical Miles Per Pound of Fuel — Two-Engine — 5000 Feet

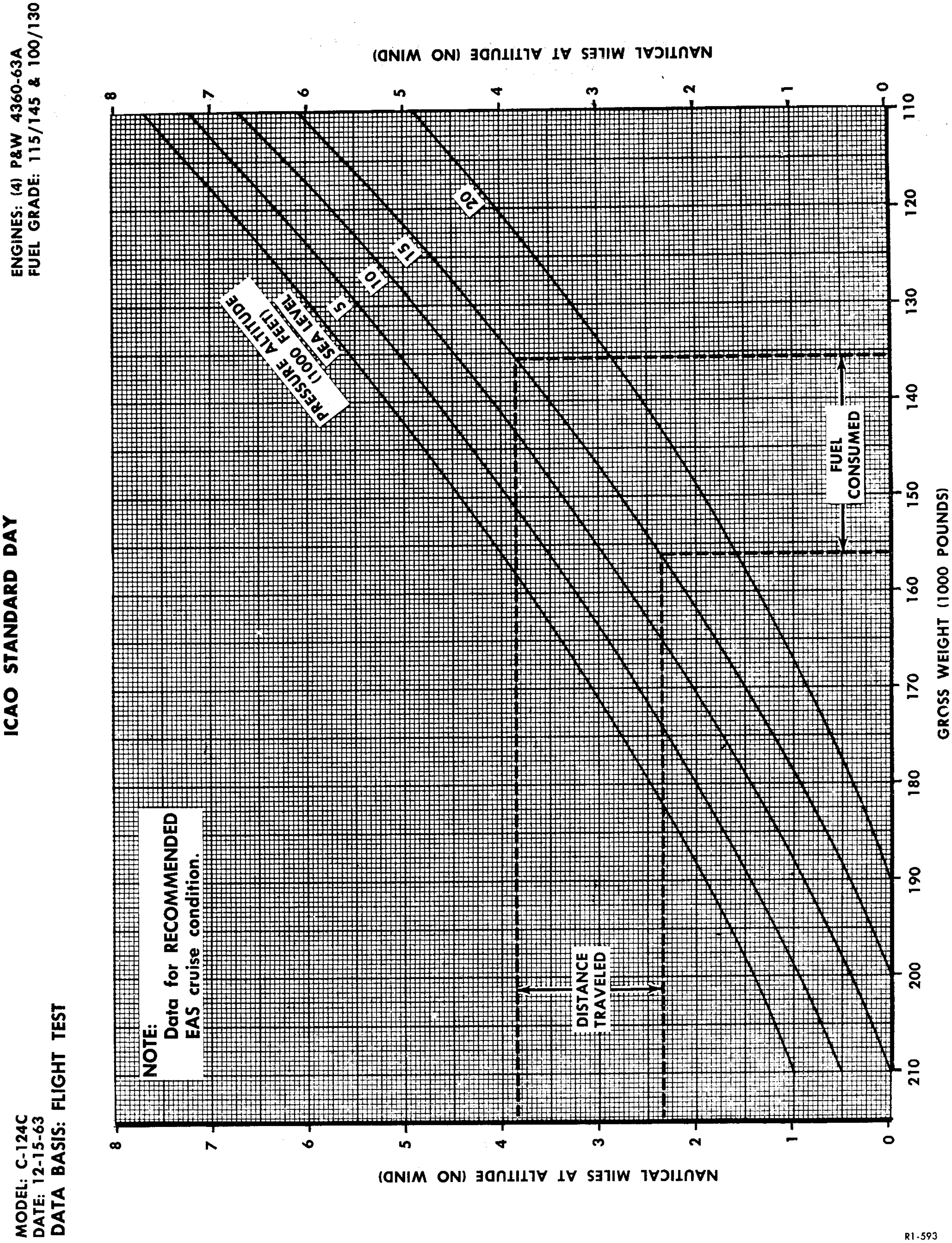

Figure A5-15. Four-Engine Long Range Prediction — Distance — ICAO Standard Day

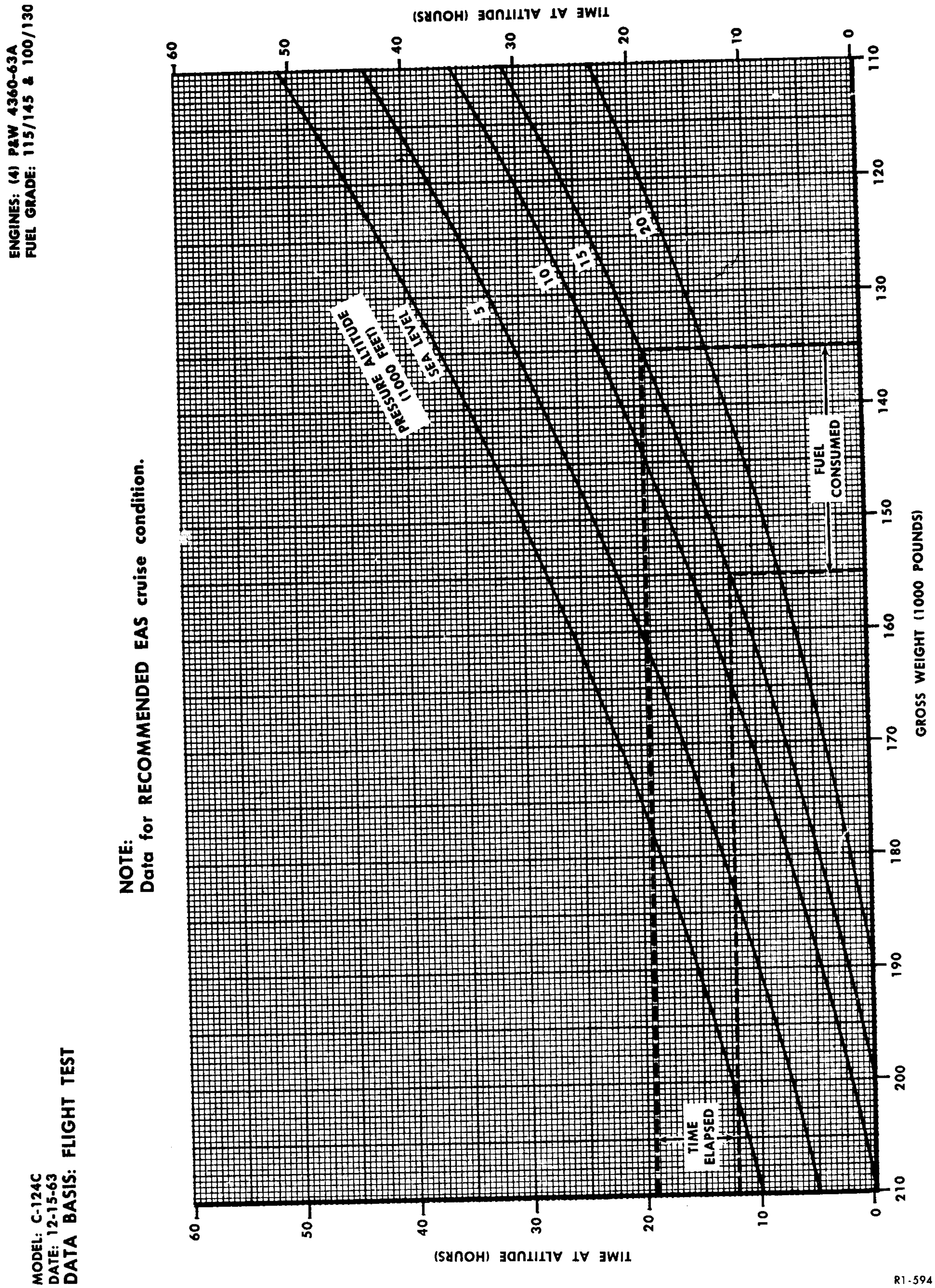

Figure A5-16. Four-Engine Long Range Prediction — Time — ICAO Standard Day

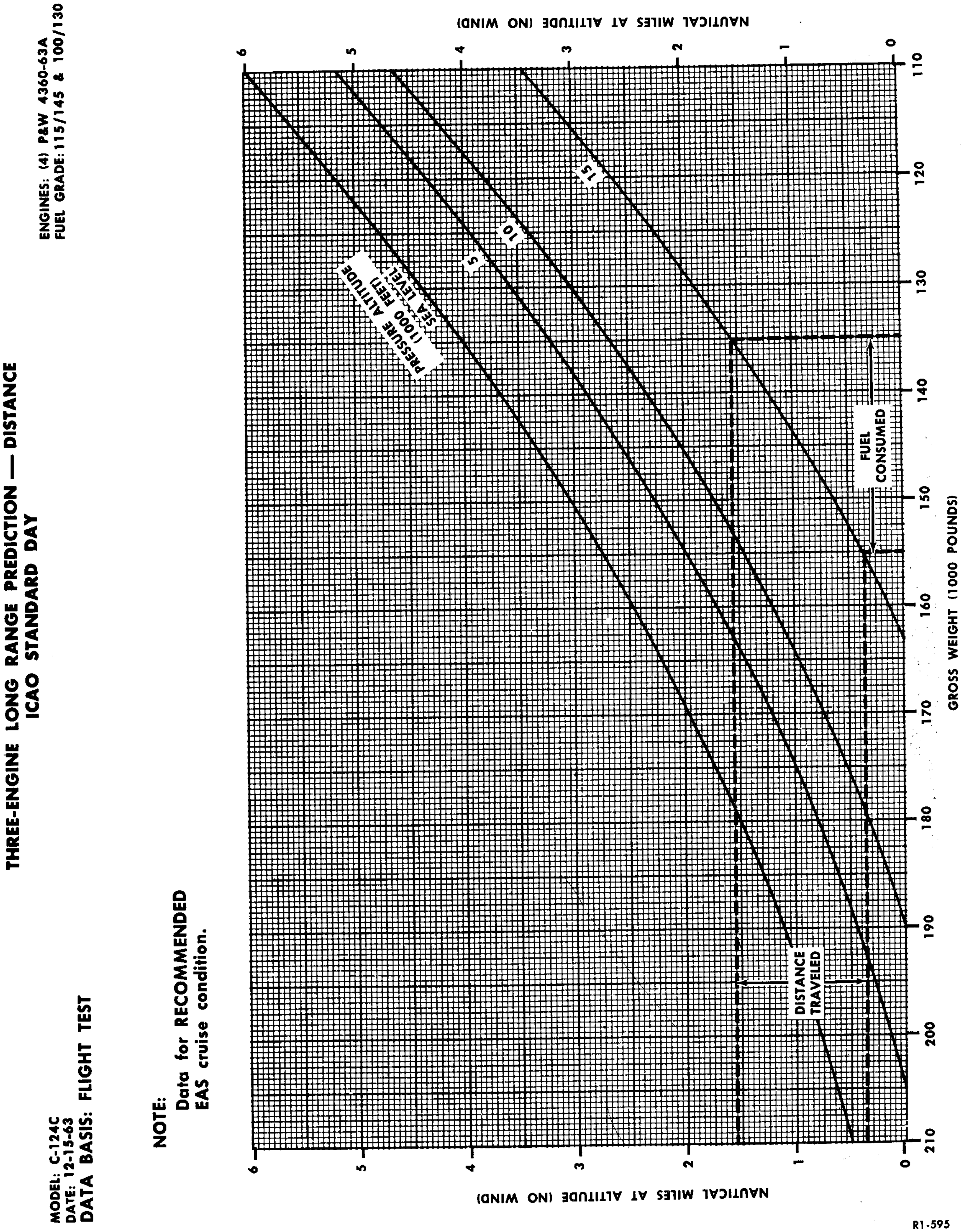

Figure A5-17. Three-Engine Long Range Prediction — Distance — ICAO Standard Day

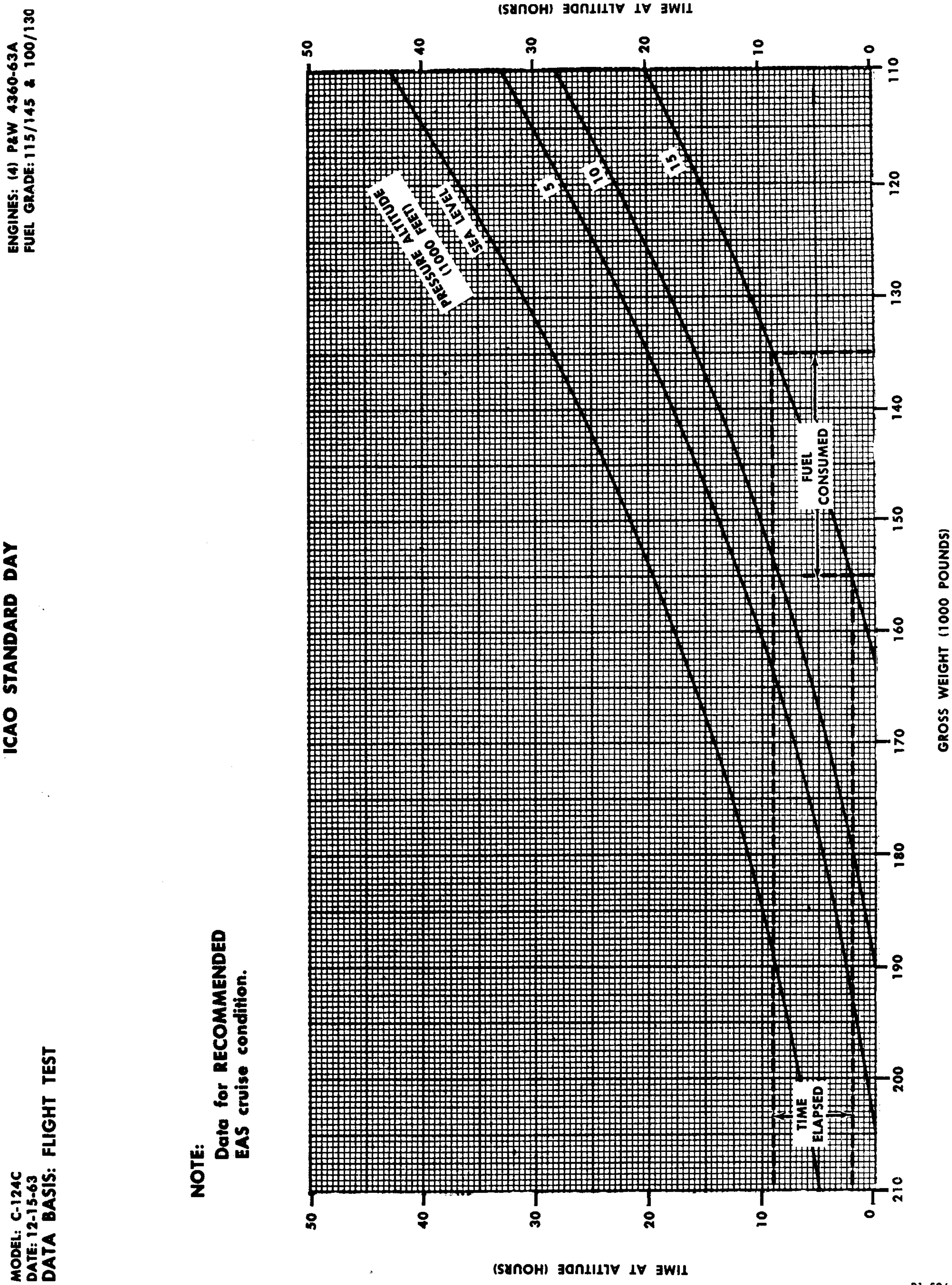

Figure A5-18. Three-Engine Long Range Prediction — Time — ICAO Standard Day

TWO-ENGINE LONG RANGE PREDICTION — DISTANCE
ICAO STANDARD DAY

MODEL: C-124C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-63A
FUEL GRADE: 115/145 & 100/130

NOTE:
Data for RECOMMENDED EAS cruise condition.

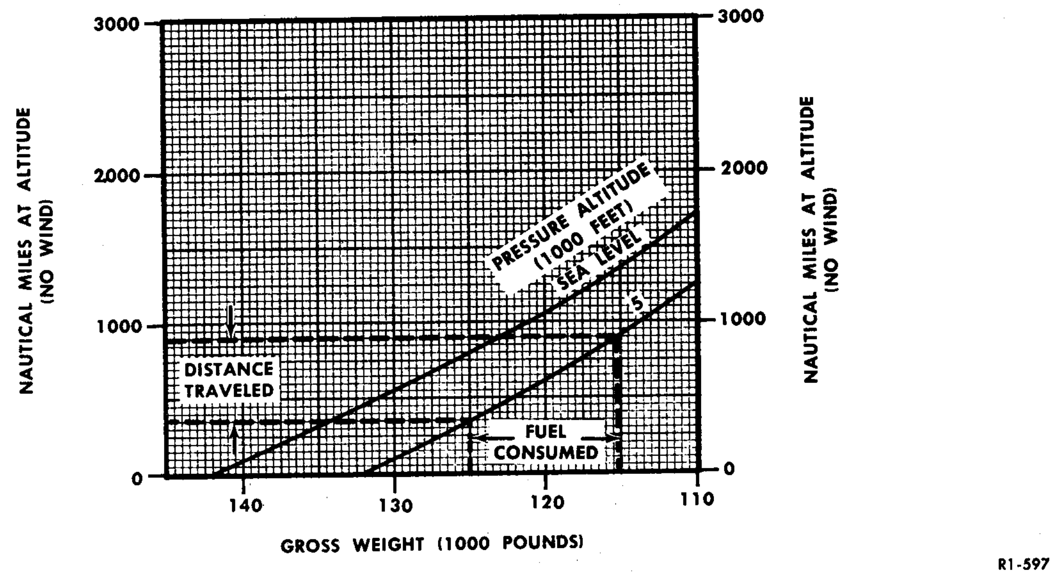

Figure A5-19. Two-Engine Long Range Prediction — Distance — ICAO Standard Day

TWO-ENGINE LONG RANGE PREDICTION — TIME
ICAO STANDARD DAY

MODEL: C-124C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-63A
FUEL GRADE: 115/145 & 100/130

NOTE:
Data for RECOMMENDED EAS cruise condition.

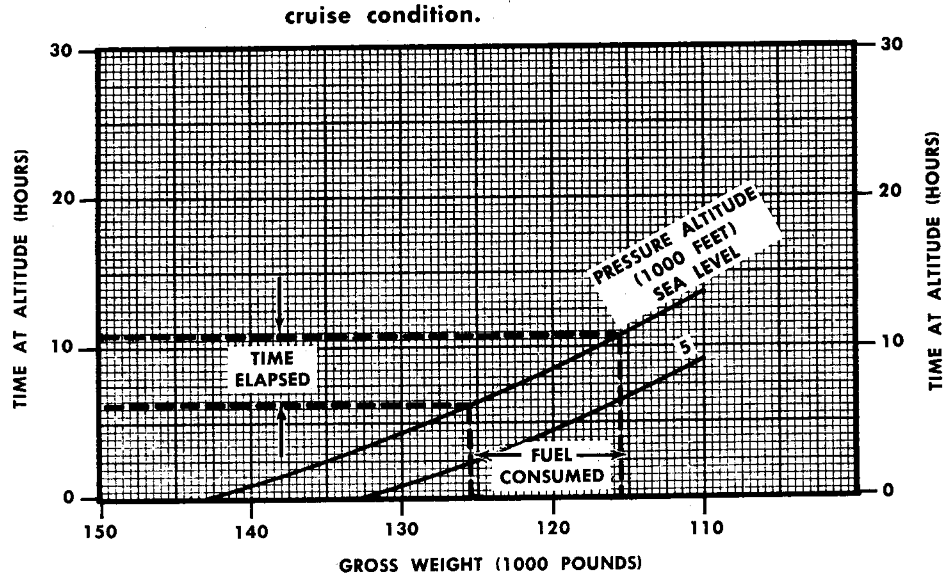

Figure A5-20. Two-Engine Long Range Prediction — Time — ICAO Standard Day

FOUR-ENGINE LONG RANGE SUMMARY
ICAO STANDARD DAY

MODEL: C-124C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-63A
FUEL GRADE: 115/145 & 100/130

NOTE:
Data for RECOMMENDED EAS cruise condition.

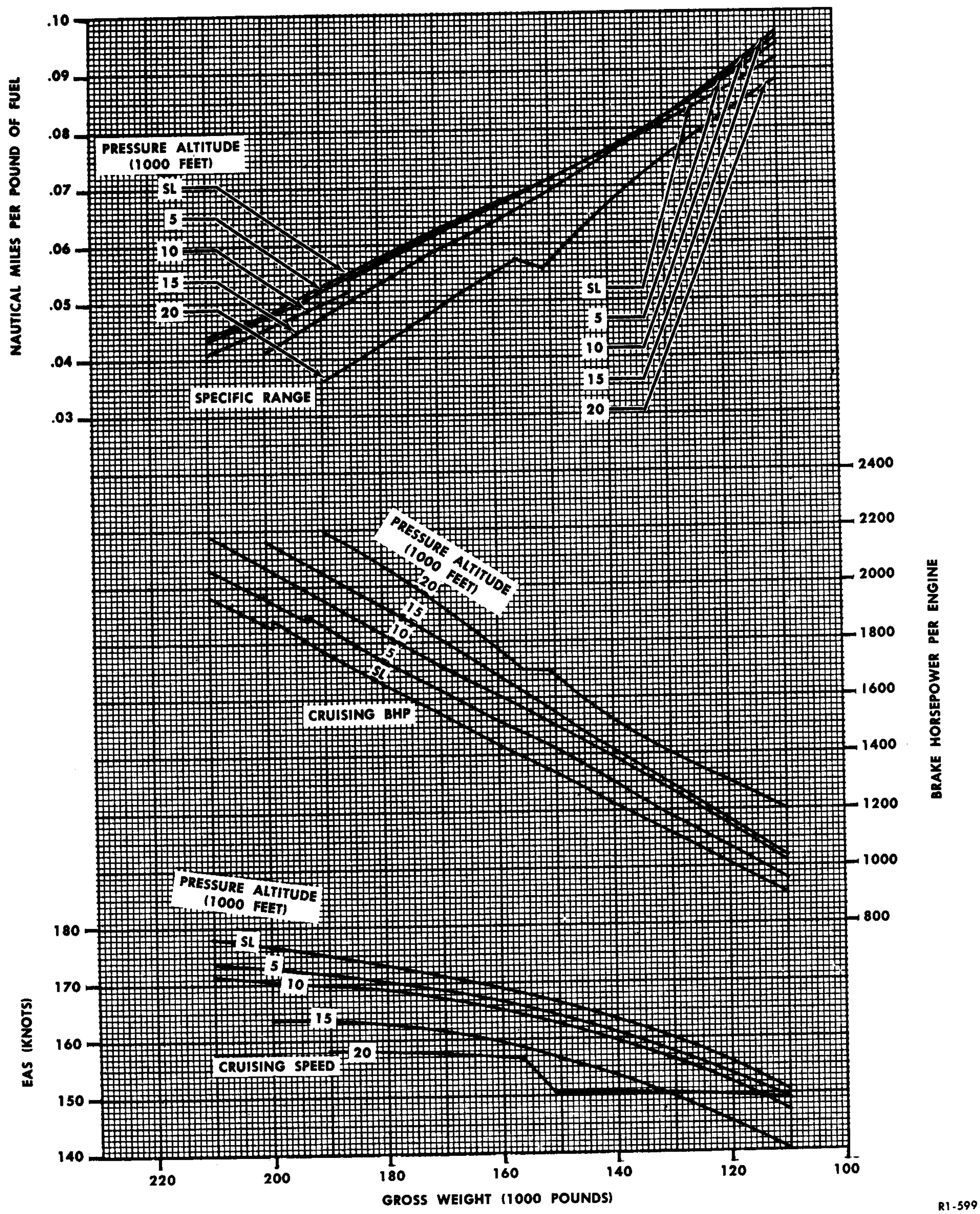

Figure A5-21. Four-Engine Long Range Summary — ICAO Standard Day

THREE-ENGINE LONG RANGE SUMMARY
ICAO STANDARD DAY

MODEL: C-124C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-63A
FUEL GRADE: 115/145 & 100/130

NOTE:
Data for RECOMMENDED EAS cruise condition.

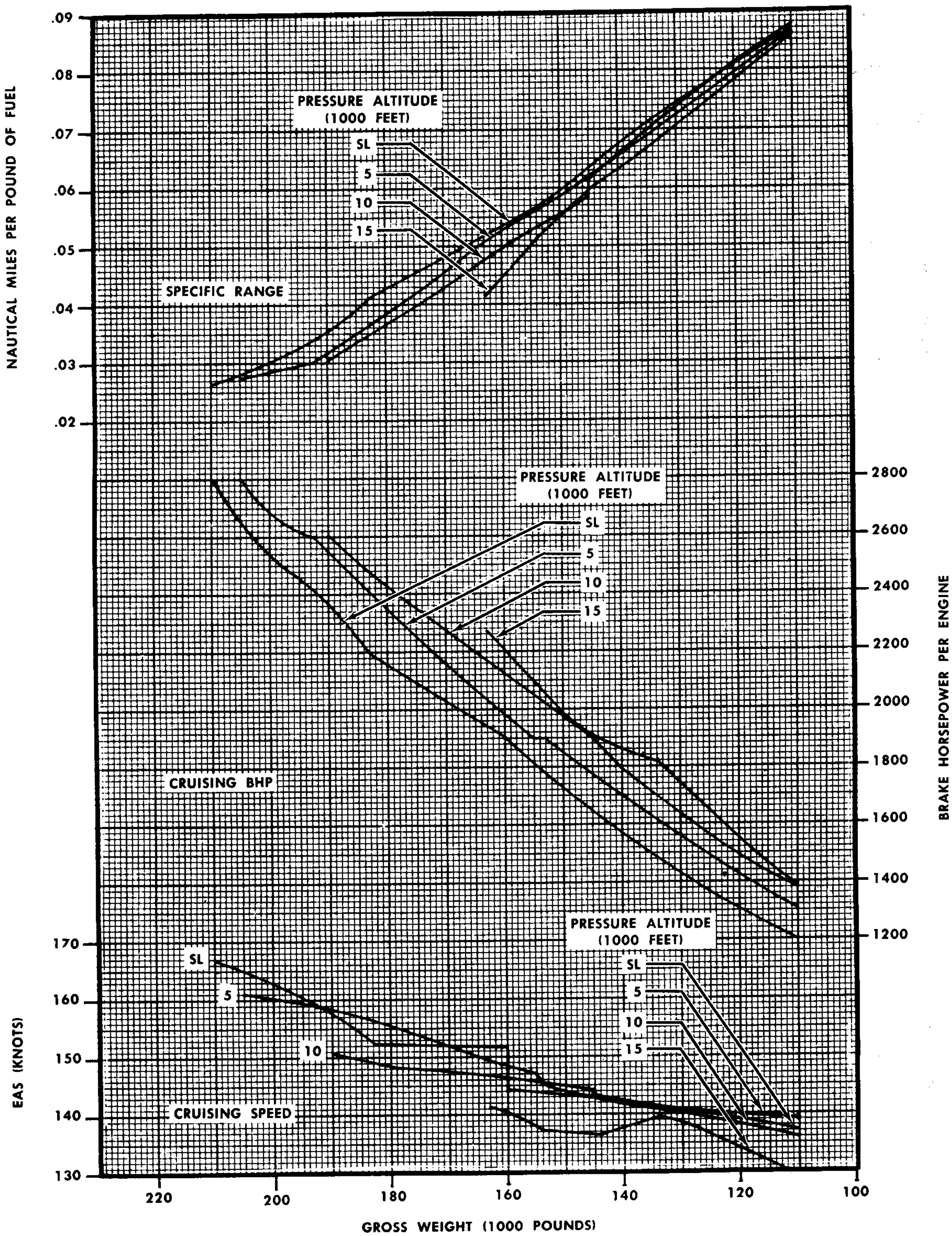

Figure A5-22. Three-Engine Long Range Summary — ICAO Standard Day

TWO-ENGINE LONG RANGE SUMMARY
ICAO STANDARD DAY

MODEL: C-124C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-63A
FUEL GRADE: 115/145 & 100/130

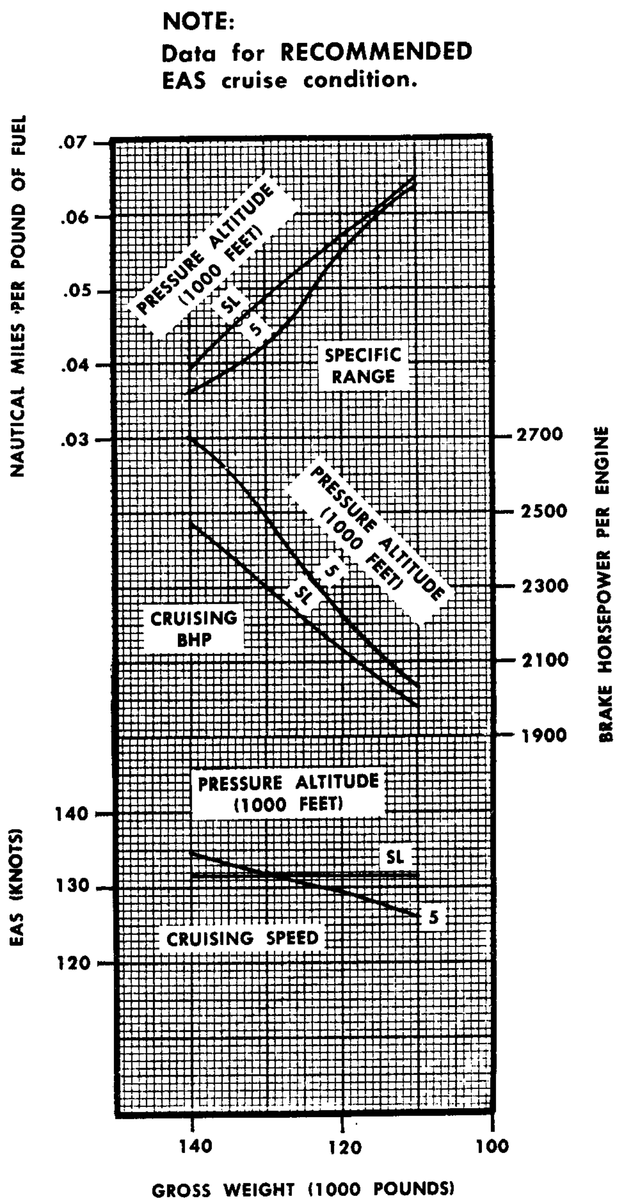

Figure A5-23. Two-Engine Long Range Summary — ICAO Standard Day

MAXIMUM GROSS WEIGHT FOR LEVEL FLIGHT TWO-ENGINE OPERATION IN GROUND EFFECT

WING FLAPS = ZERO DEGREES, GEAR UP
SEA LEVEL

MODEL: C-124C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-63A
FUEL GRADE: 115/145 & 100/130

NOTE:

1. Propellers on inoperative engines feathered.
2. Cowl flaps on inoperative engines closed.
3. Includes drag from cowl flaps on operating engines.
4. —— Standard Day = 15°C.
   – – Hot day = 38°C.
5. For 100/130 grade fuel, subtract 5500 pounds at maximum power.

SAMPLE PROBLEM:

A. Gross weight = 175,000 pounds.
B. Power = METO power (Standard Day).
C. Maximum height above ground attainable = 45 feet.

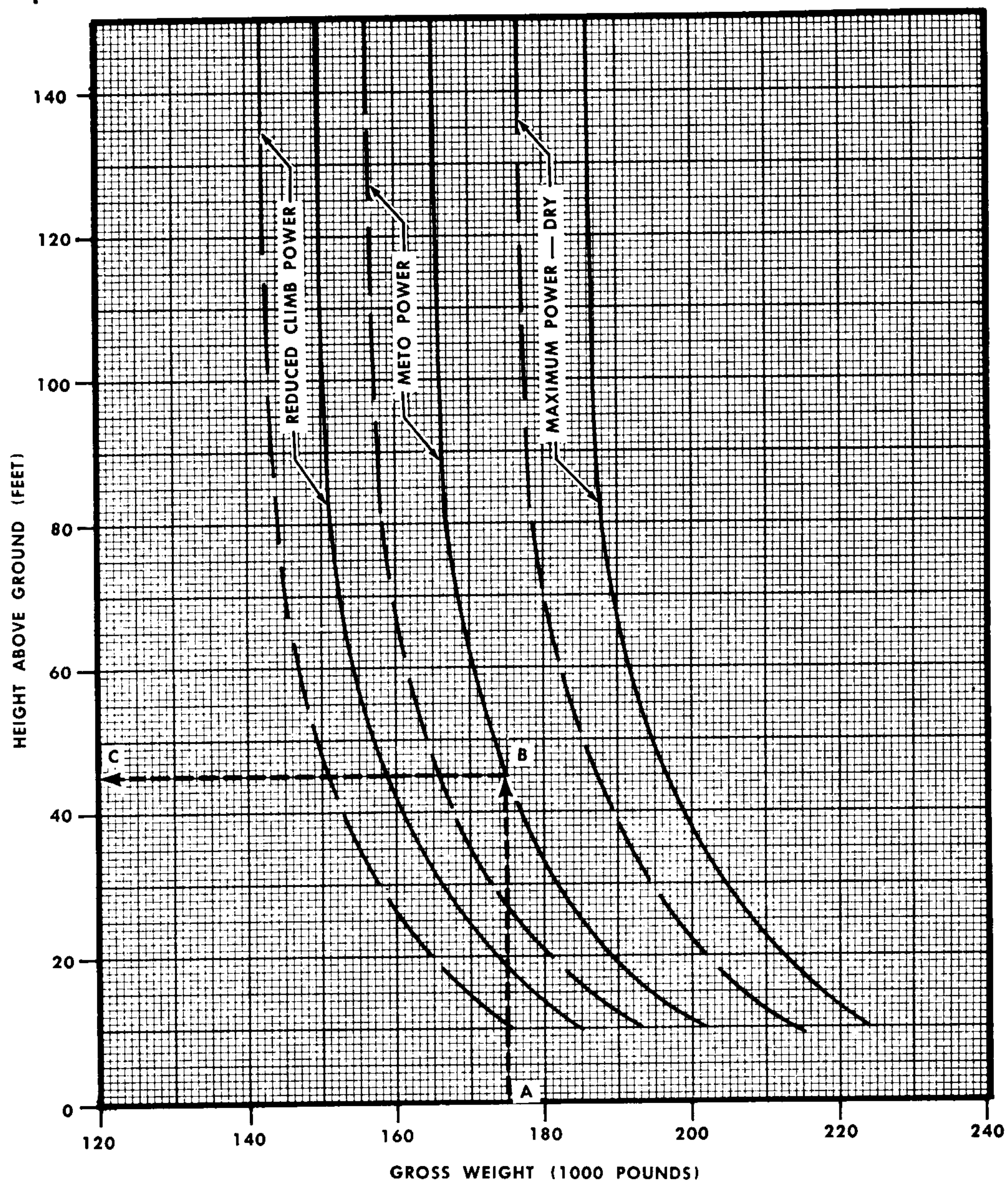

Figure A5-24. Maximum Gross Weight for Level Flight — Two-Engine Operation in Ground Effect

REQUIRED SPEED FOR TWO-ENGINE OPERATION IN GROUND EFFECT

WING FLAPS = ZERO DEGREES, GEAR UP
SEA LEVEL

MODEL: C-124C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-63A
FUEL GRADE: 115/145 & 100/130

NOTE:

1. Propellers on inoperative engines feathered.
2. Cowl flaps on inoperative engines closed.
3. Includes drag from cowl flaps on operating engines.
4. For 100/130 grade fuel, subtract 2 Knots at maximum power.

SAMPLE PROBLEM:

A. Gross weight = 175,000 pounds.
B. Power = METO power (Standard Day).
C. Required IAS to maintain altitude = 137 knots.

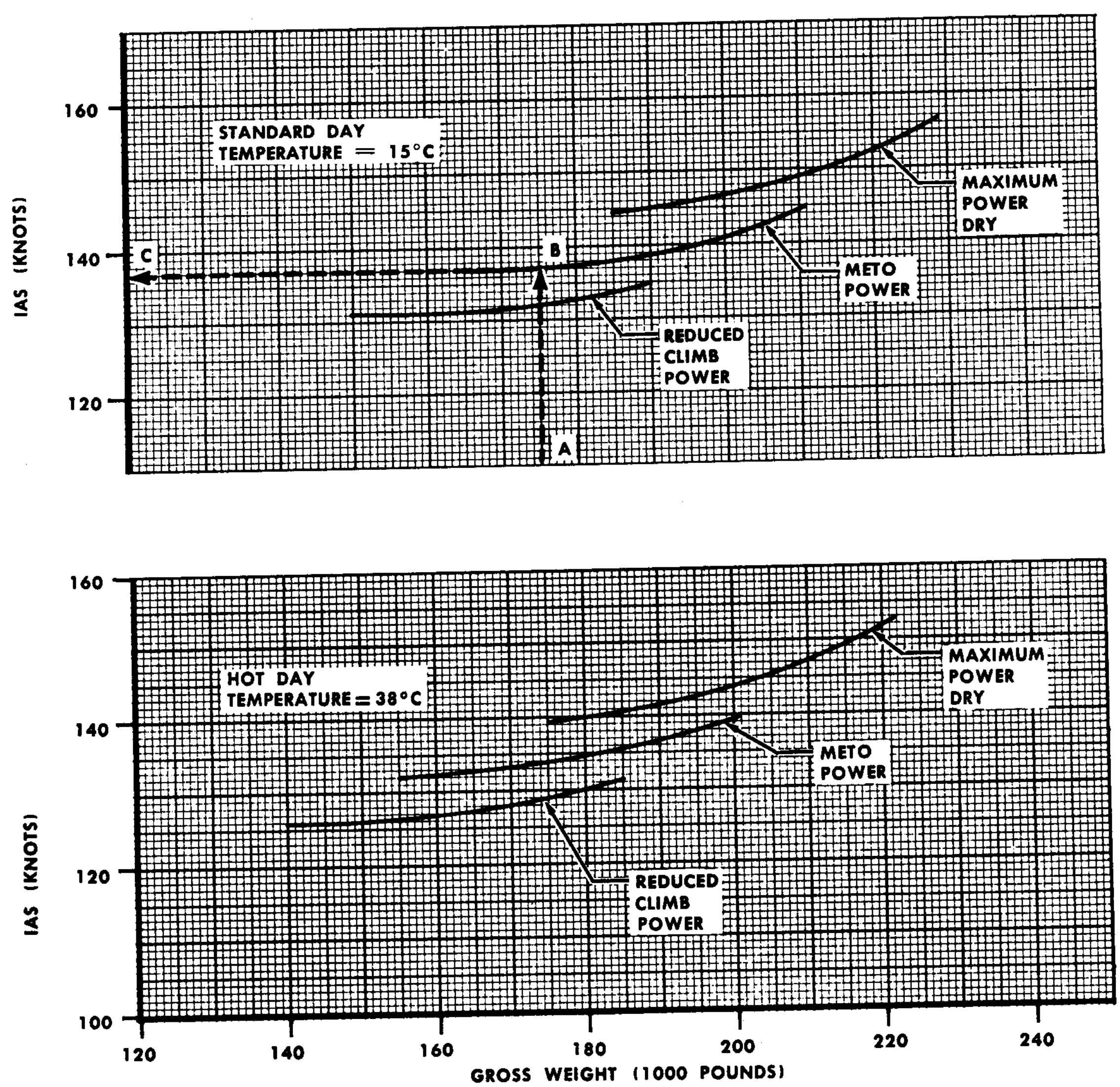

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Figure A5-25. Required Speed for Two-Engine Operation in Ground Effect

COWL FLAP DRAG

MODEL: C-124A/C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-20WD/-63A
FUEL GRADE: 115/145 & 100/130

SAMPLE PROBLEM:
Given:
5000 feet density altitude.
$\left(\frac{1}{\sqrt{\sigma}} = 1.0773\right)$.
Four-engine cruise at 200 knots EAS.
Find:
Additional power required if cowl flap settings are increased from 5 degrees to 6 degrees.
Solution:
The additional cowl flap opening results in increased power required of 216 x 1.0773 minus 180 x 1.0773 or 38.7 brake horsepower per engine.

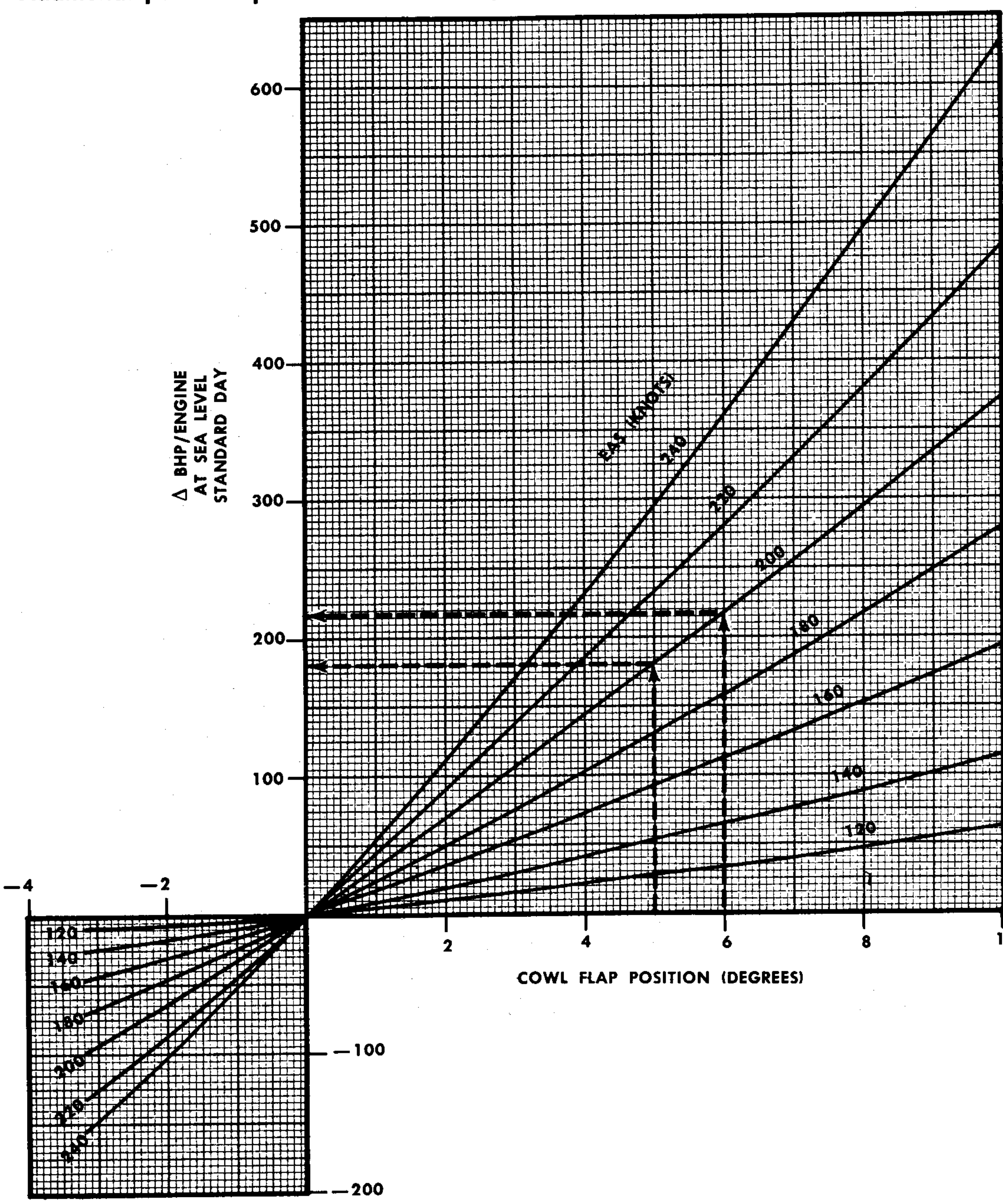

Figure A5-26. Cowl Flap Drag

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PART VI

LANDING

TABLE OF CONTENTS

LIST OF CHARTS

LANDING PERFORMANCE.

Landing performance is presented for various wing flap deflections utilizing brakes plus maximum four-engine reverse thrust or brakes only. Data are included to correct for unusual runway conditions, varying number of engines with maximum reverse thrust, headwind, and density altitude. Also included are data to determine descent power, recommended approach and threshold speeds, and stalling speeds.

Approach, threshold and stall speed data are presented for both part and full span flap airplane configurations. However, all Landing Distance charts have been constructed for the partial span flap configuration. For aircraft with full span flap configuration (AF49-243 through AF51-182), it is necessary to correct the charts by the following:

1. Wing flaps full down — Brakes plus four-engine reverse thrust: Distance X 0. 94.
2. Wing flaps full down — Brakes only: Distance X 0. 92.
3. Wing flaps 30 degrees — Brakes plus four-engine reverse thrust and brakes only: Distance X 0. 95.
4. Wing flaps 20 degrees — Brakes plus four-engine reverse thrust and brakes only: Distance X 0. 97.
5. No correction for zero degrees flap.

Stopping distances are based on maximum braking without skidding. This utilizes the maximum coefficient of friction available between the tire and the runway surface. The coefficient of friction is given in terms of runway condition readings (RCR), as measured by the James brake decelerometer, and will vary from 23 for a dry hard surface runway to 06 for any icy surface runway.

The reverse thrust used herein in based on maximum power, not to exceed the engine limitations of RPM and manifold pressure (see T.O. 1C-124A-1, Section V— Operating Limitations). Normally, 40 inches of manifold pressure is sufficient. The reverse thrust is more effective at higher speeds; therefore, on short runways, the nose should be lowered and reversing applied as soon as possible after the main wheels touch down.

A reaction distance corresponding to 3 seconds at touchdown speed is included in the landing distance to allow time for application of brakes and reverse thrust.

DISCUSSION OF CHARTS.

DESCENT POWER SCHEDULE CHART.

The Descent Power Schedule chart (figure A6-1) presents the reduction in brake horsepower per engine necessary to obtain a chosen rate of descent. For a given gross weight, EAS, and aircraft configuration, the BHP per engine required for level flight may be reduced by the Δ BHP per engine determined from the chart at the desired rate of descent. Then the aircraft will descend at the desired rate of descent as long as the EAS and configuration remain constant.

RECOMMENDED APPROACH AND THRESHOLD SPEED CHARTS.

Recommended Approach and Threshold Speeds are presented for both full span flap (figure A6-2) on AF49-232 through AF51-182, and part span flap (figure A6-3) on AF51-5173 and subsequent. For any gross weight and flap configuration, the recommended indicated approach and threshold speeds may be obtained. The recommended approach airspeeds are based on 130 percent of power-off stall speeds and threshold airspeeds are based on 120 percent of power-off stall speed.

STALLING SPEEDS — POWER-OFF CHARTS.

Stalling Speeds — Power-Off charts are also presented for the full span flap configuration (figure A6-4) and the part span flap configuration (figure A6-5). At any gross weight, flap setting and angle of bank with gear up or down the power-off stalling speed may be obtained from these charts.

LANDING DISTANCE CHARTS.

Landing Distance charts (figures A6-6 through A6-12) are presented for the following conditions:

1. Wing Flaps = 45 Degrees — Brakes plus Four-Engine Maximum Reverse Thrust.
2. Wing Flaps = 45 Degrees — Brakes Only.
3. Wing Flaps = 30 Degrees — Brakes plus Four-Engine Maximum Reverse Thrust.
4. Wing Flaps = 30 Degrees — Brakes Only.
5. Wing Flaps = 20 Degrees — Brakes plus Four-Engine Maximum Reverse Thrust.
6. Wing Flaps = 20 Degrees — Brakes Only.
7. Wing Flaps = Zero Degrees — Brakes plus Four-Engine Maximum Reverse Thrust.

These charts present landing data for ground roll and total distance to clear a height of 50 feet. These data allow for 3 seconds delay after touchdown before application of brakes and/or reverse thrust. The airspeed at the 50 foot height is 120 percent of power-off stall speed and touchdown is at 110 percent of power-off stall speed. All the charts are prepared for landing on dry, hard runway surfaces. For any reasonable gross weight, density altitude and wind condition, the landing distances may be determined. Sample problems are included on each chart.

EFFECT OF RUNWAY SLOPE ON LANDING GROUND ROLL.

The Effect of Runway Slope on Landing Ground Roll charts (figures A6-13 and A6-14) are provided to correct the ground roll distance when runway slope is other than zero percent, for brakes plus four-engine reverse thrust and for brakes only. Correction for runway slope is applied to the distances obtained from the appropriate landing distance charts after correction for wing velocity, and before correction for runway conditions. The brakes plus four-engine reverse thrust chart (figure A6-13) gives corrections with wing flaps at zero degrees, 20 degrees and full down; the brakes only chart (figure A6-14) gives corrections for wing flaps at 20 degrees and full down only.

EFFECT OF UNUSUAL RUNWAY CONDITIONS ON LANDING GROUND ROLL CHARTS.

These charts (figures A6-15 and A6-16) are presented to give corrected ground roll distances for landing made on dry turf, wet concrete, or macadam, snow or wet grass, and ice-covered runways as compared to landing distances on dry concrete or macadam. Coefficients of friction are given in terms of runway condition readings (RCR) and will vary from 23 for a dry hard surface runway, to 04. These data are given for brakes plus four-engine maximum reverse thrust and brakes only. The corrected ground roll distance is found by entering the appropriate chart with landing ground roll obtained from the Landing Distance charts (figures A6-6 through A6-12) and the runway condition, as shown in the sample problems included on the charts.

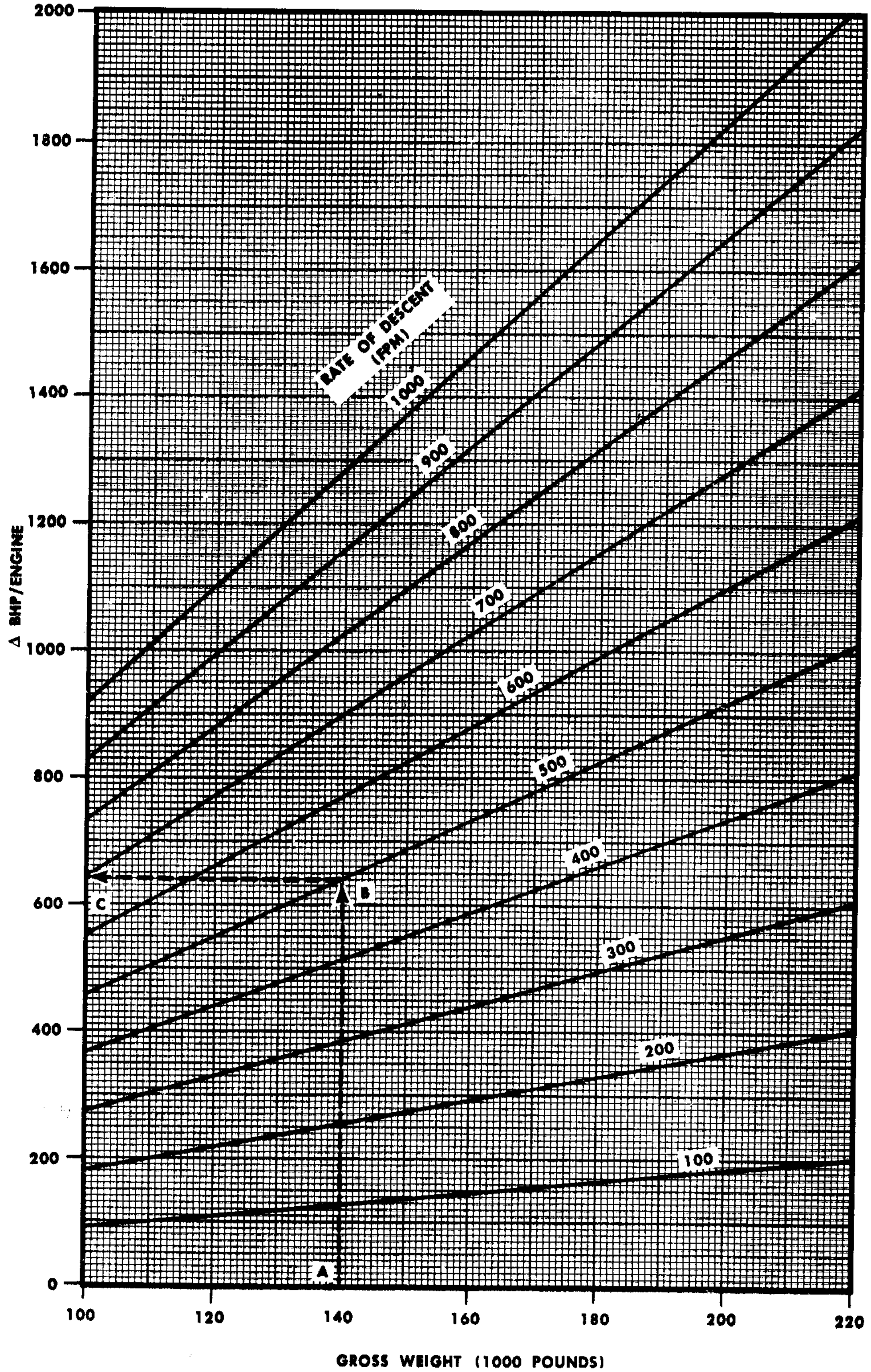
PERCENT OF LANDING GROUND ROLL DISTANCE WITH BRAKES ONLY VERSUS NUMBER OF ENGINES WITH FULL REVERSE THRUST.

The information on figure A6-17 is to provide data for landing ground roll distance with one or more engines inoperative and reverse thrust available on the remaining engines. An explanation is presented for obtaining landing distance when the above conditions occur.

DESCENT POWER SCHEDULE
FOUR-ENGINE

MODEL: C-124A/C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-20WD/-63A



NOTE:

1. The ΔBHP/engine read from this chart is the power reduction required for a desired rate of descent for a given gross weight, configuration and equivalent airspeed remaining constant.
2. For a given gross weight, equivalent airspeed and configuration, BHP/engine for level flight minus ΔBHP/engine for rate of descent equals BHP/engine required for that rate of descent.
3. Δ BHP/Engine $= \dfrac{\text{Rate of Descent} \times \text{Wt.}}{108{,}900}$

SAMPLE PROBLEM:

A. Gross weight at start of descent = 140,000 pounds.

B. Desired rate of descent = 500 FPM.

C. Reduction of power required = 640 BHP/engine.

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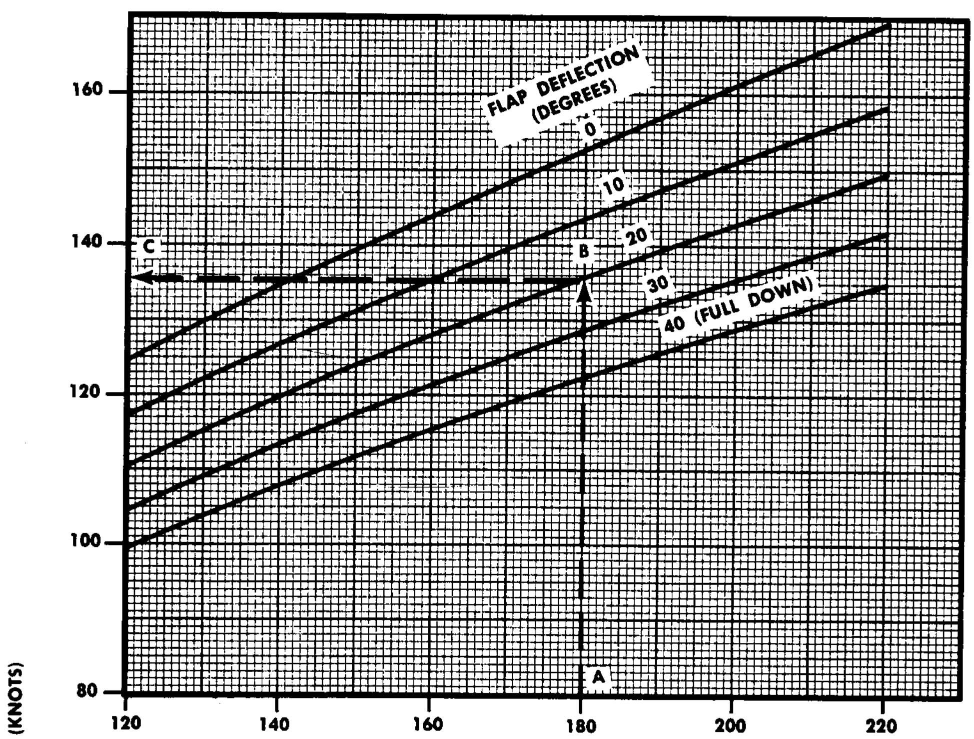
Figure A6-1. Descent Power Schedule — Four-Engine

RECOMMENDED APPROACH AND THRESHOLD SPEEDS
AF49-232 THROUGH AF51-182
FULL SPAN FLAP CONFIGURATION

MODEL: C-124A/C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

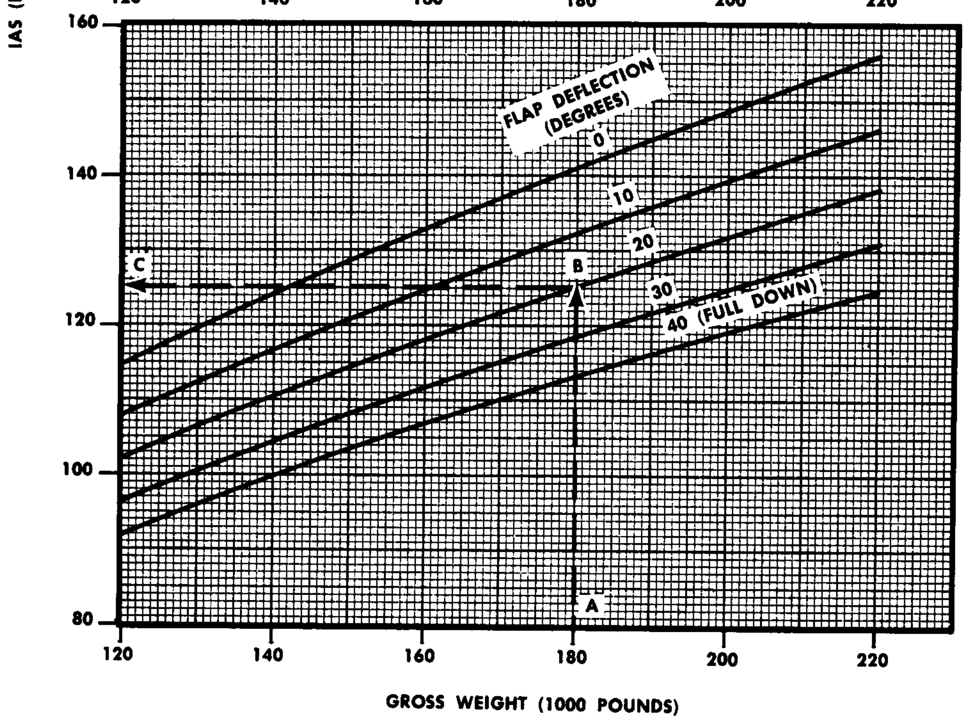
ENGINES: (4) P&W 4360-20WD/-63A



APPROACH SPEEDS
(130 PERCENT POWER-OFF STALL SPEED)

NOTE:
Do not exceed 132 knots IAS with flaps fully deflected.

SAMPLE PROBLEM:
A. Gross weight = 180,000 pounds.
B. Flap deflection = 20 degrees.
C. Approach speed = 135 knots.



THRESHOLD SPEEDS
(120 PERCENT POWER-OFF STALL SPEED)

SAMPLE PROBLEM:
A. Gross weight = 180,000 pounds.
B. Flap deflection = 20 degrees.
C. Threshold speed = 125 knots.

Figure A6-2. Recommended Approach and Threshold Speeds (AF49-232 through AF51-182)

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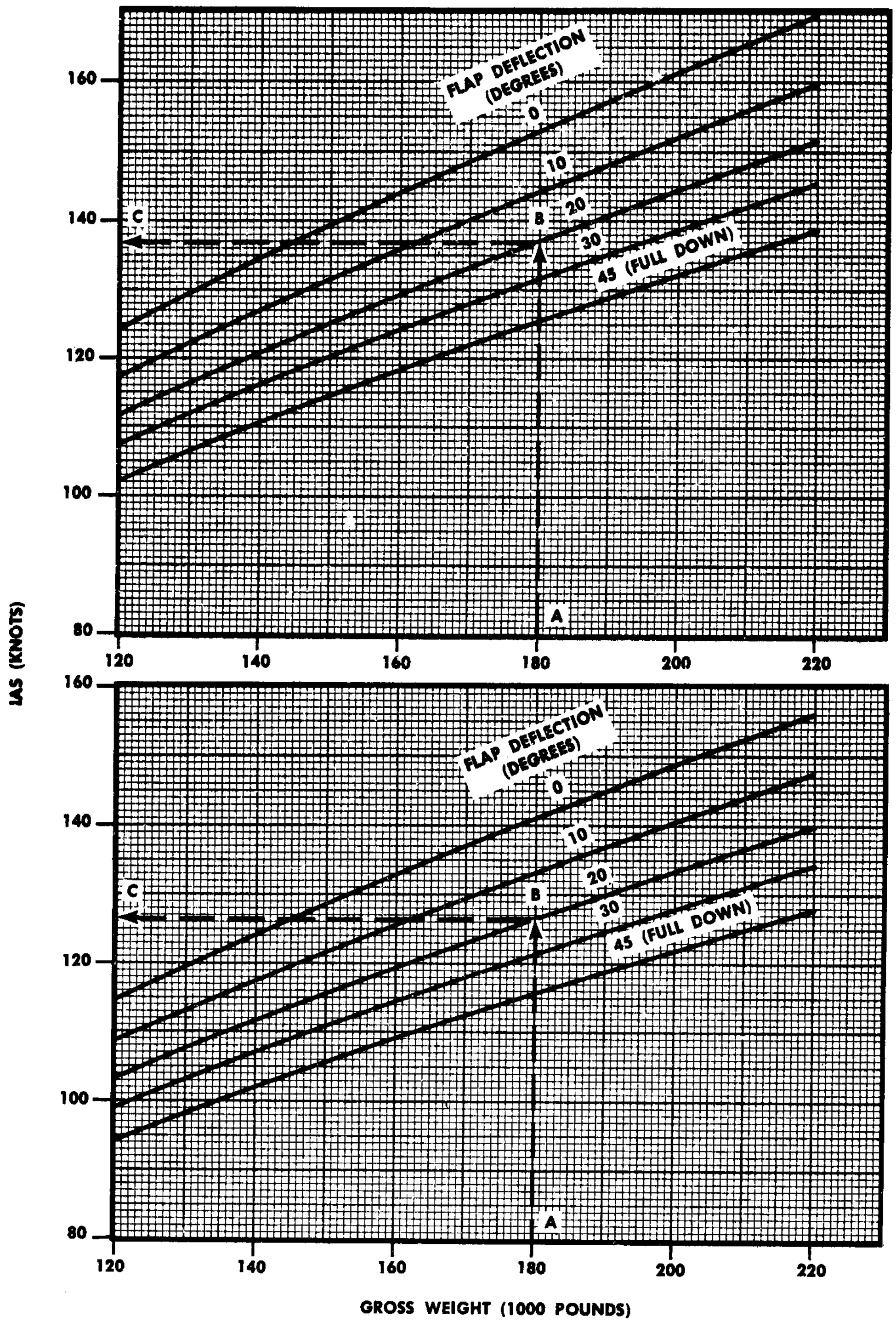
RECOMMENDED APPROACH AND THRESHOLD SPEEDS
AF51-5173 AND SUBSEQUENT
PART SPAN FLAP CONFIGURATION

MODEL: C-124 C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-63A



APPROACH SPEEDS
(130 PERCENT POWER-OFF STALL SPEED)

NOTE:
Do not exceed 132 knots IAS with flaps fully deflected.

SAMPLE PROBLEM:
A. Gross weight = 180,000 pounds.
B. Flap deflection = 20 degrees.
C. Approach speed = 137 knots.

THRESHOLD SPEEDS
(120 PERCENT POWER-OFF STALL SPEED)

SAMPLE PROBLEM:
A. Gross weight = 180,000 pounds.
B. Flap deflection = 20 degrees.
C. Threshold speed = 126 knots.

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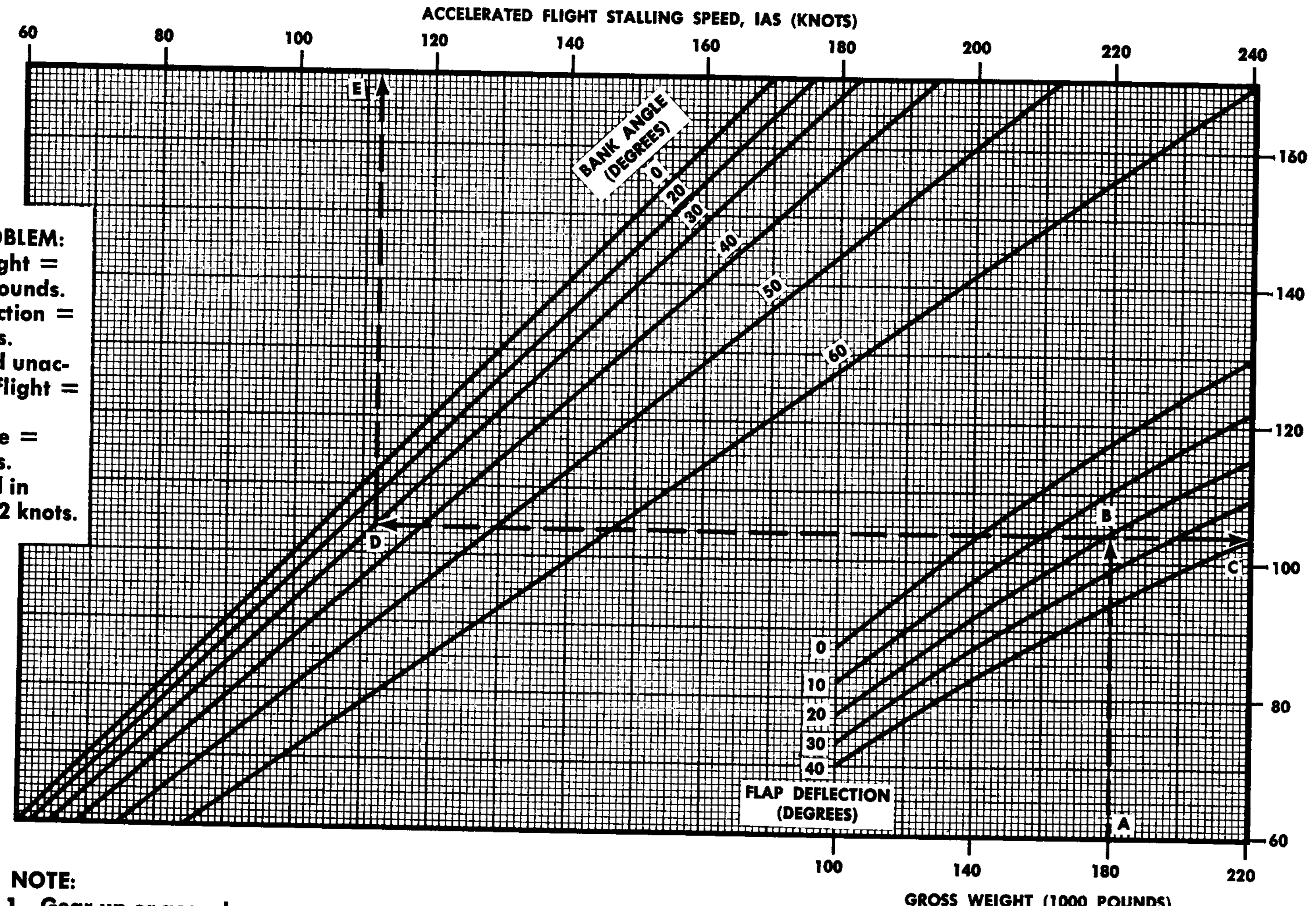
Figure A6-3. Recommended Approach and Threshold Speeds (AF51-5173 and Subsequent)

STALLING SPEEDS — POWER OFF
AF49-232 THROUGH AF51-182
FULL SPAN FLAP CONFIGURATION

MODEL: C-124A/C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-20WD/-63A



SAMPLE PROBLEM:
- A. Gross weight = 180,000 pounds.
- B. Flap deflection = 20 degrees.
- C. Stall speed unaccelerated flight = 104 knots.
- D. Bank angle = 30 degrees.
- E. Stall speed in turn = 112 knots.

NOTE:
1. Gear up or gear down.
2. Full span flap configuration (outboard flap deflection is 50 percent of inboard flap).
3. IAS must be corrected for instrument error to obtain instrument reading.

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Figure A6-4. Stalling Speeds — Power Off (AF49-232 through AF51-182)

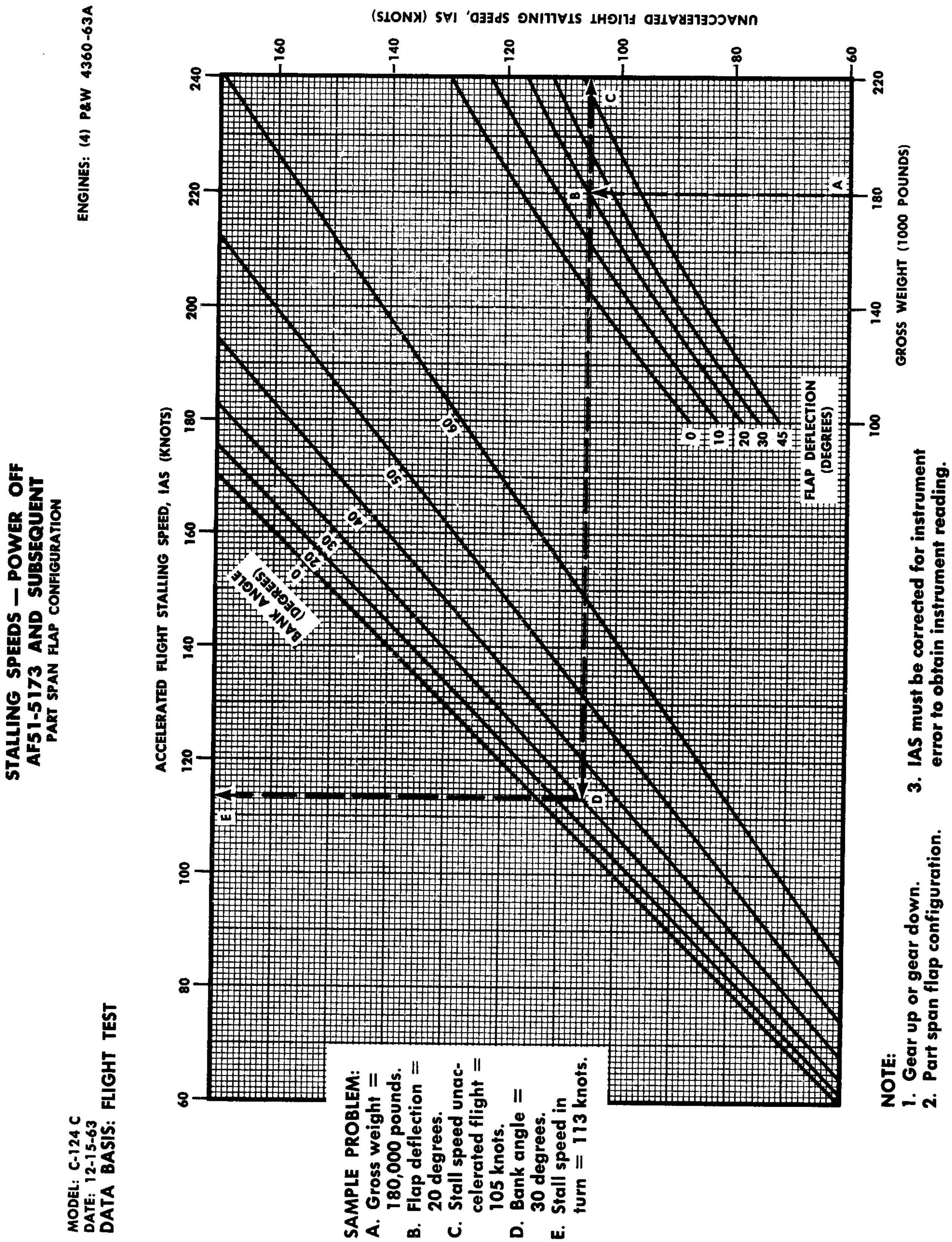

Figure A6-5. Stalling Speeds — Power Off (AF51-5173 and Subsequent)

ENGINES: (4) P&W 4360-63A
FUEL GRADE: 115/145 & 100/130

NOTE:

1. Threshold speed = 120 percent power-off stall speed.
2. Touchdown speed = 110 percent power-off stall speed.
3. Cowl flaps = 5 degrees.
4. Oil cooler doors full open.
5. Dry, hard runway surface.
6. 3 seconds time delay before brakes and reverse thrust are applied.
7. For aircraft AF49-243 through AF51-182 with 40 degrees flap setting, multiply distance by 0.94.

SAMPLE PROBLEM:

A. OAT = 10°C.
B. Pressure altitude = 5300 feet.
C. Density altitude = 6000 feet.
D. Gross weight = 180,000 pounds.
E. Zero wind ground roll = 2820 feet.
F. Headwind = 20 knots.
G. Landing ground roll = 2020 feet.
H. Total distance from 50 foot height to stop = 3225 feet.

LANDING DISTANCE
WING FLAPS = 45 DEGREES
BRAKES PLUS FOUR-ENGINE REVERSE THRUST

MODEL: C-124C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

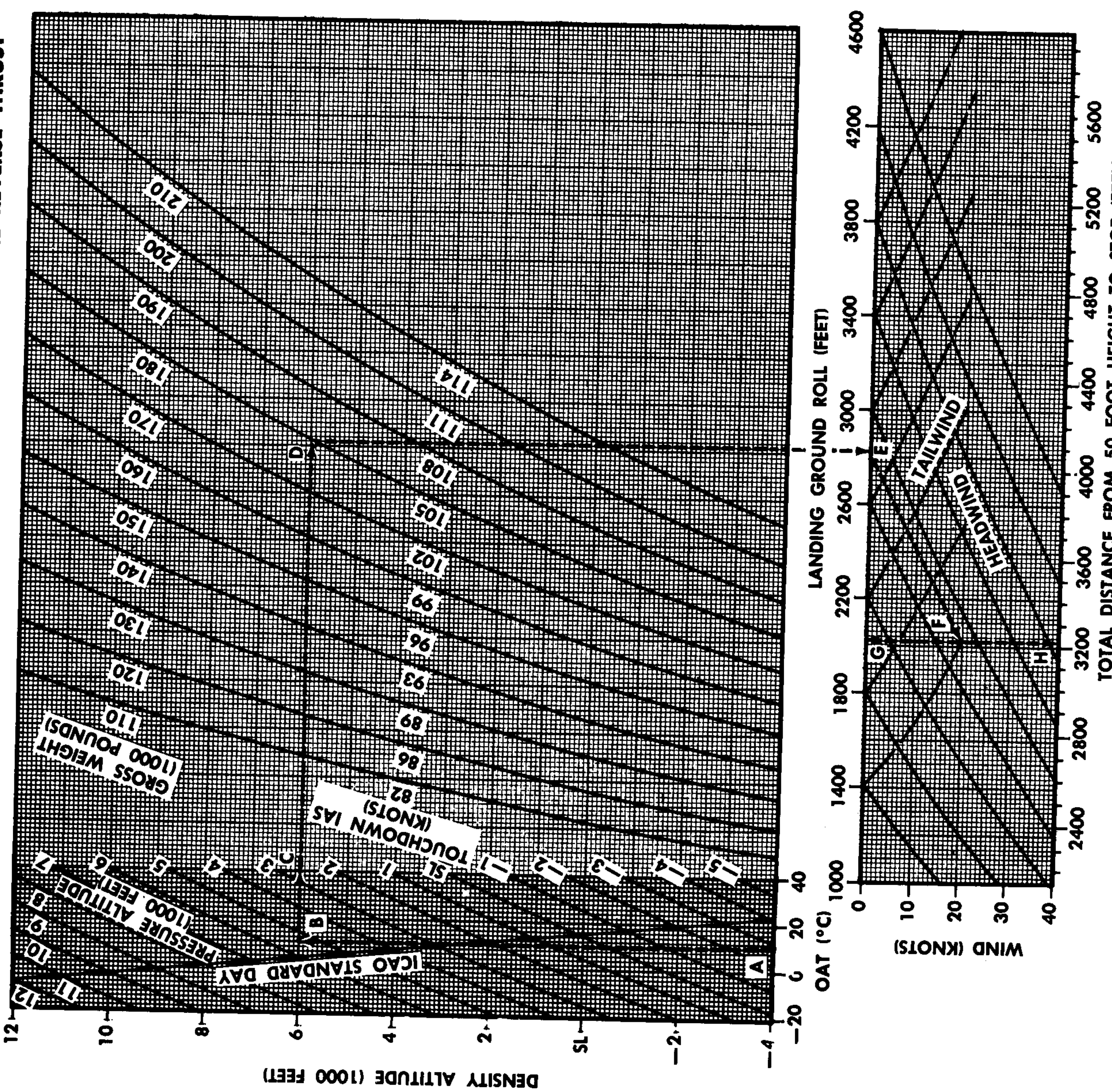

Figure A6-6. Landing Distance — Wing Flaps = 45 Degrees — Brakes Plus Four-Engine Reverse Thrust

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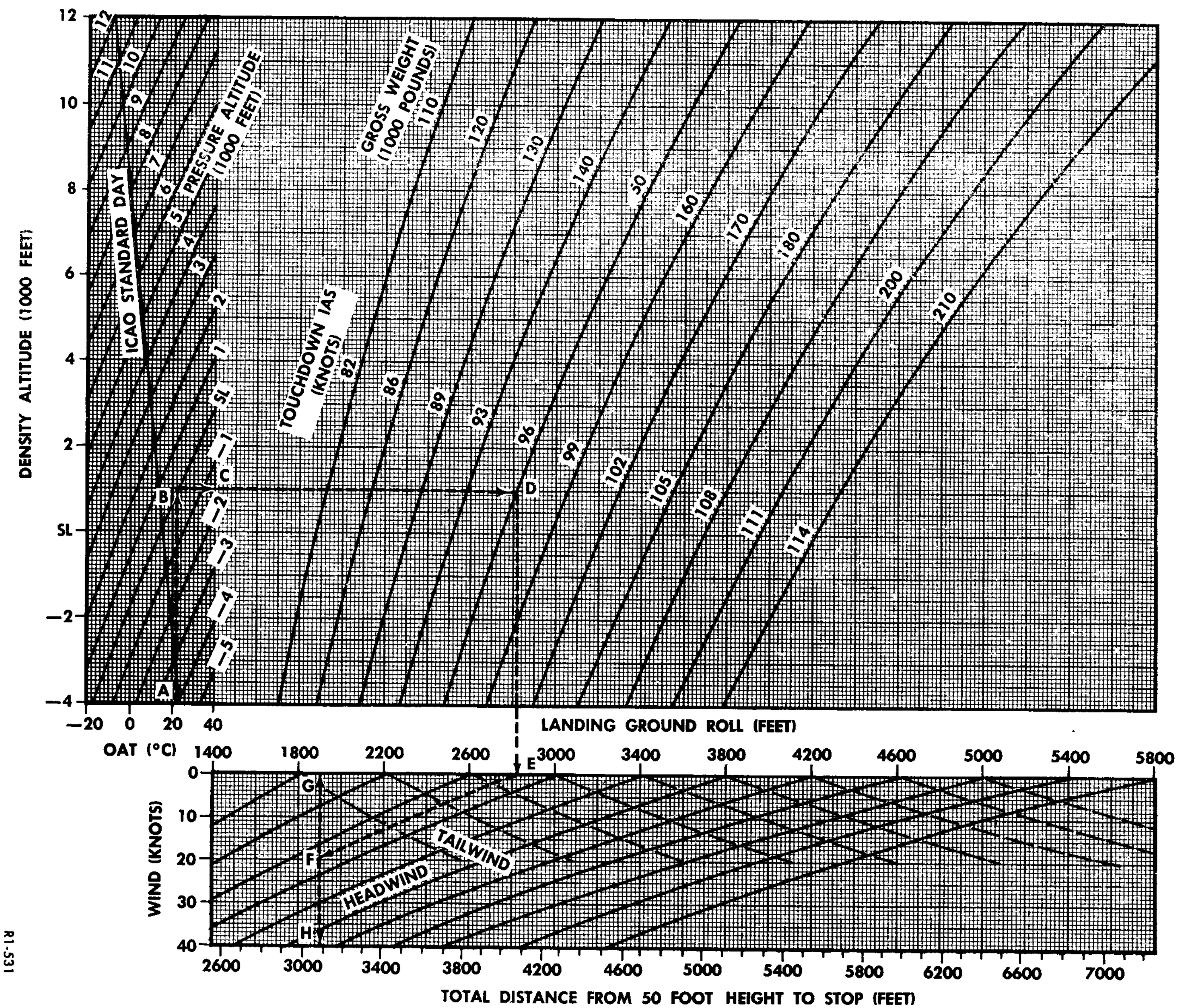
MODEL: C-124C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

LANDING DISTANCE
WING FLAPS = 45 DEGREES
BRAKES ONLY

ENGINES: (4) P&W 4360-63A
FUEL GRADE: 115/145 & 100/130



NOTE:
1. Threshold speed = 120 percent power-off stall speed.
2. Touchdown speed = 110 percent power-off stall speed.
3. Cowl flaps = 5 degrees.
4. Oil cooler doors full open.
5. Dry, hard runway surface.
6. 3 seconds time delay before brakes are applied.
7. For aircraft AF49-243 through AF51-182 with 40 degrees flap setting, multiply distance by 0.92.

SAMPLE PROBLEM:
A. OAT = 22°C.
B. Pressure altitude = 100 feet.
C. Density altitude = 1000 feet.
D. Gross weight = 150,000 pounds.
E. Zero wind ground roll = 2820 feet.
F. Headwind = 20 knots.
H. Landing ground roll = 1900 feet.
G. Total distance from 50 foot height to stop = 3080 feet.

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Figure A6-7. Landing Distance — Wing Flaps = 45 Degrees — Brakes Only

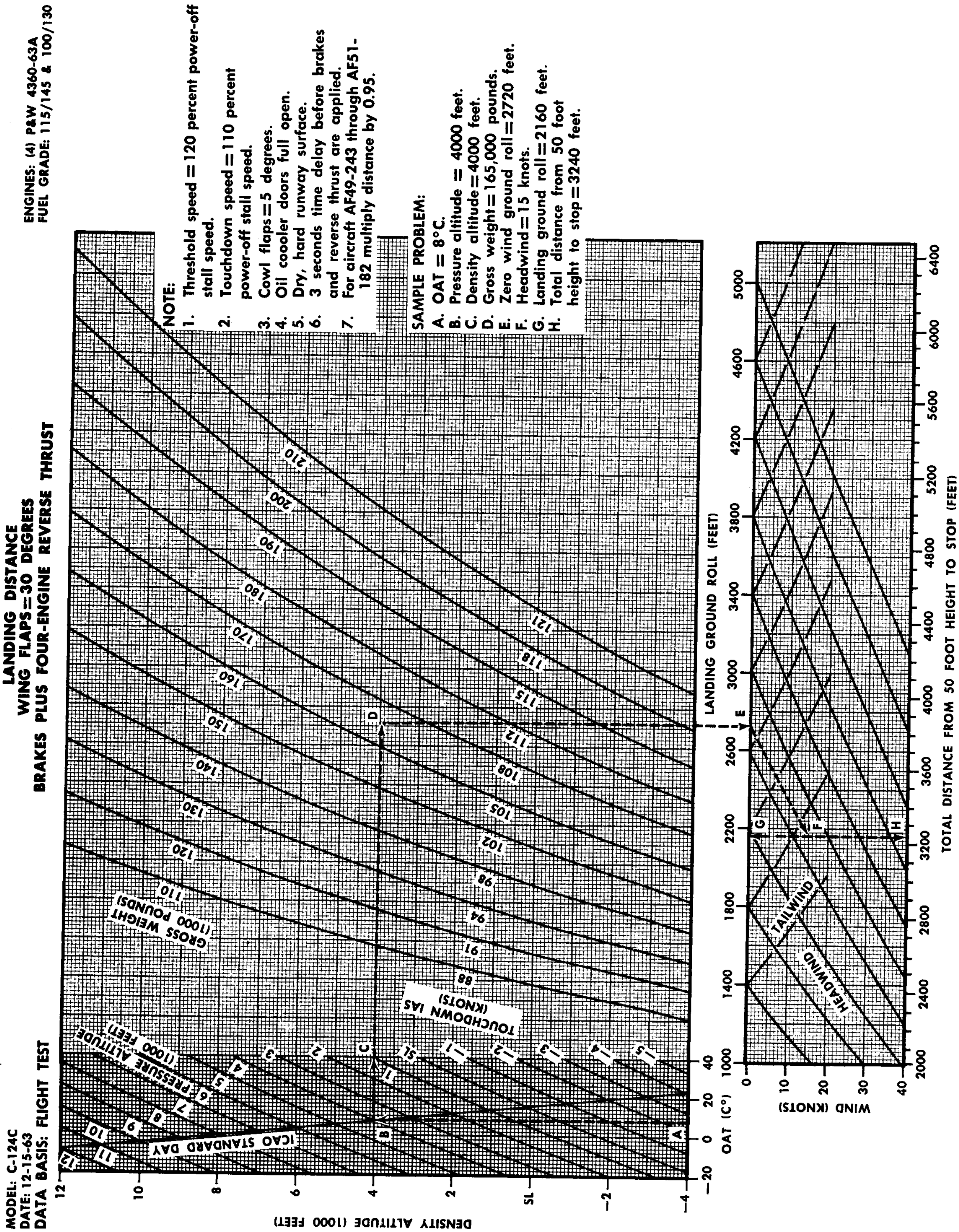

Figure A6-8. Landing Distance — Wing Flaps=30 Degrees — Brakes Plus Four-Engine Reverse Thrust

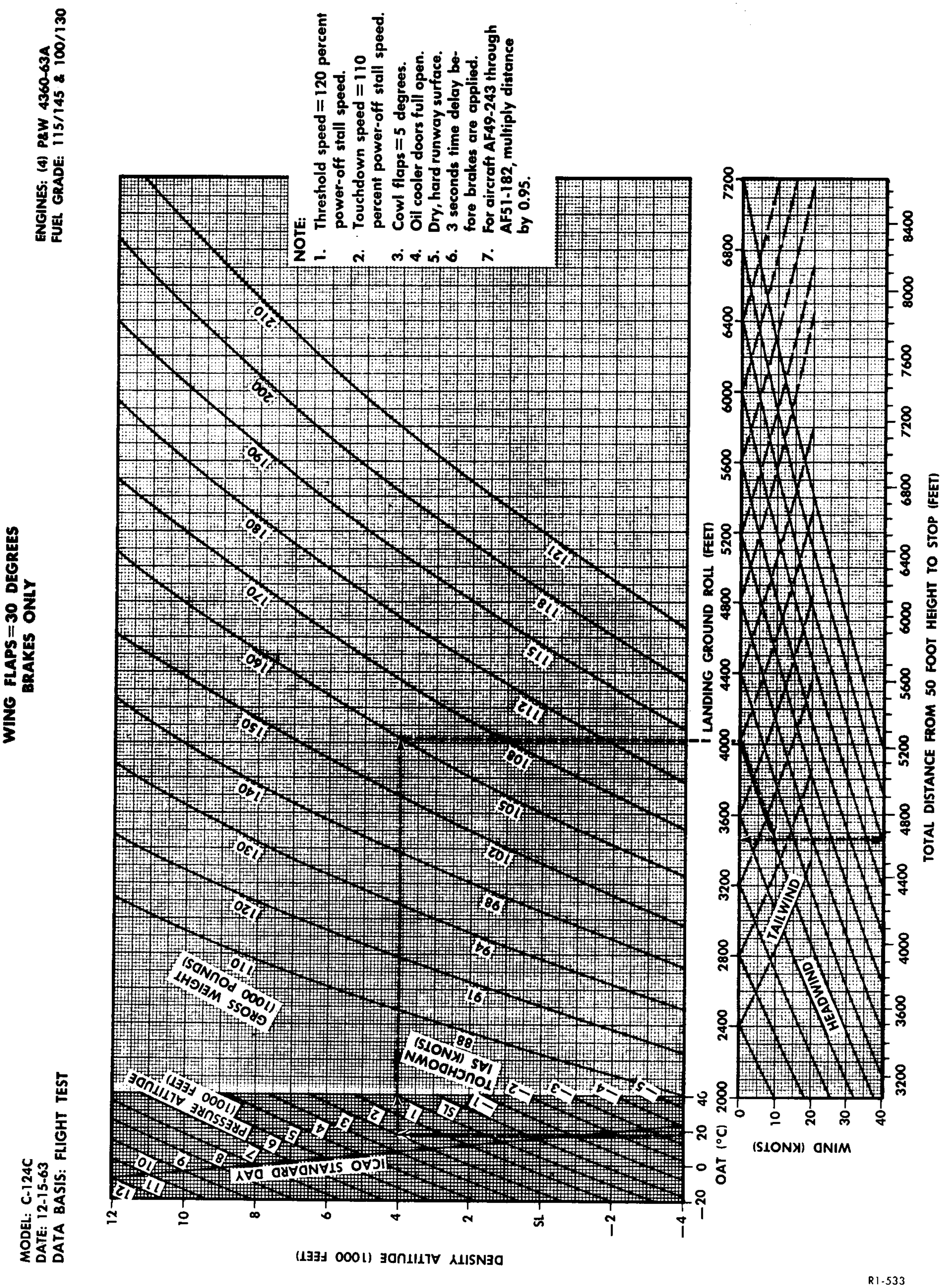

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Figure A6-9. Landing Distance — Wing Flaps =30 Degrees — Brakes Only

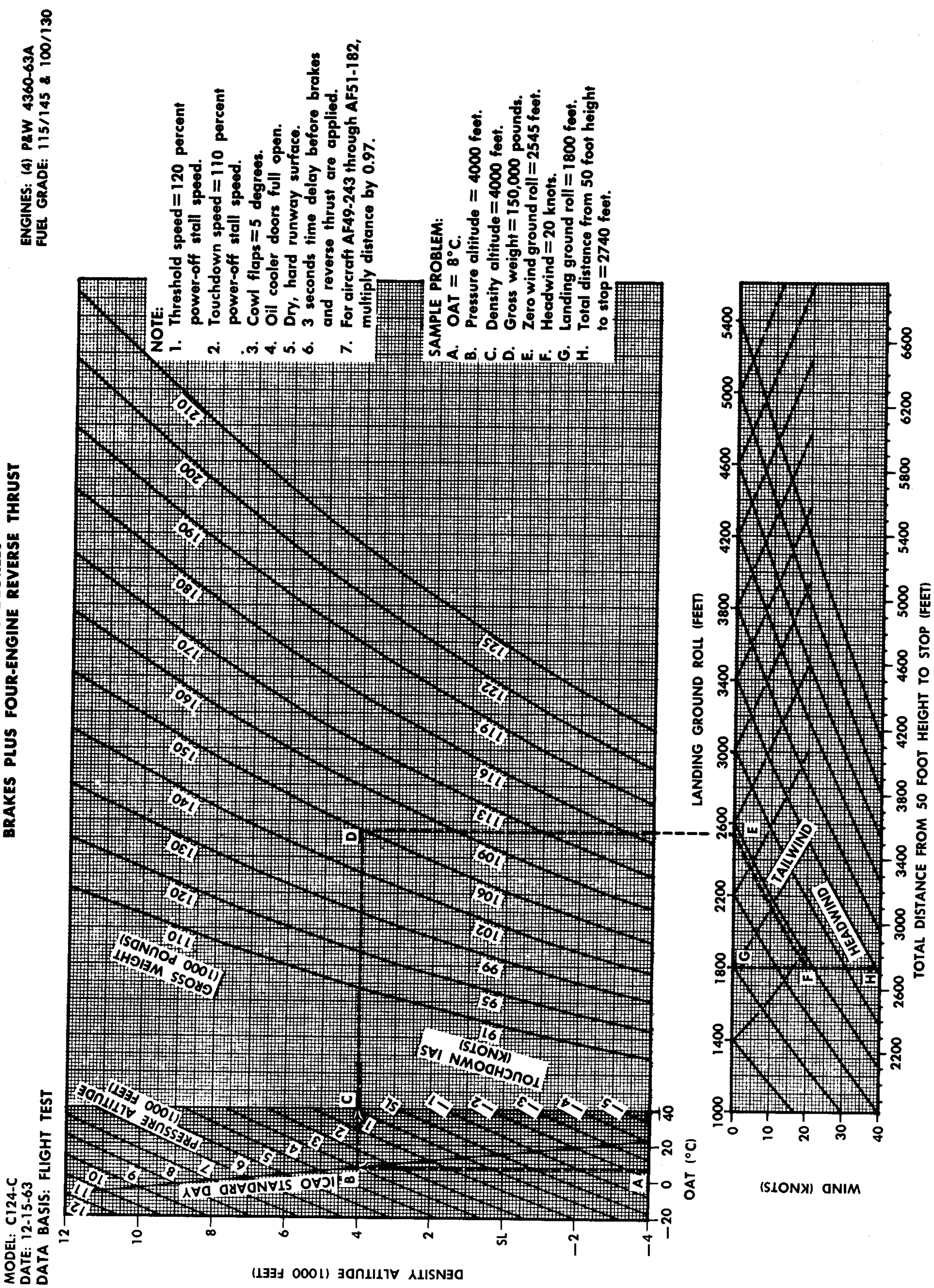

Figure A6-10. Landing Distance — Wing Flaps = 20 Degrees — Brakes Plus Four-Engine Reverse Thrust

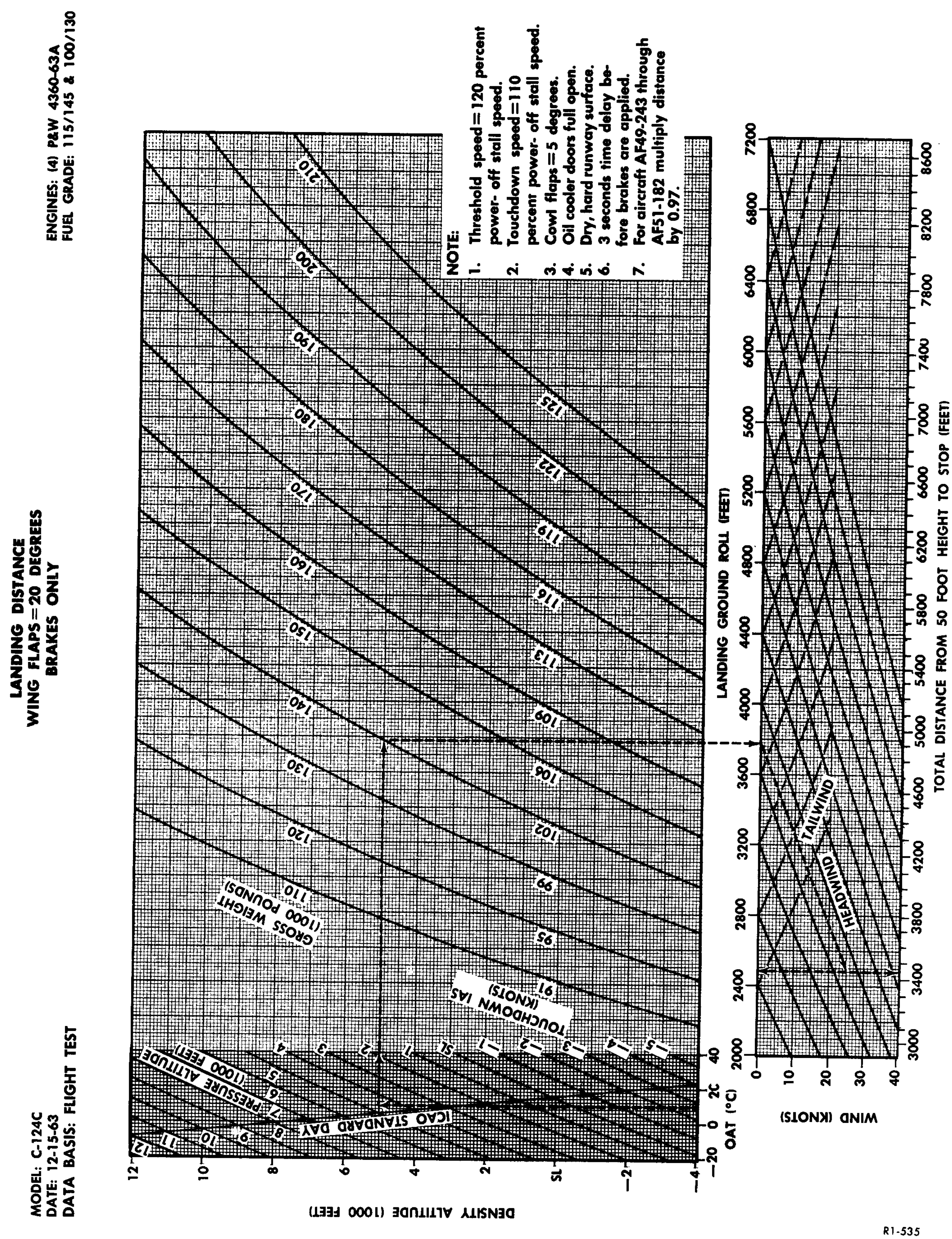

Figure A6-11. Landing Distance — Wing Flaps = 20 Degrees — Brakes Only

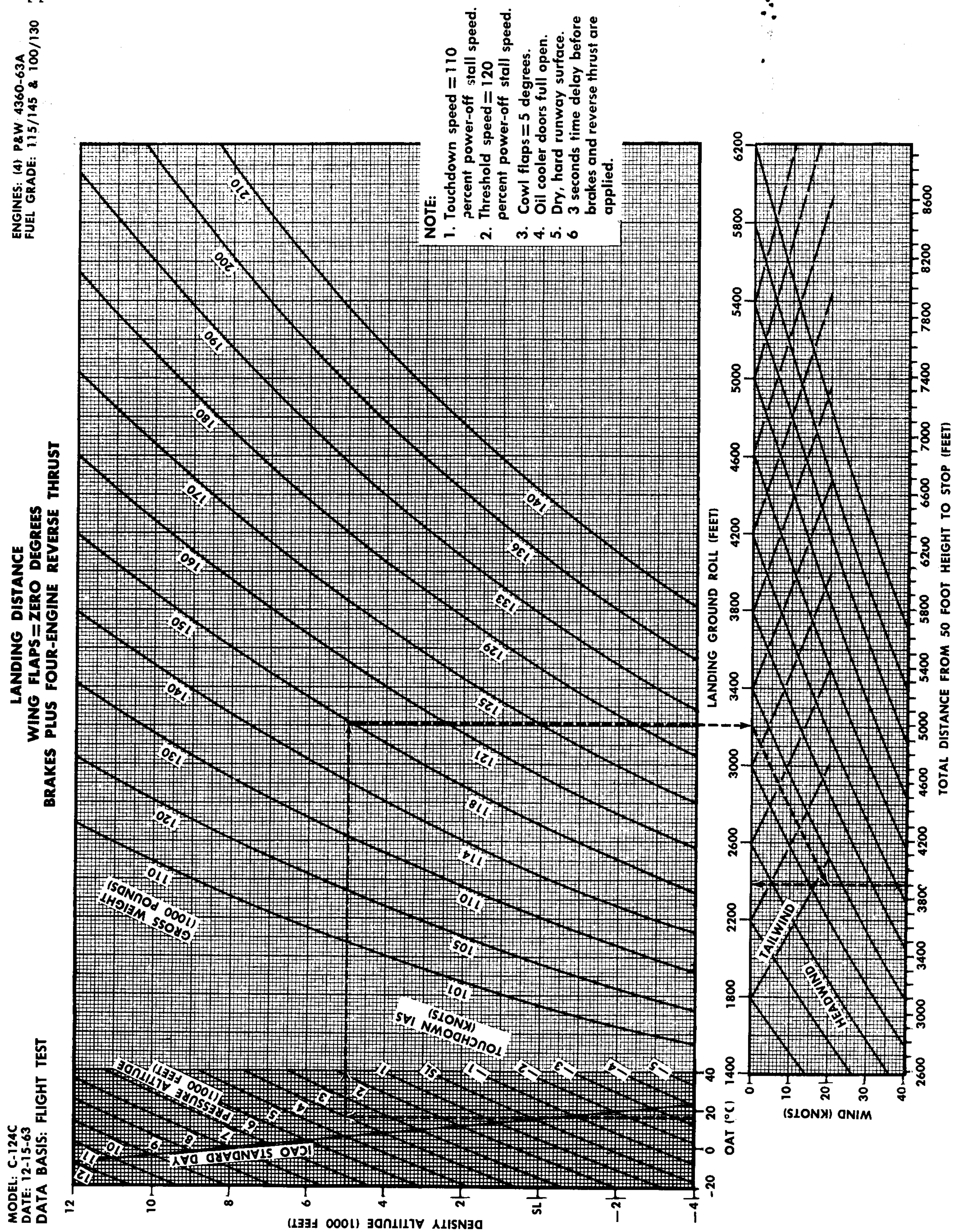

Figure A6-12. Landing Distance — Wing Flaps = Zero Degrees — Brakes Plus Four-Engine Reverse Thrust

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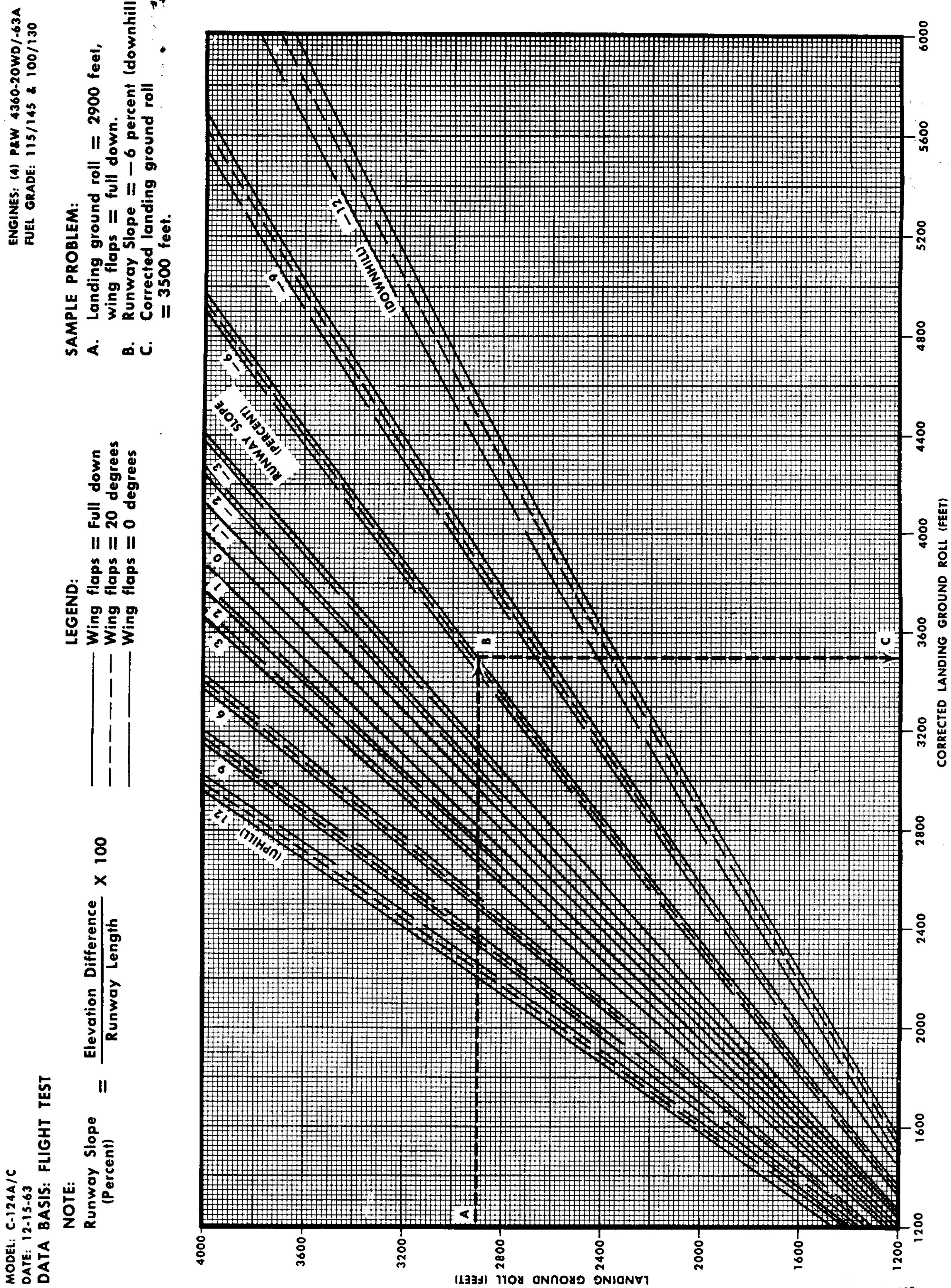

Figure A6-13. Effect of Runway Slope On Landing Ground Roll — Brakes Plus Four-Engine Reverse Thrust

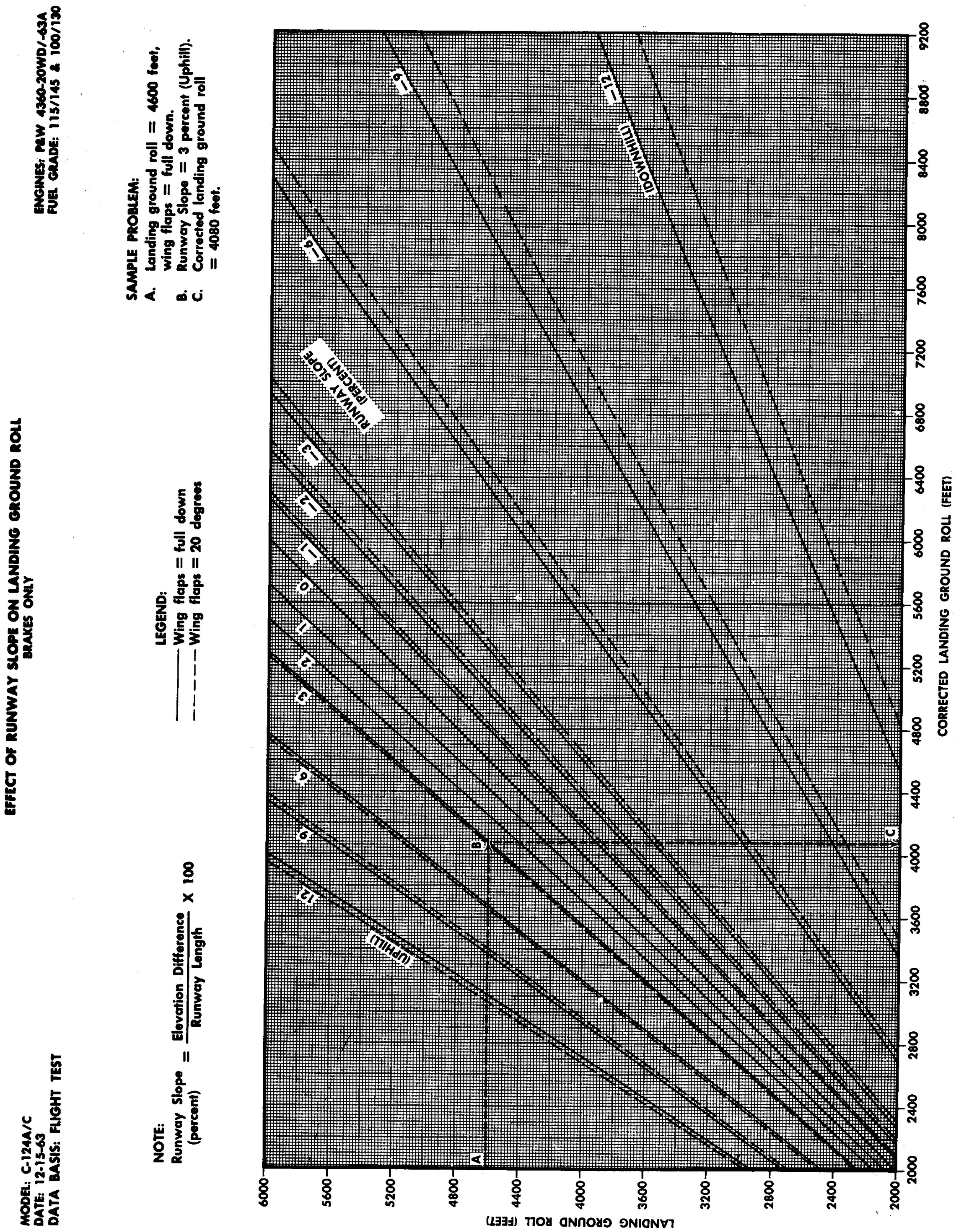

Figure A6-14. Effect of Runway Slope on Landing Ground — Brakes Only

EFFECT OF UNUSUAL RUNWAY CONDITIONS ON LANDING GROUND ROLL
BRAKES PLUS FOUR-ENGINE REVERSE THRUST

MODEL: C-124A/C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-20WD/-63A
FUEL GRADE: 115/145 & 100/130

LEGEND:
- ——— Wing flaps = Full down.
- — — Wing flaps = 20 degrees
- – – – Wing flaps = 0 degrees.

RUNWAY SURFACE CONDITION	RUNWAY CONDITION READING (RCR)
DRY CONCRETE OR MACADAM	23
DRY TURF	15
WET CONCRETE OR MACADAM	12
SNOW OR WET GRASS	08
ICE	06

SAMPLE PROBLEM:
A. Landing ground roll = 2800 feet.
B. Snow surface, wing flaps Full down.
C. Corrected landing ground roll = 4100 feet

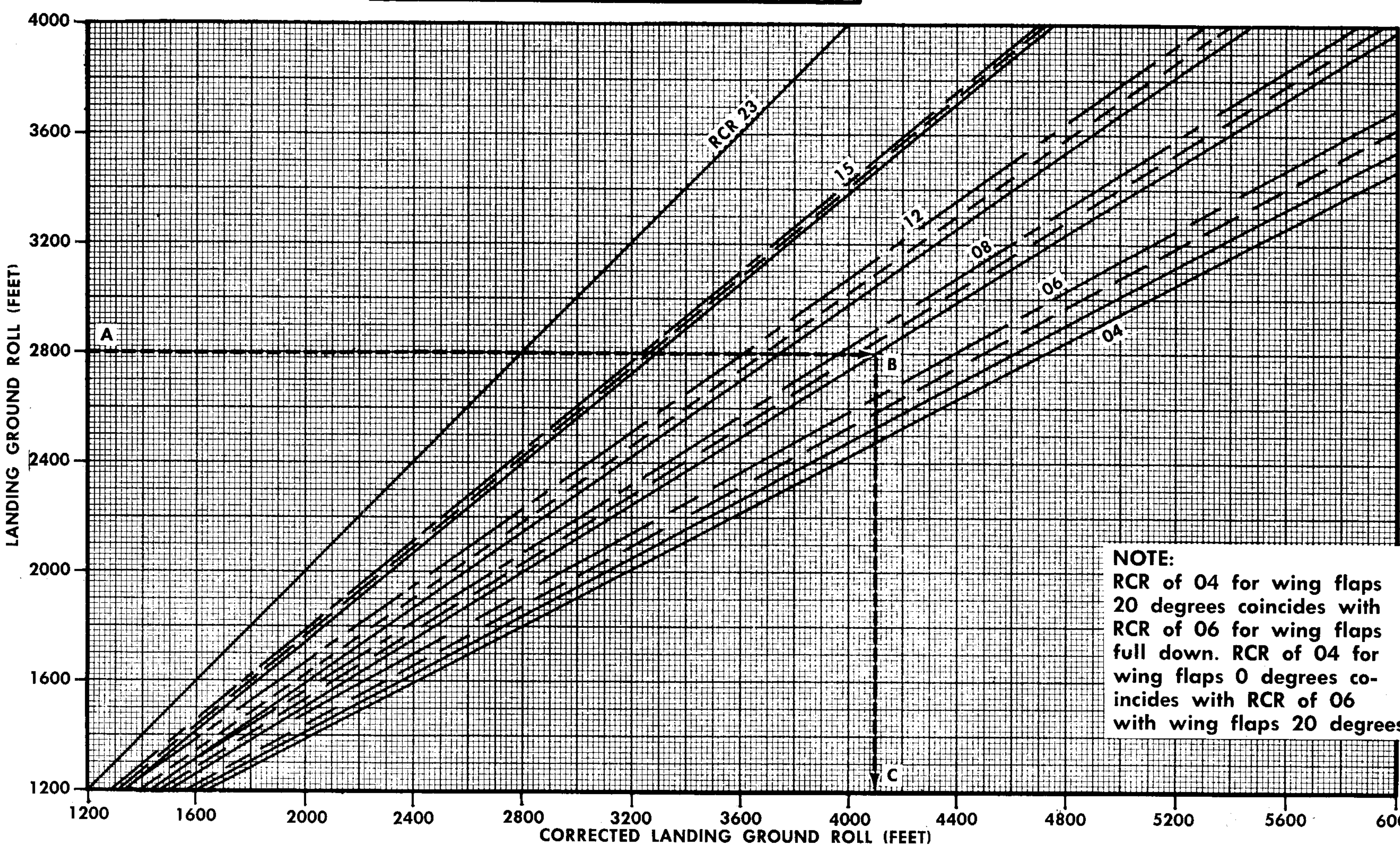

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Figure A6-15. Effect of Unusual Runway Conditions on Landing Ground Roll — Brakes Plus Four-Engine Reverse Thrust

MODEL: C-124A/C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

EFFECT OF UNUSUAL RUNWAY CONDITIONS ON LANDING GROUND ROLL

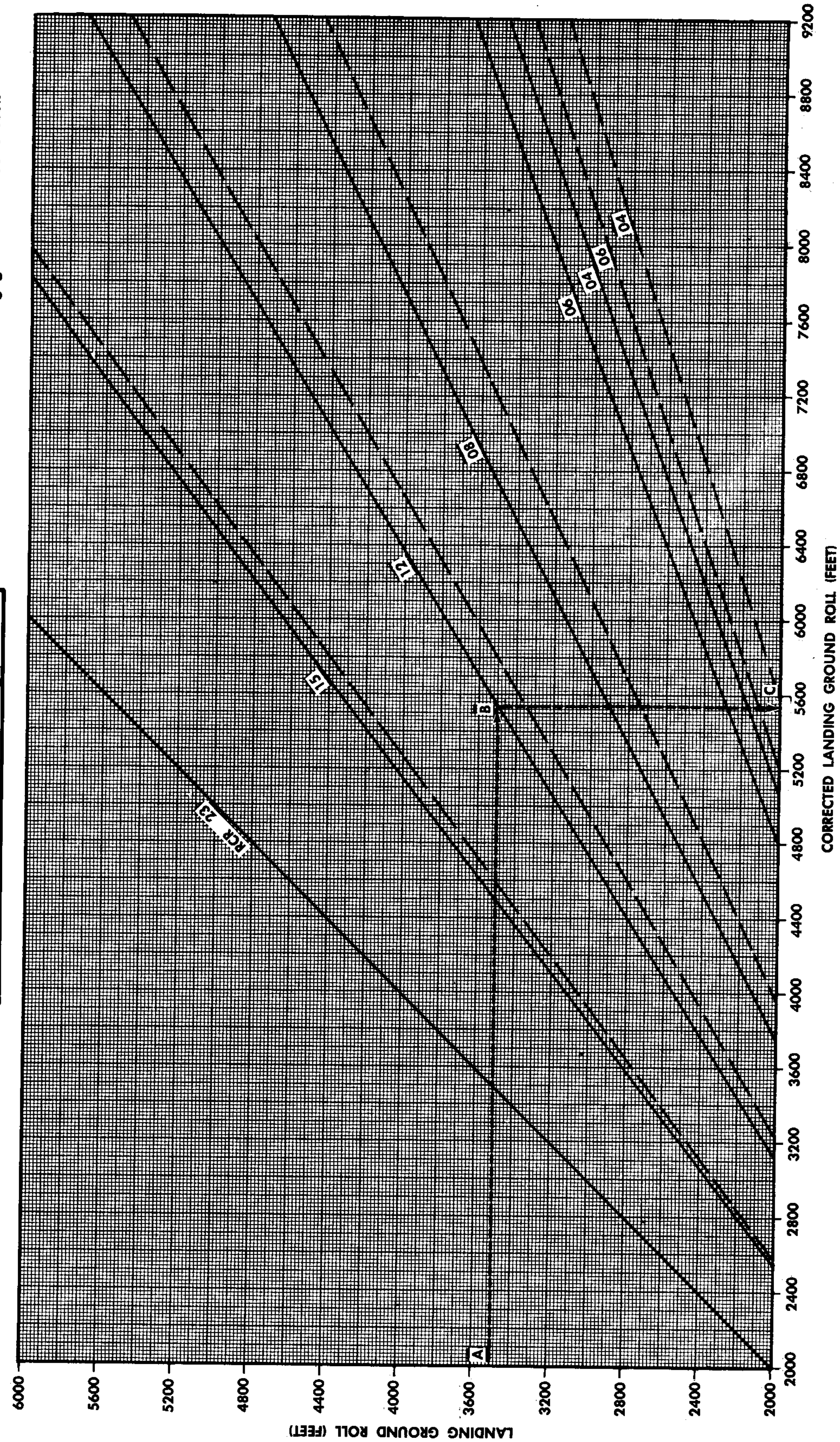
BRAKES ONLY

ENGINES: (4) P&W 4360-20WD/-63A
FUEL GRADE: 115/145 & 100/130

LEGEND:
1. ——— Wing flaps = Full down.
2. – – – – Wing flaps = 20 degrees.

RUNWAY SURFACE CONDITION	RUNWAY CONDITION READING (RCR)
DRY CONCRETE OR MACADAM	23
DRY TURF	15
WET CONCRETE OR MACADAM	12
SNOW OR WET GRASS	08
ICE	06

SAMPLE PROBLEM:
A. Landing ground roll = 3500 feet.
B. Wet, hard runway surface (RCR 12), flaps full down.
C. Corrected landing ground roll = 5540 feet.



R1-554

Figure A6-16. Effect of Unusual Runway Conditions on Landing Ground Roll — Brakes Only

LANDING GROUND ROLL

PERCENT OF GROUND ROLL DISTANCE WITH BRAKES ONLY VERSUS NUMBER OF ENGINES WITH FULL REVERSE THRUST

Number of Engines with Full Reverse Thrust	*Percent of Ground Roll Distance with Brakes Only
0	100
2	80
4	65

*Data based on conditions of symmetrical power. If three engines are operating, base the landing requirements on data for two engines symmetrical power condition and apply as much power on asymmetric operating engine as possible to reduce ground roll. If two engines are inoperative on same side or three engines are inoperative, obtain landing ground roll from brakes only data. Again apply as much power as possible on asymmetric operating engines to reduce ground roll.

NOTES:

1. Dry, hard runway surface
2. Touchdown speed = 110 percent of power off stalling speed
3. Cowl flaps = 5 degrees
4. Oil cooler doors full open
5. Applicable for wing flaps at 20 degrees, 30 degrees, or full down

Figure A6-17. Landing Ground Roll — Percent of Ground Roll Distance With Brakes Only Versus Number of Engines With Full Reverse Thrust

PART VII

MISSION PLANNING

TABLE OF CONTENTS

LIST OF CHARTS

DISCUSSION.

To obtain optimum use of the C-124C aircraft, mission planning prior to the flight and constant checking of the progress of the flight against a predicted flight plan are required. The following items are pertinent to mission planning and consideration should be given to each item by the pilot and engineer prior to each mission. Applicable data will be entered on the Takeoff and Landing data cards. Availability of this information, revised to reflect any changes in flight plans or conditions, at all times during the mission, will insure the safest and most economical operation of the aircraft under all operating conditions.

NORMAL TAKEOFF (BASED ON REJECT TORQUE PRESSURE).

1. Gross weight and center of gravity position.
2. Pressure altitude.
3. Outside air temperature (OAT).
4. Carburetor air temperature (CAT).
5. Dew point temperature.
6. Density altitude (figure A1-4).
7. ADI on or off, and fuel grade.
8. Region of low blower operation (figures A2-16 and A2-17).
9. Takeoff manifold pressure (figures A2-16 and A2-17).
10. Predicted torque pressure and brake horsepower available for takeoff under existing conditions (figures A2-16 and A2-17).
11. Reject torque pressure (figures A2-16 and A2-17).
12. Available runway length and condition.

13. Wing flap setting.
14. Wind velocity and component (figure A3-2).
15. Takeoff factor (figure A3-3).
16. Runway slope (figures A3-7 and A3-18).
17. Takeoff speed (figures A3-14 through A3-17 and A3-19).
18. Takeoff ground run, zero slope (figures A3-14 through A3-17).
19. Takeoff ground run corrected for runway slope (figure A3-18).
20. Takeoff acceleration (figure A3-21).

EMERGENCY TAKEOFF DATA.

1. Gross weight limited by climb performance (figures A3-4 through A3-6).
2. Gross weight limited by critical field length (figures A3-7 through A3-10).
3. Refusal speed (figures A3-11 through A3-13).
4. Refusal distance (figure A3-21).
5. Acceleration check distance.
6. Acceleration check speed (figure A3-21).
7. Distance to stop for aborted takeoff (figure A3-22).

CLIMBOUT AND CLIMB TO CRUISING ALTITUDE.

1. Climbout speed for normal climbout (figure A3-19 or A3-20).
2. Climbout speed for obstacle clearance (figure A3-19 or A3-20).
3. Wing flap retraction speed (figure A3-19 or A3-20).
4. Climbout factor (figures A3-23 and A3-24).
5. Gross weight limited by climbout over obstacle (figure A3-25).
6. Gross weight before climb.
7. Climb EAS (figures A4-1 through A4-10).
8. Cowl flap position for climb (figures A4-1 through A4-10).
9. Power schedule for climb (figures A4-1 through A4-10).
10. Time to climb (figures A4-1 through A4-10).
11. Distance to climb (figures A4-1 through A4-10).
12. Fuel to climb (figures A4-1 through A4-10).
13. Emergency and cruise ceiling (figure A4-11).
14. Emergency rate of climb (figures A4-12 through A4-26).
15. Recommended speed for best rate of climb (figure A4-27).
16. Recommended speed for best angle of climb (figure A4-27).

CRUISE.

1. Atmospheric conditions.
2. Initial cruise gross weight.
3. Aircraft operating weight.
4. Reserve fuel required.
5. Cruising altitude.

6. Cruise distance.
7. Initial brake horsepower required for cruise at recommended airspeeds (figures A5-2 through A5-14 or A5-21 through A5-23).
8. Carburetor air temperature.
9. Initial cruise RPM (figures A2-2 through A2-5).
10. Initial cruise manifold pressure (figures A2-6 through A2-9).
11. Initial cruise torque pressure (figure A2-10).
12. Nautical miles per pound of fuel at start of cruise (figures A5-2 through A5-14 or A5-21 through A5-23).
13. Initial recommended cruising speed (figures A5-2 through A5-14 or A5-21 through A5-23).
14. Gross weight at end of cruise (figures A5-15 through A5-20).
15. Cruising time (figures A5-15 through A5-20).
16. Total flight time.
17. Fuel burned for climb and cruise.
18. Reserve fuel (figures A5-15 through A5-20).
19. Total fuel required for mission.
20. Cargo carried.
21. Emergency two-engine cruise in ground effect, weight and speed (figures A5-24 and A5-25).

DESCENT.

1. Descent speed (speed at last cruising airspeed) (figures A5-2 through A5-14 or A5-21 through A5-23).
2. Descent fuel (see Fuel Flow charts discussion, Part 2 of Appendix).
3. Reduction in power required to obtain a given rate of descent (figure A6-1).
4. Time to descend.
5. Horizontal distance traveled during descent.

LANDING.

1. Available runway length, slope and RCR.
2. Pressure altitude of runway.
3. Outside air temperature.
4. Wind velocity (figure A3-2).
5. Wing flap setting.
6. Gross weight for landing.
7. Recommended approach speed (figure A6-2 or A6-3).
8. Recommended threshold speed (figure A6-2 or A6-3).
9. Power-off stalling speed (figure A6-4 or A6-5).
10. Landing distance, brakes only (figures A6-7, -9, -11, -14 and -16).
11. Landing distance, brakes plus four-engine reverse thrust (figures A6-6, -8, -10, -12, and -13 to -15).

GO-AROUND.

1. Compute the best IAS and rate of climb at the field conditions and gross weight for four-engine go-around (figures A4-12 through A4-16).

2. Compute the best IAS and rate of climb at the field conditions and gross weight for three-engine go-around (figures A4-17 through A4-21, and A4-27).

3. Compute the best IAS and rate of climb at the field conditions and gross weight for two-engine go-around (figure A4-26).

COMPUTING FLIGHT PLAN DATA.

The following sample mission has been computed in order to illustrate proper use of the appendix performance charts in preparing a flight plan.

Note

Partial span flap configuration, (AF51-5173 and subsequent) has been used for this sample mission.

NORMAL TAKEOFF (BASED ON REJECT TORQUE PRESSURE).

1. Gross weight = 185,000 pounds, center of gravity within limits (Refer to Section V, T.O. 1C-124A-1).
2. Pressure altitude = sea level.
3. Outside air temperature (OAT) = 20° C.
4. Carburetor air temperature (CAT) = OAT + 5° C = 25° C.
5. Dew point = 50° F.
6. Density altitude = 600 feet (figure A1-4).
7. ADI — on, fuel grade 115/145.
8. Region of low blower operation is part throttle (wet power, figure A2-16).
9. Takeoff manifold pressure = 62.85 inches Hg (figure A2-16). (Includes 0.35 inches Hg vapor pressure correction.)
10. Predicted torque pressure and brake horsepower available for takeoff under existing conditions = 244 psi and 3575 BHP (figure A2-16).
11. Reject torque pressure = 231.5 psi (figure A2-16).
12. Available runway length and condition = 6000 feet, dry, hard runway surface.
13. Wing flap setting = 20 degrees.
14. Headwind velocity = 20 knots (figure A3-2).
15. Takeoff factor = 1.9 (figure A3-3). (Based on reject torque pressure = 231.5 psi).
16. Runway slope = 1 percent downhill (figure A3-18).
17. Takeoff speed at 185,000 pounds = 112 knots IAS (figure A3-14).
18. Takeoff ground run, zero slope (figure A3-14).
    a. Zero wind = 4000 feet.
    b. 20-knot headwind = 2800 feet.
19. Takeoff ground run corrected for a one-percent downhill slope (10-foot decline per 1000 feet of runway) (figure A3-18).
    a. Zero wind = 3800 feet.
    b. 20-knot headwind = 2700 feet.
20. Takeoff acceleration (figure A3-21).
    a. Zero wind.
        (1) Velocity at 1000 feet = 66 knots.
        (2) Velocity at 3000 feet = 103 knots.

b. 20-knot headwind.

(1) Velocity at 1000 feet = 82 knots.

(2) Velocity at 2000 feet = 102 knots.

EMERGENCY TAKEOFF DATA.

1. Gross weight limited by climb performance (figure A3-4).

   a. For 100 FPM rate of climb = 195,500 pounds.

   b. For 50 FPM rate of climb = 200,500 pounds.

2. Gross weight limited by critical field length (figures A3-7 and A3-8).

   a. Corrected actual field length = 6480 feet.

   b. Zero wind = 200,000 pounds.

   c. 20-knot headwind = greater than 210,000 pounds.

Therefore, takeoff weight of 185,000 pounds is safe and critical field length is less than runway length.

Note

If the gross weight limited by critical field length is less than predicted takeoff gross weight, then cargo and/or fuel should be off-loaded until gross weight equals the gross weight limited by critical field length. For this condition see Gross Weight Limited by Critical Field Length charts discussion, (Part 3 of Appendix) for procedure.

3. Refusal speed (for a 6000-foot runway) (figure A3-11).

   a. Zero wind = 101 knots.

   b. 20-knot headwind = 116 knots (use takeoff speed of 112 knots).

4. Refusal distance (figure A3-21).

   a. Zero wind = 2800 feet.

   b. 20-knot headwind = 3050 feet (use takeoff distance of 2700 feet).

5. Desired acceleration check distance.

   a. Zero wind = 2000 feet.

   b. 20-knot headwind = 2000 feet.

6. Acceleration check (figure A3-21).

   a. Zero wind = 89 knots.

   b. 20-knot headwind = 102 knots.

7. Distance to stop for aborted takeoff (figure A3-22). For the condition where abort speed = refusal speed.

   a. Zero wind = 2650 feet (at 101 knots).

   b. 20-knot headwind = 2450 feet (at 112 knots).

8. Effects of unusual runway conditions on stopping distance (figure A3-22). Assume that concrete runway is wet, RCR = 12. For the zero wind case, the stopping distance = 4150 feet.

This exceeds the dry runway stopping distance from refusal speed by 1500 feet. Therefore, the refusal speed for the wet runway must be reduced such that the distance to accelerate to abort speed plus the distance to stop equals the runway available. The following sample problem is given to illustrate the solution of this problem.

a. Assume some lower speed, i.e., 90 knots.

b. Distance to accelerate to 90 knots = 2050 feet (figure A3-21). (Use acceleration curve previously determined.)

c. Distance to stop from 90 knots = 3450 feet (figure A3-22).

d. Total distance to accelerate and stop = (b) + (c) = 5450 feet. (This is less than the 6000 foot runway.)

e. Assume higher speed, i.e., 95 knots.

f. Repeat steps (b) through (d) as necessary until a speed is found which will allow the aircraft to stop in the remaining wet runway.

g. 93 knots will give a ground run of 2300 feet and a stopping distance of 3700 feet or a total of 6000 feet.

CLIMBOUT AND CLIMB TO CRUISING ALTITUDE.

1. Climbout speed for normal climbout (110 percent power-off V_S) = 118 knots (figure A3-20).

2. Climbout speed for obstacle clearance (105 percent power-off V_S = takeoff speed) = 112 knots (figure A3-20).

3. Wing flap retraction speed = 131 knots (figure A3-20).

4. Climbout factor for 75-foot obstacle at 8800 feet (figure A3-23).

   a. Zero wind = 19.9.

   b. 10-knot tailwind = 19.3.

5. Gross weight limited by climbout over obstacle (figure A3-25).

   a. Zero wind = 187,000 pounds.

   b. 10-knot tailwind = 181,000 pounds.

If no other climbout path were available, takeoff gross weight would have to be reduced in order to provide obstacle clearance if engine failure occurred at or near critical engine failure speed for the tailwind case.

6. Gross weight before climb = gross weight before takeoff (185,000 pounds) less 1270 pounds of fuel for warmup, taxi, takeoff and climbout = 183,730 pounds.

7. Climbing EAS for Standard Day atmospheric conditions, 2350 RPM, and normal mixture = 151 knots (figure A4-3).

8. Cowl flap position for climb = 1.4 degrees (figure A4-3).

9. Power schedule for climb (figure A4-3). Constant 45 inches Hg manifold pressure, part throttle low blower to full throttle, then full throttle low blower to 10,000 feet.

10. Time to climb to a cruising altitude of 10,000 feet = 20.5 minutes (0.34 hours) (assume start of climb at sea level) (figure A4-3).

11. Distance to climb to 10,000 feet = 56 miles (Assume start of climb at sea level.) (figure A4-3).

12. Fuel to climb to 10,000 feet = 2230 pounds (Assume start of climb at sea level.) (figure A4-3).

13. Emergency and cruise ceilings at METO power (figure A4-11). (Assume gross weight = 150,000 pounds.)

    a. Four-engine emergency ceiling (100 FPM) = 24,300 feet.

    b. Three-engine cruise ceiling (300 FPM) = 9800 feet.

14. Emergency rate of climb, takeoff gross weight = 185,000 pounds, sea level pressure altitude (density altitude = 600 feet), dew point 50°F, CAT = 25°C, 205.5 psi dry takeoff power — reject

torque pressure (figure A2-17), configuration "a" — gear and flaps up. (Interpolate between charts and use peaks of speed curves for "best" climb speed.)

a. Four-engine — 145 knots; 735 FPM (figures A4-15 and A4-16).

b. Three-engine — 136 knots; 285 FPM (figures A4-20 and A4-21).

c. Two-engine — at weights above 180,000 pounds R/C will be negative (figure A4-25). (No chart available for interpolation.)

15. Recommended speed for best rate of climb with maximum power at sea level on a standard day, flaps 20 degrees, gear down for both three and four-engine operation at a takeoff gross weight of 185,000 pounds = 115 knots (figure A4-27).

16. Recommended speed for best angle of climb with the same conditions stated in Item 15 above = 112 knots (figure A4-27).

CRUISE.

1. Atmospheric conditions at cruise altitude of 10,000 feet ICAO Standard Day.

2. Initial cruise gross weight = takeoff gross weight less fuel for takeoff and climb = (185,000 - 1270 - 2230) 181,500 pounds.

3. Aircraft operating weight 110,000 pounds (gross weight less fuel and cargo).

4. Reserve fuel required (at long range speeds) = 2 hours holding at destination.

5. Cruise distance to destination = 2080 nautical miles.

6. Initial brake horsepower required for cruise at recommended air speeds = 1850 BHP per engine (figure A5-5, or A5-21).

7. Carburetor air temperature = 0°C (OAT + 5°C = -5°C + 5°C).

8. Initial cruise RPM = 2240 (figure A2-3).

9. Initial cruise manifold pressure = 35.5 inches Hg (figure A2-7).

10. Initial torque pressure and BMEP (figure A2-10).

a. Torque pressure = 157 psi.

b. BMEP = 150 psi.

11. Nautical miles per pound of fuel at start of cruise = 0.0559 (figure A5-5 or A5-21).

12. Initial recommended cruising speed = 169 knots EAS (figure A5-5 or A5-21).

13. Gross weight at end of cruise = 149,000 pounds (figure A5-15).

14. Cruising time = 10.5 hours (figure A5-16).

15. Total flight time = 10.5 hours + 0.34 hours (climb time) = 10.84 hours.

16. Fuel burned for takeoff, climb, and cruise = 185,000 – 149,000 = 36,000 pounds.

17. Reserve fuel (assumed as 2 hours holding at destination at long range speeds): If cruising time is extended 2 hours or 10.5 + 2.0 = 12.5 hours, the landing gross weight will be 144,000 pounds. Reserve fuel = 149,000 - 144,000 = 5,000 pounds (figure A5-16).

18. Total fuel required for mission = 36,000 + 5,000 = 41,000 pounds.

19. Cargo carried = landing gross weight less operating weight = 144,000 - 110,000 = 34,000 pounds of cargo.

20. Emergency two engine in ground effect cruise weight and speed (sample conditions are used to simplify solution). On standard day with METO power available maintain 50 foot altitude.

    a. Maximum gross weight for level flight = 173,500 pounds (figure A5-24).

    b. Required speed to maintain 50 feet with METO power and 173,500 pounds = 137 knots (figure A5-25).

Note

These charts may be used to determine either the maximum gross weight to maintain a given height or the maximum height which can be maintained at a given gross weight.

DESCENT.

1. Descent speed at end of cruise airspeed and gross weight of 144,000 pounds = 161 knots (figure A5-5 or A5-21).
2. Descent Fuel (See Fuel Flow charts discussion, Part 2 of Appendix).
3. Reduction in power required to obtain a given rate of descent at conditions stated in Item 1 above (Figure A6-1). Assume 500 FPM rate of descent desired. Reduction of power required = 660 BHP/eng.
4. Maintaining constant rate of descent = 500 FPM, time to descend = 10,000 feet divided by 500 FPM = 20 minutes or 0.33 hours.
5. Horizontal distance traveled during descent = approximately 174 knots (average TAS) x 0.33 hours, or 57 nautical miles.

LANDING.

1. Available runway length and condition = 7000 feet, wet macadam surface.
2. Pressure altitude of runway = sea level.
3. Outside air temperature = 15°C.
4. Runway slope = 3 percent (uphill).
5. Headwind velocity (figure A3-2). Assume:

    a. Landing runway is 024.

    b. Wind = 20 knots from 065 magnetic.

    Resultant 41 degree crosswind of 20 knots. Headwind component = 15 knots. Crosswind component = 13 knots.
6. Wing flap setting = 45 degrees full down.
7. Gross weight at landing (equivalent to gross weight at end of descent or cruise by definition) = 144,000 pounds.
8. Recommended approach speed = 112 knots (figure A6-3).
9. Recommended threshold speed = 104 knots (figure A6-3).
10. Power-off stalling speeds (figure A6-5).

    a. Wing flaps — 20 degrees.

        (1) Bank angle = zero degrees, stalling speed = 94 knots.

        (2) Bank angle = 30 degrees, stalling speed = 101 knots.

    b. Wing flaps — 45 degrees.

        (1) Bank angle = zero degrees, stalling speed = 86 knots.

        (2) Bank angle = 30 degrees, stalling speed = 93 knots.

11. Landing distance with brakes only (figure A6-7, A6-14 and A6-16) (touchdown speed = 94 knots).

		Zero Wind	15-Knot Headwind
a.	Ground roll — dry runway — zero slope.	2600 feet	1950 feet
b.	Ground roll — Dry runway corrected for slope.	2330 feet	Chart not extended in this low region.
c.	Total distance from 50-foot height to stop — dry runway, zero slope.	3830 feet	3130 feet
d.	Total distance from 50-foot height to stop — dry runway corrected for slope = b + (c - a).	3560 feet	Chart not extended in this low region.
e.	Ground roll — wet runway (RCR = 12), zero slope.	4100 feet	Chart not extended in this low region.
f.	Ground roll — wet runway, corrected for slope.	3650 feet	Chart not extended in this low region.
g.	Total distance from 50-foot height to stop — wet runway, zero slope = e + (c - a).	5330 feet	Chart not extended in this low region.
h.	Total distance from 50-foot height to stop — wet runway corrected for slope = f + (c - a).	4880 feet	Chart not extended in this low region.

12. Landing distance with brakes plus four-engine reverse thrust (figures A6-6, A6-13 and A6-15) (touchdown speed = 94 knots) =

		Zero Wind	15-Knot Headwind
a.	Ground roll — dry runway, zero slope	1720 feet	1280 feet
b.	Total distance from 50-foot height to stop — dry runway, zero slope	2900 feet	2440 feet

c. For wet runway and slope correction procedure refer to Item 11 above.

GO-AROUND.

1. Compute the best IAS and rate of climb at the field conditions and gross weight for four-engine go-around (figures A4-13 and A4-14) using 144,000 pounds landing weight and interpolating between the charts. Maximum dry power torque pressure available using sea level standard day, dew point = 50° F, and CAT = 20°C is 218.5 psi (figure A2-17).

   a. Configuration "f," wing flaps 45 degrees — gear down; IAS for best rate of climb = 95.5 knots, rate of climb = 340 FPM.

b. Configuration "b," wing flaps 20 degrees —gear up, IAS for best rate of climb = 124 knots, rate of climb = 1150 FPM.

2. Compute the best IAS and rate of climb for three-engine go-around at the same conditions as for four-engine go-around (figures A4-18 and A4-19 or A4-27).

Note

IAS for best climb may be obtained from figure A4-27. To insure that positive rate of climb is available, see figures A4-18 and A4-19.

a. Configuration "b," wing flaps 20 degrees — gear up; IAS = 117 knots, rate of climb = 580 FPM.

b. Configuration "a," wing flaps zero degrees — gear up; IAS = 128 knots, rate of climb = 790 FPM.

3. Compute the best IAS and rate of climb for two-engine go-around (figure A4-26).

a. Wing flaps zero degrees — gear up; IAS = 121 knots, rate of climb = 190 FPM.

4. Compute minimum flap retraction speed for 144,000 pounds (figure A3-20). Flap retraction speed = 115 knots.

RUNWAY LOAD BEARING CHART.

The Runway Load Bearing chart (figure A7-2) is included to determine the load bearing capabilities for various combinations of gross weight and CG position. Values are given for tire contact pressure, equivalent single wheel load, load classification number, unit construction index, and California bearing ratio. The values determined from the chart may be used to compare with the load bearing capabilities listed in the applicable ENROUTE-SUPPLEMENT (flip chart) as a guide to determine maximum takeoff and landing gross weight when runway strength is a critical factor.

The load bearing capabilities shown on the chart provide an adequate safety factor for unlimited use. When necessary, a 25 percent overload factor can be used for occasional landings without damage to the runways. The data shown is based on tires inflated to 35 percent tire deflection in accordance with existing maintenance procedures.

Contact pressure is given in psi, and is the load per square inch that the tires exert on runway. The Equivalent Single Wheel Load (ESWL) adjusts the load on each single wheel for the mutual action of two or more single wheels which are in close proximity. Unit Construction Index (UCI), Load Classification Number (LCN), and California Bearing Ratio (CBR), are indexes which are used to indicate the strength of runways in various parts of the world. UCI and/or LCN are generally applied to concrete and flexible surface (macadam) runways, and CBR is generally applied to sod and unsurfaced runways.

The following example illustrates the method of obtaining runway load bearing information from the chart:

Given: Gross Weight = 128,200 pounds.

CG Position = 27 percent MAC.

Find: Contact pressure, ESWL, LCN, UCI, and CBR.

Enter the chart with the gross weight of 128,200 pounds (A) and read across to the CG position of 27 percent MAC (B). Read down to the contact pressure line (C) and to the left to find contact pressure of 46 psi (D). For equivalent single wheel load, read down to the correction curve at (E) and to the left to find the load of 37,000 pounds (F). Load classification number, unit construction index, and California bearing ratio are found in the same way, by reading down to the appropriate correction curve and to the left; LCN curve (G), LCN = 25(H); UCI curve (I), UCI = 24 (J); CBR curve (K), CBR = 4 (L).

TAKEOFF DATA

DATE 12-15-63 AIRCRAFT NR 51-5194

ACCELERATION	2000 FT	— SEC	102 IAS
REFUSAL	2700 FT	—	112 IAS
TAKEOFF	2700 FT	—	112 IAS

CLIMBOUT	112 IAS (OBSTACLE)	118 IAS (NORMAL)
MINIMUM FLAP RETRACTION		131 IAS
CLIMBING SPEED		151 IAS

CONDITIONS

Hp S.L. 20°C (Oat °C) 50° F (Dewpoint) Hd 600 FT

REJECT TPSI	231.5 PSI (WET)	— (DRY)
TAKEOFF FACTOR	1.9 (WET)	— (DRY)

6000 FT 180 (Runway length — Heading) -1 (Slope) 23/210° 20H (Wind) (Component)

CLIMBOUT FACTOR 19.9

GROSS WEIGHT

185,000 LBS (Actual)

195,000 LBS (Limited by 3-Engine Climb)

210,000 LBS + (Limited by Critical Field Length)

187,000 LBS (Limited by Obstacle)

LANDING DATA

RECOMMENDED APPROACH SPEEDS
GEAR DOWN

FLAPS	1.3VS	1.2VS	1.1VS
20°	122	113	103
30°	118	109	100
FULL	112	104	95

LANDING GROUND ROLL*

	FLAPS	TOT. DIST. H50	GROUND ROLL
BRAKES ONLY	45°	4880 FT	3650 FT
BRAKES 2 ENG REV	45°	4150 FT	2920 FT

EMERGENCY 3-ENGINE GO AROUND

EMERGENCY CLIMB SPEED

GEAR UP, FLAP 20°	117 IAS
GEAR UP, FLAP 0°	128 IAS
MINIMUM FLAP RETRACTION	115 IAS

EMERGENCY 2-ENGINE GO AROUND

GEAR UP FLAPS UP 190 FPM 121 IAS

*As Applicable

R1-628

Figure A7-1. C-124C Takeoff and Landing Data Cards

RUNWAY LOAD BEARING CHART

MODEL: C-124A/C
DATE: 12-15-63
DATA BASIS: ESTIMATED

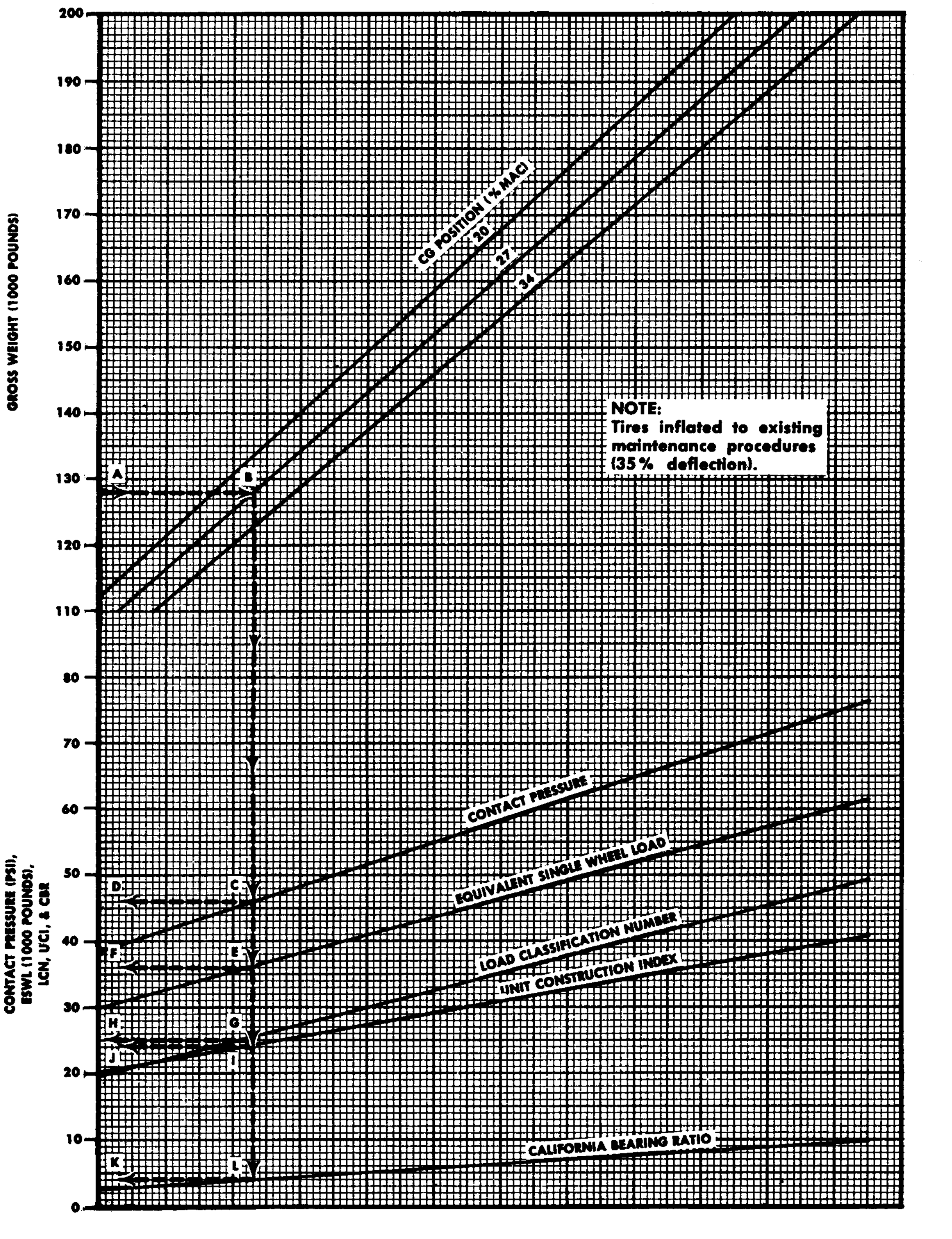


Figure A7-2. Runway Load Bearing Chart

PART I

INTRODUCTION

TABLE OF CONTENTS

LIST OF CHARTS

INTRODUCTION.

The information in this Manual is presented to assist the operating personnel in a better understanding of the conditions for which the performance charts have been determined, why these conditions have been used, and the potential effects on performance for conditions of operation other than those for which the performance charts are presented. The data contained in this Appendix supplements T. O. 1C-124A-1 Flight Manual for C-124A aircraft modified by T. O. 1C-124A-542.

CHARTS.

The performance charts are presented in graphic form and are based on data obtained during flight tests of a production model aircraft. No arbitrary conservatism has been included in preparation of the data.

Takeoff, Landing, Emergency Climb, Power Schedule, and Fuel Flow charts are presented in such a manner that the performance may be determined for any reasonable atmospheric conditions. Long Range Prediction and Range Summary charts are presented for ICAO Standard Atmospheric Conditions. Climb performance charts are presented for both ICAO Standard Atmospheric and Army Hot Day Conditions. The emergency performance charts (one or more engines inoperative) are identified by a solid red corner border with black E's on the pages; hot day or nonstandard day conditions are identified by a solid yellow corner border; and emergency charts, hot day, are identified by a dashed red corner border with black E's.

The performance charts are presented for engine operation with Rich mixture setting for takeoff and climb, and with Normal or Manual Adjustment mixture setting, as applicable, for cruise. Fuel grade 115/145 has been used for all performance data. In addition, Maximum Brake Horsepower charts and Climb Performance charts are included for fuel grade 100/130. Limits for operation with fuel grade 100/130 are shown on all charts affected by such limits.

DEFINITIONS.

Pressure Altitude	The number of feet from the 29.92 inches of mercury datum plane.
Critical Engine Failure Speed	The speed at which engine failure permits acceleration to takeoff in the same distance that the aircraft may be decelerated to a stop. (Deceleration is accomplished with normal braking and two engines in reverse thrust.)
Critical Field Length	The total length of runway required to accelerate on all engines to critical engine failure speed, experience an engine failure, then continue to takeoff or stop.
Predicted Torque	Maximum torque reading available (in psi) for takeoff with normal engine operation corrected for atmospheric conditions.
Reject Torque	The minimum torque reading acceptable (in psi) for takeoff (5% less than predicted torque).
Refusal Speed	The highest speed to which the airplane may be accelerated on four engines and stopped safely within the limits of the runway.
Steady Wind Value	Reported steady wind.
Gust Increment	Reported wind in excess of steady wind value.
Headwind	Effective wind parallel to the runway, determined from the steady wind value.
Tailwind	Effective wind parallel to the runway, determined from the steady wind value plus the gust increment.
Crosswind	Effective wind across the runway, determined from the steady wind value plus the gust increment.
Wind Component	Effective wind parallel or across the runway.
Refusal Distance	The distance required to accelerate to refusal speed under normal conditions.
Takeoff Speed	Recommended IAS (105 percent of power-off stall speed) at which the main gear leaves the ground or lifts off.
Climbout Speed	Recommended IAS (110 percent of power-off stall speed) for climbout after takeoff, when it is not necessary to clear an obstacle. When an obstacle near the end of the

runway must be cleared, it is recommended that climb be accomplished at takeoff speed.

Flap Retraction Speed	Recommended IAS for raising flaps after takeoff and climb-out are accomplished.
Climbing Speed	The EAS for climb to cruising altitude after gear and flaps are up and takeoff power has been reduced to climb power. This is the speed for the best rate of climb, considering proper engine cooling.
Speed for Best Rate of Climb	The speed at which the rate of climb is maximum for existing conditions.
Recommended Speed for Best Angle of Climb	The speed at which the angle of the climbout flight path will be maximum. Flight at speeds less than 105 percent of power-off stall speed is not recommended, although at low gross weights best angle of climb may occur at lower speeds.
Runway Condition Reading	A number indicating the relative slickness or coefficient of friction of the runway surface as measured by the James brake decelerometer, used to correct stopping distances for landing on other than a dry hard surface runway.

DISCUSSION OF CHARTS.

AIRSPEED CALIBRATION AND ATMOSPHERIC DATA.

The Airspeed Position Error Correction charts are presented for three configurations of the aircraft: (1) clean configuration, (2) wing flaps 20 degrees, and (3) wing flaps full down. Effects of static pressure errors (due to static pressure pickup location) on altimeter readings are negligible; therefore, no data are presented. The following data are also included in this section:

Compressibility Correction to Calibrated Airspeed Chart

Temperature Correction for Compressibility Chart

Density Altitude Chart

ICAO Standard Atmosphere Charts

Specific Humidity Chart

Temperature Conversion Chart.

SYMBOLS AND DEFINITIONS.

Symbol	Definition
Alt.	Altitude
BHP	Brake horsepower (RPM x T.P. x 0.00533)
BMEP	Brake mean effective pressure
°C	Degrees Centigrade
CAS	Calibrated airspeed, instrument reading corrected for instrument and position error
CAT	Carburetor air temperature
CBR	California bearing ratio
CHT	Cylinder head temperature
Corr	Correction, corrected
Cyl	Cylinder
DEG.	Degrees
Dist	Distance
Dn	Down
EAS	Equivalent airspeed, calibrated airspeed corrected for compressibility
Eng	Engine
Est	Estimated
ESWL	Equivalent single wheel load
°F	Degrees Fahrenheit
FF	Fuel Flow
FPM	Feet per minute
Ft	Feet
Gal	Gallon
Gr Wt.	Gross weight
H_d	Density altitude

Symbol	Definition
Hr	Hour
Hp	Pressure altitude
IAS	Indicated airspeed, instrument reading corrected for instrument error
ICAO	International Civil Aviation Organization
In. Hg	Inches of mercury (pressure)
Inb'd	Inboard
Inst	Instrument
IOAT	Indicated outside air temperature
Kts	Knots
LB.	Pound
LCN	Load Classification Number
Max	Maximum
METO	Maximum except takeoff
Min	Minutes
MAP	Manifold absolute pressure, inches of mercury
NM	Nautical miles
NMPP	Nautical miles per pound of fuel
OAT.	Outside air temperature, actual
Outb'd	Outboard
P.	Pressure, static atmosphere
Press.	Pressure
PSI	Pounds per square inch (pressure)
R/C.	Rate of climb, feet per minute

Symbol	Definition
RCR.	Runway condition reading
R/D.	Rate of descent, feet per minute
RPM	Revolutions per minute
SL.	Sea level
Sp. Hum	Specific humidity
Sq	Square
Std.	Standard
T.	Absolute temperature in °R or °K
t	Temperature in °F or °C
TAS.	True airspeed, equivalent airspeed corrected for atmospheric density $TAS = EAS \times \frac{1}{\sqrt{\sigma}}$
TEMP	Temperature
TD.	Touchdown
TO.	Takeoff
TP	Torque pressure (psi)
UCI	Unit construction index
V.	Velocity
V_s	Power-off stall speed
V_{to}	Takeoff speed
Wt	Weight
Δ (Delta) . . .	Increment of weight, drag, or airspeed
$\delta_{C.F.}$ (Delta) .	Cowl flap setting (degrees)
δ_f	Wing flap deflection (degrees)
ρ (Rho)	Air density, slugs per cubic foot
σ (Sigma). . . .	Air density ratio, ρ / ρ_0
μ (Mu).	Coefficient of friction

runway must be cleared, it is recommended that climb be accomplished at takeoff speed.

Flap Retraction Speed	Recommended IAS for raising flaps after takeoff and climb-out are accomplished.
Climbing Speed	The EAS for climb to cruising altitude after gear and flaps are up and takeoff power has been reduced to climb power. This is the speed for the best rate of climb, considering proper engine cooling.
Speed for Best Rate of Climb	The speed at which the rate of climb is maximum for existing conditions.
Recommended Speed for Best Angle of Climb	The speed at which the angle of the climbout flight path will be maximum. Flight at speeds less than 105 percent of power-off stall speed is not recommended, although at low gross weights best angle of climb may occur at lower speeds.
Runway Condition Reading	A number indicating the relative slickness or coefficient of friction of the runway surface as measured by the James brake decelerometer, used to correct stopping distances for landing on other than a dry hard surface runway.

DISCUSSION OF CHARTS.

AIRSPEED CALIBRATION AND ATMOSPHERIC DATA.

The Airspeed Position Error Correction charts are presented for three configurations of the aircraft: (1) clean configuration, (2) wing flaps 20 degrees, and (3) wing flaps full down. Effects of static pressure errors (due to static pressure pickup location) on altimeter readings are negligible; therefore, no data are presented. The following data are also included in this section:

Compressibility Correction to Calibrated Airspeed Chart

Temperature Correction for Compressibility Chart

Density Altitude Chart

ICAO Standard Atmosphere Charts

Specific Humidity Chart

Temperature Conversion Chart.

SYMBOLS AND DEFINITIONS.

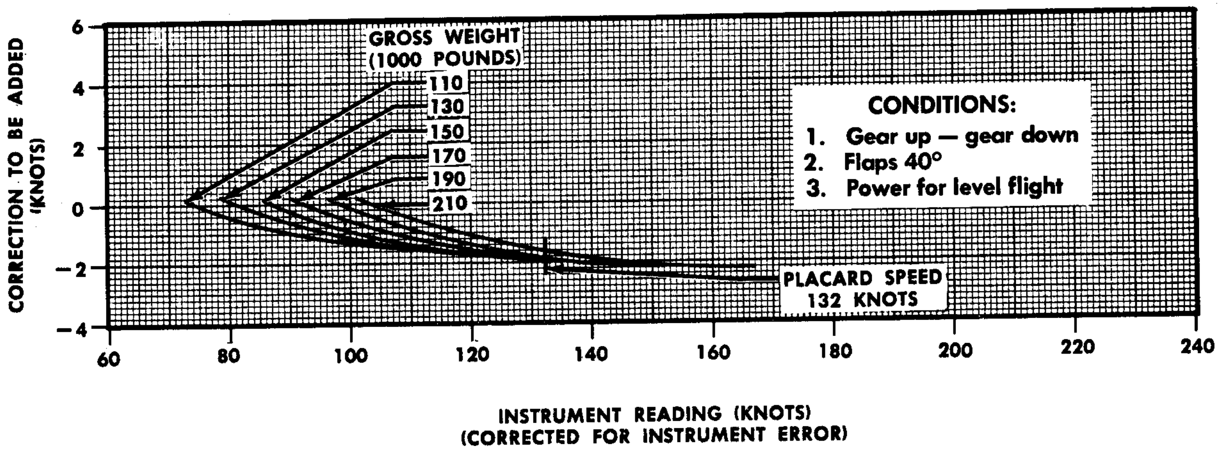
Symbol	Definition
Alt.	Altitude
BHP	Brake horsepower (RPM x T.P. x 0.00533)
BMEP	Brake mean effective pressure
°C	Degrees Centigrade
CAS	Calibrated airspeed, instrument reading corrected for instrument and position error
CAT	Carburetor air temperature
CBR	California bearing ratio
CHT	Cylinder head temperature
Corr	Correction, corrected
Cyl	Cylinder
DEG	Degrees
Dist	Distance
Dn	Down
EAS	Equivalent airspeed, calibrated airspeed corrected for compressibility
Eng	Engine
Est	Estimated
ESWL	Equivalent single wheel load
°F	Degrees Fahrenheit
FF	Fuel Flow
FPM	Feet per minute
Ft	Feet
Gal	Gallon
Gr Wt	Gross weight
H_d	Density altitude

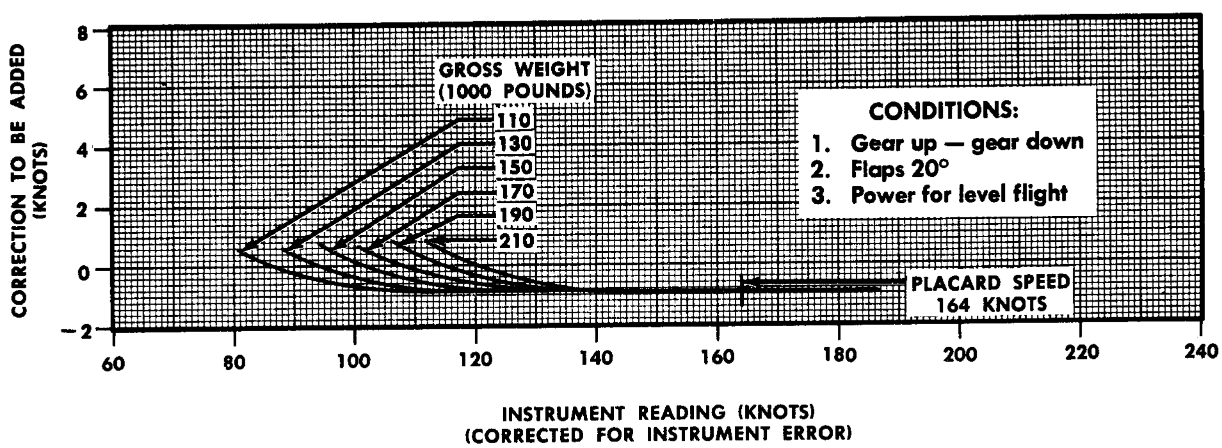
Symbol	Definition
Hr	Hour
Hp	Pressure altitude
IAS	Indicated airspeed, instrument reading corrected for instrument error
ICAO	International Civil Aviation Organization
In. Hg	Inches of mercury (pressure)
Inb'd	Inboard
Inst	Instrument
IOAT	Indicated outside air temperature
Kts	Knots
LB.	Pound
LCN	Load Classification Number
Max	Maximum
METO	Maximum except takeoff
Min	Minutes
MAP	Manifold absolute pressure, inches of mercury
NM	Nautical miles
NMPP	Nautical miles per pound of fuel
OAT.	Outside air temperature, actual
Outb'd	Outboard
P.	Pressure, static atmosphere
Press.	Pressure
PSI	Pounds per square inch (pressure)
R/C.	Rate of climb, feet per minute

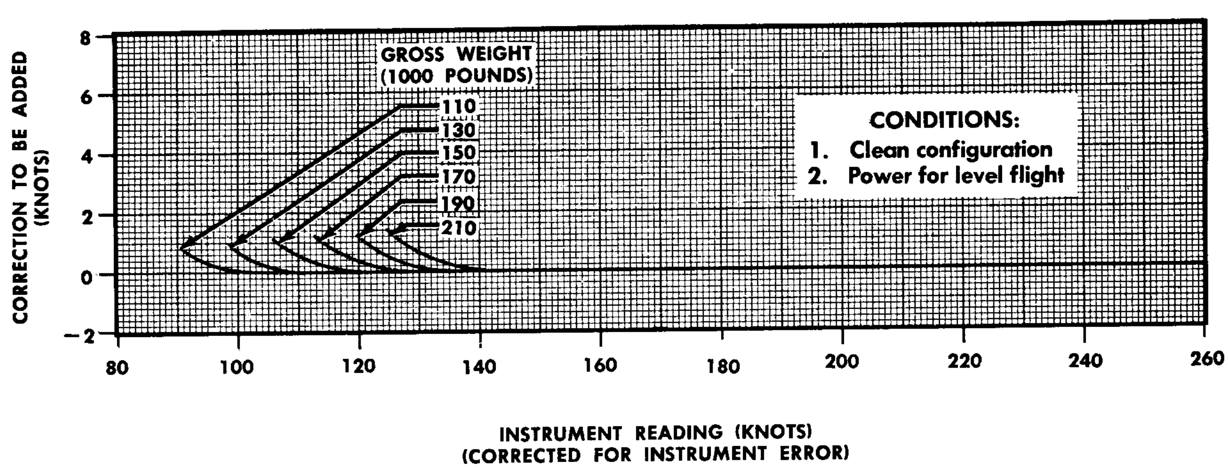
Symbol	Definition
RCR.	Runway condition reading
R/D.	Rate of descent, feet per minute
RPM	Revolutions per minute
SL.	Sea level
Sp. Hum.	Specific humidity
Sq	Square
Std.	Standard
T.	Absolute temperature in °R or °K
t	Temperature in °F or °C
TAS.	True airspeed, equivalent airspeed corrected for atmospheric density $TAS = EAS \times \frac{1}{\sqrt{\sigma}}$
TEMP	Temperature
TD.	Touchdown
TO.	Takeoff
TP	Torque pressure (psi)
UCI	Unit construction index
V.	Velocity
V_s	Power-off stall speed
V_{to}	Takeoff speed
Wt	Weight
Δ (Delta)	Increment of weight, drag, or airspeed
$\delta_{C.F.}$ (Delta)	Cowl flap setting (degrees)
δ_f	Wing flap deflection (degrees)
ρ (Rho)	Air density, slugs per cubic foot
σ (Sigma).	Air density ratio, ρ/ρ_o
μ (Mu).	Coefficient of friction

AIRSPEED POSITION ERROR CORRECTION

MODEL: C-124A
DATE: 2-15-60
DATA BASIS: FLIGHT TEST







R1-49

Figure B1-1. Airspeed Position Error Correction

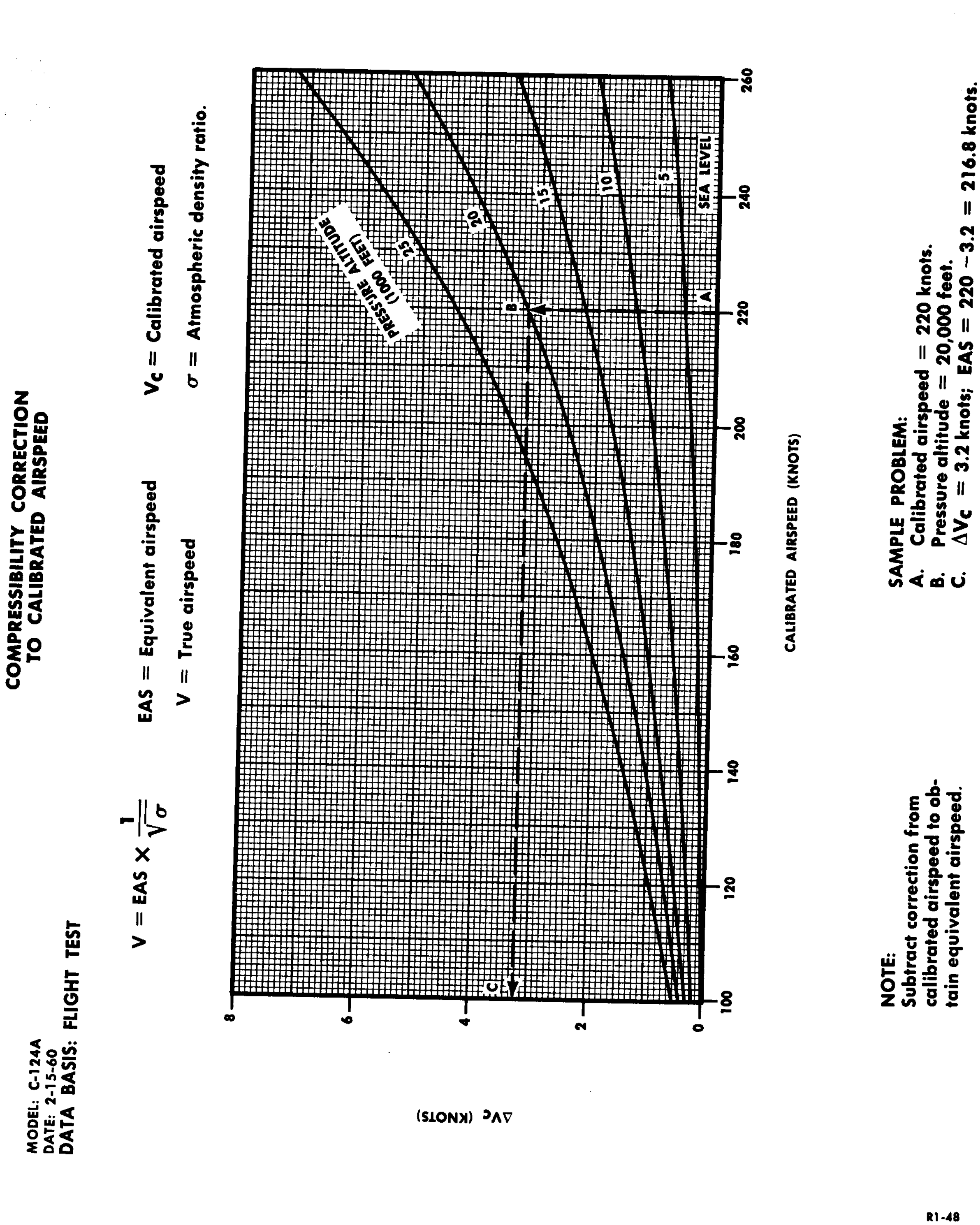
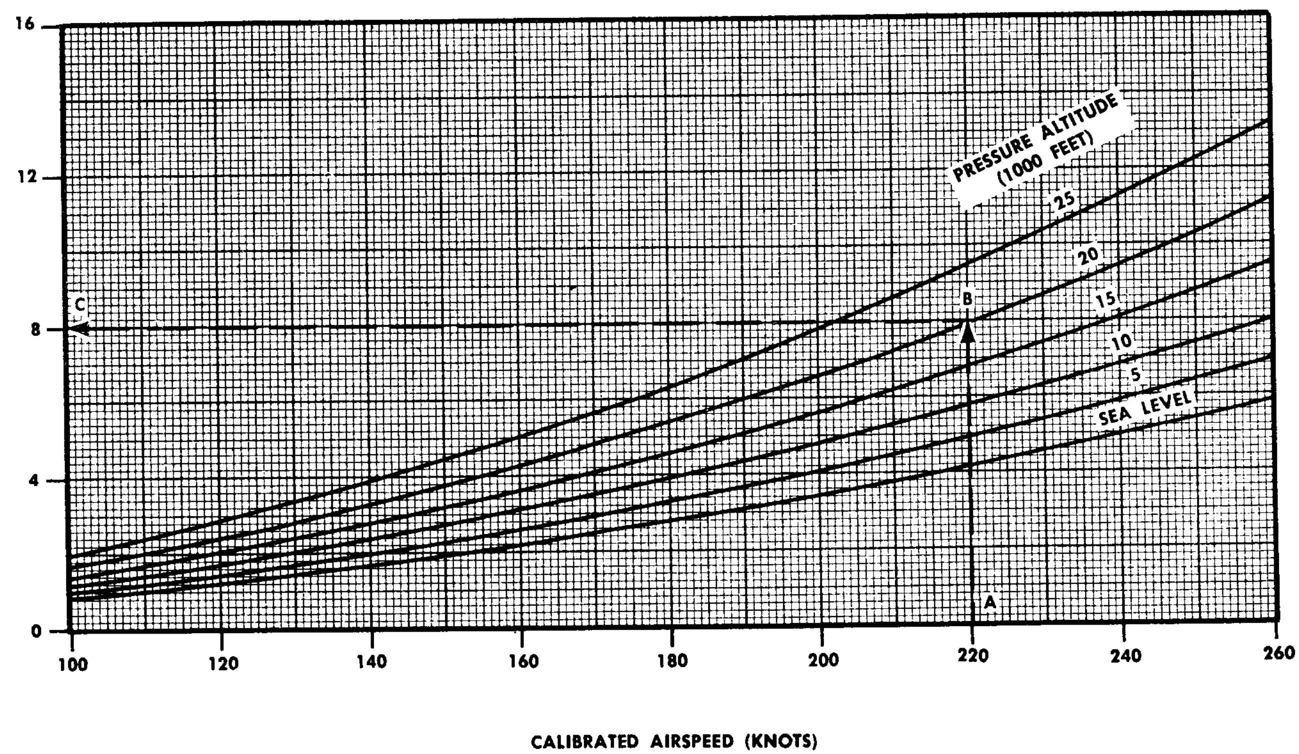


Figure B1-2. Compressibility Correction to Calibrated Airspeed

TEMPERATURE CORRECTION FOR COMPRESSIBILITY

MODEL: C-124A
DATE: 2-15-60
DATA BASIS: FLIGHT TEST



NOTE:
Subtract correction from indicated air temperature (IOAT) to obtain free air temperature (°C).

SAMPLE PROBLEM:

A. Calibrated airspeed = 220 knots.
B. Pressure altitude = 20,000 feet.
C. Temperature correction = 8° C. Corrected outside air temperature = Indicated outside air temperature −8° C.

R1-60

Figure B1-3. Temperature Correction for Compressibility

DENSITY ALTITUDE

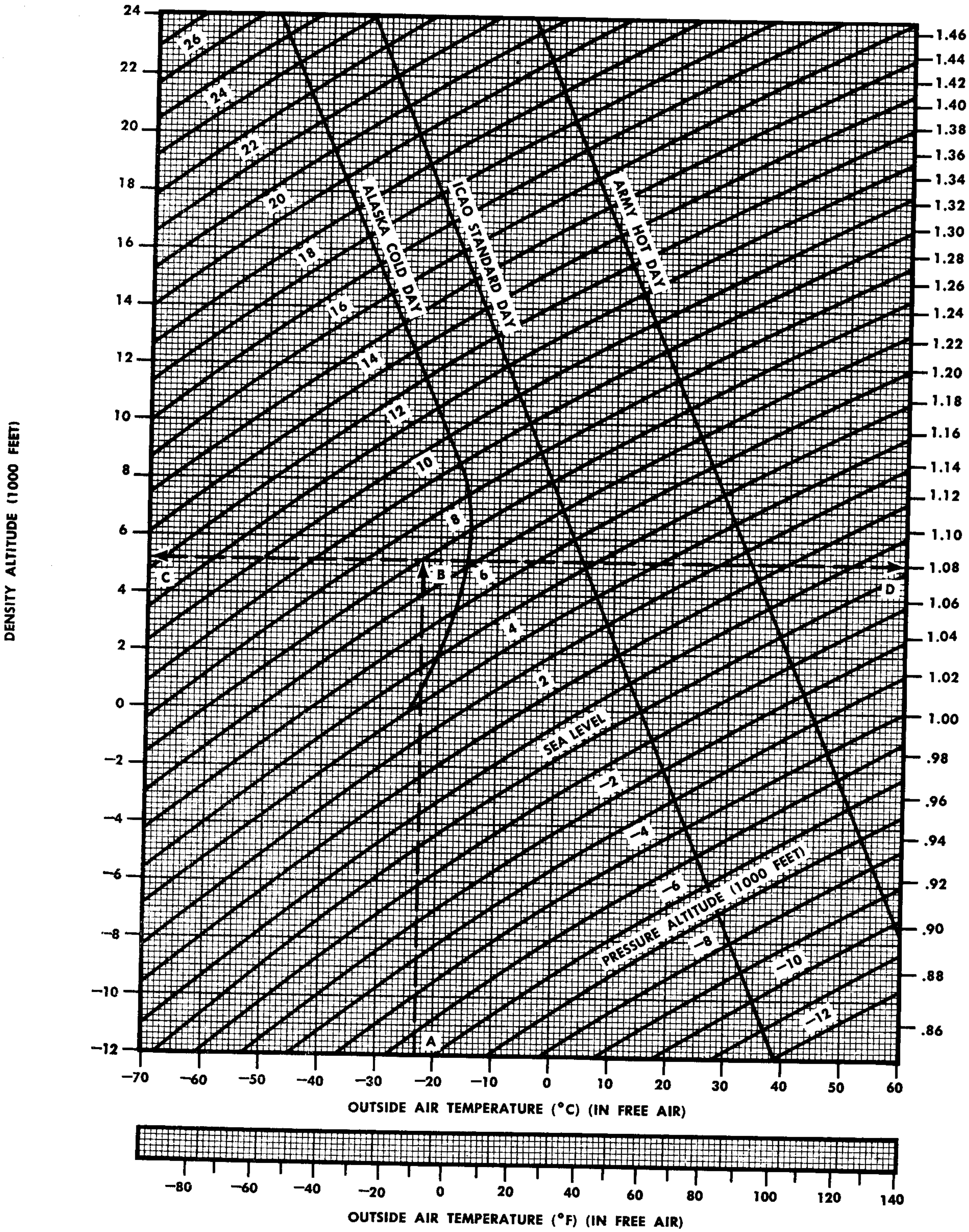
SAMPLE PROBLEM:

A. OAT. = −23° C (−9° F).

B. Pressure altitude = 8000 feet.

C. Density altitude = 5200 feet.

D. $\frac{1}{\sqrt{\sigma}} = 1.08.$



$\frac{1}{\sqrt{\sigma}}$

Figure B1-4. Density Altitude

ICAO STANDARD ATMOSPHERE TABLE

STANDARD S. L. CONDITIONS:
Temperature = 15°C (59°F)
Pressure = 29.921 in. Hg (2116.216 lb/sq. ft.)
Density = .0023769 slugs/cu. ft.
Speed of sound = 1116.89 ft/sec. (661.7 knots)

CONVERSION FACTORS:
1 in. Hg = 70.727 lb/sq. ft.
1 in. Hg = 0.49116 lb./sq. in.
1 Knot = 1.151 mph
1 Knot = 1.688 ft./sec.

Altitude Feet	Density Ratio σ	SMOE Factor $\frac{1}{\sqrt{\sigma}}$	Temperature °C	Temperature °F	Speed of Sound (Knots)	Pressure In. Hg	Pressure Ratio δ
0	1.000	1.0000	15.000	59.000	661.7	29.921	1.0000
1000	.9711	1.0148	13.019	55.434	659.5	28.856	.9644
2000	.9428	1.0299	11.038	51.868	657.2	27.821	.9298
3000	.9151	1.0454	9.056	48.302	654.9	26.817	.8962
4000	.8881	1.0611	7.075	44.735	652.6	25.842	.8637
5000	.8617	1.0773	5.094	41.169	650.3	24.896	.8320
6000	.8359	1.0938	3.113	37.603	647.9	23.978	.8014
7000	.8106	1.1107	1.132	34.037	645.6	23.088	.7716
8000	.7860	1.1279	- 0.850	30.471	643.3	22.225	.7428
9000	.7620	1.1456	- 2.831	26.905	640.9	21.388	.7148
10,000	.7385	1.1637	- 4.812	23.338	638.6	20.577	.6877
11,000	.7155	1.1822	- 6.793	19.772	636.2	19.791	.6614
12,000	.6932	1.2011	- 8.774	16.206	633.9	19.029	.6360
13,000	.6713	1.2205	-10.756	12.640	631.5	18.292	.6113
14,000	.6500	1.2403	-12.737	9.074	629.1	17.577	.5875
15,000	.6292	1.2606	-14.718	5.508	626.7	16.886	.5643
16,000	.6090	1.2815	-16.699	1.941	624.3	16.216	.5420
17,000	.5892	1.3028	-18.680	- 1.625	621.9	15.569	.5203
18,000	.5699	1.3246	-20.662	- 5.191	619.4	14.942	.4994
19,000	.5511	1.3470	-22.643	- 8.757	617.0	14.336	.4791
20,000	.5328	1.3700	-24.624	-12.323	614.6	13.750	.4595
21,000	.5150	1.3935	-26.605	-15.889	612.1	13.184	.4406
22,000	.4976	1.4176	-28.586	-19.456	609.6	12.636	.4223
23,000	.4806	1.4424	-30.568	-23.022	607.2	12.107	.4046
24,000	.4642	1.4678	-32.549	-26.588	604.7	11.597	.3876
25,000	.4481	1.4938	-34.530	-30.154	602.2	11.103	.3711
26,000	.4325	1.5206	-36.511	-33.720	599.7	10.627	.3552
27,000	.4173	1.5480	-38.492	-37.286	597.2	10.168	.3398
28,000	.4025	1.5762	-40.474	-40.852	594.6	9.725	.3250
29,000	.3881	1.6052	-42.455	-44.419	592.1	9.297	.3107
30,000	.3741	1.6349	-44.436	-47.985	589.6	8.885	.2970
31,000	.3605	1.6654	-46.417	-51.551	587.0	8.488	.2837
32,000	.3473	1.6968	-48.398	-55.117	584.4	8.106	.2709
33,000	.3345	1.7291	-50.380	-58.683	581.8	7.737	.2586
34,000	.3220	1.7623	-52.361	-62.249	579.3	7.382	.2467
35,000	.3099	1.7964	-54.342	-65.816	576.7	7.041	.2353
36,000	.2981	1.8315	-56.323	-69.382	574.0	6.712	.2243
36,089	.2971	1.8347	-56.500	-69.700	573.7	6.683	.2234
37,000	.2843	1.8753	-56.500	-69.700	573.7	6.397	.2138
38,000	.2710	1.9209	-56.500	-69.700	573.7	6.097	.2038
39,000	.2583	1.9677	-56.500	-69.700	573.7	5.811	.1942
40,000	.2462	2.0155	-56.500	-69.700	573.7	5.538	.1851
41,000	.2346	2.0645	-56.500	-69.700	573.7	5.278	.1764
42,000	.2236	2.1148	-56.500	-69.700	573.7	5.030	.1681
43,000	.2131	2.1662	-56.500	-69.700	573.7	4.794	.1602
44,000	.2031	2.2189	-56.500	-69.700	573.7	4.569	.1527
45,000	.1936	2.2728	-56.500	-69.700	573.7	4.355	.1455

Figure B1-5. ICAO Standard Atmosphere Table (Sheet 1 of 2)

ICAO STANDARD ATMOSPHERE TABLE

ALTITUDE IN 100-FOOT INCREMENTS AND $\frac{1}{\sqrt{\sigma}}$

Altitude Feet	$\frac{1}{\sqrt{\sigma}}$	Altitude Feet	$\frac{1}{\sqrt{\sigma}}$	Altitude Feet	$\frac{1}{\sqrt{\sigma}}$	Altitude Feet	$\frac{1}{\sqrt{\sigma}}$	Altitude Feet	$\frac{1}{\sqrt{\sigma}}$
100	1.0015	6100	1.0955	12100	1.2030	18100	1.3269	24100	1.4704
200	1.0029	6200	1.0971	12200	1.2049	18200	1.3291	24200	1.4729
300	1.0044	6300	1.0988	12300	1.2069	18300	1.3313	24300	1.4755
400	1.0059	6400	1.1005	12400	1.2088	18400	1.3335	24400	1.4781
500	1.0074	6500	1.1022	12500	1.2107	18500	1.3358	24500	1.4807
600	1.0088	6600	1.1039	12600	1.2127	18600	1.3380	24600	1.4833
700	1.0103	6700	1.1056	12700	1.2146	18700	1.3403	24700	1.4860
800	1.0118	6800	1.1073	12800	1.2166	18800	1.3425	24800	1.4886
900	1.0133	6900	1.1090	12900	1.2185	18900	1.3448	24900	1.4912
1000	1.0148	7000	1.1107	13000	1.2205	19000	1.3470	25000	1.4938
1100	1.0163	7100	1.1124	13100	1.2224	19100	1.3493	25100	1.4965
1200	1.0178	7200	1.1141	13200	1.2244	19200	1.3516	25200	1.4991
1300	1.0193	7300	1.1158	13300	1.2264	19300	1.3539	25300	1.5018
1400	1.0208	7400	1.1175	13400	1.2284	19400	1.3561	25400	1.5045
1500	1.0223	7500	1.1193	13500	1.2303	19500	1.3584	25500	1.5071
1600	1.0238	7600	1.1210	13600	1.2323	19600	1.3607	25600	1.5098
1700	1.0253	7700	1.1227	13700	1.2343	19700	1.3630	25700	1.5125
1800	1.0269	7800	1.1245	13800	1.2363	19800	1.3653	25800	1.5152
1900	1.0284	7900	1.1262	13900	1.2383	19900	1.3677	25900	1.5179
2000	1.0299	8000	1.1279	14000	1.2403	20000	1.3700	26000	1.5206
2100	1.0314	8100	1.1297	14100	1.2423	20100	1.3723	26100	1.5233
2200	1.0330	8200	1.1314	14200	1.2444	20200	1.3746	26200	1.5260
2300	1.0345	8300	1.1332	14300	1.2464	20300	1.3770	26300	1.5287
2400	1.0360	8400	1.1350	14400	1.2484	20400	1.3793	26400	1.5315
2500	1.0376	8500	1.1367	14500	1.2504	20500	1.3817	26500	1.5342
2600	1.0391	8600	1.1385	14600	1.2525	20600	1.3840	26600	1.5370
2700	1.0407	8700	1.1403	14700	1.2545	20700	1.3864	26700	1.5397
2800	1.0422	8800	1.1420	14800	1.2565	20800	1.3888	26800	1.5425
2900	1.0438	8900	1.1438	14900	1.2586	20900	1.3911	26900	1.5453
3000	1.0454	9000	1.1456	15000	1.2606	21000	1.3935	27000	1.5480
3100	1.0469	9100	1.1474	15100	1.2627	21100	1.3959	27100	1.5508
3200	1.0485	9200	1.1492	15200	1.2648	21200	1.3983	27200	1.5536
3300	1.0501	9300	1.1510	15300	1.2668	21300	1.4007	27300	1.5564
3400	1.0516	9400	1.1528	15400	1.2689	21400	1.4031	27400	1.5592
3500	1.0532	9500	1.1546	15500	1.2710	21500	1.4055	27500	1.5620
3600	1.0548	9600	1.1564	15600	1.2731	21600	1.4079	27600	1.5649
3700	1.0564	9700	1.1582	15700	1.2752	21700	1.4103	27700	1.5677
3800	1.0580	9800	1.1600	15800	1.2773	21800	1.4128	27800	1.5705
3900	1.0595	9900	1.1618	15900	1.2794	21900	1.4152	27900	1.5734
4000	1.0611	10000	1.1637	16000	1.2815	22000	1.4176	28000	1.5762
4100	1.0627	10100	1.1655	16100	1.2836	22100	1.4201	28100	1.5791
4200	1.0643	10200	1.1673	16200	1.2857	22200	1.4225	28200	1.5819
4300	1.0659	10300	1.1692	16300	1.2878	22300	1.4250	28300	1.5848
4400	1.0676	10400	1.1710	16400	1.2899	22400	1.4275	28400	1.5877
4500	1.0692	10500	1.1729	16500	1.2921	22500	1.4299	28500	1.5906
4600	1.0708	10600	1.1747	16600	1.2942	22600	1.4324	28600	1.5935
4700	1.0724	10700	1.1766	16700	1.2963	22700	1.4349	28700	1.5964
4800	1.0740	10800	1.1784	16800	1.2985	22800	1.4374	28800	1.5993
4900	1.0757	10900	1.1803	16900	1.3006	22900	1.4399	28900	1.6022
5000	1.0773	11000	1.1822	17000	1.3028	23000	1.4424	29000	1.6052
5100	1.0789	11100	1.1840	17100	1.3049	23100	1.4449	29100	1.6081
5200	1.0806	11200	1.1859	17200	1.3071	23200	1.4474	29200	1.6110
5300	1.0822	11300	1.1878	17300	1.3093	23300	1.4499	29300	1.6140
5400	1.0838	11400	1.1897	17400	1.3115	23400	1.4525	29400	1.6170
5500	1.0855	11500	1.1916	17500	1.3136	23500	1.4550	29500	1.6199
5600	1.0871	11600	1.1935	17600	1.3158	23600	1.4576	29600	1.6229
5700	1.0888	11700	1.1954	17700	1.3180	23700	1.4601	29700	1.6259
5800	1.0905	11800	1.1973	17800	1.3202	23800	1.4627	29800	1.6289
5900	1.0921	11900	1.1992	17900	1.3224	23900	1.4652	29900	1.6319
6000	1.0938	12000	1.2011	18000	1.3246	24000	1.4678	30000	1.6349

Figure B1-5. ICAO Standard Atmosphere Table (Sheet 2 of 2)

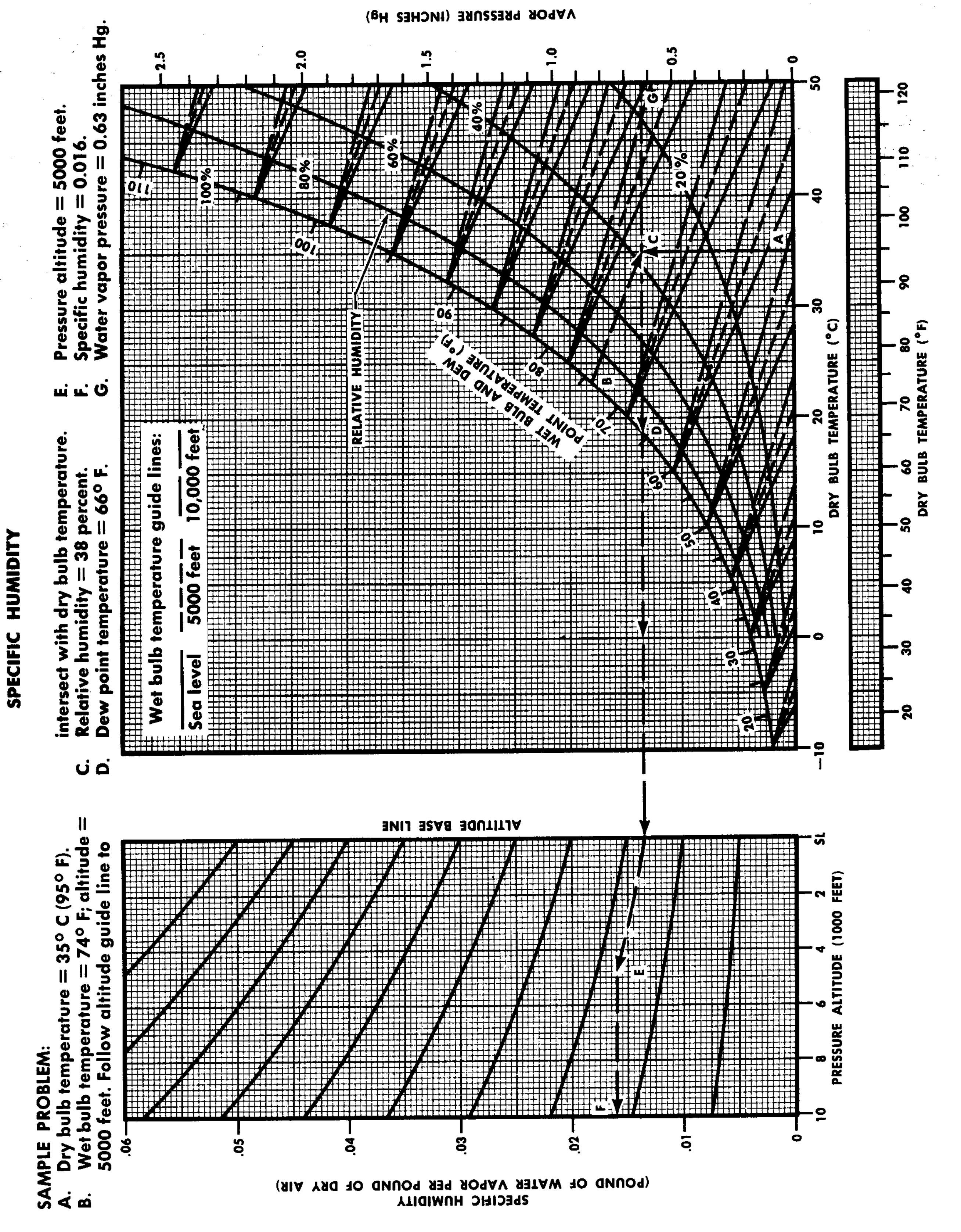


Figure B1-6. Specific Humidity

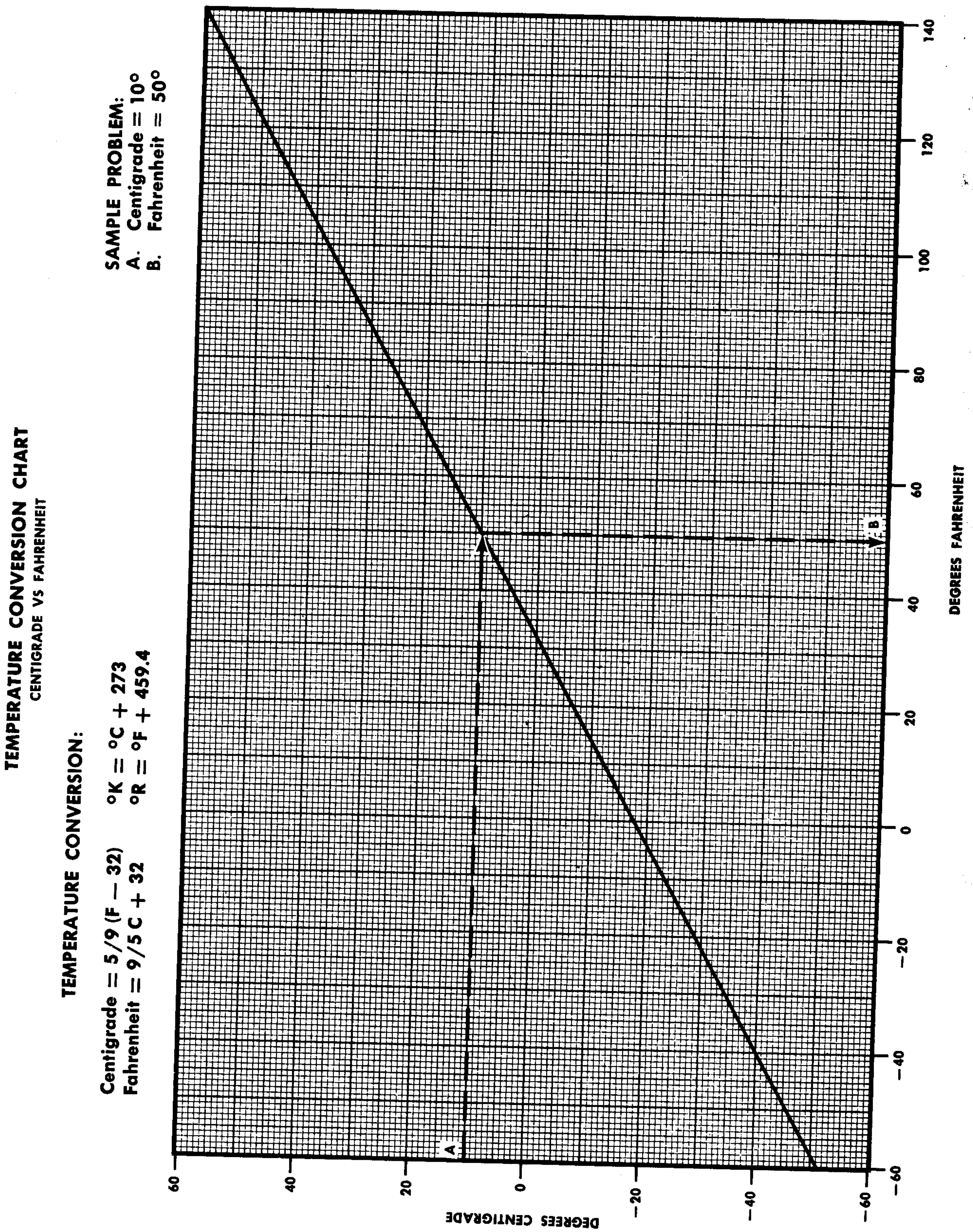


Figure B1-7. Temperature Conversion Chart

PART II

POWER PLANT

TABLE OF CONTENTS

LIST OF CHARTS

POWER PLANT CHARACTERISTICS.

Power plant characteristics are presented for both 115/145 and 100/130 grade fuel on the Maximum Brake Horsepower charts (figures B2-16 and B2-17). The Brake Horsepower — RPM Schedule curves (figures B2-2 through B2-5), Brake Horsepower — Manifold pressure Schedule curves (figures B2-6 through B2-9) the Torque Pressure Vs RPM and BHP chart (figure B2-10) and the Fuel Flow curves (figures B2-11 through B2-14) are based on operation with fuel grade 115/145; however, limits have been added to allow their use with fuel grade 100/130. The Engine Limitations Curve (figure B2-1) is based on operation with fuel grade 115/145 but may be used with fuel grade 100/130 providing the limits shown in Section V, T. O. 1C-124A-1 are adhered to. The Effect of Humidity on Max Power chart (figure B2-18) may be used with either 115/145 or 100/130 grade fuel.

It is important to note that the performance charts are based on engine calibration data with the carburetor heat control in the COLD position. With this setting, the carburetor air temperature should indicate approximately 5°C above corrected outside air temperature. This temperature difference is the result of the adiabatic temperature rise of the ram air and the location of the intake duct above the engine.

EFFECTS OF CARBURETOR AIR PRE-HEAT ON ENGINE PERFORMANCE.

When carburetor air pre-heat is used, there will be a loss in engine performance for two reasons. First, because of the increase in carburetor air temperature, the operating density altitude of the engine is increased and the power for a given manifold pressure is decreased. Second, the normal air induction system is blocked off and carburetor air is taken from a location above the rear bank of cylinders. This air has passed through the fins on the forward banks of cylinders and is low energy air. Thus, little or no benefit is obtained from the ram pressure available at the front face of the engine. If temperatures other than normal carburetor air temperature prevail, the correction plots on the charts should be used to determine the proper power settings.

EFFECTS OF CARBURETOR AIR TEMPERATURE ON ENGINE PERFORMANCE.

The effect of temperature on brake horsepower can be approximated by the following equation, provided there is no change in supercharger impeller efficiency:

$$\frac{BHP_1}{BHP_2} = \sqrt{\frac{T_2}{T_1}}$$

(Where T = absolute carburetor air temperature)

For ambient air temperatures near 280° Kelvin, the loss in BHP for each increase in air temperature of 5°C is approximately 1 percent. The loss in impeller efficiency in the supercharger results in additional power loss of between 0.5 and 1 percent of the total power. For general use, the approximation that a power loss of 1.5 percent of the total power occurs for each 5°C rise in temperature is valid.

This method should NOT be used for power predictions. The charts included in this section give sufficient coverage for power predictions throughout the normal operating range.

PROPELLER LOAD.

The propeller load is the relationship between the RPM of a propeller of constant pitch and the power required to drive it at a given speed. Propeller load lines are determined from the following formula:

$$BHP_1 = BHP_2 \left[\frac{RPM_1}{RPM_2}\right]^3$$

The propeller load line defines a region of engine operation with normal mixture, higher than the rated limit (150 BMEP Low Blower, 140 BMEP High Blower) up to METO power.

DISCUSSION OF CHARTS.

ENGINE LIMITATIONS CURVE.

The Engine Limitations Curve (figure B2-1) is presented for general information on engine operating limitations and characteristics. The data are based on flight tests, corrected to zero ram conditions.

BRAKE HORSEPOWER-RPM AND BRAKE HORSEPOWER-MANIFOLD PRESSURE SCHEDULES.

The Brake Horsepower-RPM Schedules (figures B2-2 through B2-5) and the Brake Horsepower-Manifold Pressure Schedules (figures B2-6 through B2-9), indicate the proper RPM and manifold pressure settings for any desired brake horsepower for operation with fuel grade 115/145. Limits for operation with fuel grade 100/130 are called out in notes on each chart where necessary. These schedules allow the use of a constant RPM for each BHP for any CAT during part throttle operation. Only the MAP is adjusted to obtain the desired brake horsepower. The CAT correction grid to the left of the MAP schedules make this correction. The CAT correction grid at the bottom of each schedule is a correction for critical altitude which will vary when a constant BHP-RPM combination is used for all CAT's. For variable slip and full throttle operation, the critical altitude correction grid also corrects RPM for nonstandard day CAT's. The MAP is corrected in the same manner as for part throttle operation. The correction plot limits and proper engine limits are shown on the charts and will not be exceeded when the desired BHP is selected from Part 5 (Range section) as outlined in Part 7 (Mission Planning, Cruise).

In Normal Mixture, low blower critical altitude is defined by a propeller load curve through METO power or 150 BMEP, whichever is lower. High blower critical altitude is defined by a propeller load curve through METO power or 140 BMEP, whichever is lower. For Manual Lean Mixture operation, the standard day Low Blower critical altitude is determined by 150 BMEP down to 10,000 feet altitude and 10,000 feet to the minimum RPM for normal operation (1400 RPM). Critical altitude for high blower is determined by 140 BMEP down to 15,000 feet altitude and 15,000 feet to the minimum RPM for normal operation (1400 RPM). It is important to note that all cruise performance data in the appendix are designed to conform to these power schedules and the limits shown on the curves. Limits for operation with fuel grade 100/130 are called out in the notes on each chart.

TORQUE PRESSURE VERSUS RPM AND BHP CHART.

The Torque Pressure Versus RPM and BHP Chart (figure B2-10) is presented for determining torque pressure for any given BHP-RPM combination. Limits for 140 and 150 BMEP are shown for convenience. Low blower and high blower propeller loads are also presented.

FUEL FLOW CHARTS.

Fuel Flow charts for fuel grades 115/145 and 100/130 (figures B2-11 through B2-14) show values of fuel flow per engine during all normal cruising operations for normal and manual adjustment mixture settings. Limits for operation with fuel grade 100/130 are called out in the notes on each chart. The desired BHP for entering these curves should be obtained from Part 5 (Range Section). The correction plots are the same as for the BHP-RPM schedule charts. The proper engine limits are shown on the charts and will not be exceeded when the desired BHP to be used is selected. The proper RPM and manifold pressure for any BHP-pressure altitude combination on the fuel flow charts should be taken from the BHP-RPM and Brake Horsepower-Manifold Pressure charts at the same BHP-pressure altitude combination.

Note

Approximately the same amount of fuel will be used during descent as would be consumed in continuing cruise at altitude for the same distance as required for the descent.

DETERMINING BHP AND AVERAGE POWER VARIATION.

The average amount of power variation, if variation does exist, may be determined by the operators of each individual aircraft. This can be accomplished during the first several takeoffs after the aircraft is received. Pressure altitude and specific humidity should be recorded before the take-off; torque pressures, RPM, and CAT for all four engines should be recorded during each takeoff. From the recorded data, an average power variation may be obtained with the use of the Maximum Brake Horsepower charts. The brake horsepower may be determined from the torque pressure and RPM by using the equation:

$$BHP = 0.00533\ (TP)\ (RPM)$$

The percent power variation curves on the Maximum BHP charts can then be entered with a predetermined percent variation which will correct predicted power and torque pressure to the expected indicated power and torque pressure. A reject torque pressure or power variation of minus 5 percent from predicted will be used as minimum for takeoff. If this reject torque pressure cannot be obtained for takeoff, the aircraft should be rejected until the engines can be inspected for possible malfunctions and corrective action taken.

HEATER FUEL CONSUMPTION.

The Heater Fuel Consumption chart (figure B2-15) is included to show heater fuel flows for the following combinations of heater usage:

Flight compartment heater only.

Cabin heater only.

Flight compartment and cabin heaters.

Flight compartment, cabin and surface heaters.

The chart shows the average fuel flow rate in pounds per hour as a function of outside air temperature.

MAXIMUM BRAKE HORSEPOWER CHARTS.

The Maximum Brake Horsepower charts for wet and dry power (figures B2-16 and B2-17) provide data for determining the predicted torque pressure MAP and corresponding BHP and reject torque pressure for takeoff. An installation loss of 60 BHP has also been built into the curves.

Separate charts for fuel grade 115/145 and 110/130 are provided for operation from sea level to 8000 feet. The charts for operation from 7000 to 14,000 feet are based on operation with either 115/145 or 100/130 grade fuel.

Note

Wet Power operation is limited under extremely low temperatures due to the freezing temperature of the water-alcohol mixture, regardless of CAT. Normal C-124 water-alcohol mixture (50/50) begins to freeze at -42°C. Therefore, dry takeoff is recommended at temperatures below -30°C.

For takeoff below sea level pressure altitude, use sea level values for computing data. Do not exceed the maximum sea level manifold pressure indicated on the charts. Data are shown for low blower only; this is because no high blower rating is given for the P & W 4360-20WD engine supercharger combination presently installed. All takeoffs should be accomplished in low blower only. Maximum manifold pressure varies linearilly between the full throttle limit at critical altitude and sea level. This variation allows the use of the maximum available power at lower altitudes and still provides a limit so that the engine will not be overboosted at the higher altitudes.

Manifold Pressure Correction To Limit BHP

Under certain operating conditions, the combination of CAT and pressure altitude may result in manifold pressure settings, which will exceed the maximum allowable BHP. The Manifold Pressure Correction curve is applicable to all powers above the maximum of 3500 BHP (243 Psi Torque Pressure) for part and full throttle low blower. To avoid the possibility of overboost during maximum power operation, any power obtained for a given CAT-pressure altitude condition and corrected for dew point which still exceeds the maximum BHP limit, should be extended to the manifold pressure correction curve to obtain the manifold pressure correction. Applying this correction to the manifold pressure obtained for the original conditions will result in operation at the maximum BHP limit (3500 BHP-WET or DRY). In the event the torque pressure indicating system is inoperative during cold weather operations, overboosting may be avoided by setting power to the level indicated by the corrected manifold pressure.

Manifold Pressure Correction for Humidity.

Under certain conditions of humidity and carburetor air temperature, the maximum manifold pressures shown on the charts may be exceeded by as much as 1.5 inches Hg MAP due to the existing vapor pressure. This correction is presented so that at any given dew point temperature a correction may be obtained within the limits of the correction plots for both dew point and carburetor air temperature. Where vapor pressure exists, the MAP instrument reading will include this pressure as part of the total reading. Adding the MAP correction available will allow some recovery of the MAP and power lost due to the vapor pressure. During some instances of part throttle operation at high dew point temperatures and pressure altitudes near the critical altitude for high CAT's, full throttle may be reached before the full correction to the MAP can be attained. This will result in less power recovery. For all normal operation at or near standard day the full correction allowed will be obtainable. The correction plots are shown so that they can be used only for the temperature ranges for which the correction is applicable.

EFFECT OF HUMIDITY ON MAX POWER CHART.

The effect of humidity on maximum power engine performance is shown on figure B2-18. This effect is reflected in the dew point correction curves on the maximum brake horsepower charts. The power loss due to humidity correction can be shown to be the result of the following items:

1. Pressure and density altitudes of dry air are increased because of the presence of vapor pressure.
2. Fuel air ratio is increased because fuel is metered on total through the venturi, and the total flow includes water vapor as well as air.
3. The thermal efficiency of the combustion process is reduced because of the presence of water vapor.

BLOWER SHIFT.

The shift from low blower to high blower is accompanied by a temporary power loss because the power required to effect the shift is greater than the increase of power due to the shift. Before shifting to high blower in cruise, reduce MAP. 3 to 4 inches Hg. After the shift is completed, add power up to the desired level. For blower shift during climb see the discussion in Part 4 (Climb).

ENGINE LIMITATIONS CURVE
SEA LEVEL CALIBRATION
ICAO STANDARD DAY
LOW BLOWER ZERO RAM

MODEL: C-124A
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-20WD
FUEL GRADE: 115/145 & 100/130

SAMPLE PROBLEM:

A. On Altitude Calibration Curve locate 2400 RPM and 40 inches Hg manifold pressure.

B. On Sea Level Calibration Curve locate same RPM and manifold pressure. Read BHP = 1960.

C. Transfer 1960 BHP from B to C and draw straight line from C to A.

D. Assume altitude of 5000 feet and read BHP = 2070.

NOTE:
Operating limits with alternate grade 100/130 fuel are tabulated in Section V, T.O. 1C-124A-1.

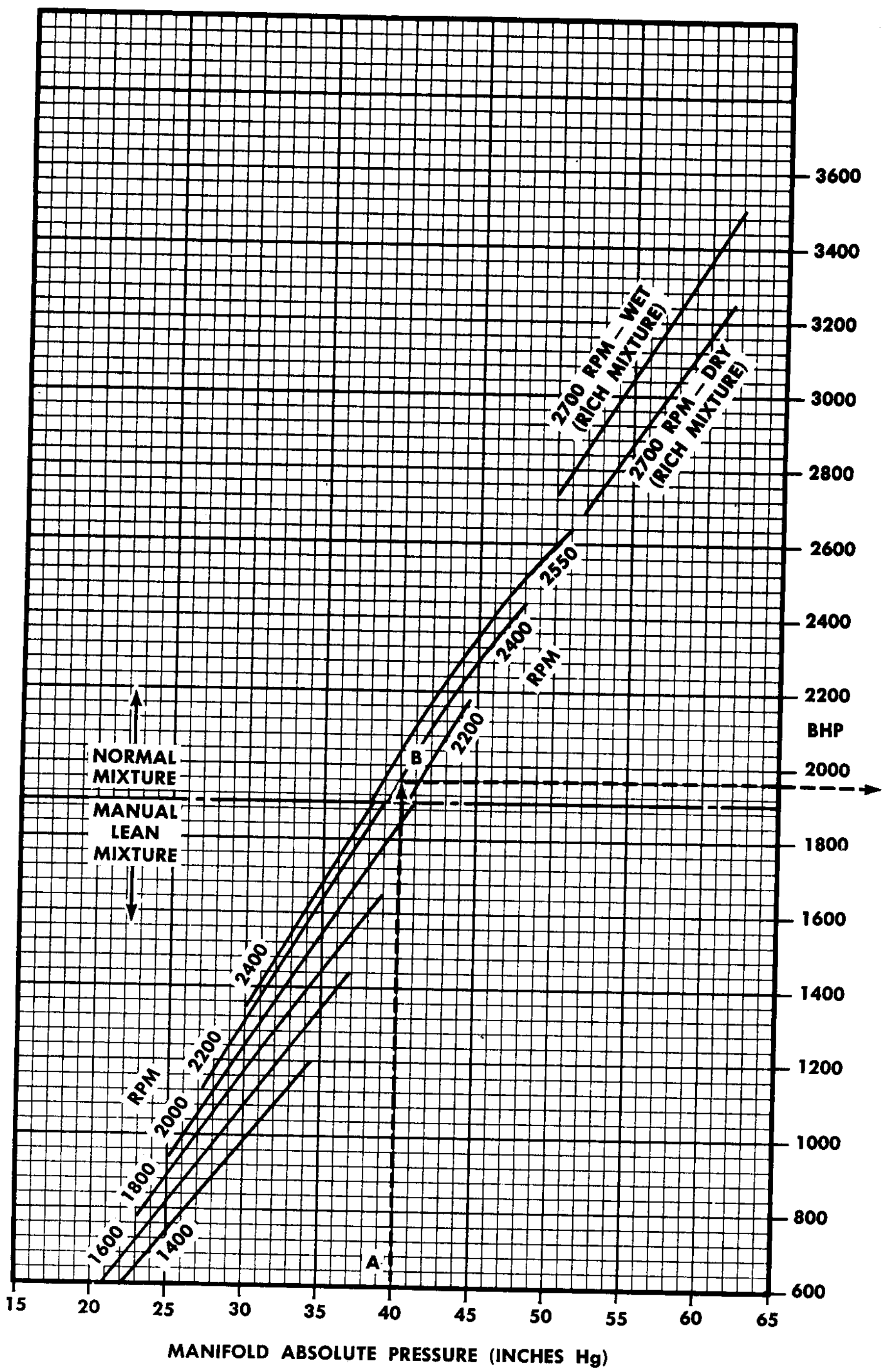


Figure B2-1. Engine Limitations Curve — Sea Level Calibration (Sheet 1 of 2)

ENGINE LIMITATIONS CURVE ALTITUDE CALIBRATION

ICAO STANDARD DAY
LOW BLOWER ZERO RAM

MODEL: C-124A
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P & W 4360-20W
FUEL GRADE: 115/145 & 100/130

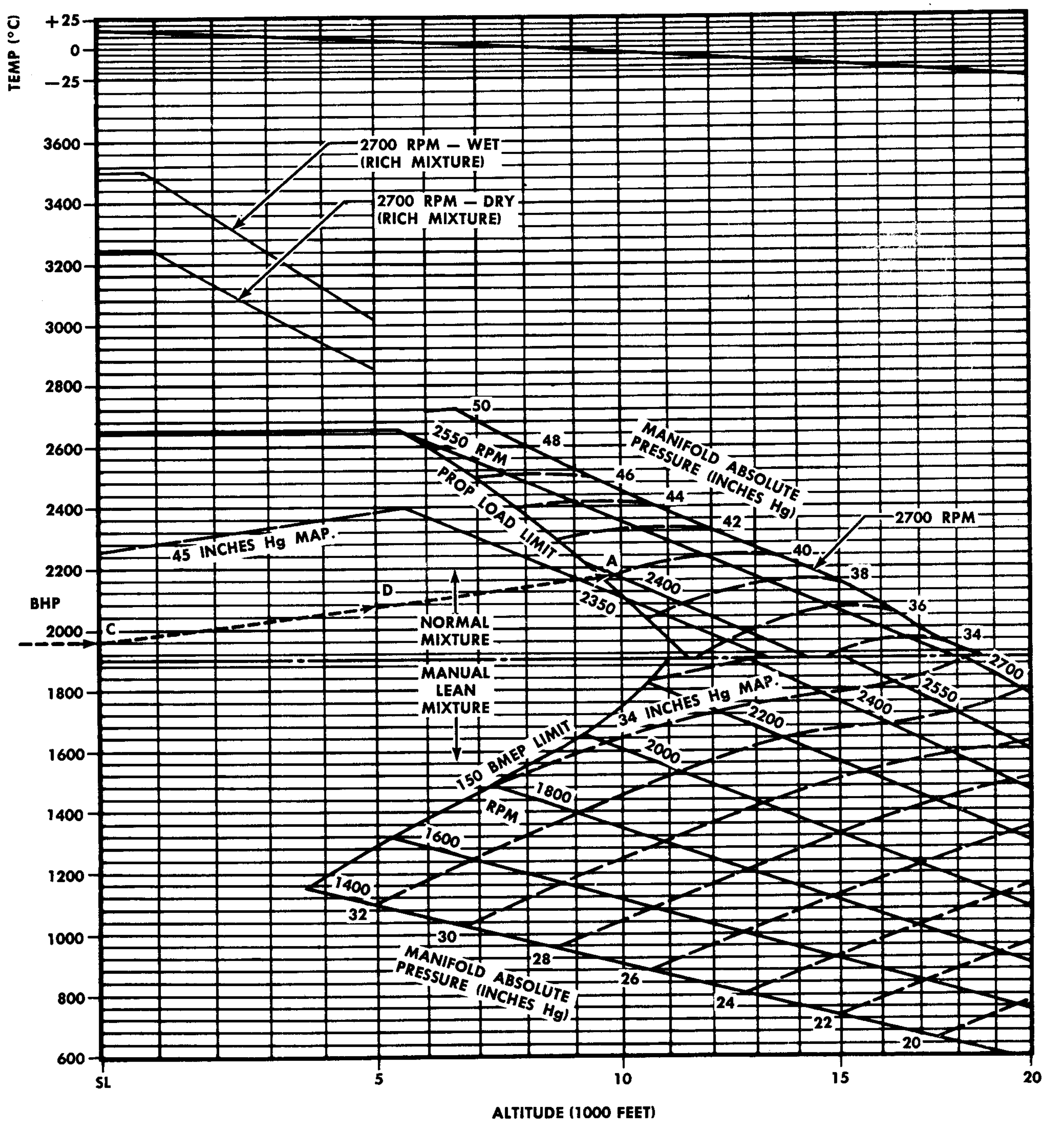


Figure B2-1. Engine Limitations Curve — Altitude Calibration (Sheet 2 of 2)

BRAKE HORSEPOWER — RPM SCHEDULE
LOW BLOWER — NORMAL MIXTURE

MODEL: C-124A
DATE: 10-15-61
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-20W
FUEL GRADE: 115/145 & 100/130

NOTE:

1. This chart must be used in conjunction with the Low Blower — NORMAL MIXTURE BHP — MAP. Schedule.
2. Carburetor air temperature = OAT. +5°C.
3. Data above 1900 BHP for fuel grade 115/145.
4. Do not exceed 2500 BHP with 100/130 fuel grade. All data below 2500 BHP good for fuel grade 100/130.
5. Method of obtaining desired brake horsepower outlined in Part 7 (Mission Planning, Cruise).

SAMPLE PROBLEM:

A. Indicated CAT. = 15°C.
B. Pressure altitude = 7000 feet.
C. Desired BHP = 2350.
D. RPM setting = 2440 (part throttle).

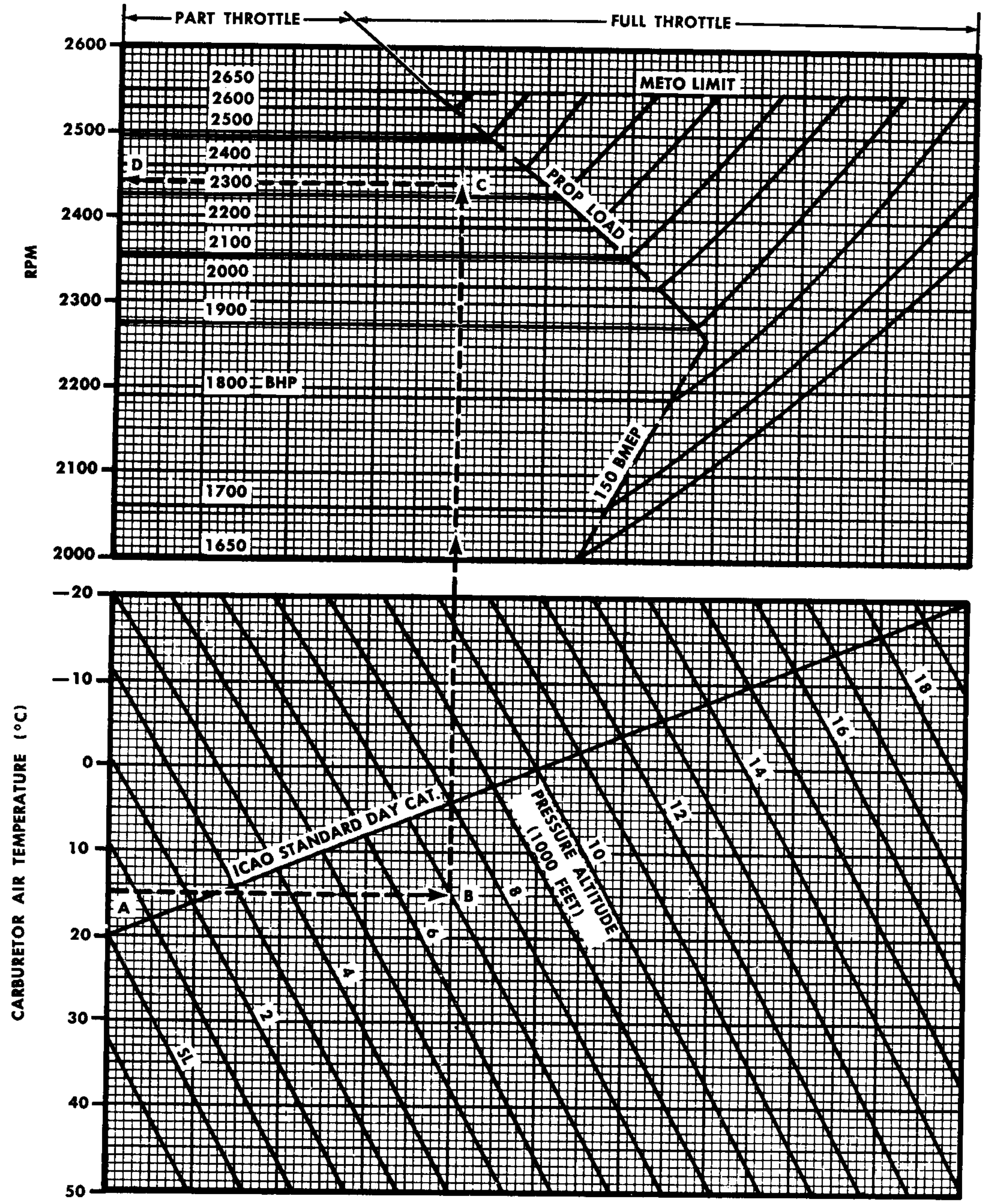
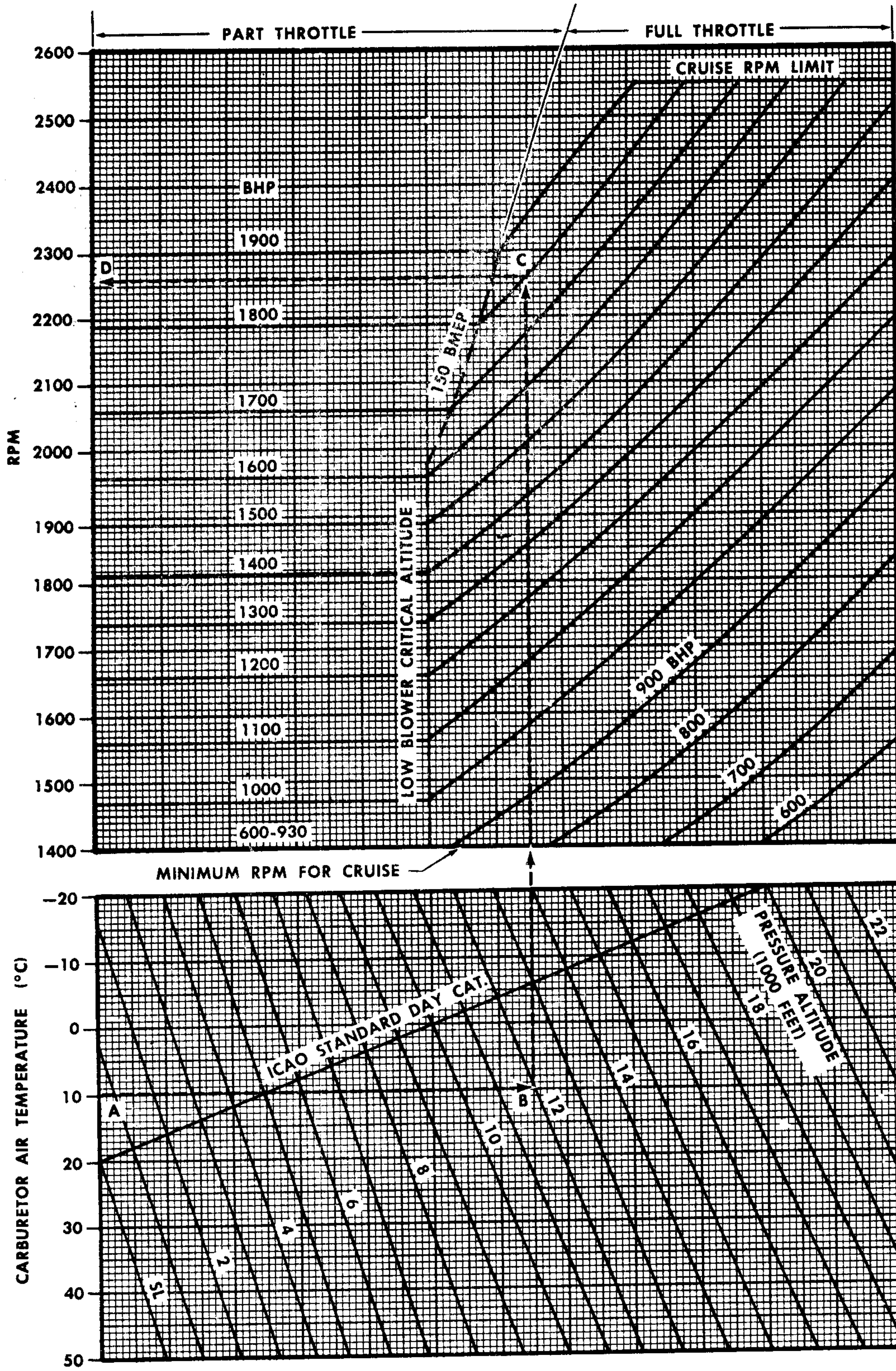


Figure B2-2. Brake Horsepower — RPM Schedule — Low Blower — Normal Mixture

BRAKE HORSEPOWER — RPM SCHEDULE
LOW BLOWER — MANUAL LEAN MIXTURE

MODEL: C-124A
DATE: 10-15-61
DATA BASIS: FLIGHT TEST

ENGINES: (4) P & W 4360-20W
FUEL GRADE: 115/145 & 100/130



NOTE:
1. This chart must be used in conjunction with the Low Blower—MANUAL—LEAN MIXTURE BHP—MAP. Schedule.
2. Carburetor air temperature = OAT. +5°C.
3. Do not exceed 1650 BHP with 100/130 grade fuel.
4. Method of obtaining desired brake horsepower outlined in Part 7 (Mission Planning, Cruise).

SAMPLE PROBLEM:
A. Indicated CAT. = 10°C.
B. Pressure altitude = 12,000 feet.
C. Desired BHP = 1800.
D. RPM setting = 2260 (full throttle).

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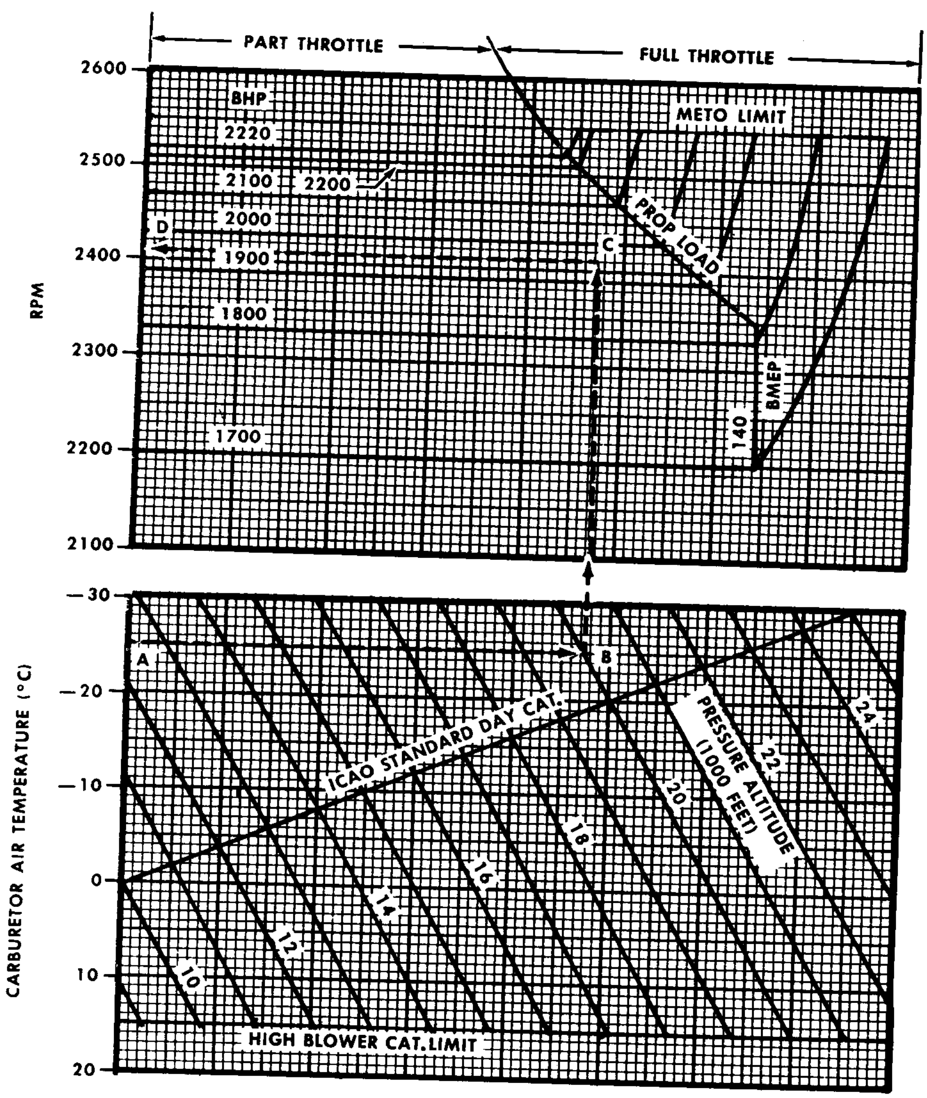
Figure B2-3. Brake Horsepower — RPM Schedule — Low Blower — Manual Lean Mixture

BRAKE HORSEPOWER — RPM SCHEDULE
HIGH BLOWER — NORMAL MIXTURE

MODEL: C-124A
DATE: 10-15-61
DATA BASIS: ESTIMATED

ENGINES: (4) P & W 4360-20W
FUEL GRADES: 115/145 & 100/130

NOTE:
1. This chart must be used in conjunction with the High Blower—NORMAL MIXTURE BHP-MAP. Schedule.
2. Carburetor air temperature = OAT. + 5°C.
3. Do not exceed 2100 BHP with 100/130 fuel grade.
4. Method of obtaining desired brake horsepower outlined in Part 7 (Mission Planning, Cruise).



SAMPLE PROBLEM:
A. Indicated CAT. = −25°C.
B. Pressure altitude = 20,000 feet.
C. Desired BHP = 1950.
D. RPM setting = 2410 (part throttle).

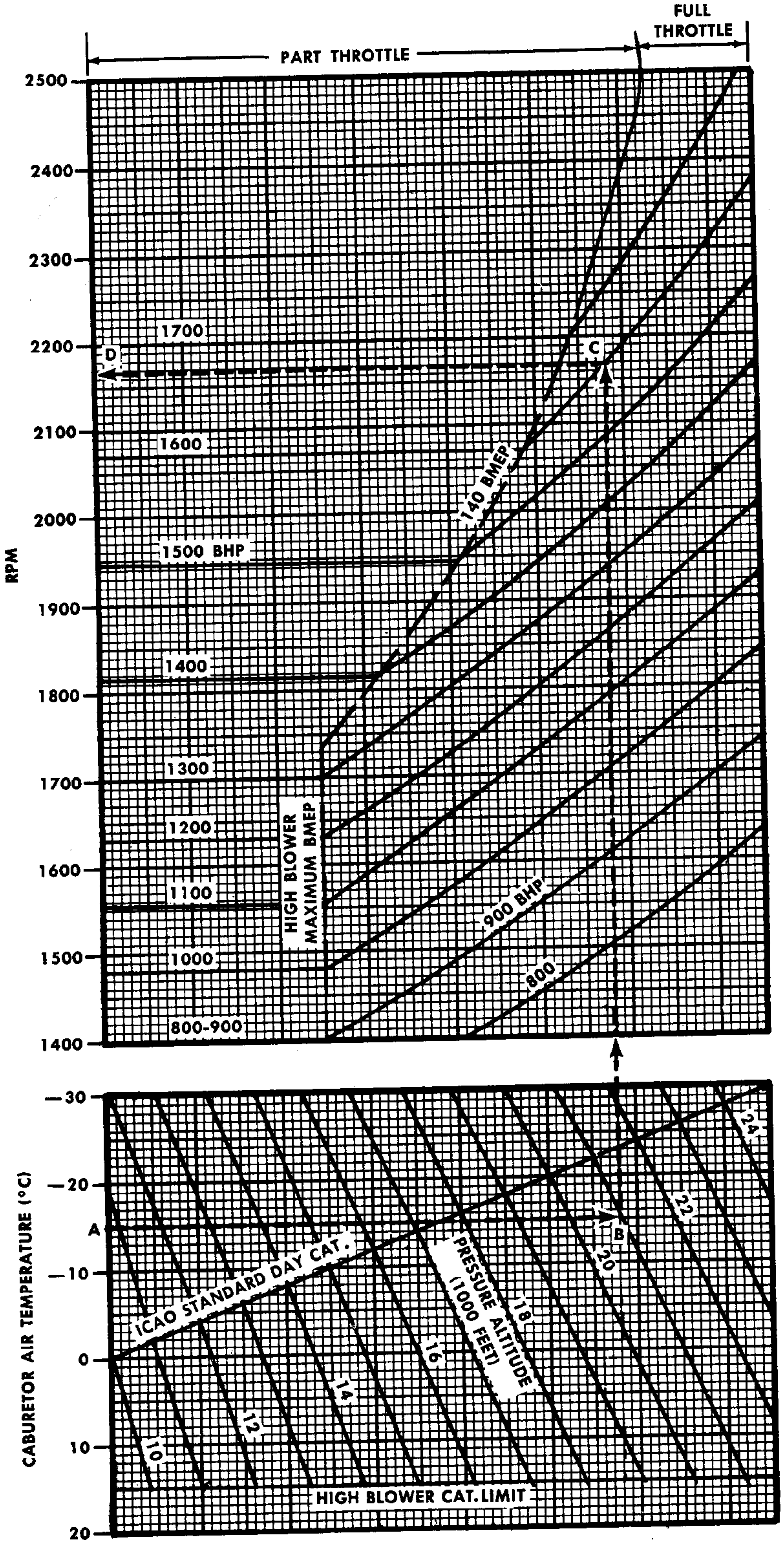
R1-366

Figure B2-4. Brake Horsepower — RPM Schedule — High Blower — Normal Mixture

BRAKE HORSEPOWER — RPM SCHEDULE
HIGH BLOWER
MANUAL LEAN MIXTURE

MODEL: C-124A
DATE: 10-15-61
DATA BASIS: ESTIMATED

ENGINES: (4) P & W R4360-20W
FUEL GRADE: 115/145 & 100/130



NOTE:
1. This chart must be used in conjunction with the High Blower — MANUAL LEAN MIXTURE BHP-MAP. Schedule.
2. Carburetor air temperature = OAT. +5°C.
3. Do not exceed 1510 BHP with 100/130 fuel grade.
4. Method of obtaining desired BHP outlined in Part 7 (Mission Planning, Cruise).

SAMPLE PROBLEM:
A. Indicated CAT. = −15°C.
B. Pressure altitude = 21,000 feet.
C. Desired BHP = 1600.
D. RPM setting = 2170 (full throttle).

R1-367

Figure B2-5. Brake Horsepower — RPM Schedule — High Blower — Manual Lean Mixture

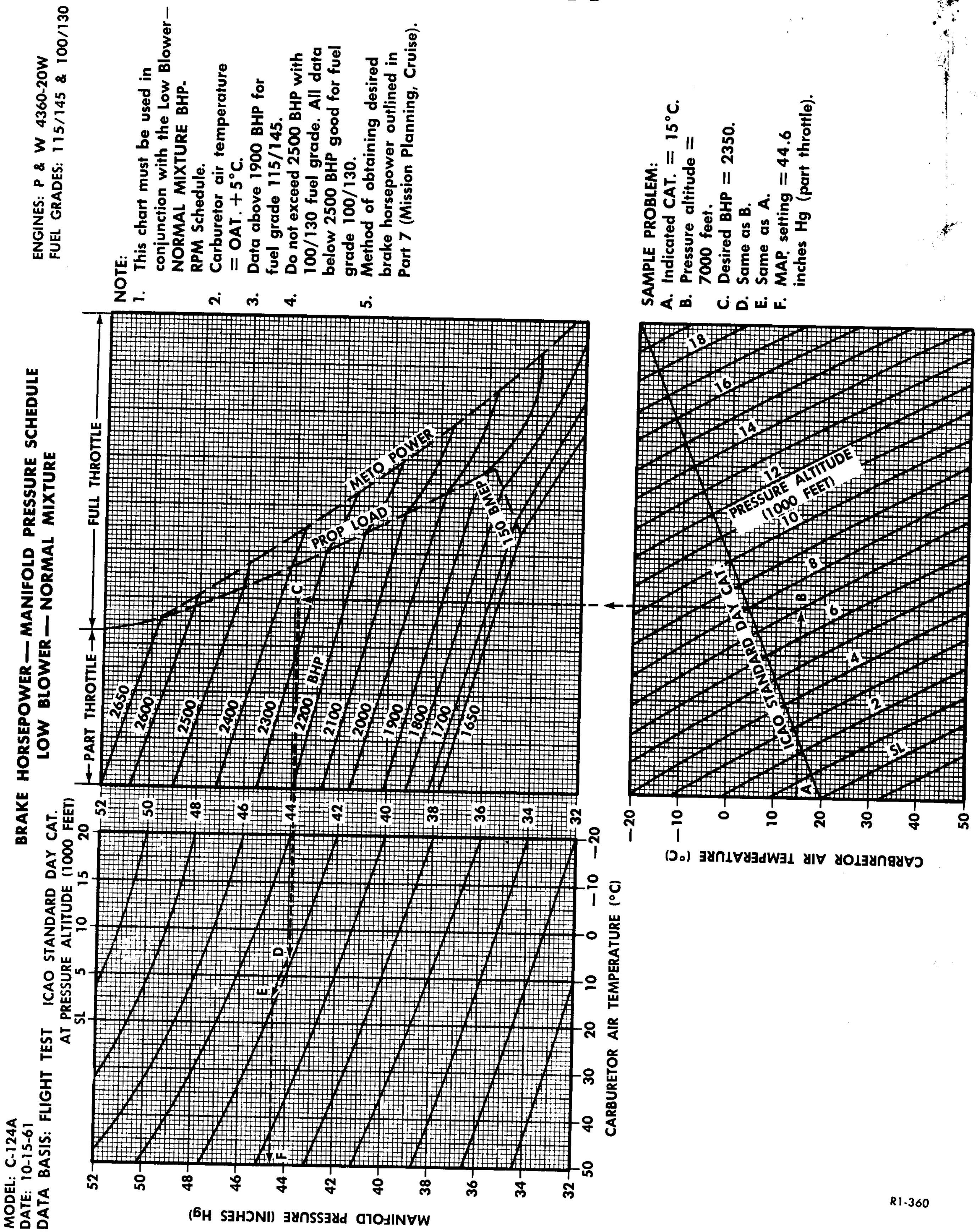


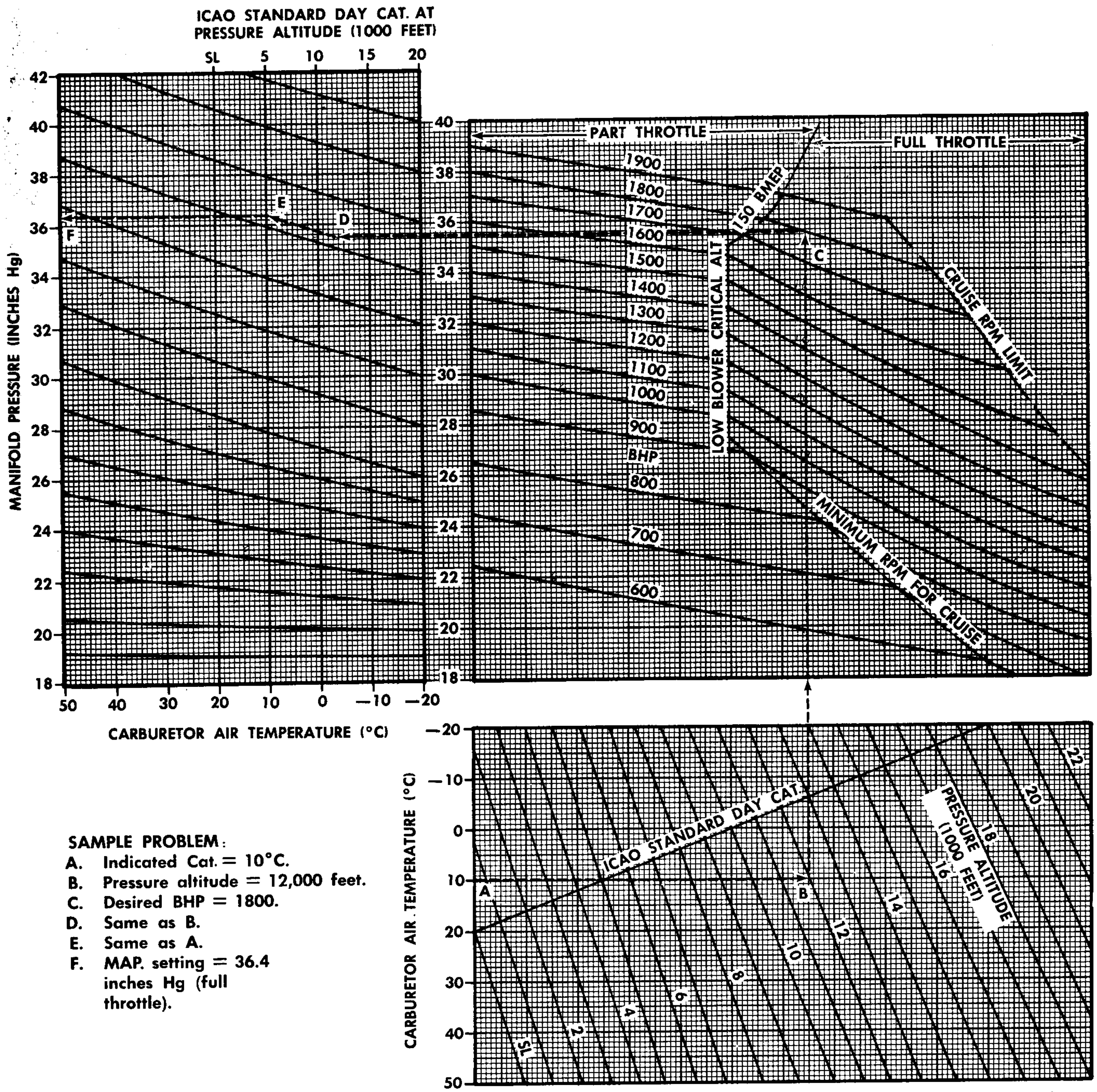
Figure B2-6. Brake Horsepower — Manifold Pressure Schedule — Low Blower — Normal Mixture

BRAKE HORSEPOWER — MANIFOLD PRESSURE SCHEDULE
LOW BLOWER
MANUAL LEAN MIXTURE

MODEL: C-124A
DATE: 10-15-61
DATA BASIS: FLIGHT TEST

ENGINES: (4) P & W 4360-20W
FUEL GRADES: 115/145 & 100/130

NOTE:
1. This chart must be used in conjunction with the Low Blower — MANUAL LEAN MIXTURE BHP-RPM Schedule.
2. Carburetor air temperature = OAT. +5°C.
3. Do not exceed 1650 BHP with 100/130 fuel grade.
4. Method of obtaining desired brake horsepower outlined in Part 7 (Mission Planning, Cruise).



SAMPLE PROBLEM:
- A. Indicated Cat. = 10°C.
- B. Pressure altitude = 12,000 feet.
- C. Desired BHP = 1800.
- D. Same as B.
- E. Same as A.
- F. MAP. setting = 36.4 inches Hg (full throttle).

Figure B2-7. Brake Horsepower — Manifold Pressure Schedule — Low Blower — Manual Lean Mixture

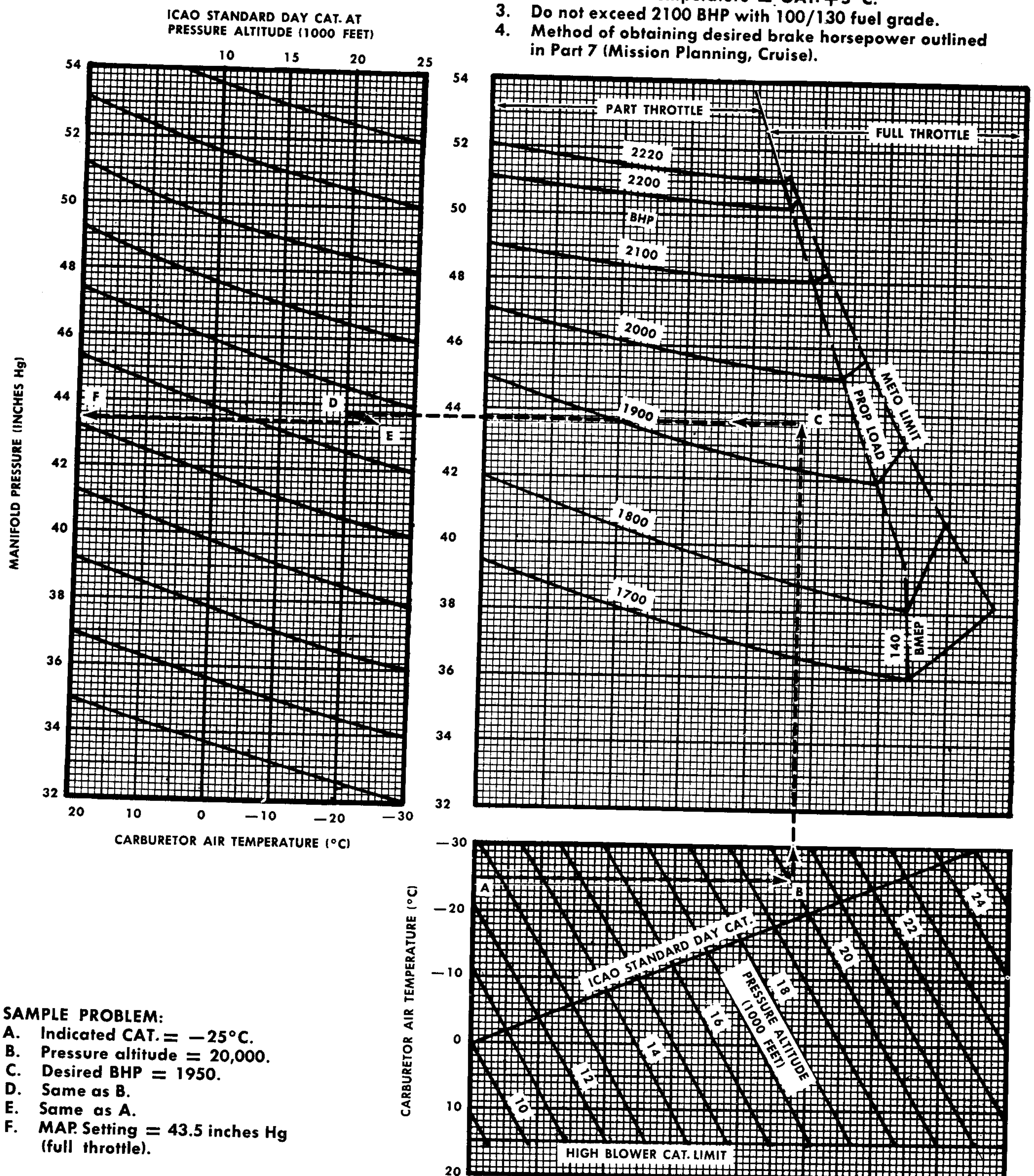
R1-361

BRAKE HORSEPOWER — MANIFOLD PRESSURE SCHEDULE
HIGH BLOWER — NORMAL MIXTURE

MODEL: C-124A
DATE: 10-15-61
DATA BASIS: ESTIMATED

ENGINES: (4) P & W 4360-20W
FUEL GRADES: 115/145 & 100/130

NOTE:
1. This chart must be used in conjunction with the High Blower — NORMAL MIXTURE BHP-RPM Schedule.
2. Carburetor air temperature = OAT. + 5°C.
3. Do not exceed 2100 BHP with 100/130 fuel grade.
4. Method of obtaining desired brake horsepower outlined in Part 7 (Mission Planning, Cruise).



SAMPLE PROBLEM:
- A. Indicated CAT. = −25°C.
- B. Pressure altitude = 20,000.
- C. Desired BHP = 1950.
- D. Same as B.
- E. Same as A.
- F. MAP. Setting = 43.5 inches Hg (full throttle).

Figure B2-8. Brake Horsepower — Manifold Pressure Schedule — High Blower — Normal Mixture

R1-368

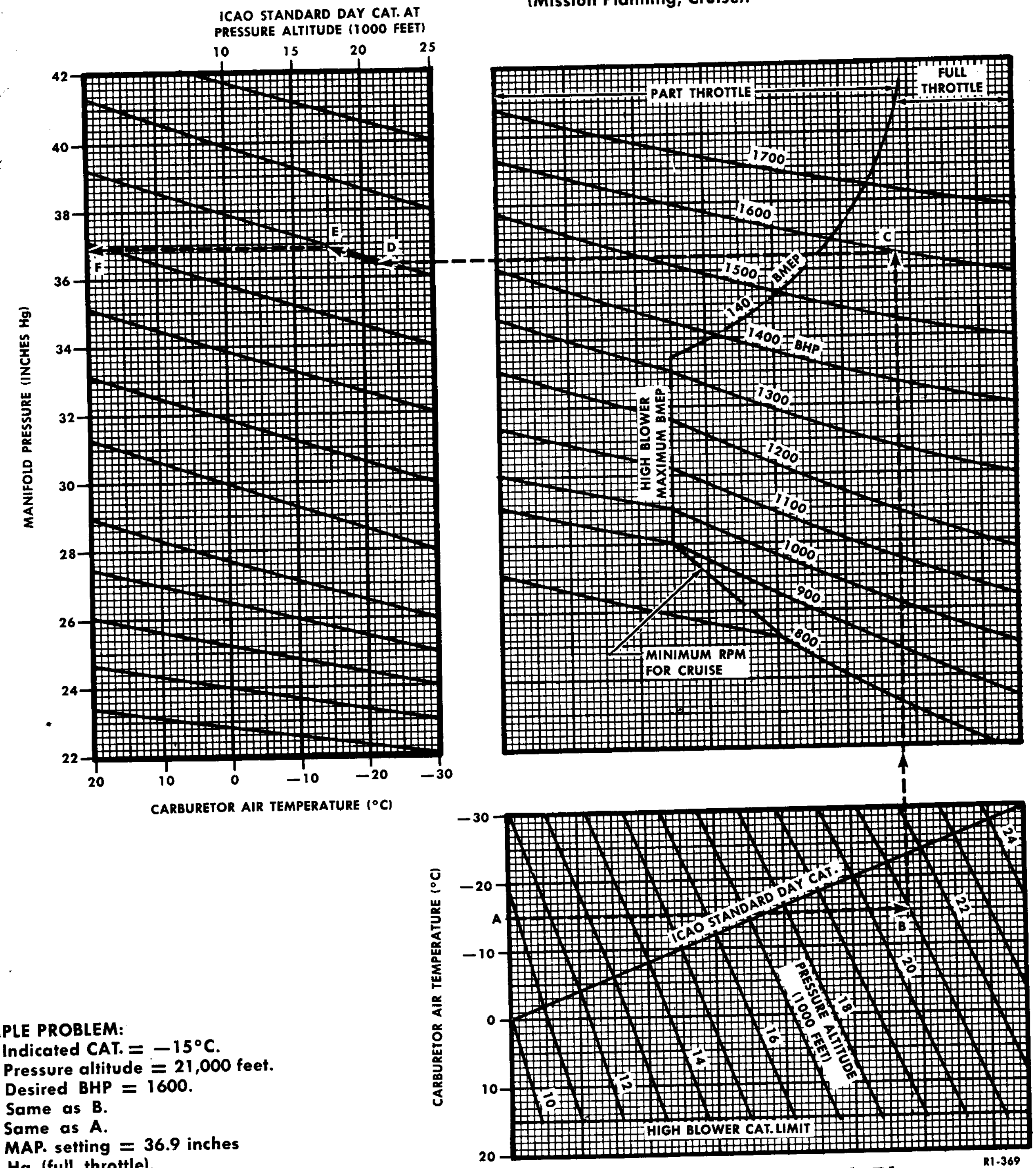
BRAKE HORSEPOWER — MANIFOLD PRESSURE SCHEDULE
HIGH BLOWER
MANUAL LEAN MIXTURE

MODEL: C-124A
DATE: 10-15-61
DATA BASIS: ESTIMATED

ENGINES: (4) P & W R4360-20W
FUEL GRADE: 115/145 & 100/130

NOTE:

1. This chart must be used in conjunction with the High Blower — MANUAL LEAN MIXTURE BHP-RPM Schedule.
2. Carburetor air temperature = OAT. +5°C.
3. Do not exceed 1510 BHP with 100/300 grade fuel.
4. Method of obtaining desired brake horsepower outlined in Part 7 (Mission Planning, Cruise).



SAMPLE PROBLEM:

A. Indicated CAT. = −15°C.
B. Pressure altitude = 21,000 feet.
C. Desired BHP = 1600.
D. Same as B.
E. Same as A.
F. MAP. setting = 36.9 inches Hg (full throttle).

Figure B2-9. Brake Horsepower — Manifold Pressure Schedule — High Blower — Manual Lean Mixture

TORQUE PRESSURE Vs RPM AND BHP

MODEL: C-124A
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

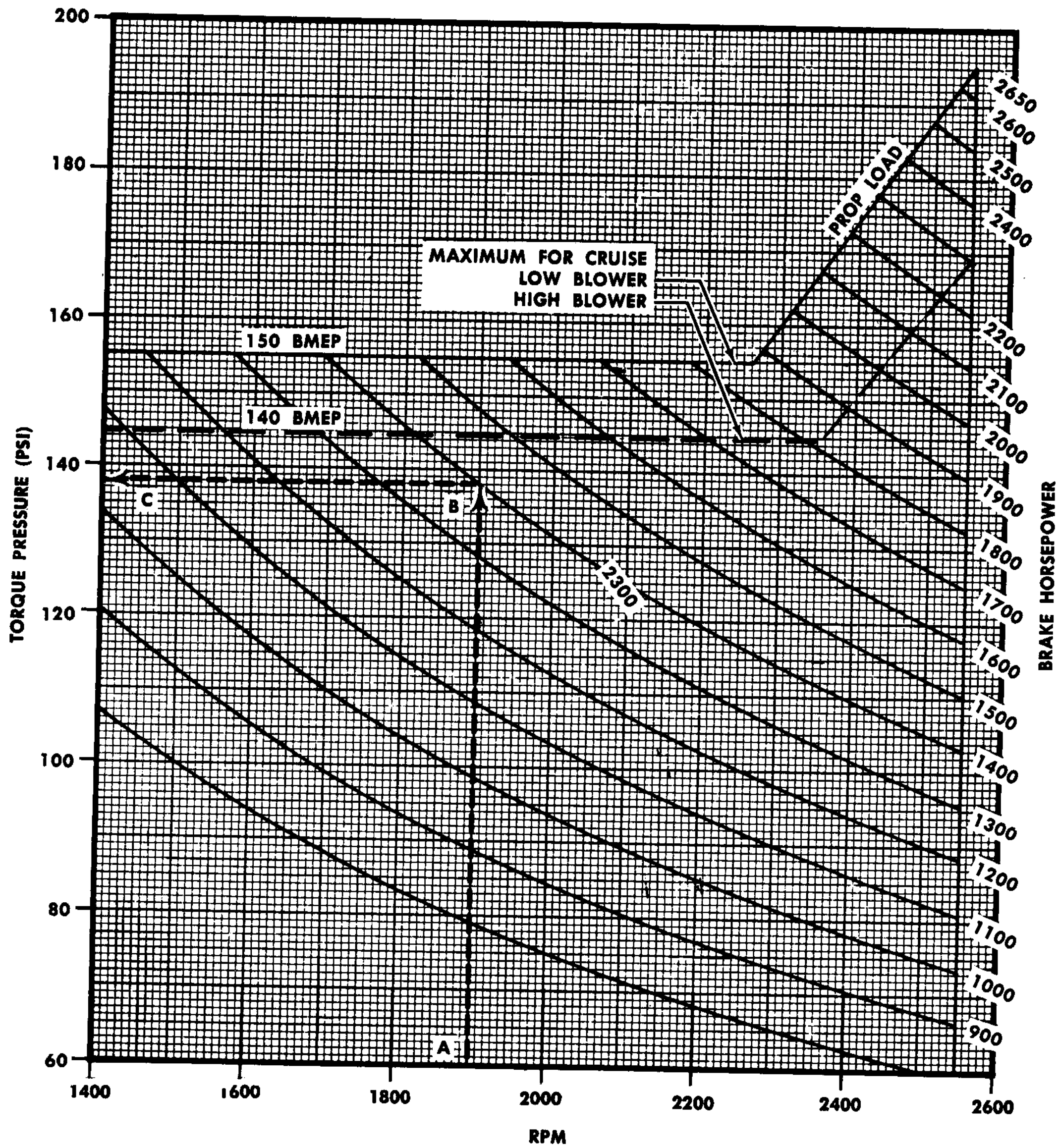
ENGINES: (4) P&W 4360-20WD
FUEL GRADE: 115/145 & 100/130

NOTE:

1. $TP = \frac{BHP}{0.00533 \times RPM}$
2. $BMEP = 181.65 \frac{BHP}{RPM}$
3. $BMEP = 0.9682 \times TP$
4. Do not exceed 2500 BHP in low blower nor 2100 BHP in high blower with 100/130 fuel grade.

SAMPLE PROBLEM:

A. RPM = 1900.
B. BHP = 1400.
C. Torque pressure = 138 PSI.



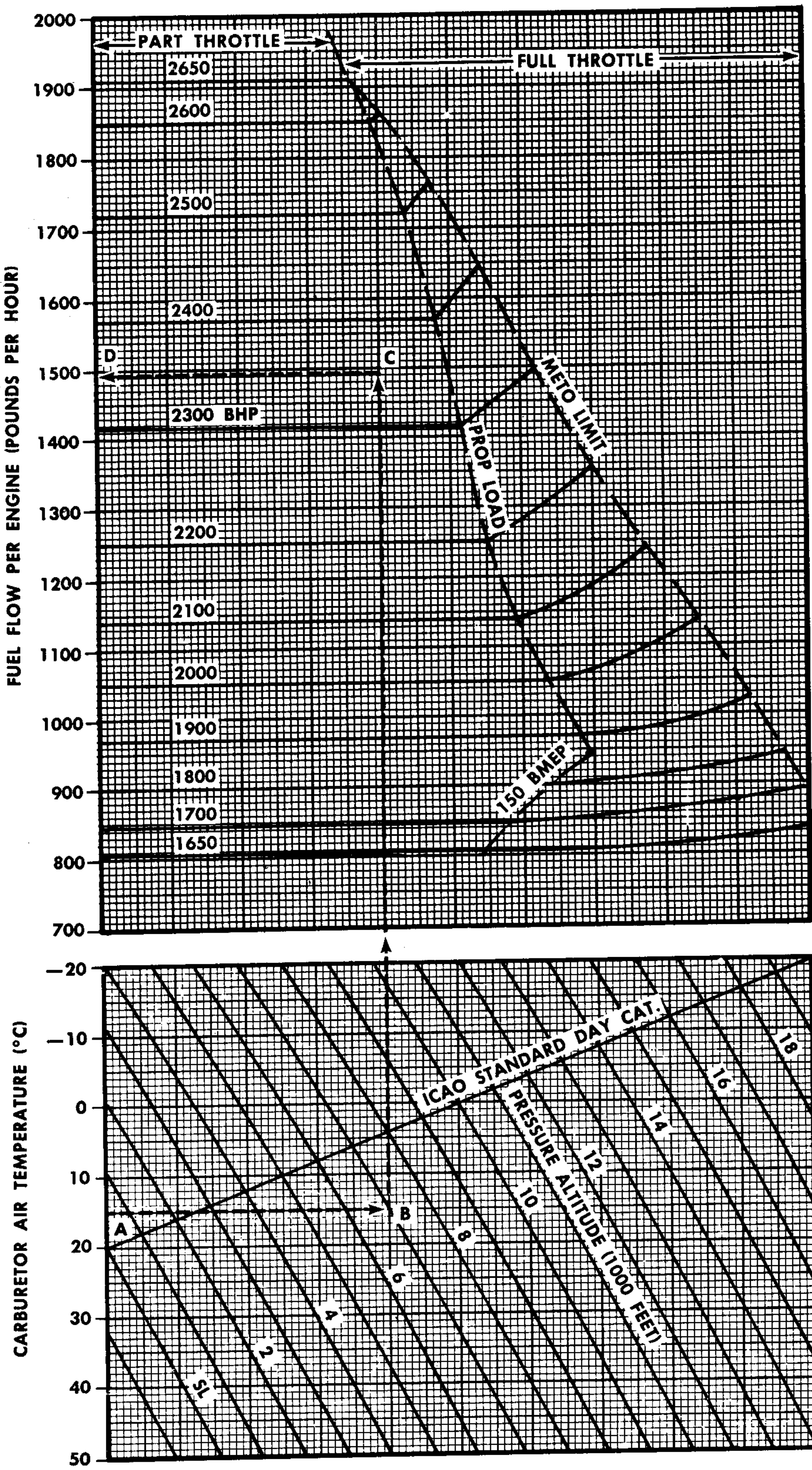
R1-73

Figure B2-10. Torque Pressure and BMEP versus RPM and BHP

FUEL FLOW
LOW BLOWER — NORMAL MIXTURE
FUEL GRADES: 115/145 & 100/130

MODEL: C-124A
DATE: 10-15-61
DATA BASIS: FLIGHT TEST

ENGINES: (4) P & W 4360-20W



NOTE:
1. This chart must be used in conjunction with the Low Blower—NORMAL MIXTURE BHP—RPM Schedule.
2. Carburetor air temperature = OAT. +5°C.
3. Data above 1900 BHP for fuel grade 115/145.
4. Do not exceed 2500 BHP with 100/130 fuel grade. All data below 2500 BHP good for fuel grade 100/130.
5. Method of obtaining desired brake horsepower outlined in Part 7 (Mission Planning, Cruise).

SAMPLE PROBLEM:
A. Indicated CAT. = 15°C.
B. Pressure altitude = 7000 feet.
C. Desired BHP = 2350.
D. Fuel flow = 1495 pounds per hour (part throttle).

R1-362

Figure B2-11. Fuel Flow — Low Blower — Normal Mixture — Fuel Grades 115/145 & 100/130

FUEL FLOW
LOW BLOWER — MANUAL LEAN MIXTURE
FUEL GRADES 115/145 & 100/130

MODEL: C-124A
DATE: 10-15-61
DATA BASIS: FLIGHT TEST

ENGINES: (4) P & W R4360-20W

NOTE:
1. This chart must be used in conjunction with the Low Blower — MANUAL LEAN MIXTURE BHP—RPM Schedule.
2. Carburetor air temperature = OAT. +5°C.
3. Do not exceed 1650 BHP with 100/130 fuel grade.
4. Method of obtaining desired brake horsepower outlined in Part 7 (Mission Planning, Cruise).

SAMPLE PROBLEM:
A. Indicated CAT. = 10°C.
B. Pressure altitude = 12,000 feet.
C. Desired BHP = 1800.
D. Fuel flow per engine = 830 pounds per hour (full throttle).

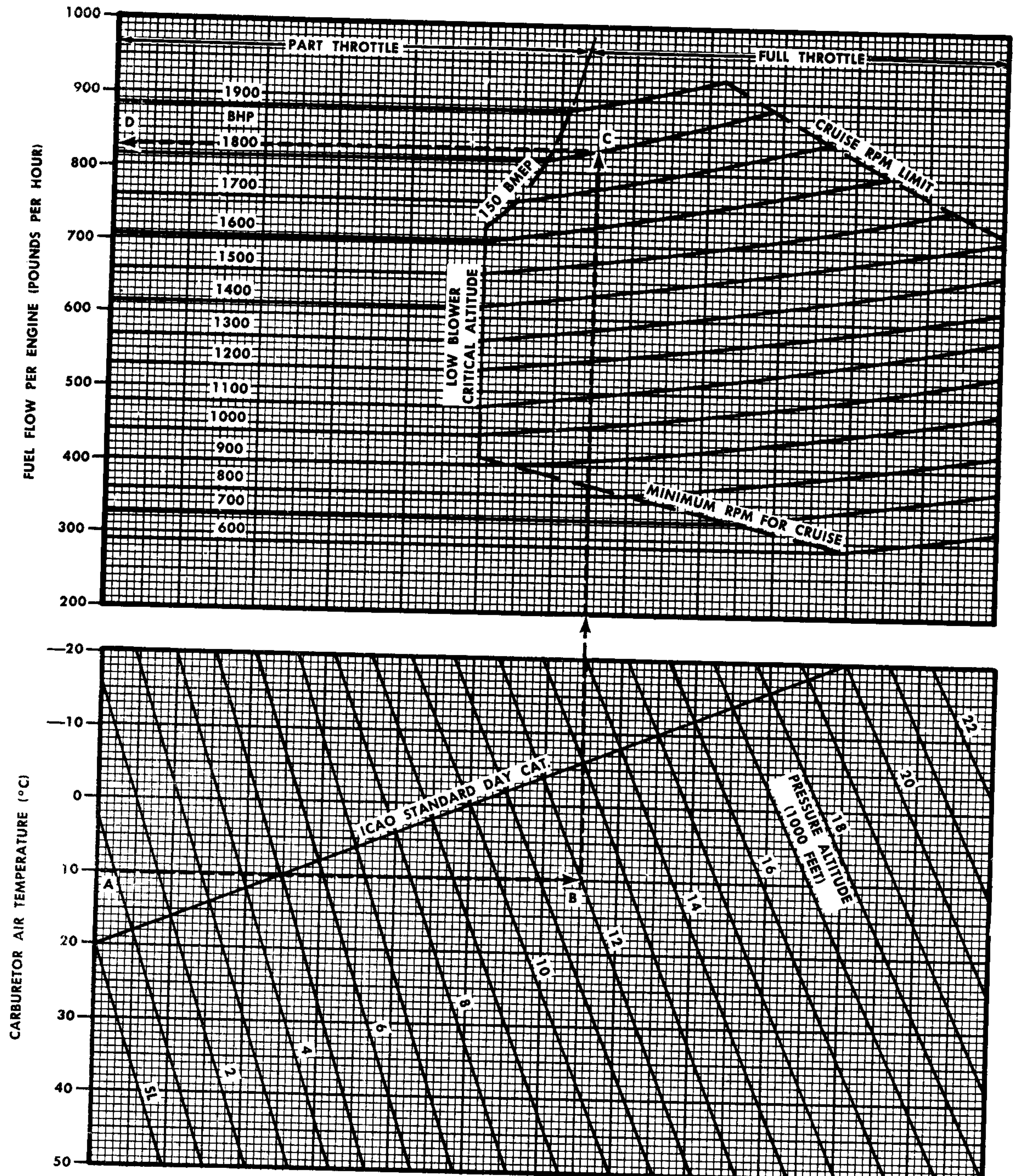


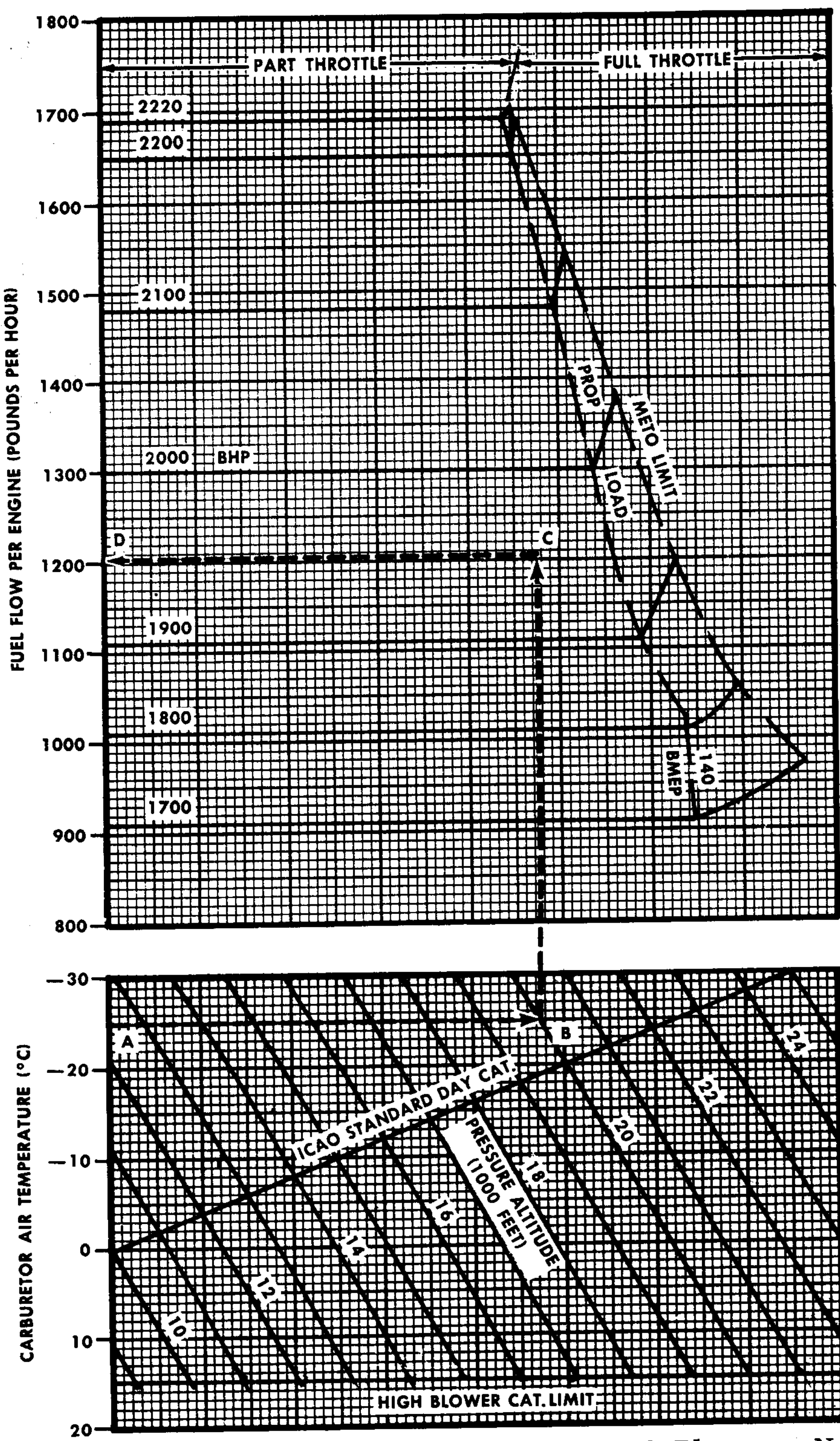
Figure B2-12. Fuel Flow — Low Blower — Manual Lean Mixture — Fuel Grades 115/145 & 100/130

R1-363

FUEL FLOW
HIGH BLOWER — NORMAL MIXTURE
FUEL GRADE 115/145 & 100/130

ENGINES: (4) P & W R4360-20W

MODEL: C-124A
DATE: 10-15-61
DATA BASIS: ESTIMATED



NOTES:

1. This chart must be used in conjunction with the High Blower — NORMAL MIXTURE BHP—RPM Schedule.
2. Carburetor air temperature = OAT. +5°C.
3. Do not exceed 2100 BHP with 100/130 fuel grade.
4. Method of obtaining desired brake horsepower outlined in Part 7 (Mission Planning, Cruise).

SAMPLE PROBLEM:

A. Indicated Cat. = − 25°C.
B. Pressure altitude = 20,000 feet.
C. Desired BHP = 1950.
D. Fuel flow = 1205 pounds per hour (part throttle).

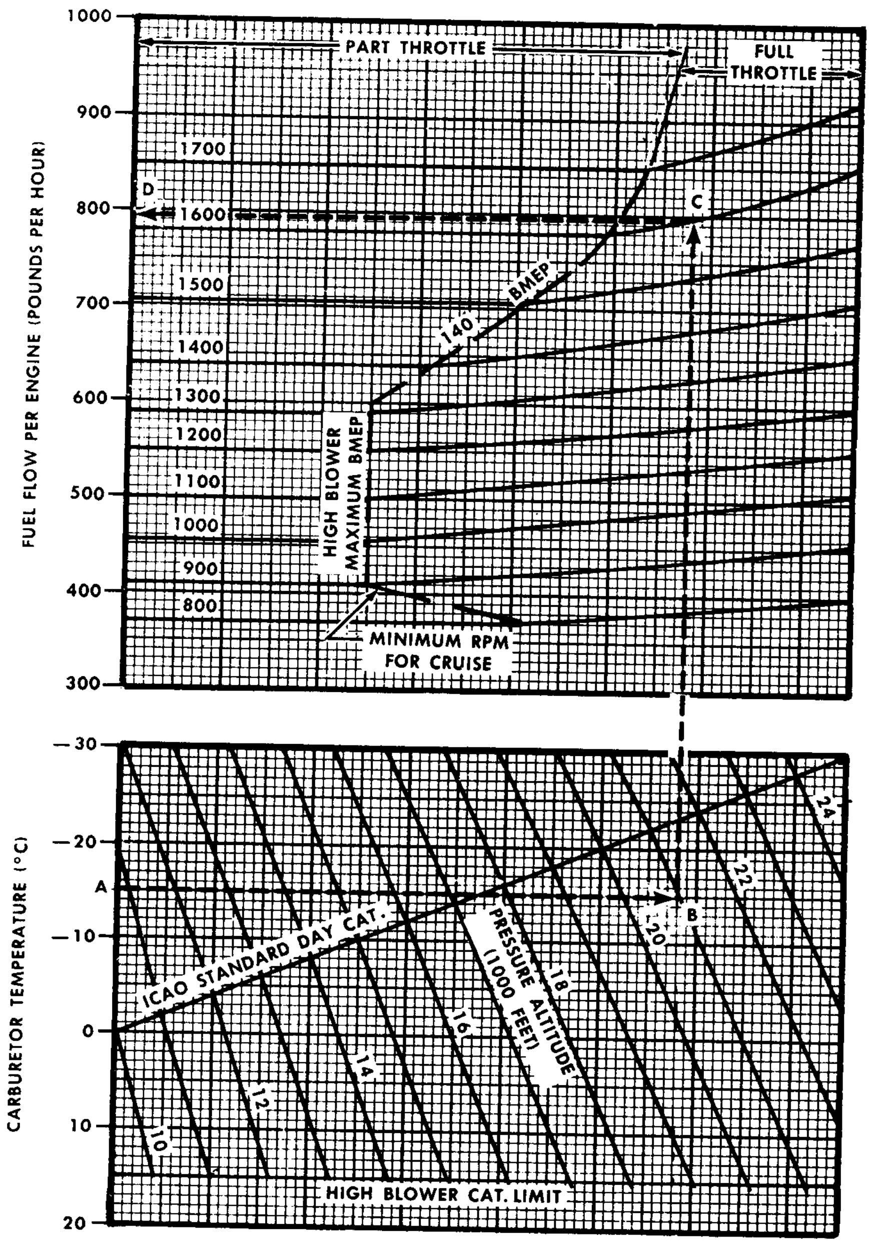
R1-370

Figure B-13. Fuel Flow — High Blower — Normal Mixture — Fuel Grades 115/145 & 100/130

FUEL FLOW
HIGH BLOWER — MANUAL LEAN MIXTURE
FUEL GRADE 115/145 & 100/130

MODEL: C-124A
DATE: 10-15-61
DATA BASIS: ESTIMATED

ENGINES (4) P & W R4360-20W



NOTE:
1. This chart must be used in conjunction with the High Blower — MANUAL LEAN MIXTURE BHP—RPM Schedule.
2. Carburetor air temperature = OAT. +5°C.
3. Do not exceed 1510 BHP with 100/130 fuel grade.
4. Method of obtaining desired brake horsepower outlined in Part 7 (Mission Planning, Cruise).

SAMPLE PROBLEM:
A. Indicated CAT. = −15°C.
B. Pressure altitude = 21,000 ft.
C. Desired BHP = 1600.
D. Fuel flow per engine = 795 pounds per hour (full throttle).

Figure B2-14. Fuel Flow — High Blower — Manual Lean Mixture — Fuel Grades 115/145 & 100/130

R1-371

HEATER FUEL CONSUMPTION

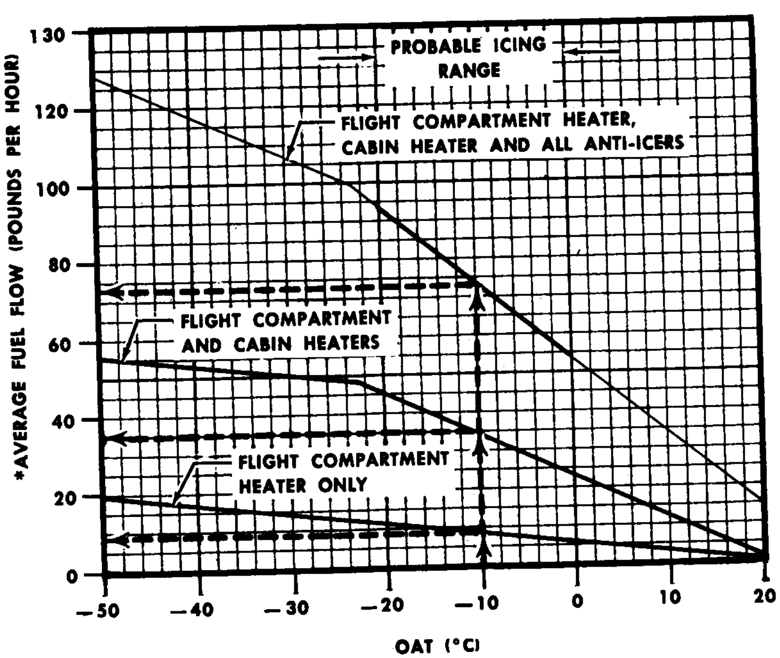
MODEL: C-124A/C
DATE: 12-15-63
DATA BASIS: ESTIMATED

ENGINES: (4) P&W 4360-20WD/-63A
FUEL GRADE: 115/145 & 100/130

LEGEND:
——— T.O. 1C-124-336 INCORPORATED
– – – T.O. 1C-124-336 NOT INCORPORATED

NOTES:
1. Values of average fuel flow are based on 175 knots IAS cruise at 10,000 feet altitude.
*2. Add 10 pounds per hour for windshield heater.

AF49-232 THROUGH AF50-1268



AF51-73 AND SUBSEQUENT

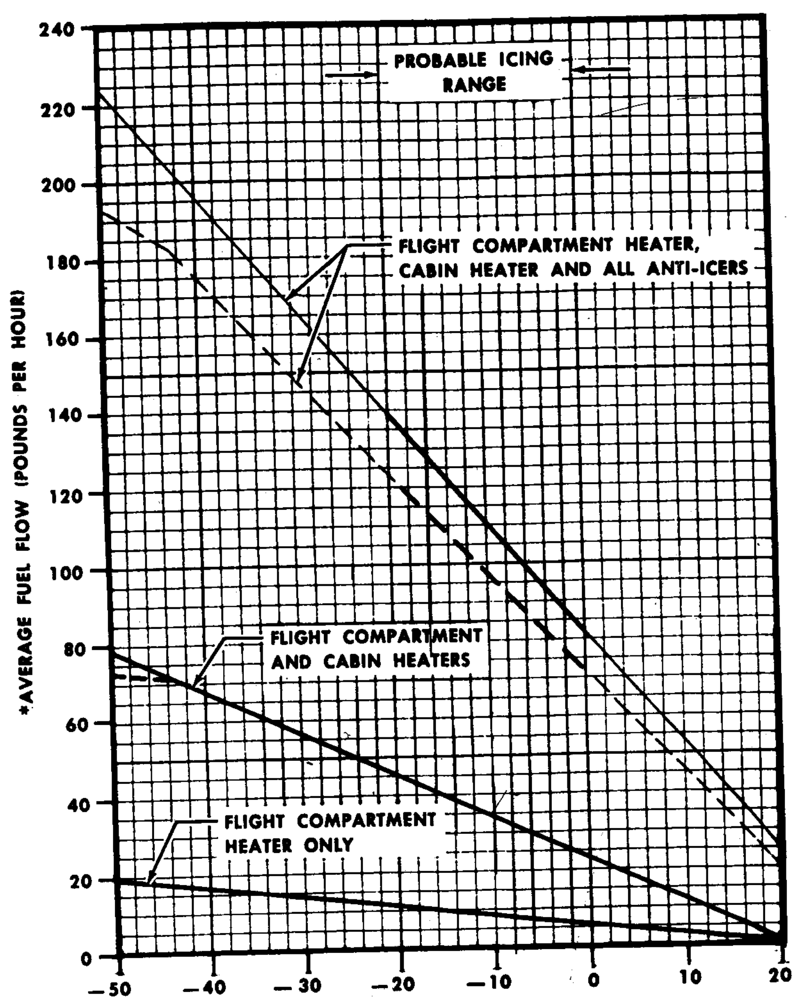


Figure B2-15. Heater Fuel Consumption

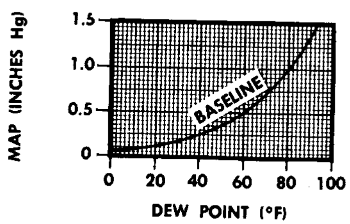
MAXIMUM BRAKE HORSEPOWER — WET

FUEL GRADE 115/145
2700 RPM

MODEL: C-124A
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-20WD
FUEL GRADE: 115/145.

ALLOWABLE INCREASE IN MAP DUE TO HUMIDITY (PART THROTTLE OPERATION ONLY)



SAMPLE PROBLEM 1:

A. Pressure altitude = 2000 feet.
B. CAT = 20°C; MAP = 58.6 inches Hg (full throttle low blower range).
C. Dew point correction baseline.
D. Dew point temperature = 40°F.
E. Humidity correction baseline (no correction for full throttle).
F. Predicted power variation = 0%.
G. Predicted torque pressure = 219.5 PSI.
H. Predicted power = 3160 brake horsepower.
J. Reject power variation = −5%.
K. Reject torque pressure = 209 PSI.

SAMPLE PROBLEM 2:

L. Pressure altitude = 750 feet.
M. CAT = −20°C; MAP = 61.8 inches Hg (part throttle low blower range).
N. Dew point correction baseline. For this CAT dew point = 0°F.
O. Manifold pressure correction baseline.
P. Manifold pressure correction = −2.5 inches Hg. Corrected manifold pressure for 3500 brake horsepower limit = 61.8 −2.5 = 59.3 inches Hg.
Q. Predicted power variation = 0%. Predicted torque pressure = 243 PSI limit. Predicted power = 3500 brake horsepower.
R. Reject power variation = −5%.
S. Reject torque pressure = 231 PSI.

NOTE:

1. Maximum allowable manifold pressure = 62 inches at sea level (see note 2).
2. Part throttle MAP may be increased up to 1.5 inches Hg due to existing vapor pressure.
3. Wet power operation is limited to OAT's above the freezing temperatures of the water-alcohol mixture in use.
4. Installation loss assumed = 60 brake horsepower.
5. Carburetor air temperature = OAT + 5°C.
6. All data shown for low blower only (High Blower for high altitude not practical).

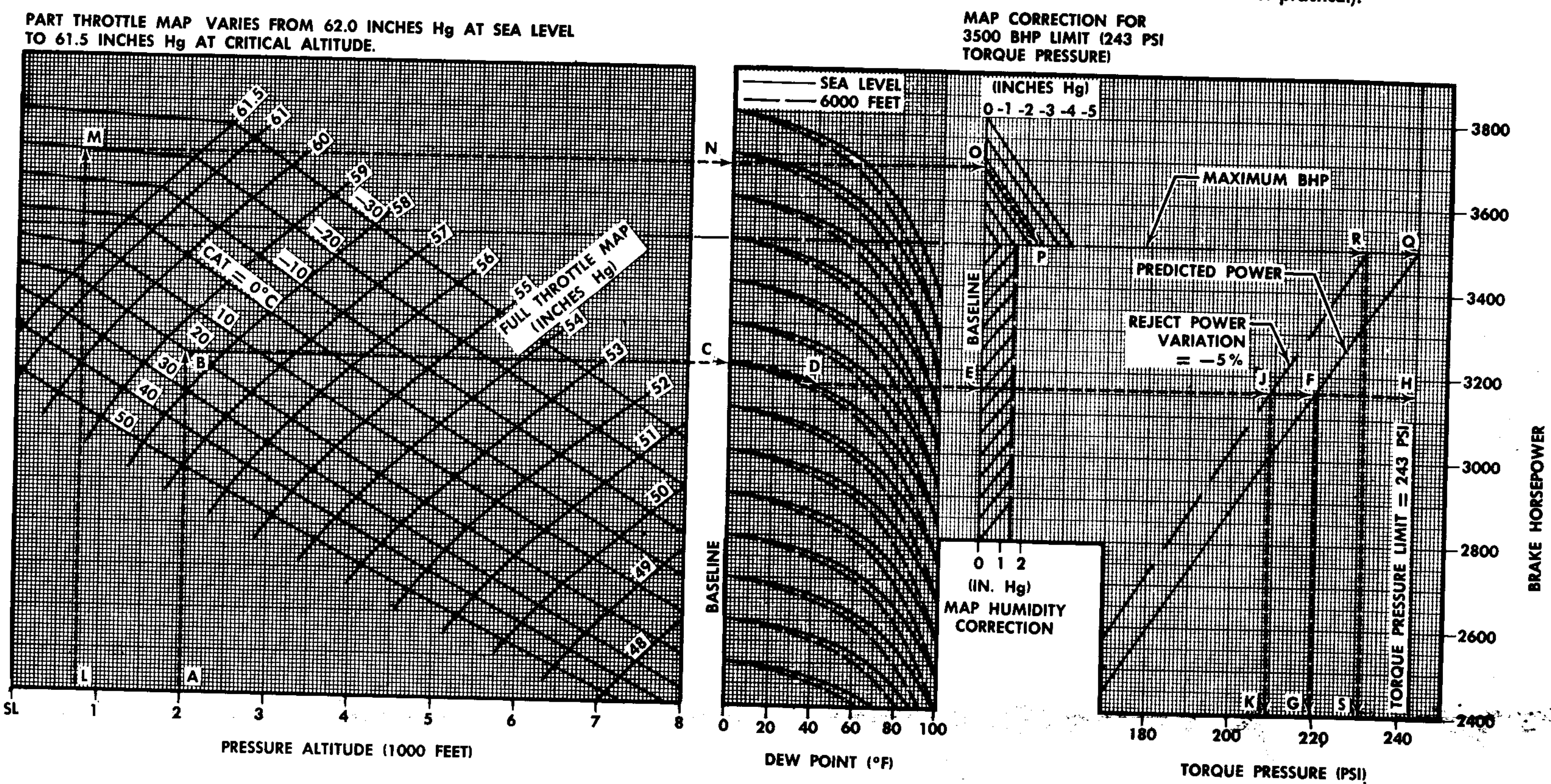


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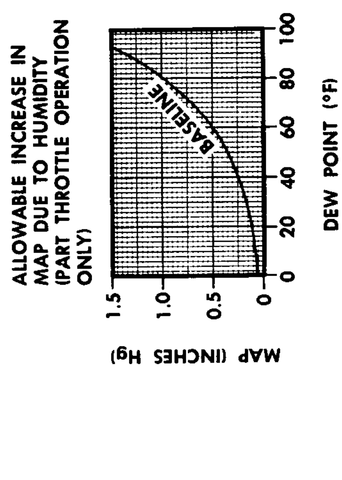
Figure B2-16. Maximum Brake Horsepower — Wet (Sheet 1 of 3)

ENGINES: (4) P&W 4360-20WD
[redacted]

MAXIMUM BRAKE HORSEPOWER — WET
FUEL GRADE 100/130
2700 RPM

MODEL: C-124A
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

NOTE:
1. Maximum allowable manifold pressure = 56 inches Hg at sea level (see note 2).
2. Part throttle MAP may be increased up to 1.5 inches Hg due to existing vapor pressure.
3. Wet power operation is limited to OAT's above the freezing temperatures of the water-alcohol mixture in use.
4. Installation loss assumed = 60 BHP.
5. Carburetor air temperature = OAT + 5°C.
6. All data shown for low blower only (High Blower for high altitude not practical).



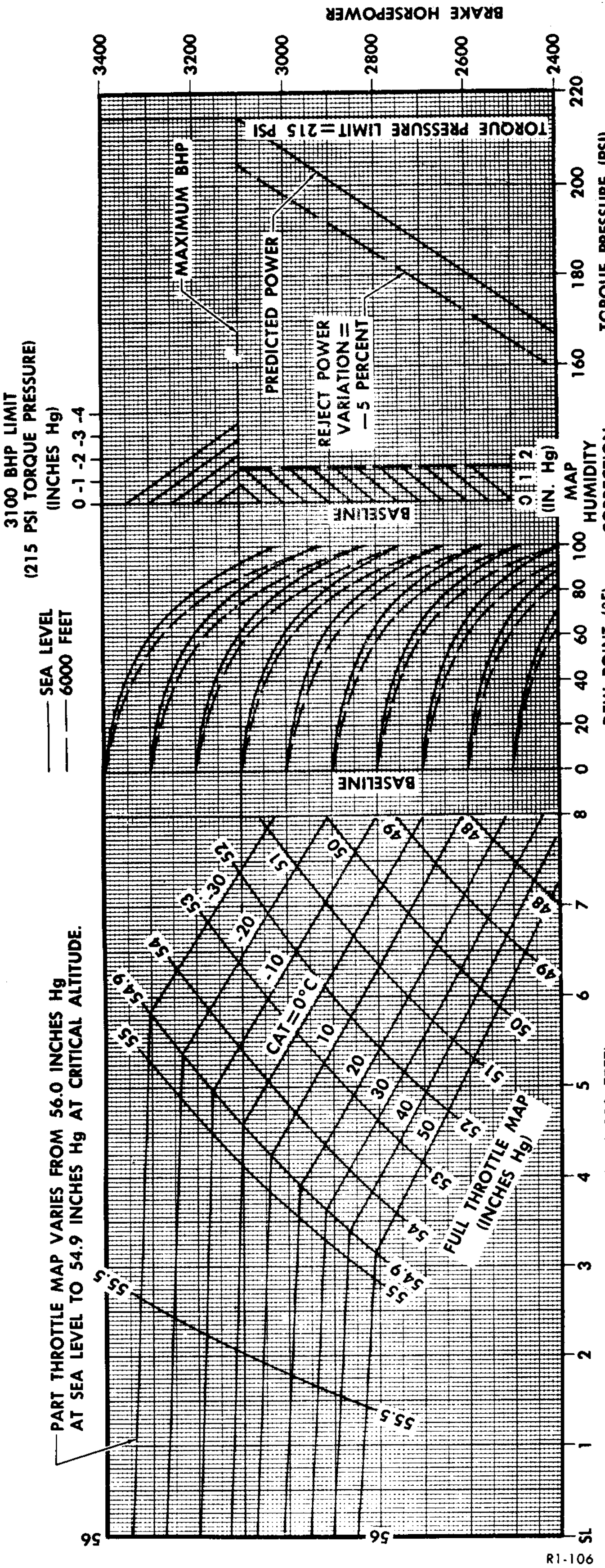


Figure B2-16. Maximum Brake Horsepower — Wet (Sheet 2 of 3)

ENGINES: (4) P&W 4360-20WD
FUEL GRADE: 115/145 & 100/130

MAXIMUM BRAKE HORSEPOWER — WET

FUEL GRADE 115/145 & 100/130
2700 RPM

NOTE:
1. Wet power operation is limited to OAT's above the freezing temperature of the water-alcohol mixture in use.
2. Installation loss assumed = 60 BHP.
3. Carburetor air temperature = OAT. +5°C.
4. All data shown for low blower only (High blower for high altitude not practical).

MODEL: C-124A
DATE: 12-15-63
DATA BASIS: ESTIMATED

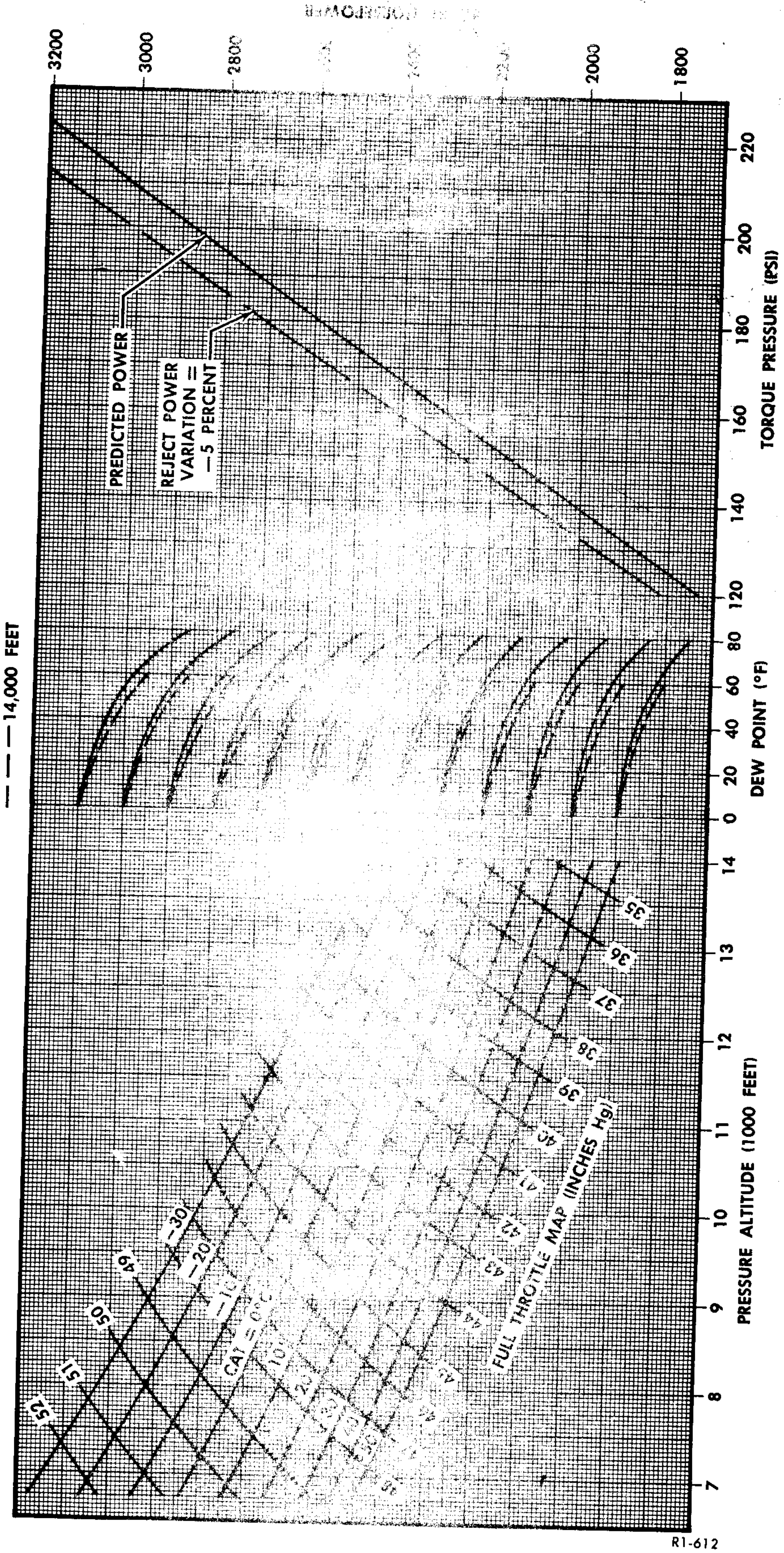


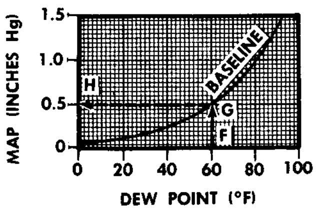
Figure B2-16. Maximum Brake Horsepower — Wet (Sheet 3 of 3)

MAXIMUM BRAKE HORSEPOWER — DRY

FUEL GRADE 115/145
2700 RPM

MODEL: C-124A
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-20WD
FUEL GRADE: 115/145



SAMPLE PROBLEM :

- A. Pressure altitude = 250 feet.
- B. CAT = +10°C; MAP = 61.4 inches Hg (part throttle).
- C. Dew point correction baseline.
- D. Dew point temperature = +60°F.
- E. Humidity correction baseline (see note 2).
- F. Same as D.
- G. Humidity correction baseline.
- H. Allowable MAP increase for humidity = +0.50 inches Hg. Corrected MAP = 61.4 + 0.50 = 61.9 inches Hg.
- J. Same as H.
- K. Predicted power variation = 0 percent.
- L. Predicted torque pressure = 217.5 PSI.
- M. Predicted power = 3135 BHP.
- N. Reject power variation = −5%.
- O. Reject torque pressure = 207.3 PSI.

NOTE:

1. Maximum allowable manifold pressure = 61.5 inches Hg at sea level (see note 2).
2. Part throttle MAP may be increased up to 1.5 inches Hg due to existing vapor pressure.
3. Installation loss assumed = 60 brake horsepower.
4. Carburetor air temperature = OAT + 5°C.
5. All data shown for low blower only (High Blower for high altitude not practical).

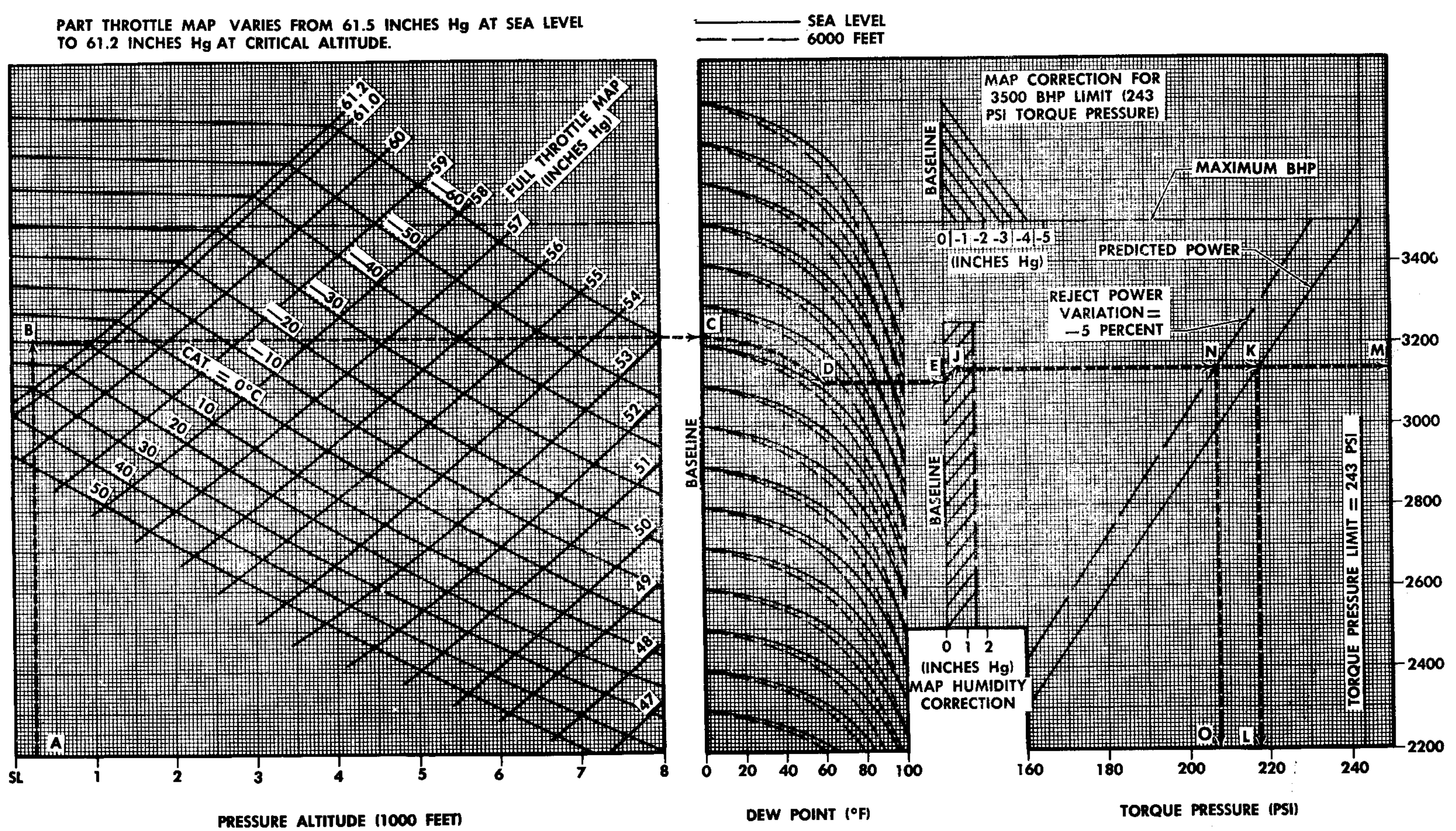


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Figure B2-17. Maximum Brake Horsepower — Dry (Sheet 1 of 3)

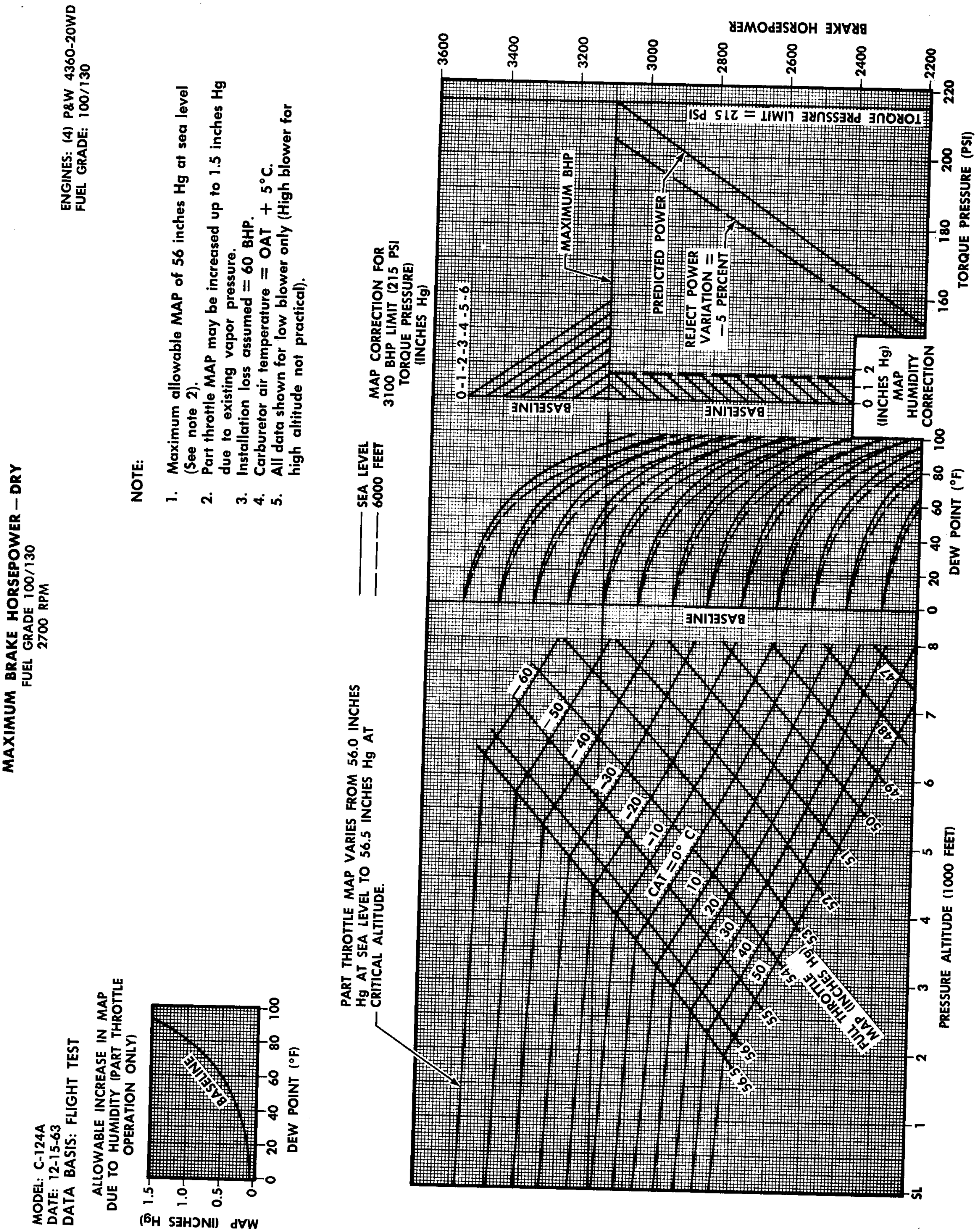

Figure B2-17. Maximum Brake Horsepower — Dry (Sheet 2 of 3)

MAXIMUM BRAKE HORSEPOWER — DRY
FUEL GRADE 115/145 & 100/130
2700 RPM

MODEL: C-124A
DATE: 12-15-63
DATA BASIS: ESTIMATED

ENGINES: (4) P&W 4360-20WD
FUEL GRADE: 115/145 & 100/130

NOTE:
1. Installation loss assumed = 60 BHP.
2. Carburetor air temperature = OAT +5°C.
3. All data shown for low blower only (High blower for high altitude not practical).

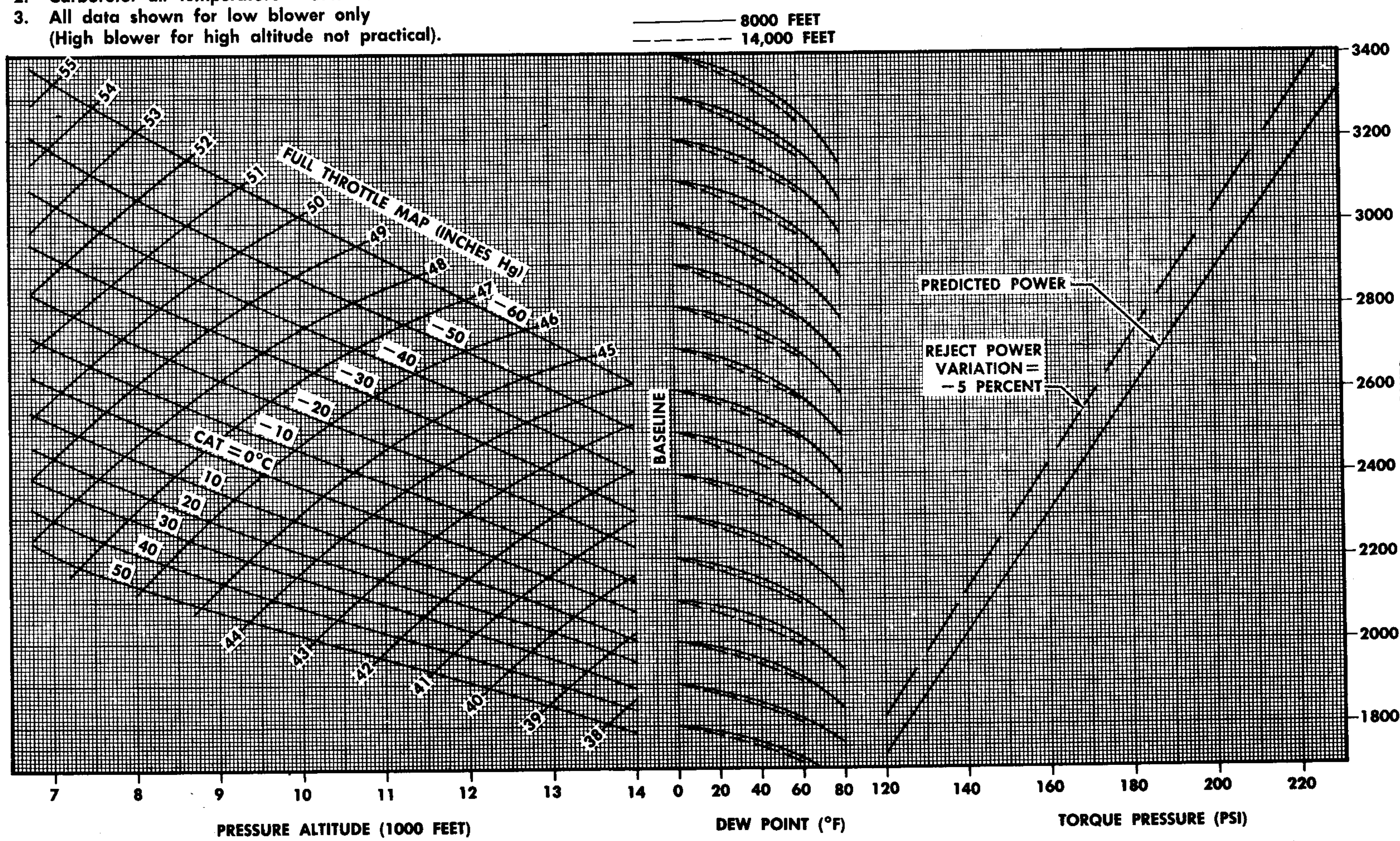

Figure B2-17. Maximum Brake Horsepower — Dry (Sheet 3 of 3)

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EFFECT OF HUMIDITY ON MAX POWER

MODEL: C-124A
DATE: 15-60
DATA BASIS: CALCULATED

ENGINES: (4) P&W 4360-20W

SAMPLE PROBLEM:

A. Vapor pressure = .20 inches Hg.
B. Dew point = 34° F.
C. Altitude = 7000 feet.

OR D. Specific humidity = 0.0056.

E. Max dry power.
F. Percent loss in max horsepower = 1.8%.

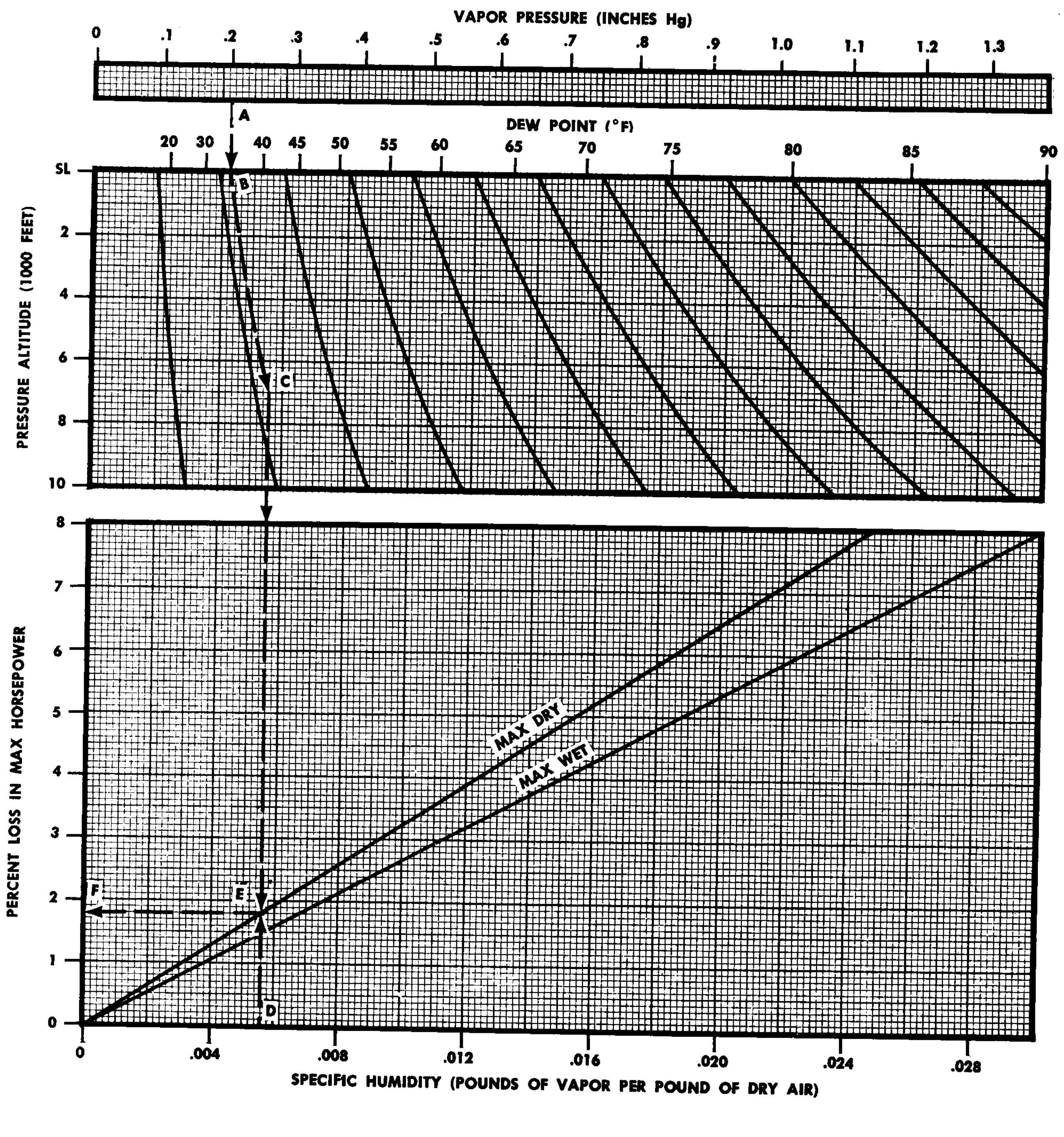

Figure B2-18. Effect of Humidity on Max Power

PART III

TAKEOFF

TABLE OF CONTENTS

LIST OF CHARTS

TAKEOFF PERFORMANCE.

Data in this section provides all the information necessary to predict the takeoff performance and field length requirements for C-124A aircraft. Wing flap deflections of 20 degrees, 10 degrees and zero degrees have been used in the presentation. It has been determined from flight tests that 20 degrees wing flaps give the most desirable over-all operation during takeoff, providing the best compromise between takeoff ground run requirements and climbout characteristics. If the takeoff weight under some circumstances is limited because of climbout characteristics with wing flaps 20 degrees, and sufficient runway is available, data are provided for takeoff planning with wing flaps 10 degrees.

Data for zero degrees wing flaps takeoff (ground run, gross weight limited by critical field length, and refusal speed charts) and a three-engine takeoff ground run chart with wing flaps 20 degrees are provided only to facilitate takeoff planning in the event an emergency flyaway is necessary, or in the event takeoff is required because maintenance or repair facilities are not available. Consideration should be given, in the selection of the takeoff gross weight for three-engine takeoff, to the possibility of a second engine becoming inoperative. The two-engine emergency climb charts should be checked to insure a reasonable climb capability in this configuration. The three-engine takeoff chart is based on one outboard engine inoperative, propeller feathered, with power on the opposite engine varied from idle at brake release to full power at 60 knots IAS.

All data presented in this part are based on takeoff at 105 percent of power-off stall speed. It should be noted that, at MAX power, the power on stall speed is approximately 10 knots lower than the power-off stall speed. However, operation at speeds less than 105 percent of power-off stall speed is not recommended. The charts have been constructed specifically for aircraft with full span wing flaps. A sample problem appears on each chart to illustrate its use.

GROUND EFFECT.

Ground effect, in general, refers to a reduction in the overall drag of an airplane when operated in close proximity to the ground. The degree of drag reduction will vary with the distance of the wing or supporting surface from the ground, being greatest when the wing is at ground level and will have, for all practical purposes, disappeared when the wing is one half the wing span above the ground. The reduction in drag is also greatest at low velocities and becomes a lesser reduction as velocity increases. All of the takeoff charts pertaining to the ground roll consider the reduction in drag due to ground effect. The only inflight data which includes ground effect are the climbout factor charts and the two-engine operation in ground effect charts.

APPLICATION OF WINDS TO TAKEOFF AND LANDING DATA.

Wind Direction and Velocity.

Winds usually are measured at some fixed point on the airfield and, within instrumentation limits, are valid for the geographical point where measured. However, if the airfield is located in an area of variable terrain the possibility exists that other various portions of the airfield winds of greater or lesser magnitude and direction may be experienced. Likewise, wind shear can result in varying wind as altitude is gained or lost on climbouts and landing approach patterns.

Because of these variables, it is recommended that the winds be applied in accordance with the Wind Summary charts.

Accounting for Wind.

The conservative approach is to accept the benefits of headwinds as an increased safety margin. Therefore, headwinds should only be considered when necessary for mission accomplishment. It is important to remember that if this approach is used, no corrections for headwind should be made to any distance or speed except when computing acceleration check. Always apply tailwinds. When headwinds or tailwinds are applied, all distances and speeds except takeoff speed and ground minimum control speed must be corrected during takeoff planning. Always apply the crosswind component and headwind gust increment to the takeoff speed, threshold speed and landing speed.

In planning a mission using winds, one of the first problems will be the determination of takeoff speed. There are three basic wind induced reasons for adjusting takeoff speed. Each condition must be investigated and the higher values used for takeoff. Then since the takeoff velocity is adjusted, the distances for ground roll, critical field length, refusal, etc., which are presented for a no wind takeoff velocity must be corrected to the higher velocity.

The crosswind component chart provides the first adjustment to takeoff velocity. This chart is designed to provide information as to whether directional control, using aerodynamic controls alone, is available at liftoff. If the no wind takeoff speed, crosswind relationship is such that this mode of control could be achieved, the takeoff velocity is increased as explained on the chart. The steady wind is used for this calculation.

Due to the omnidirectional character-

TYPE OF WIND	HOW TO OBTAIN COMPONENT	USE OF WIND COMPONENT
HEADWIND	Runway Component Enter wind component chart with steady wind value.	Apply 100% of component to acceleration check. Apply 50% of component to all takeoff and landing distances. Do not apply headwinds for terrain clearance.
TAILWIND	Runway Component Enter wind component chart with steady wind value plus the gust increment.	Apply 100% of component to acceleration check. Apply 150% of component to all takeoff and landing distances. Apply 150% of component for terrain clearance.
CROSSWIND	Crosswind Component Enter wind component chart with steady wind value plus the gust increment.	Adjust ground minimum control speed for 100% of component. Check necessity of increased takeoff and landing speeds.
GUSTS	Gust Increment Reported wind in excess of steady wind value.	Increase takeoff speed, threshold speed, and landing speed by the full gust increment not to exceed 10 knots.

Figure B3-1A. Wind Summary

istics of gusty winds, a possibility exists of a gust from head-on that will give a high airspeed reading. Trouble can then arise if liftoff is made and the gust decays. Therefore, the takeoff speed should be increased by the full gust increment not to exceed 10 knots.

With multi-engine aircraft a third correction can exist. That is the minimum speed at which directional control can be maintained in flight. This value should be determined from appropriate appendix chart and compared with takeoff velocity, which should not be less than the control speed.

DISCUSSION OF CHARTS.

TAKEOFF TERMS, DEFINITION AND RELATIONSHIP CHART.

The Takeoff Terms—Definition and Relationship chart (figure B3-1) illustrates the relationship of the terms used on the takeoff charts. Curve No. 1 represents the normal four-engine acceleration path. It shows the distance which has been traversed at any engine failure speed. It is similar to a line on the Takeoff Acceleration chart (figure B3-20), and is used in conjunction with the refusal speed (C) to establish the refusal distance (D), the acceleration check distance (E) and the acceleration check speed (F). Four-engine takeoff speed (I) and distance (J) are included to show their relationship to the other points discussed here.

Curve No. 2 represents the sum of the distances required to accelerate on four engines to engine failure speed and then to stop.

Curve No. 3 represents the sum of the distances required to accelerate on four engines to engine failure speed, and then continue to accelerate on three engines to takeoff speed. By definition, the intersection of curves 2 and 3 depicts the critical field length (A) and the critical engine failure speed (B). The intersection of the vertical line representing runway length (H) and curve 2 depicts refusal speed (C). The intersection of the same vertical line and curve 3 establishes the minimum engine failure speed from which the takeoff may be continued with the remaining three engines (G). If the gross weight is heavy enough so that the critical field length is greater than the runway length, speeds (C) and (G) will occur in reverse order. In this case, if an engine fails between speeds (C) and (G), the aircraft can neither stop within nor takeoff from the remaining runway. Therefore, takeoff gross weight should be limited by critical field length (figures B3-8 through B3-10).

TAKEOFF AND LANDING CROSSWIND CHART.

The Takeoff and Landing Crosswind chart (figure B3-2) presents runway and crosswind components in knots for runway wind angles of zero to 90 degrees for headwinds and 90 to 180 degrees for tailwinds and wind speeds up to 60 knots. The minimum nosewheel lift-off or touchdown speed is presented for wing flap deflections from zero to 40 degrees. Two sample problems appear on the chart to illustrate its use.

TAKEOFF FACTOR CHART.

The Takeoff Factor chart (figure B3-3) is used to simplify the determination of takeoff performance. The takeoff factor is determined from the parameters of outside air temperature, field pressure altitude and torque pressure. It is recommended that the reject torque pressure, as determined from the Maximum Brake Horsepower charts (figures B2-11 and B2-12) be used to determine the takeoff factor.

The takeoff factor is used to determine gross weight limited by climb performance, gross weight limited by critical field length, refusal speed, takeoff ground run, and gross weight limited by climbout over obstacle.

The Takeoff Factor chart is for use with 20, 10, or zero degrees flaps, four- or three-engine operation, and wet or dry power.

GROSSWEIGHT LIMITED BY CLIMB PERFORMANCE CHARTS.

The Gross Weight Limited by Climb Performance charts for Wing Flaps 20 Degrees (figure B3-4), Wing Flaps 10 Degrees (figure B3-5), and Wing Flaps Zero Degrees (figure B3-6) show maximum gross weights at which rates of climb of 50 FPM and 100 FPM may be maintained for three-engine operation at any reasonable takeoff torque pressure. The maximum gross weight for 50 FPM rate of climb may be determined by adding the weight shown on each chart. The charts are based on takeoff power and takeoff speed with gear up, propeller on inoperative engine feathered, wing flaps at takeoff setting, and do not include ground effect. For some conditions, a gross weight may be obtained which will exceed the structural limitations on the aircraft. See Figure 5-3 in Section V, T.O. 1C-124A-1 for these structural gross weight limitations.

EFFECT OF RUNWAY SLOPE ON CRITICAL FIELD LENGTH.

The Effect Of Runway Slope On Critical Field Length chart (figure B3-7) is included to allow correction of the gross weight limited by critical field length for the effect of runway slope. Corrections can be made for slopes from 12 percent (uphill) to -12 (downhill). The chart is used for wing flap settings of 20 degrees, 10 degrees and zero degrees. Since the gross weight limited by critical field length is based on actual runway length, correction for slope must be applied to the actual runway length before entering the critical field length charts.

GROSS WEIGHT LIMITED BY CRITICAL FIELD LENGTH CHARTS.

The Gross Weight Limited by Critical Field Length charts (figures B3-8 through B3-10) illustrate the takeoff performance when an engine failure occurs during the takeoff ground run. These data are presented to establish a takeoff gross weight that will be safe at a given field, under given atmospheric conditions, if an engine fails. If the actual gross weight is equal to the gross weight limited by critical field length for the given conditions, the airplane may be stopped after engine failure or a three-engine takeoff may be completed safely within the available runway length. If an engine failure occurs before the critical engine failure speed is reached, stopping distance is less than the remaining runway length, and the takeoff should be aborted. If the engine failure occurs after the critical engine failure speed is reached, three-engine takeoff distance is less than the remaining runway length (stopping distance is greater than the remaining runway length) and the takeoff should be continued on three engines. The actual gross weight should never be greater than the gross weight limited by critical field length. The critical engine failure speed may be obtained from the refusal speed charts (figures B3-11 through B3-13) by using critical field length for the runway length.

The gross weight limited by critical field length charts are based on the following assumptions:

1. Takeoff speed is 105 percent of power-off stall speed.
2. Normal acceleration on four engines to the engine failure speed.
3. Drag after engine failure is equal to drag prior to engine failure, plus drag of a windmilling propeller on an inoperative outboard engine, plus the drag of rudder and aileron deflection required to maintain directional control.
4. When the airplane is stopped, a reaction distance corresponding to 3 seconds at engine failure speed is added to the stopping distance to allow time for making the decision to stop, and the application of all necessary controls.
5. Deceleration distance is based on maximum braking plus two-engine reverse thrust.

REFUSAL SPEED CHARTS.

The usual situation during operation of C-124A aircraft is to have an actual runway length greater than the critical field length for the given conditions. Since it is always desirable to safely stop an airplane within the limits of the runway in the event of an engine failure, rather than risk a three-engine takeoff and go-around, the refusal speed charts (figures B3-11 through B3-13) are presented to allow the decision to stop to be made at the highest speed possible, not to exceed takeoff speed, and still allow a safe stop. If the critical field length and runway length are the same, then refusal speed and critical engine failure speed are identical. If, however, the runway length is greater than critical field length, then the refusal speed may be considerably higher than critical engine failure speed. Therefore, the refusal speed is of primary importance during a takeoff operation. It must be remembered, however, that the validity of the refusal speed is dependent upon a normal four-engine acceleration of the aircraft. If the acceleration is low, the aircraft will have used more runway than predicted in reaching the refusal speed, and insufficient runway will remain in which to stop the airplane. For this reason, use of acceleration check speeds or times is necessary to insure safe takeoff. The validity of the refusal speed is also dependent upon factors which affect the deceleration of the aircraft. The effects of runway slopes less than 3 percent are negligible for refusal speed. For large runway slopes, the refusal speed may be approximated by using the appropriate downhill or uphill slope correction grid on the refusal speed charts. A correction grid for the effect of winds is also included on the refusal speed charts. Examples are included on each of the charts to illustrate the methods of using the charts with various runway slope conditions. Figure B3-11 is used for the downhill slope example, figure B3-10 for uphill slope, and figure B3-12 for zero slope.

To obtain a more accurate refusal speed under combinations of adverse conditions such as runway slope and poor braking RCR, The Distance to Stop For Aborted Takeoff chart (figure B3-21) may be used in conjunction with the Takeoff Acceleration chart (figure B3-20). An example of this method of determining refusal speed is included in Part 7, Mission Planning. The effect of wing flap configuration on refusal speed is negligible and no correction is necessary for aircraft with full span wing flaps.

TAKEOFF GROUND RUN CHARTS.

Field length requirements for normal takeoff (figures B3-14 through B3-18) present takeoff ground run for wing flap deflections of 20, 10, and zero degrees with four engines operating, along with a runway slope correction (figure B3-18) to takeoff ground run. Also presented is a takeoff ground run chart with 20 degrees wing flap deflection for three-engine operation (figure B3-17).

TAKEOFF, CLIMBOUT, AND FLAP RETRACTION SPEEDS CHART.

The Takeoff, Climbout and Flap Retraction Speeds chart (figure B3-19) is presented for various aircraft gross weights. The indicated airspeeds shown are recommended for takeoff and climbout with 20, 10, and 0 degrees flaps. Also, the minimum IAS for flap retraction from any flap deflection is given. Flap retraction speed is based on 110 percent of the power-off stalling speed with flaps retracted. Cut-off lines are shown on the chart for minimum directional control speed with one or two engines inoperative. For these conditions, the propellers on inoperative engines are windmilling; wing flaps 20, 10, and 0 degrees, and max power is being developed by the remaining engines.

TAKEOFF ACCELERATION CHART.

The Takeoff Acceleration chart (figure B3-20) is presented to determine if the airplane acceleration is normal and can be expected to reach the refusal speed at the proper distance down the runway. The velocity which the aircraft should obtain at a given time or distance from brake release may be determined at a particular check point by following a guide line from the point where the takeoff speed intersects the distance required for takeoff to a velocity lower than takeoff. If the airspeed at this check point is low, then the airplane is not accelerating properly.

Note

All refusal speeds and field lengths are valid only if the airplane acceleration is normal. Therefore, acceleration checks are necessary to insure safe takeoff operations.

DISTANCE TO STOP FOR ABORTED TAKEOFF CHART.

The Distance to Stop for Aborted Takeoff chart (figure B3-21) presents the distance to stop from a given speed assuming one propeller windmilling, the opposite engine at IDLE, brakes, and two engines maximum reverse thrust. The chart takes under consideration and corrects for the following variables: (1) Wind, (2) Runway Slope, (3) Density Altitude, (4) Unusual Runway Conditions, (5) Gross Weight.

The unusual runway conditions taken into account are dry hard runway surfaces, dry turf, wet concrete or macadam, snow or wet grass, and ice.

Note

Utilizing braking force only the aircraft will slide downhill on runways of slope greater than 11.0 percent for wet concrete or macadam, 8.0 percent for snow or wet grass, and 4.8 percent for ice.

CLIMBOUT FACTOR CHARTS.

The Climbout Factor charts (figures B3-22 and B3-23) are used in conjunction with the Gross Weight Limited by Climbout Over Obstacle chart (figure B3-24). Charts are included for three-engine climbout with wing flaps 20 and 10 degrees. Ground effect has been included and recommended cowl flap angle of 8 degrees is used. When terrain clearance is of primary concern, the climbout speed is maintained at 105 percent of power-off stalling speed for maximum angle of climb.

For each configuration two charts are presented. The first is for obstacle heights of zero to 200 feet and horizontal distances from 1000 to 12,000 feet (based on critical field length). This chart also has a tailwind correction plot. The second chart is for a range of zero to 800 feet in height and 3000 to 24,000 feet horizontally and does not have a wind correction.

Distance from brake release to takeoff is based on critical field length for a hard, dry runway surface, zero wind, and zero slope. Any increase in critical field length will move the lift off point closer to the obstacle. To correct for the effect of runway slope, first determine the change in critical field length due to runway slope. Enter the chart with the obstacle distance, decreased by the amount of increase in critical field length. The increase in critical field length due to a slippery runway surface should also be subtracted from the distance to the obstacle.

An aircraft will have better climb performance in the clean configuration. Therefore, if an obstacle exists a considerable distance out on the climbout flight and space is available, it is recommended that the pilot circle, climb, and clean up the aircraft before continuing the flight.

GROSS WEIGHT LIMITED BY CLIMBOUT OVER OBSTACLE CHART.

The Gross Weight Limited by Climbout Over Obstacle chart (figure B-24) provides the maximum allowable takeoff gross weight as limited by climbout over an obstacle for three-engine operation. The limit weight is determined by the takeoff factor (figure B3-3) and a climbout factor (figures B3-22 and B3-23). The Gross Weight Limited by Climbout Over Obstacle chart is valid for 20 or 10 degrees wing flaps and wet or dry power.

TAKEOFF TERMS — DEFINITION AND RELATIONSHIP

SAMPLE PROBLEM:

- A. Critical field length.
- B. Critical engine failure speed.
- C. Refusal speed.
- D. Refusal distance.
- E. Acceleration check distance.
- F. Acceleration check speed.
- G. Minimum engine failure speed for continued takeoff.
- H. Runway length.
- I. Takeoff speed.
- J. Four-engine takeoff distance.

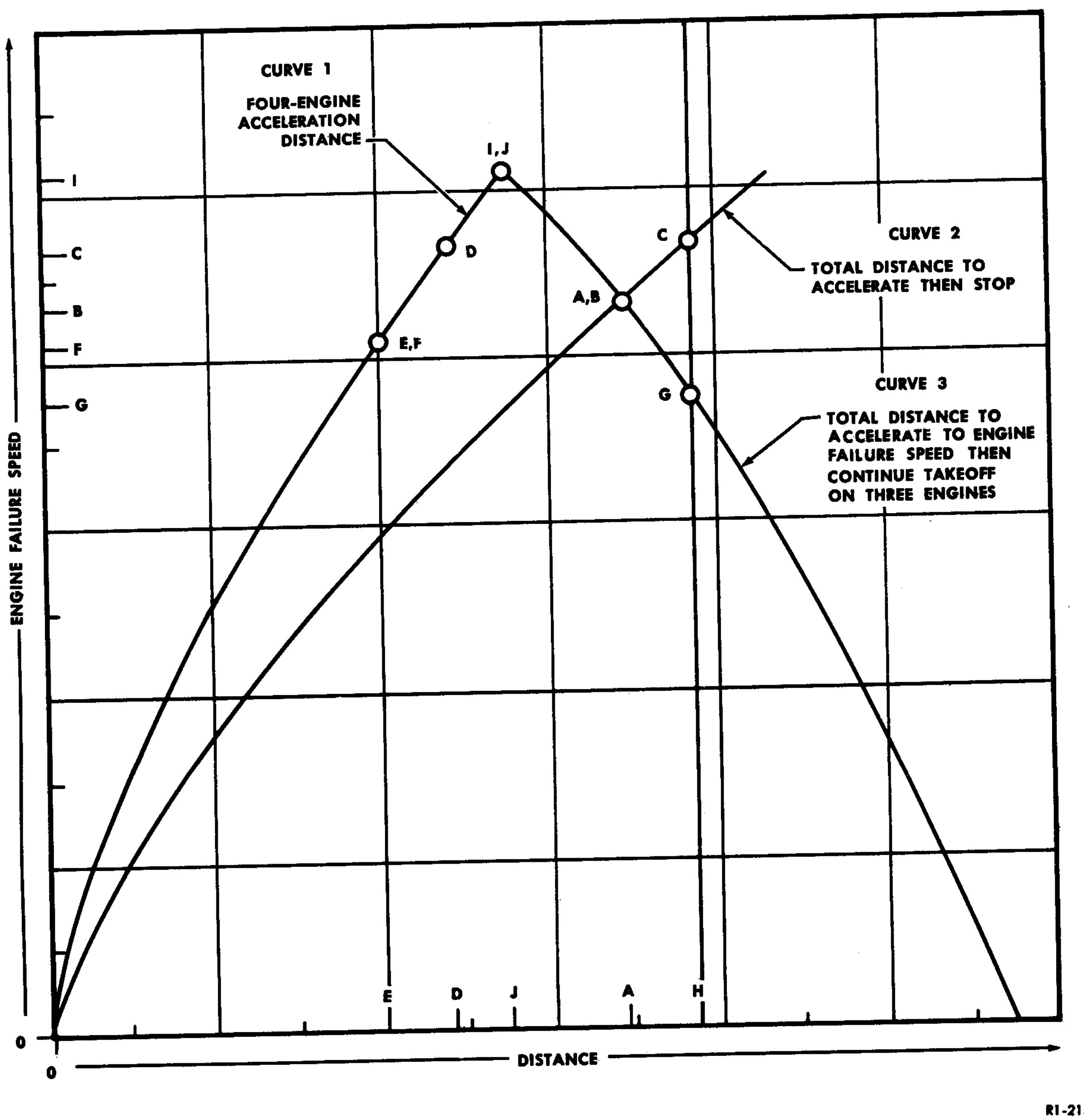

Figure B3-1. Takeoff Terms — Definition and Relationship

TAKEOFF AND LANDING CROSSWIND CHART

MODEL: C-124A
DATE: 10-15-61
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-20W

SAMPLE PROBLEM NO. 1:
Takeoff on runway 1 (10 degrees).
Wind = 23 knots from 72 degrees (magnetic) with gusts to 33 knots.

A. Runway wind angle = 72 − 10 = 62°.
B. Wind velocity with gusts = 33 knots.
C. Crosswind component = 29 knots.
D. Wing flaps = 20 degrees.
E. Minimum nose wheel lift-off speed = 108 knots.
F. Steady wind velocity = 23 knots.
G. Headwind component = 11 knots.

SAMPLE PROBLEM NO. 2:
Takeoff on runway 1 (10 degrees).
Wind = 23 knots from 252 degrees (magnetic) with gusts to 33 knots.

A. Runway wind angle = 360 − (225 − 10) = 118°.
B. Wind velocity with gusts = 33 knots.
C. Crosswind component = 29 knots.
D. Wing flaps = 20 degrees.
E. Minimum nose wheel lift-off speed = 108 knots.
F. Steady wind velocity = 23 knots.
G. Tailwind component = 11 knots.

NOTE:
1. Flap and gear placard speeds must be observed.
2. For crosswind component, use maximum gust velocity.

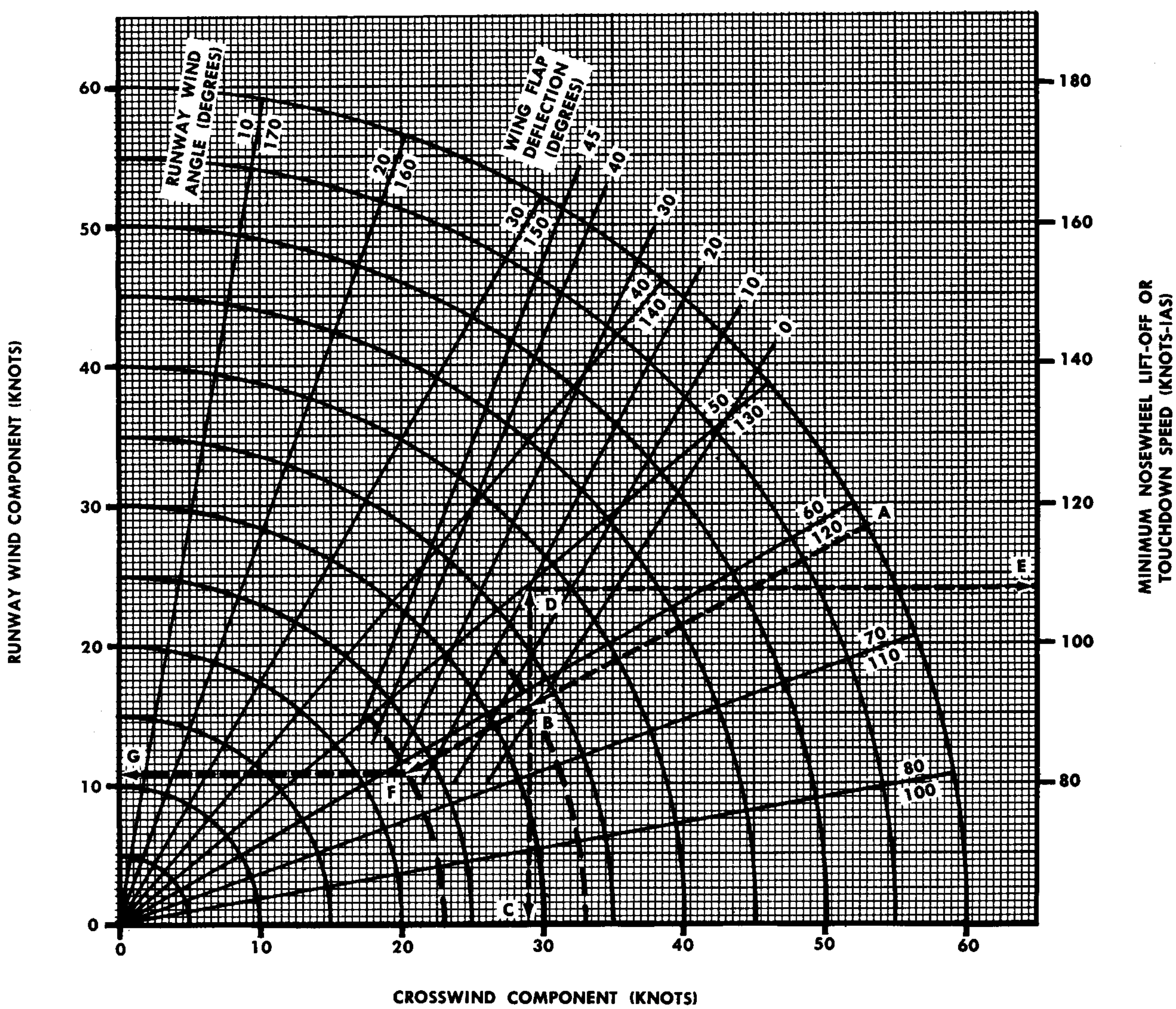

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Figure B3-2. Takeoff and Landing Crosswind Chart

TAKEOFF FACTOR

MODEL: C-124A
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-20WD
FUEL GRADE: 115/145 & 100/130

NOTE:

1. Valid for 20, 10 or zero degree flaps, four or three-engine operation, wet or dry power.
2. Use takeoff factor to determine gross weight limited by climb performance, gross weight limited by critical field length, refusal speed, takeoff ground run, and gross weight limited by climbout over obstacle.

SAMPLE PROBLEM:

A. Density altitude = 1500 feet.
B. Torque pressure = 230 PSI.
C. Takeoff factor = 2.2.

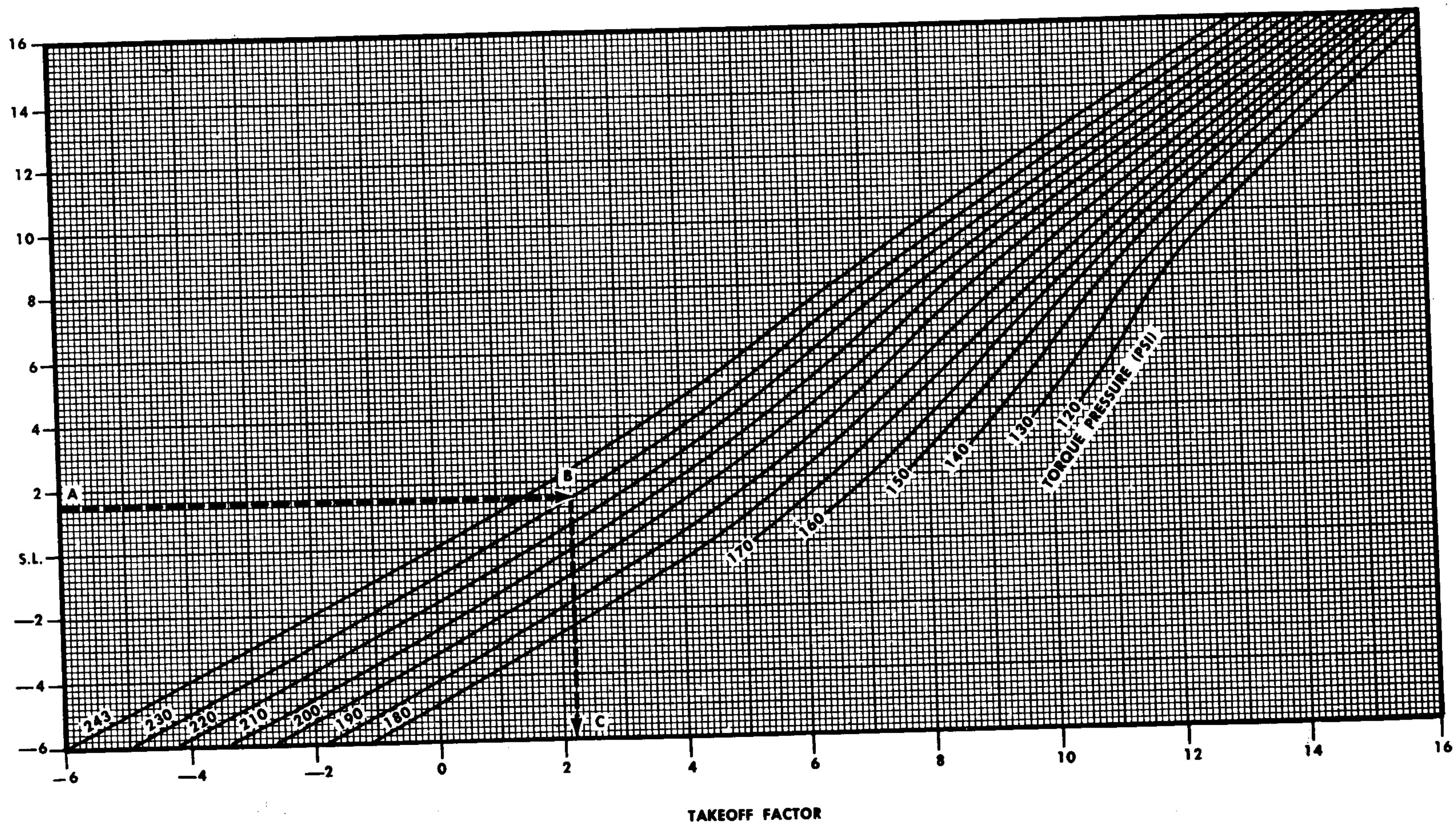

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Figure B3-3. Takeoff Factor

GROSS WEIGHT LIMITED BY CLIMB PERFORMANCE
WING FLAPS = 20 DEGREES
THREE-ENGINE OPERATION
2700 RPM

MODEL: C-124A
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W4360-20WD
FUEL GRADE: 115/145 & 100/130

NOTE:
1. Rate of climb at takeoff speed.
2. Cowl flaps = 8°.
3. Ground effect not included.
4. Inoperative propeller feathered.
5. Gear up.
6. Rate of climb = 100 FPM.
7. Add 5000 pounds for 50 FPM rate of climb.

SAMPLE PROBLEM:
A. Takeoff factor = +2.8.
B. Torque pressure = 210 PSI.
C. Gross weight = 178,500 pounds.

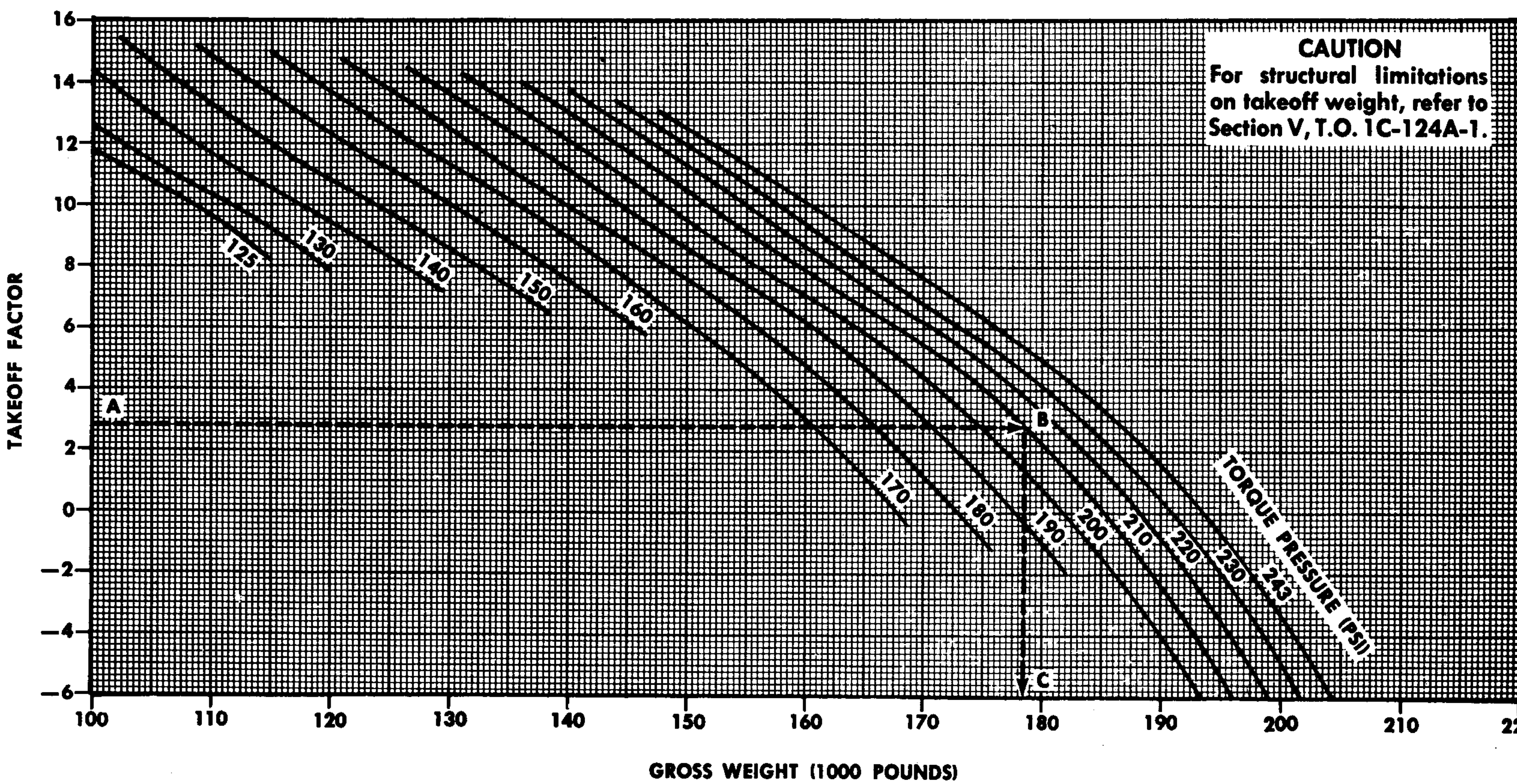


Figure B3-4. Gross Weight Limited by Climb Performance — Wing Flaps = 20 Degrees

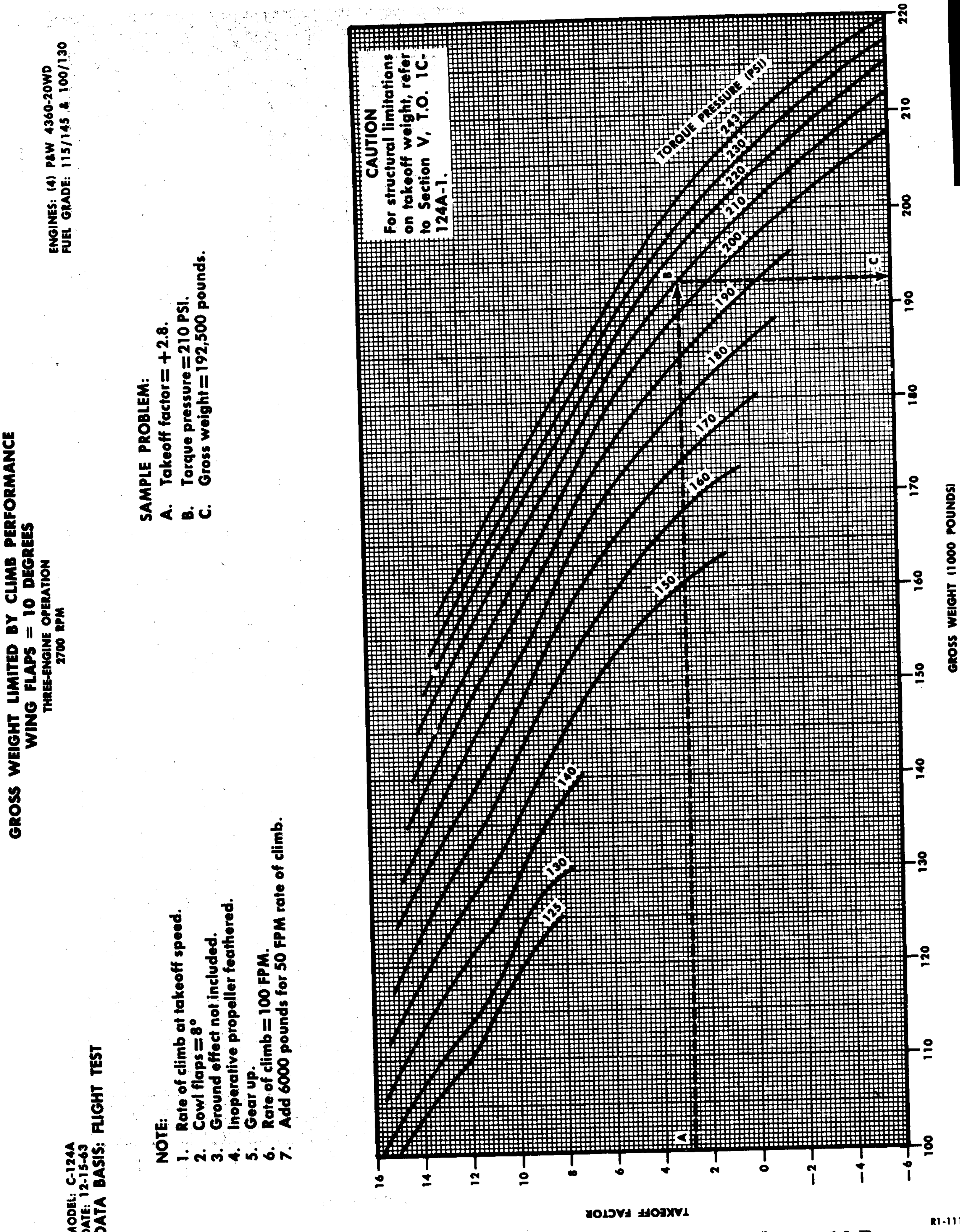


Figure B3-5. Gross Weight Limited by Climb Performance — Wing Flaps = 10 Degrees

MODEL: C-124A
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-20WD
FUEL GRADE: 115/145 & 100/130

GROSS WEIGHT LIMITED BY CLIMB PERFORMANCE
WING FLAPS = ZERO DEGREES

THREE ENGINE OPERATION
2700 RPM

NOTE:
1. Rate of climb at takeoff speed.
2. Cowl flaps = 8°.
3. Ground effect not included.
4. Inoperative propeller feathered.
5. Gear up.
6. Rate of climb = 100 FPM.
7. Add 6000 pounds for 50 FPM rate of climb.

SAMPLE PROBLEM:
A. Takeoff factor = +2.8.
B. Torque pressure = 210 PSI.
C. Gross weight = 208,500 pounds.

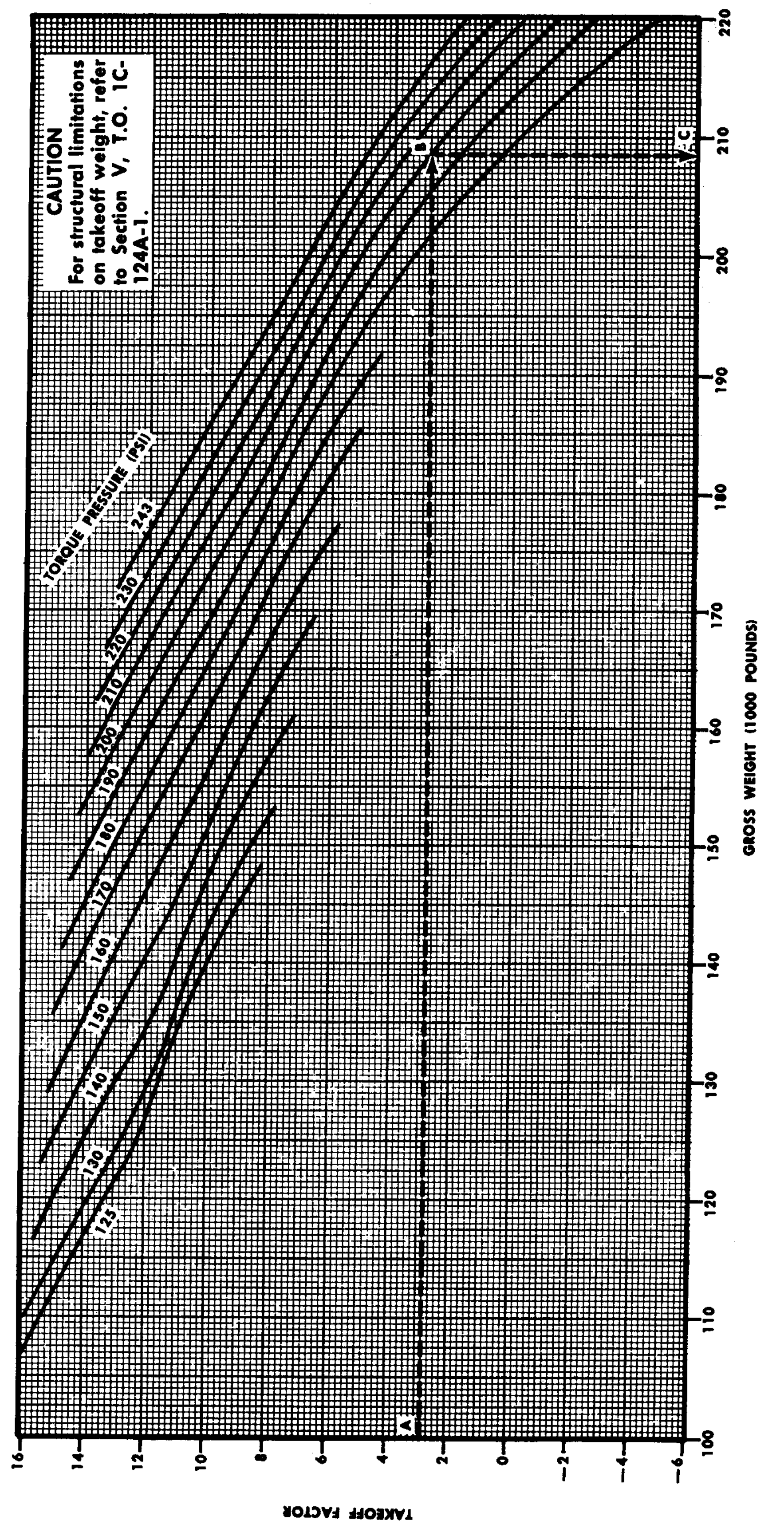


Figure B3-6. Gross Weight Limited by Climb Performance—Wing Flaps = Zero Degrees

EFFECT OF RUNWAY SLOPE ON CRITICAL FIELD LENGTH

MODEL: C-124A/C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

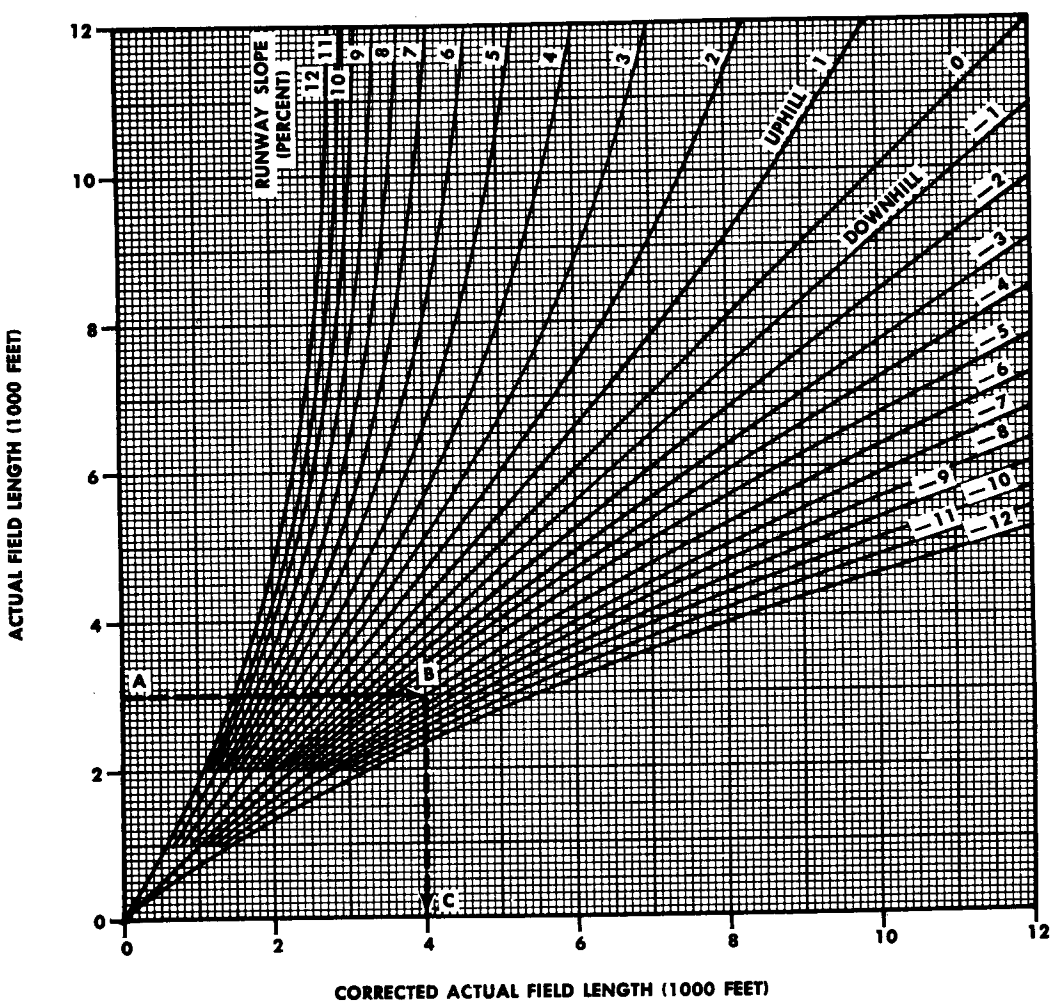
ENGINES: (4) P&W 4360-20WD/-63A
FUEL GRADE: 115/145 & 100/130

NOTE:

1. Runway Slope (percent) $= \frac{\text{Elevation Difference}}{\text{Runway Length}} \times 100.$
2. Wing flaps = 20, 10, or 0 degrees.
3. Use the corrected actual field length to enter the Critical Field Length Charts.

SAMPLE PROBLEM:

A. Actual field length = 3000 feet.
B. Runway slope = −6 percent (downhill).
C. Corrected actual field length to enter Critical Field Length Charts = 4000 feet.



R1-630

Figure B3-7. Effect Of Runway Slope On Critical Field Length

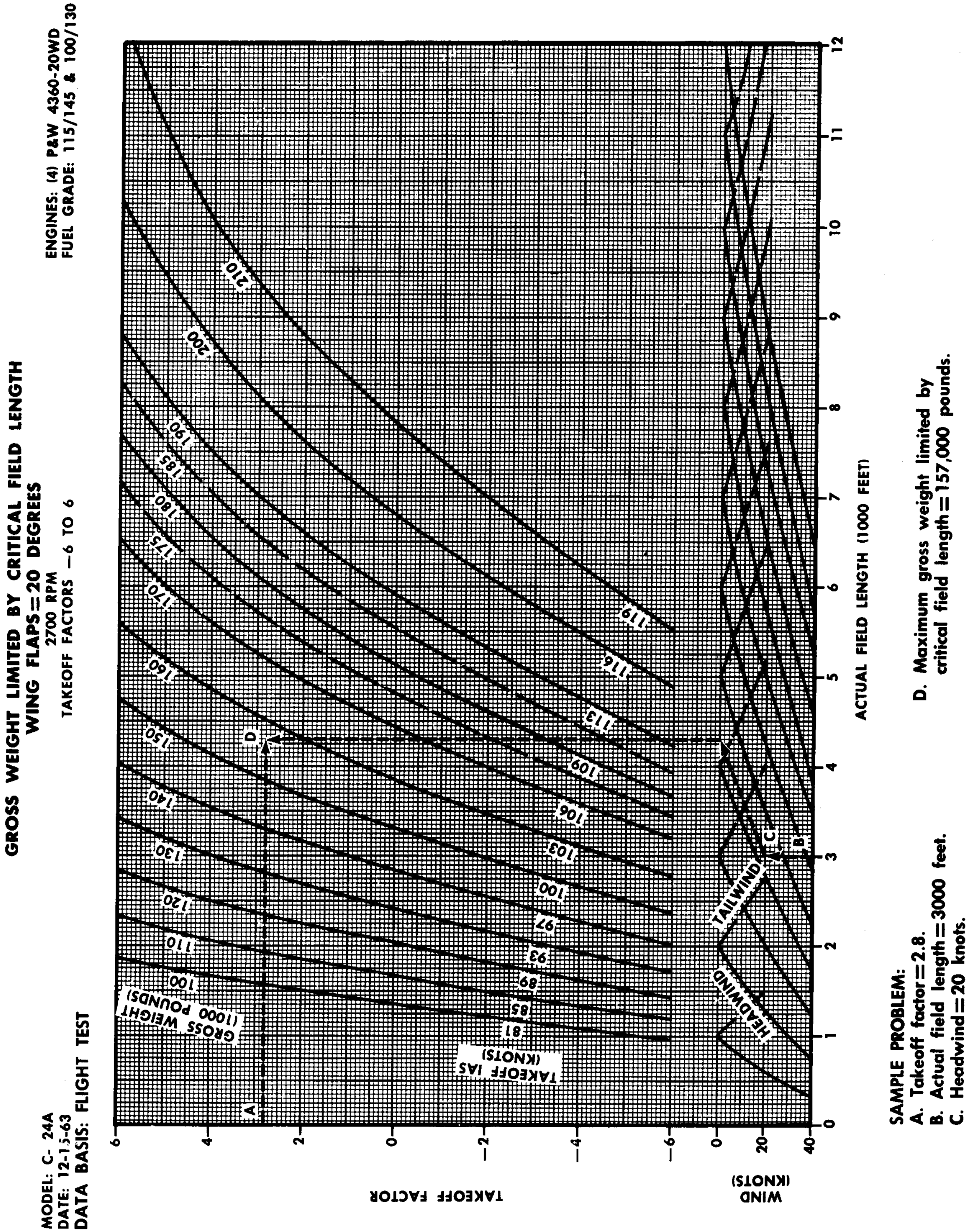
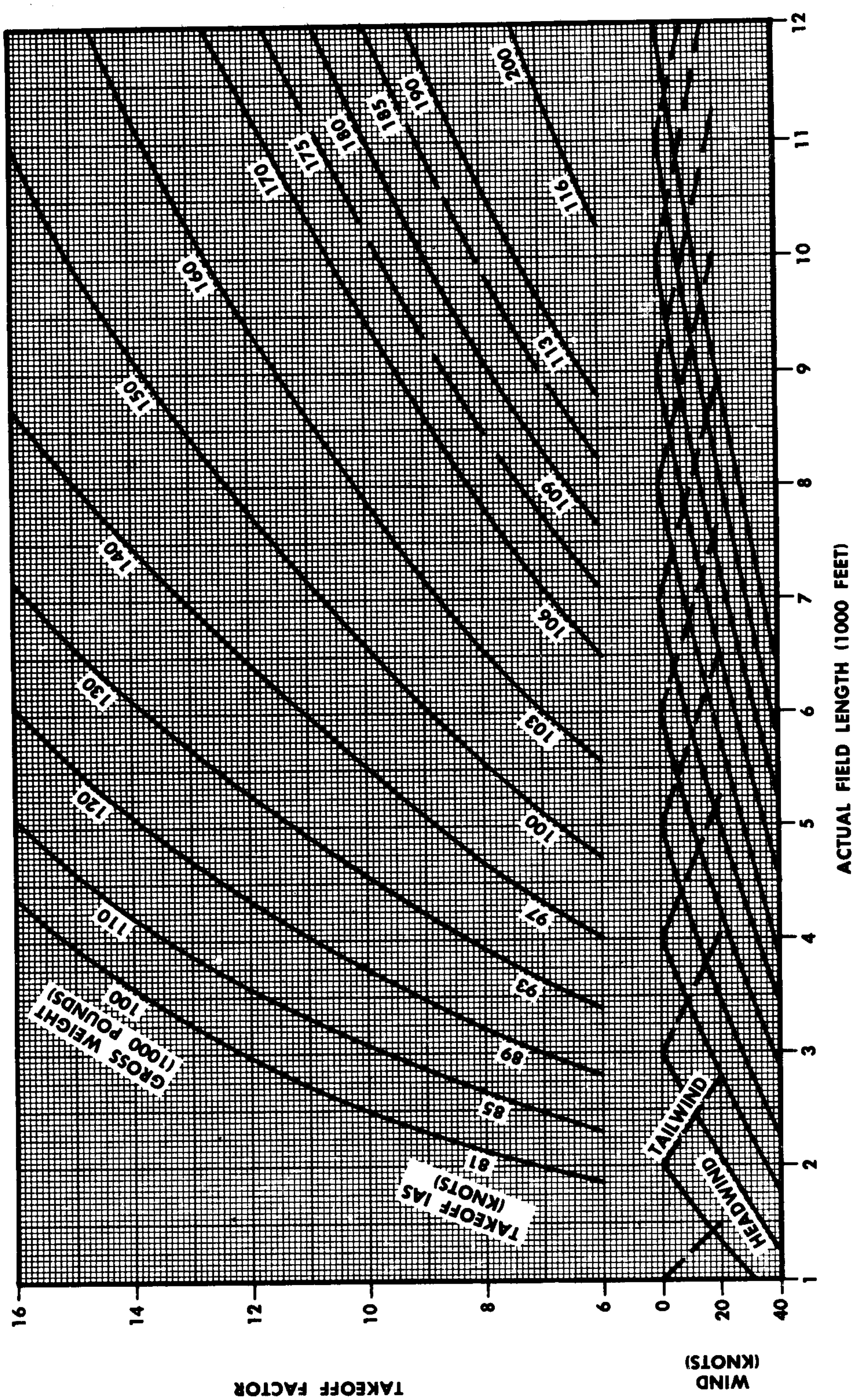


Figure B3-8. Gross Weight Limited by Critical Field Length—Wing Flaps = 20 Degrees (Sheet 1 of 2)

GROSS WEIGHT LIMITED BY CRITICAL FIELD LENGTH
WING FLAPS = 20 DEGREES
2700 RPM
TAKEOFF FACTORS 6 TO 16

ENGINES: (4) P&W 4360-20WD
FUEL GRADE: 115/145 & 100/130



MODEL: C-124A
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

NOTE:
1. V_{TO} = 105 percent power-off stall speed.
2. Hard runway surface.
3. Cowl flaps = 8 degrees.
4. Inoperative propeller windmilling.
5. Refer to Part 3, Appendix, for gross weight limited by climb performance.
6. Refer to Section V, T.O. 1C-124A-1, for structural limitations.
7. See Refusal Speed chart for critical engine failure speed.
8. Stop with brakes plus two-engine maximum reverse thrust.

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Figure B3-8. Gross Weight Limited by Critical Field Length—Wing Flaps = 20 Degrees (Sheet 2 of 2)

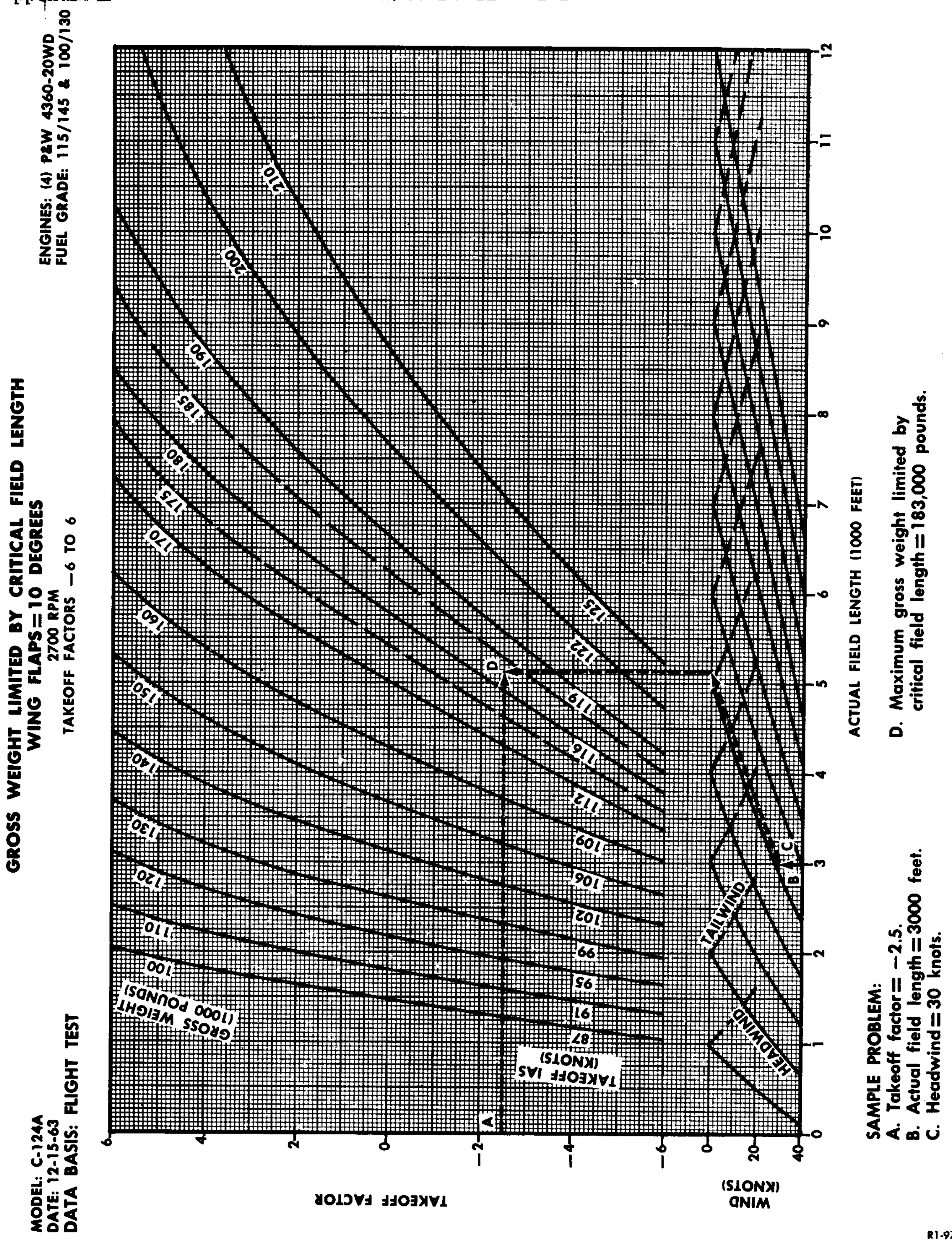
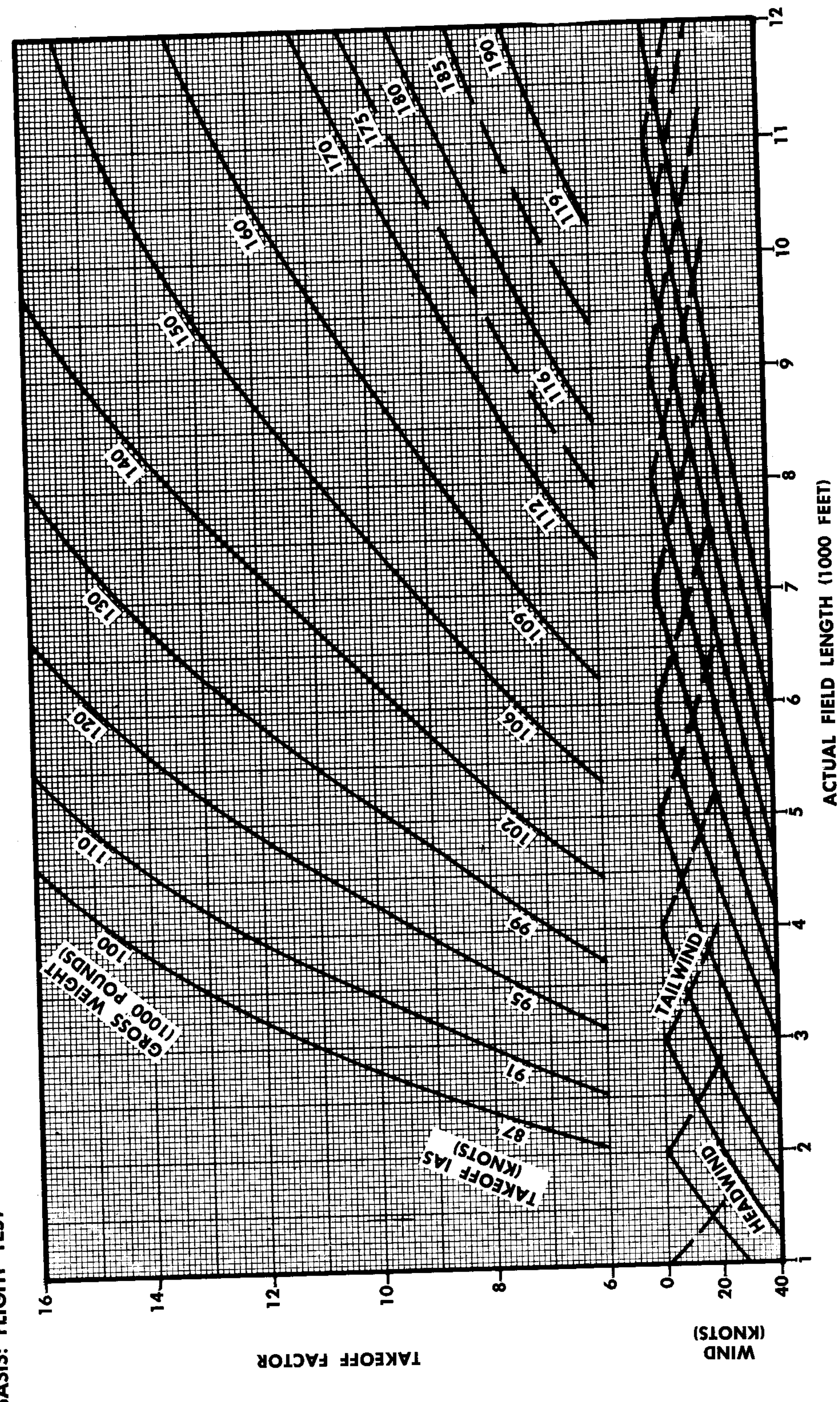


Figure B3-9. Gross Weight Limited by Critical Field Length — Wing Flaps = 10 Degrees (Sheet 1 of 2)

GROSS WEIGHT LIMITED BY CRITICAL FIELD LENGTH
WING FLAPS = 10 DEGREES
2700 RPM
TAKEOFF FACTORS 6 TO 16

MODEL: C-124A
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-20WD
FUEL GRADE: 115/145 & 100/130



NOTE:
1. V_{TO} = 105 percent power-off stall speed.
2. Hard runway surface.
3. Cowl flaps = 8 degrees.
4. Inoperative propeller windmilling.
5. Refer to Part 3, Appendix, for gross weight limited by climb performance.
6. Refer to Section V, T.O. 1C-124A-1, for structural limitations.
7. See Refusal Speed chart for critical engine failure speed.
8. Stop with brakes plus two-engine maximum reverse thrust.

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Figure B3-9. Gross Weight Limited by Critical Field Length Wing Flaps = 10 Degrees (Sheet 2 of 2)

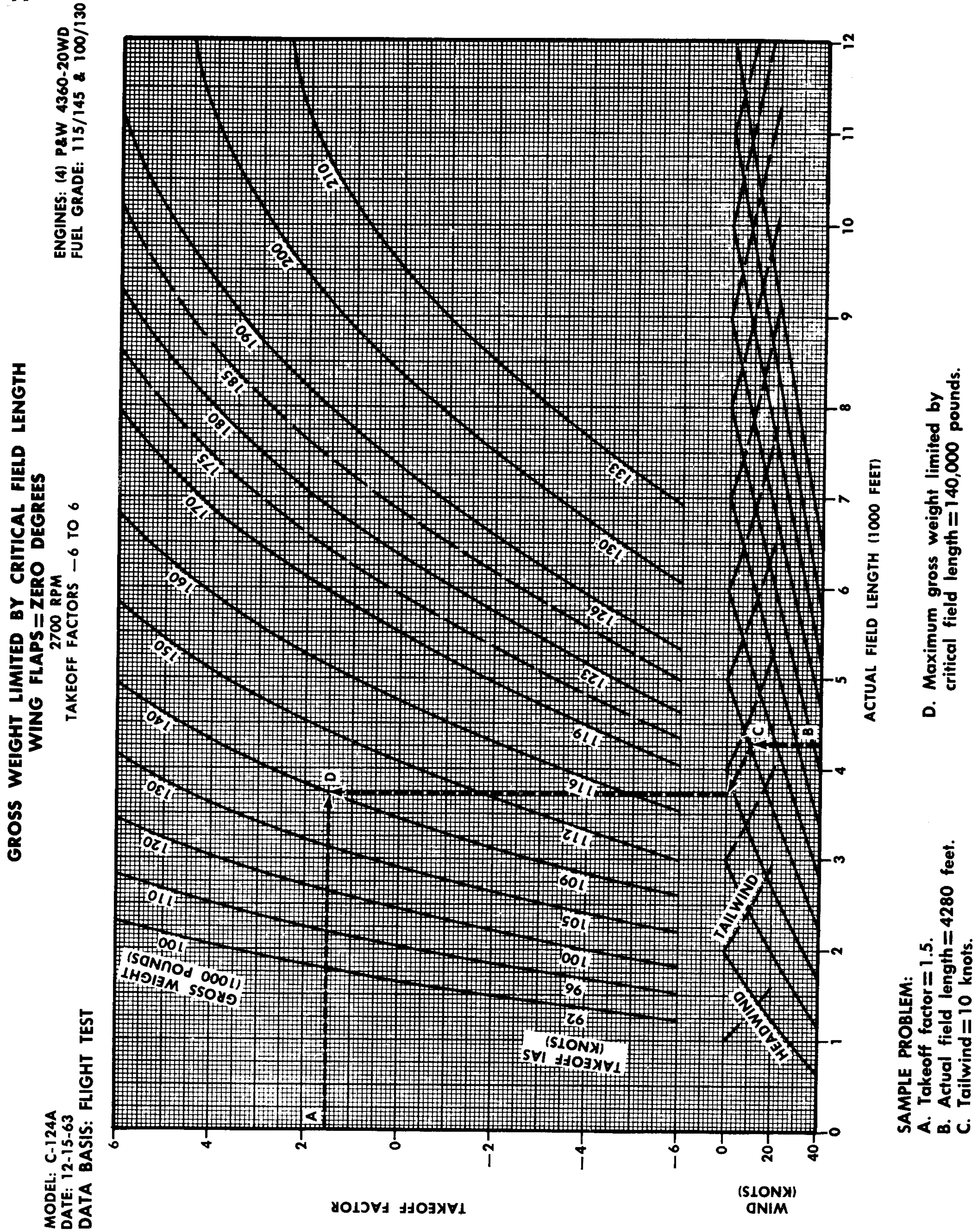


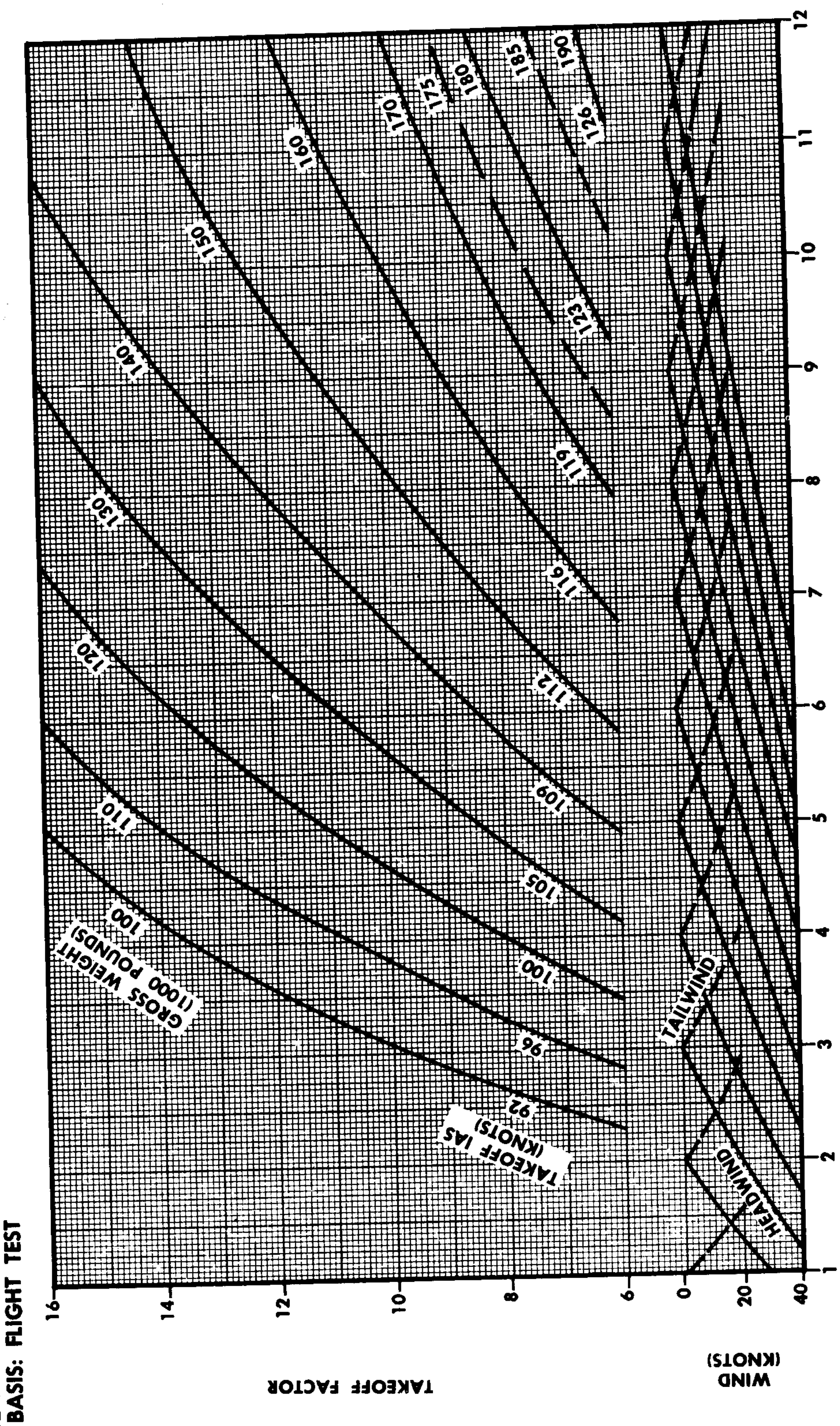
Figure B3-10. Gross Weight Limited by Critical Field Length — Wing Flaps = Zero Degrees (Sheet 1 of 2)

GROSS WEIGHT LIMITED BY CRITICAL FIELD LENGTH
WING FLAPS = ZERO DEGREES

2700 RPM

TAKEOFF FACTORS 6 TO 16

ENGINES: (4) P&W 4360-20WD
FUEL GRADE: 115/145 & 100/130



MODEL: C-124A
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

NOTE:

1. V_{TO} = 105 percent power-off stall speed.
2. Hard runway surface.
3. Cowl flaps = 8 degrees.
4. Inoperative propeller windmilling.
5. Refer to Part 3, Appendix, for gross weight limited by climb performance.
6. Refer to Section V, T.O. 1C-124A-1, for structural limitations.
7. See Refusal Speed chart for critical engine failure speed.
8. Stop with brakes plus two-engine maximum reverse thrust.

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Figure B3-10. Gross Weight Limited by Critical Field Length — Wing Flaps = Zero Degrees (Sheet 2 of 2)

REFUSAL SPEED — WING FLAPS = 20 DEGREES

2700 RPM

MODEL: C-124A
DATE: 12-15-63

ENGINES: (4) P&W 4360-20WD
FUEL GRADE: 115/145 & 100/130

NOTE:
1. Hard runway surface.
2. Cowl flaps = 8 degrees.
3. Inoperative propeller windmilling.
4. Stop with brakes plus two-engine maximum reverse thrust.
5. To obtain critical engine failure speed, use runway length equal to critical field length.

SAMPLE PROBLEM:
A. Takeoff factor = 2.8.
B. Runway length = 4500 feet.
C. Runway slope = —8 percent.
D. Gross weight = 140,000 pounds.
E. No wind refusal IAS = 88 knots.
F. Headwind = 10 knots.
G. Refusal IAS = 96 knots.

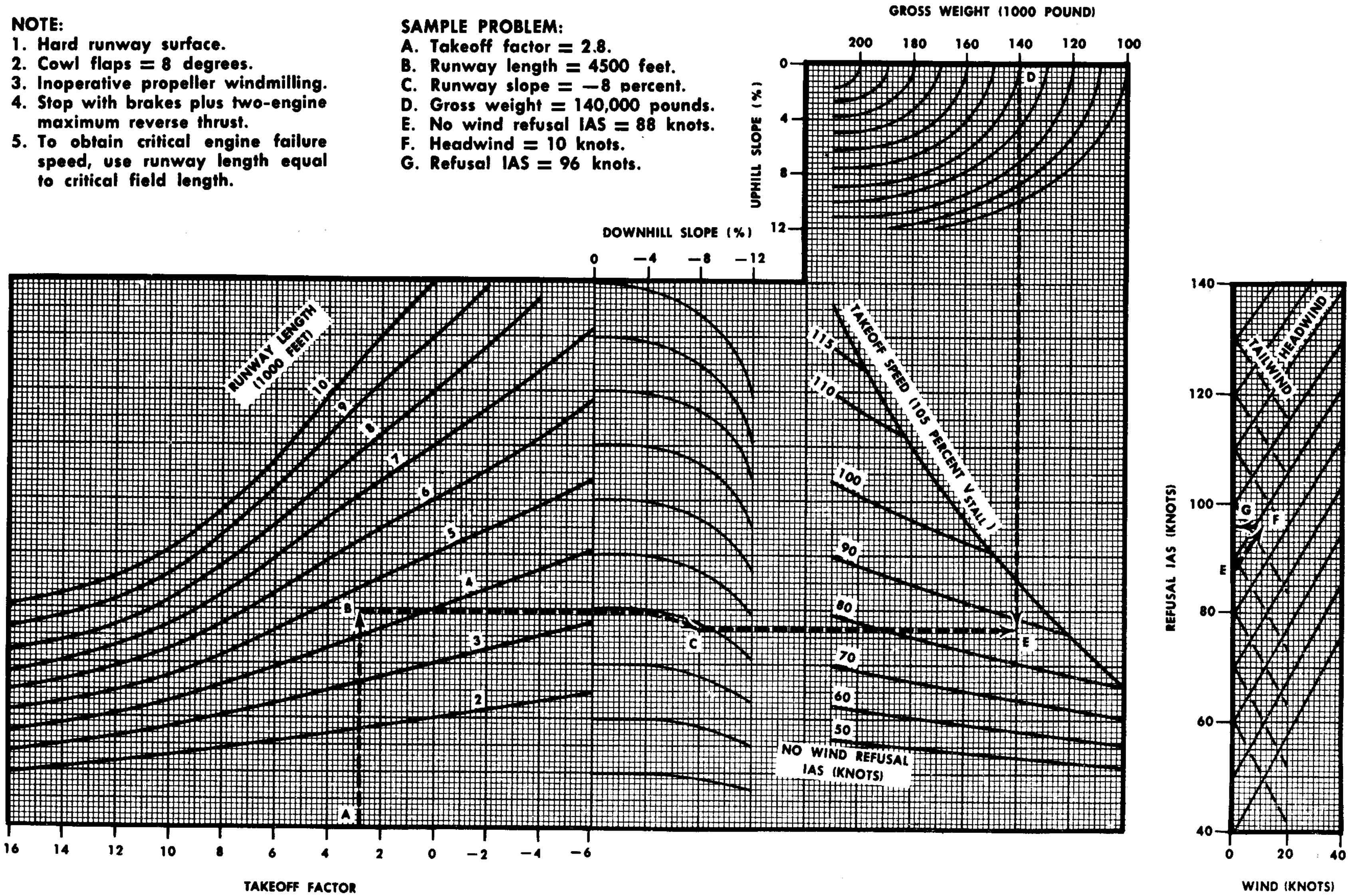

Figure B3-11. Refusal Speed—Wing Flaps = 20 Degrees

REFUSAL SPEED — WING FLAPS = 10 DEGREES
2700 RPM

MODEL: C-124A
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-20WD
FUEL GRADE: 115/145 & 100/130

NOTE:
1. Hard runway surface.
2. Cowl flaps = 8 degrees.
3. Inoperative propeller windmilling.
4. Stop with brakes plus two-engine maximum reverse thrust.
5. To obtain critical engine failure speed, use runway length equal to critical field length.

SAMPLE PROBLEM:
A. Takeoff factor = —3.0.
B. Runway length = 5000 feet.
C. Gross weight = 145,000 pounds.
D. Runway slope = 7 percent (uphill).
E. No wind refusal IAS = 101 knots.
F. Headwind = 25 knots.
G. Refusal IAS = 120 knots. (Note, use the takeoff speed of 104 knots.)

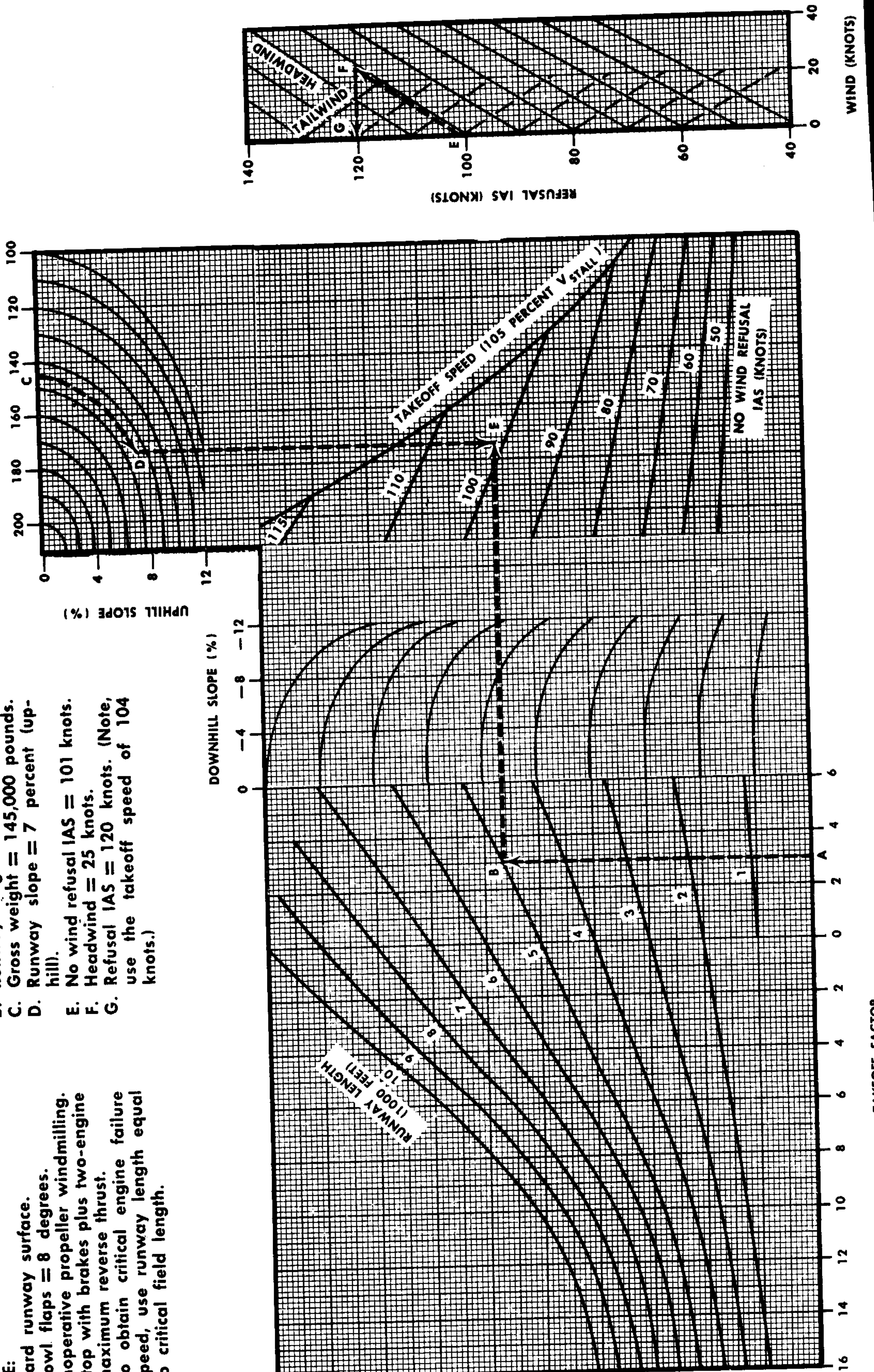

Figure B3-12. Refusal Speed — Wing Flaps = 10 Degrees

REFUSAL SPEED — WING FLAPS = ZERO DEGREES

2700 RPM

MODEL: C-124A
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-20W D
FUEL GRADE: 115/145 & 100/130

NOTE:
1. Hard runway surface.
2. Cowl flaps = 8 degrees.
3. Inoperative propeller windmilling.
4. Stop with brakes plus two-engine maximum reverse thrust.
5. To obtain critical engine failure speed, use runway length equal to critical field length.

SAMPLE PROBLEM:
A. Takeoff factor = −2.5.
B. Runway length = 4000 feet.
C. Runway slope = 0 percent.
D. Gross weight = 170,000 pounds.
E. No wind refusal IAS = 92 knots.
F. Tailwind = 10 knots.
G. Refusal IAS = 84 knots.

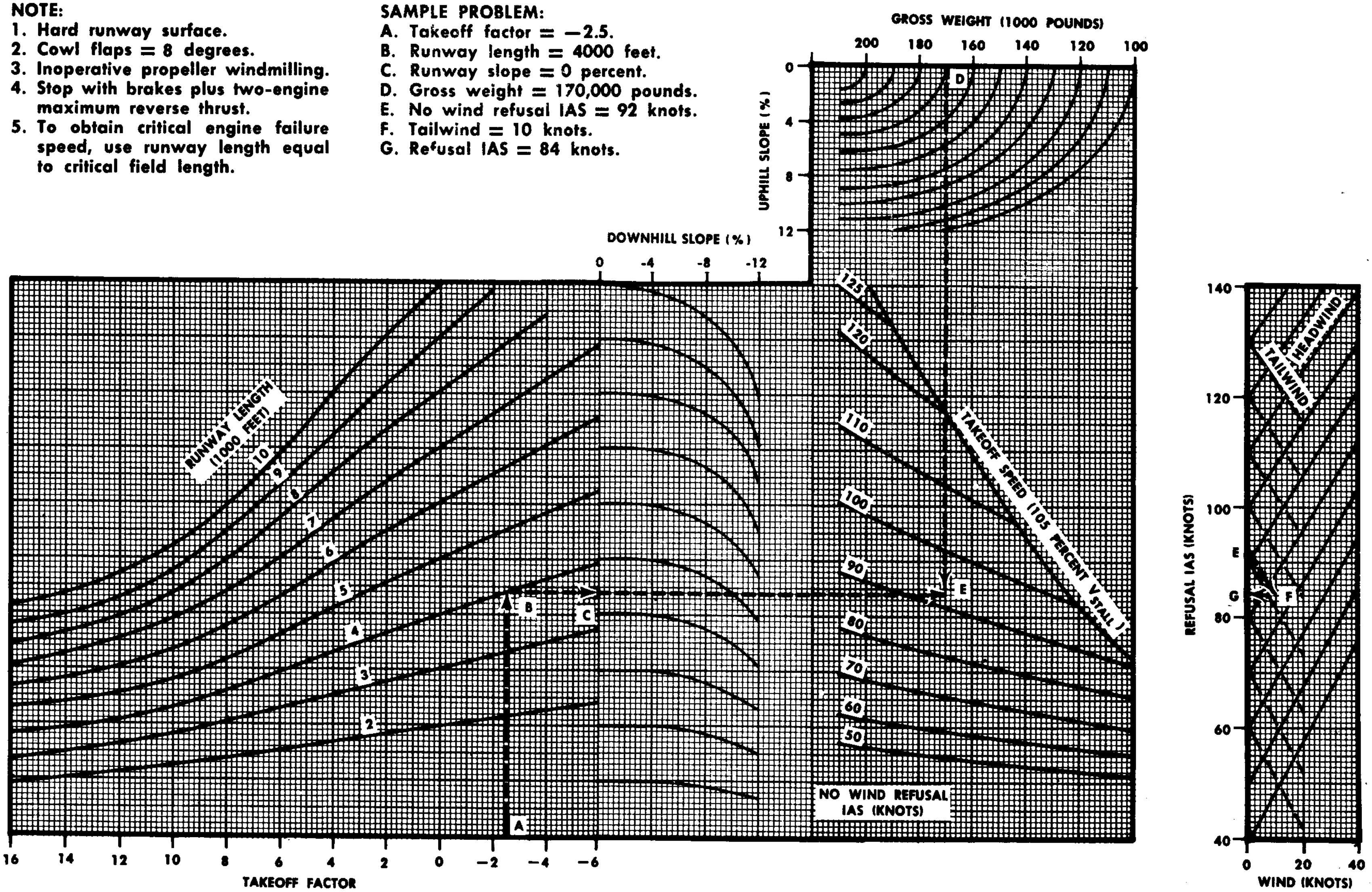

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Figure B3-13. Refusal Speed—Wing Flaps = Zero Degrees

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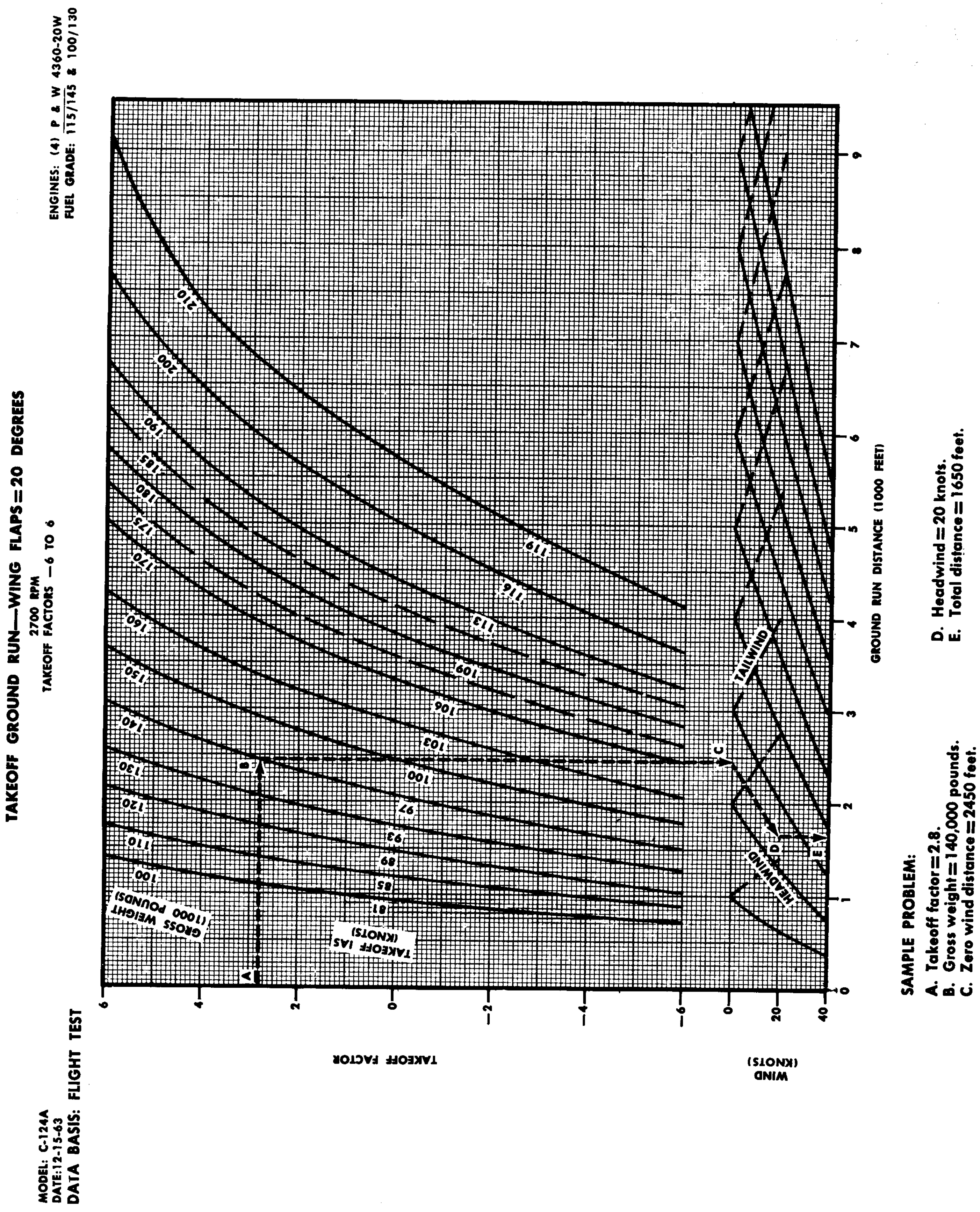


Figure B3-14. Takeoff Ground Run—Wing Flaps = 20 Degrees (Sheet 1 of 2)

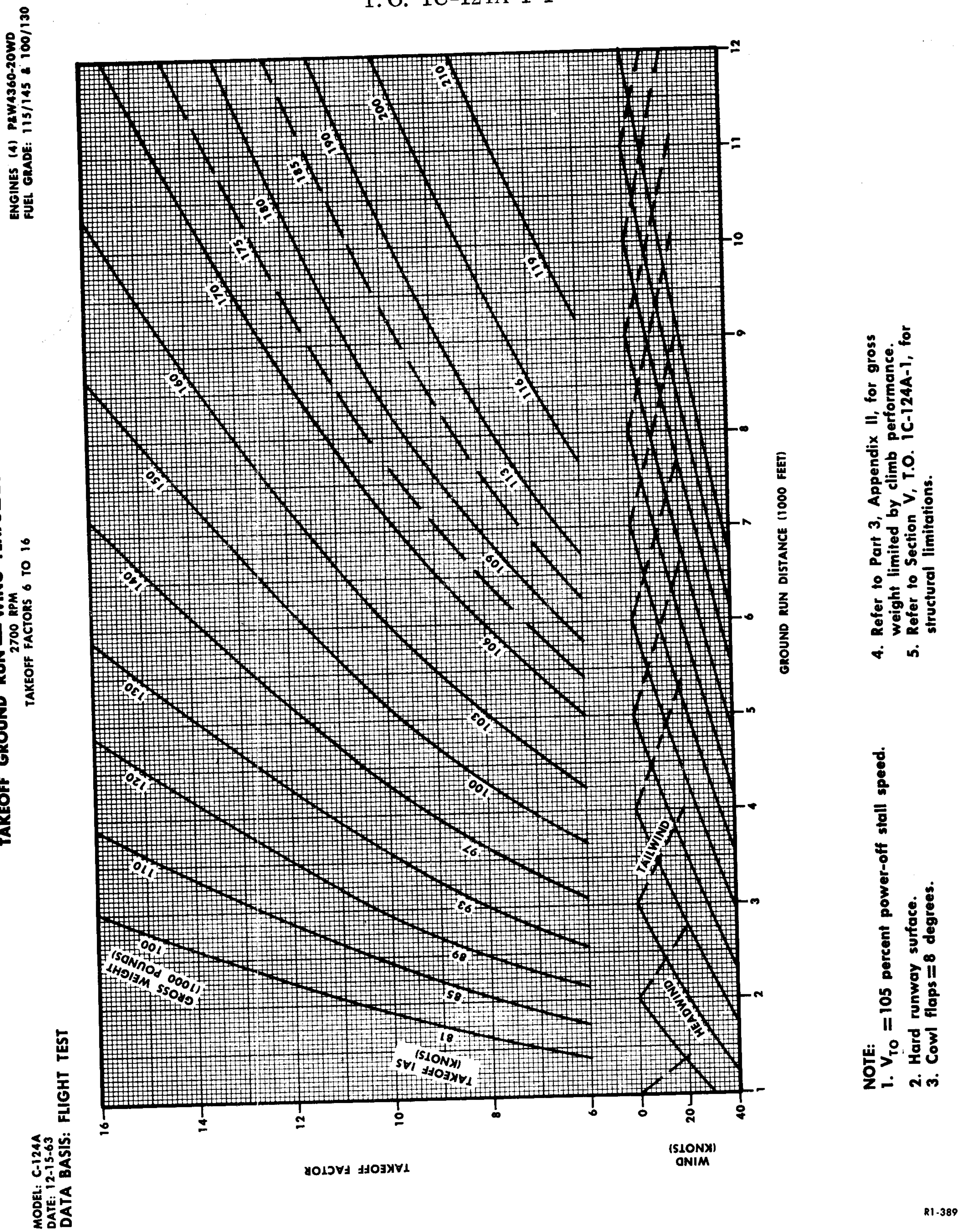


Figure B3-14. Takeoff Ground Run — Wing Flaps = 20 Degrees (Sheet 2 of 2)

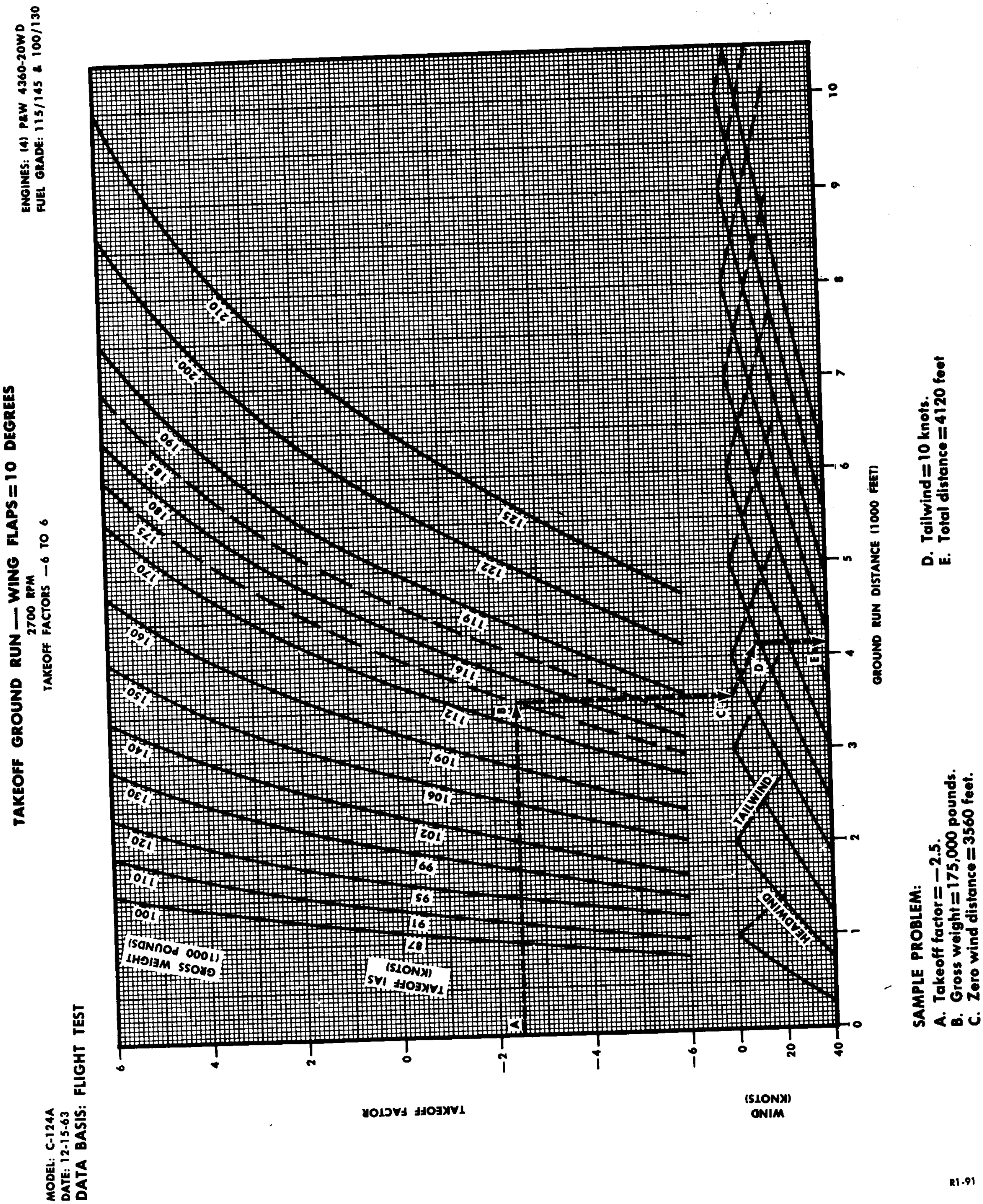


Figure B3-15. Takeoff Ground Run — Wing Flaps = 10 Degrees (Sheet 1 of 2)

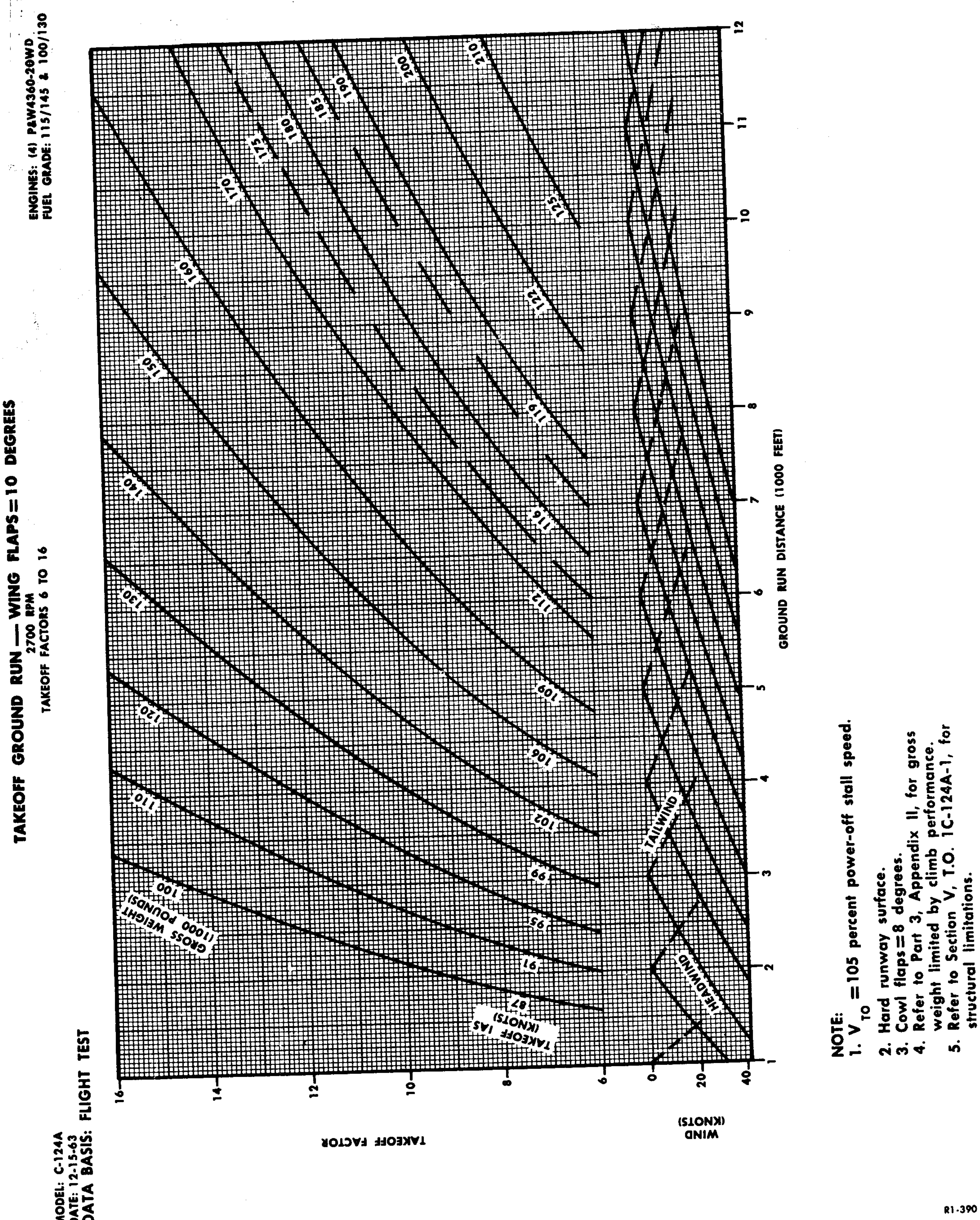


Figure B3-15. Takeoff Ground Run—Wing Flaps = 10 Degrees (Sheet 2 of 2)

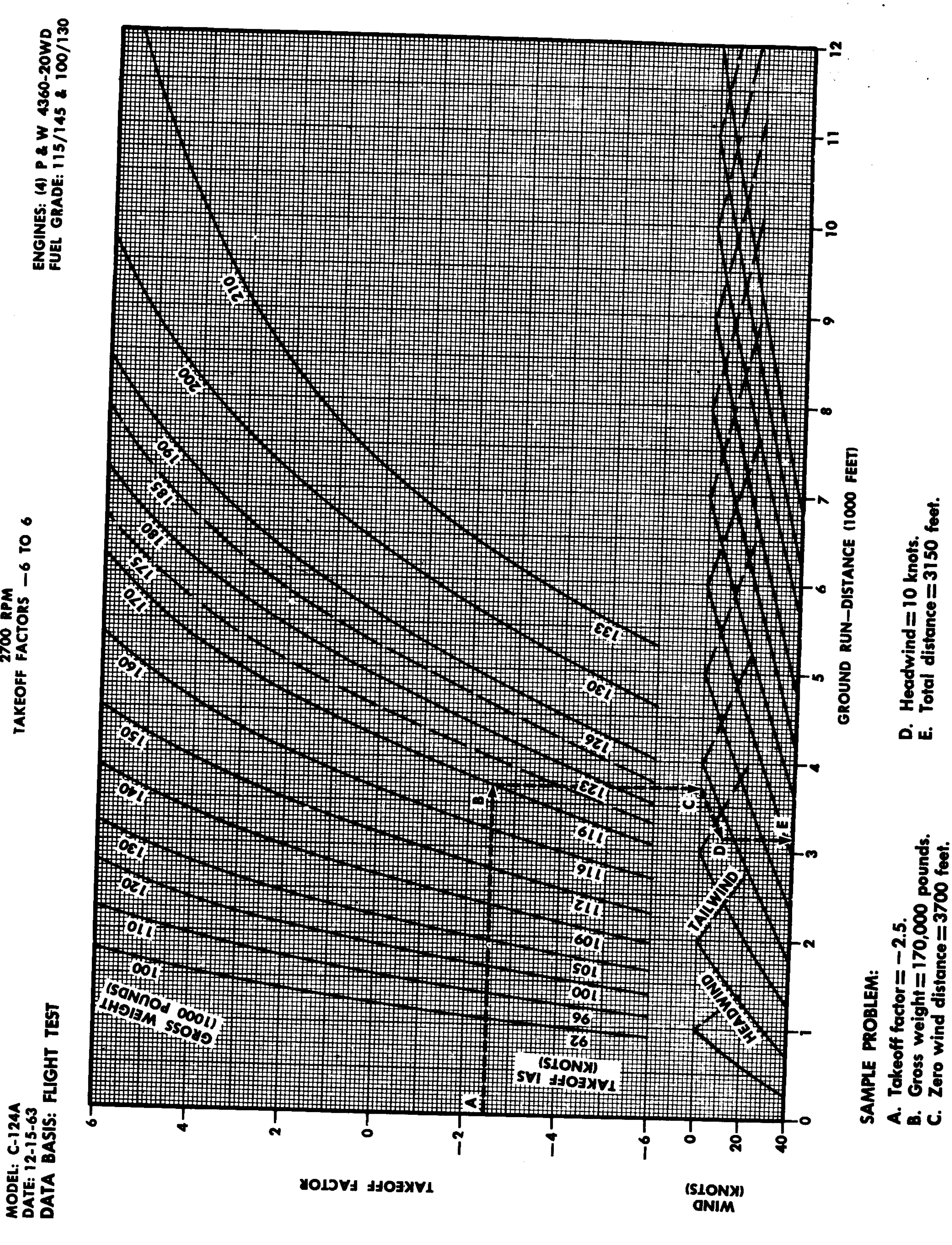
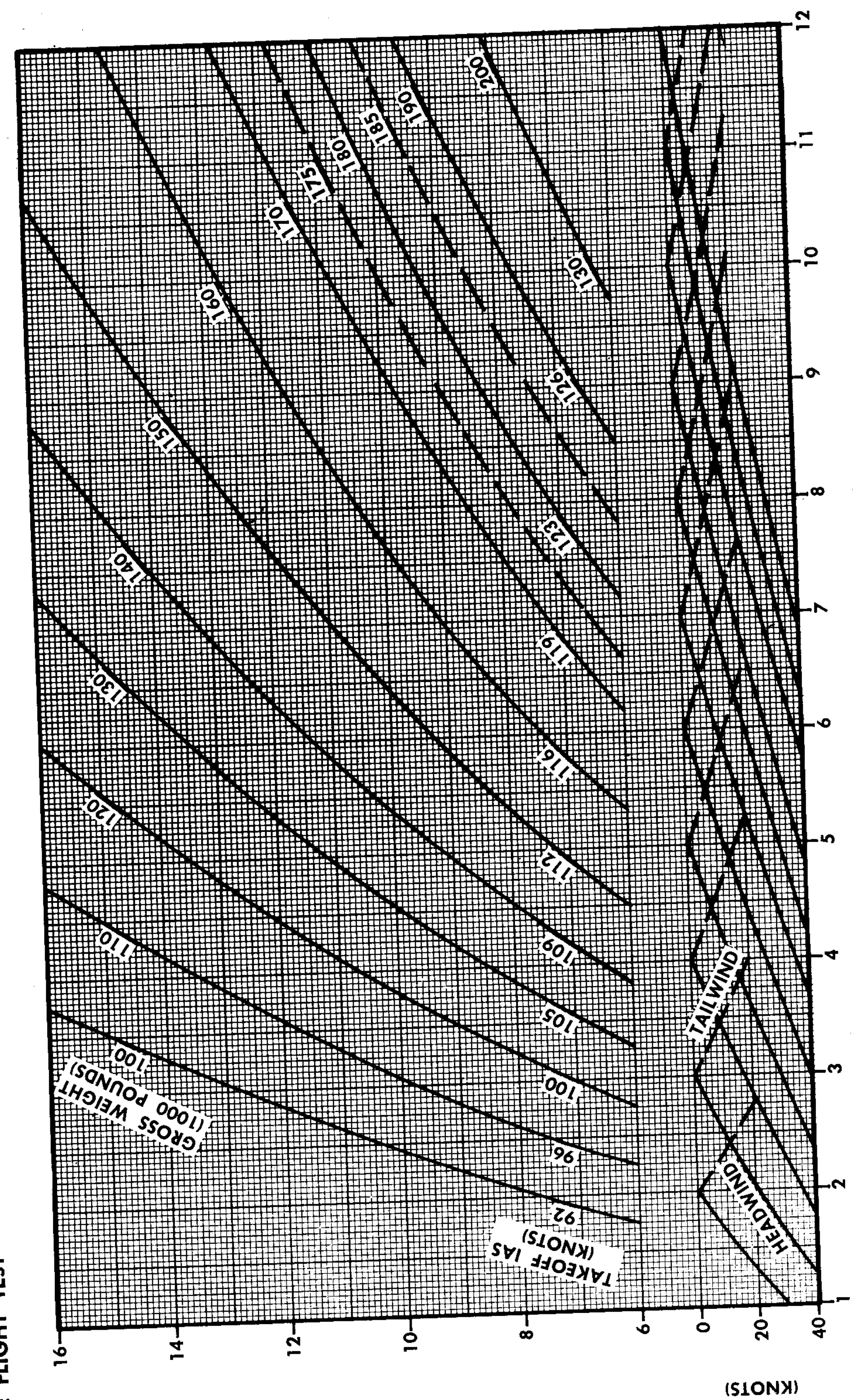


Figure B3-16. Takeoff Ground Run—Wing Flaps = Zero Degrees (Sheet 1 of 2)

TAKEOFF GROUND RUN — WING FLAPS = ZERO DEGREES

2700 RPM
TAKEOFF FACTORS 6 TO 16

ENGINES: (4) P&W4360-20WD
FUEL GRADE: 115/145 & 100/130



NOTE:
1. V_{TO} = 105 percent power-off stall speed.
2. Hard runway surface.
3. Cowl flaps = 8 degrees.
4. Refer to Part 3, Appendix II, for gross weight limited by climb performance.
5. Refer to Section V, T.O. 1C-124A-1, for structural limitations.

MODEL: C-124A
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

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Figure B3-16. Takeoff Ground Run — Wing Flaps = Zero Degrees (Sheet 2 of 2)

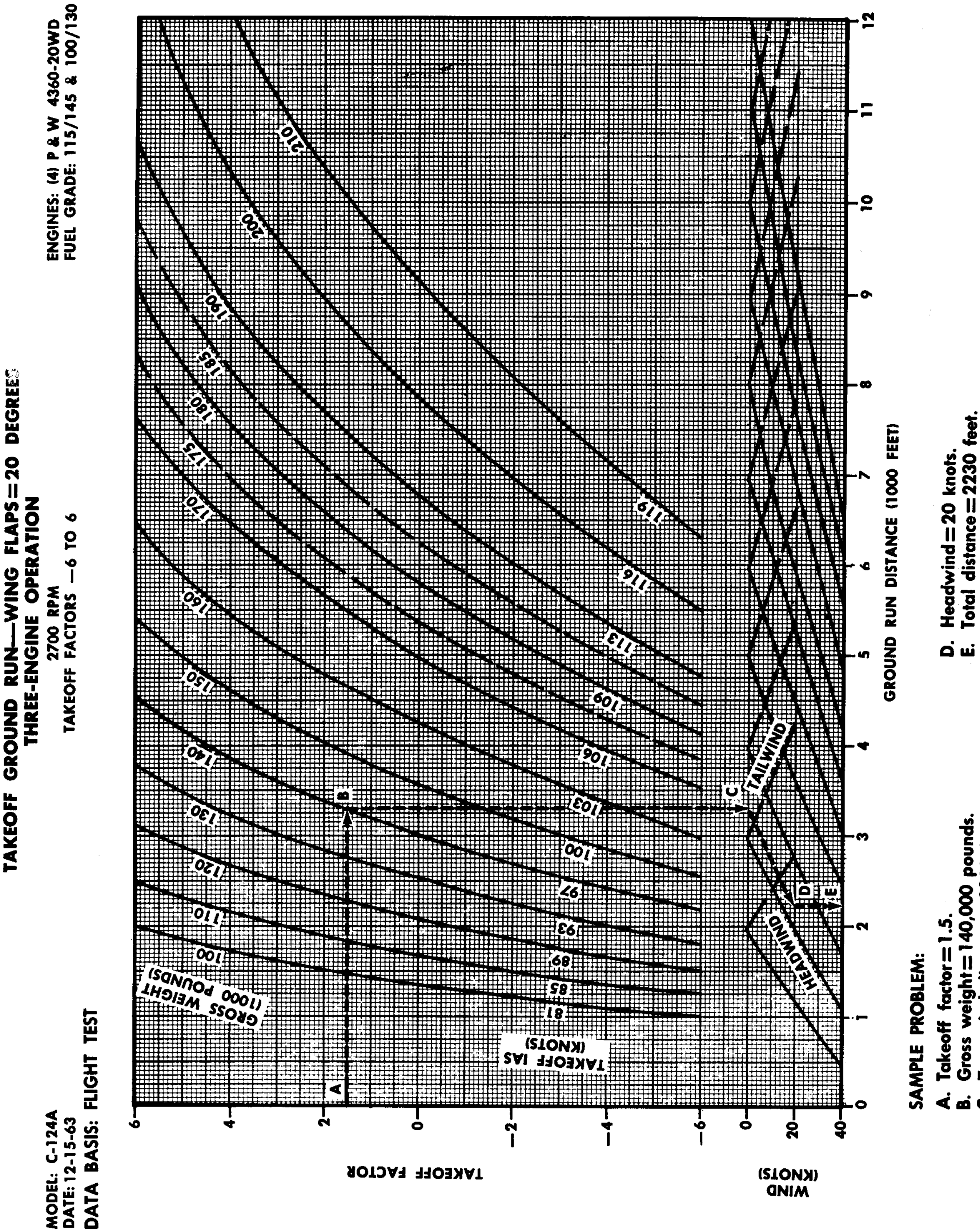
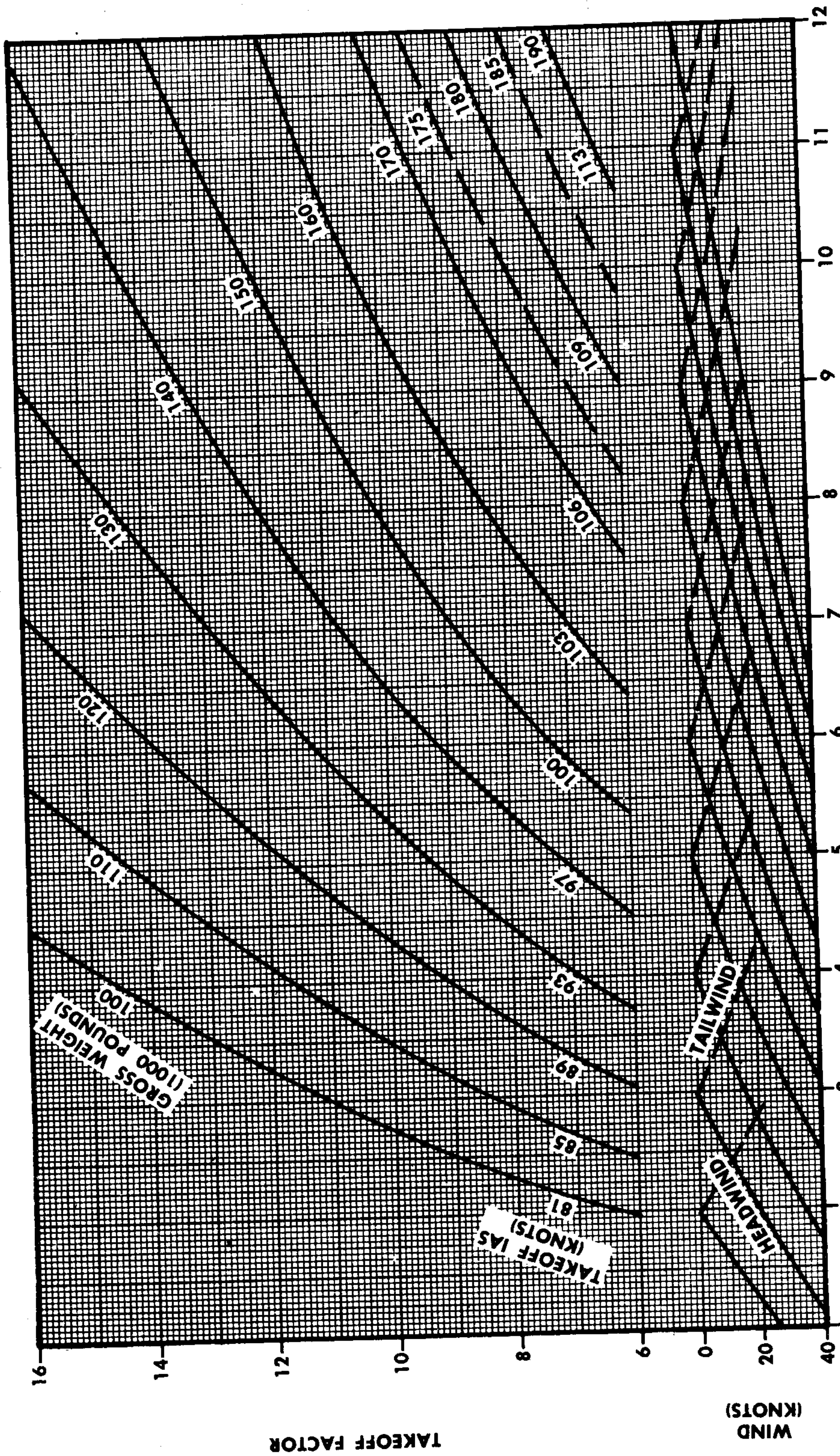


Figure B3-17. Takeoff Ground Run—Wing Flaps = 20 Degrees — Three-Engine Operation (Sheet 1 of 2)

MODEL: C-124A
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

TAKEOFF GROUND RUN — WING FLAPS = 20 DEGREES
THREE-ENGINE OPERATION
2700 RPM
TAKEOFF FACTORS 6 TO 16

ENGINES: (4) P&W4360-20WD
FUEL GRADE: 115/145 & 100/130



NOTE:
1. V_{TO} = 105 percent power-off stall speed.
2. Hard runway surface.
3. Cowl flaps = 8 degrees.
4. Inoperative propeller feathered.
5. Refer to Part 4, Appendix II, for two-engine emergency climb performance.
6. Power on assymmetric operating engine varies from idle at brake release to full power at 60 knots.
7. Refer to Section V, T.O. IC-124A-1, for structural limitations.

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Figure B3-17. Takeoff Ground Run — Wing Flaps = 20 Degrees — Three-Engine Operation (Sheet 2 of 2)

EFFECT OF RUNWAY SLOPE ON TAKEOFF DISTANCE

MODEL: C-124A/C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-20WD/-63A
FUEL GRADE: 115/145 & 100/130

NOTE:
$$\text{Runway Slope (percent)} = \frac{\text{Elevation Difference}}{\text{Runway Length}} \times 100$$

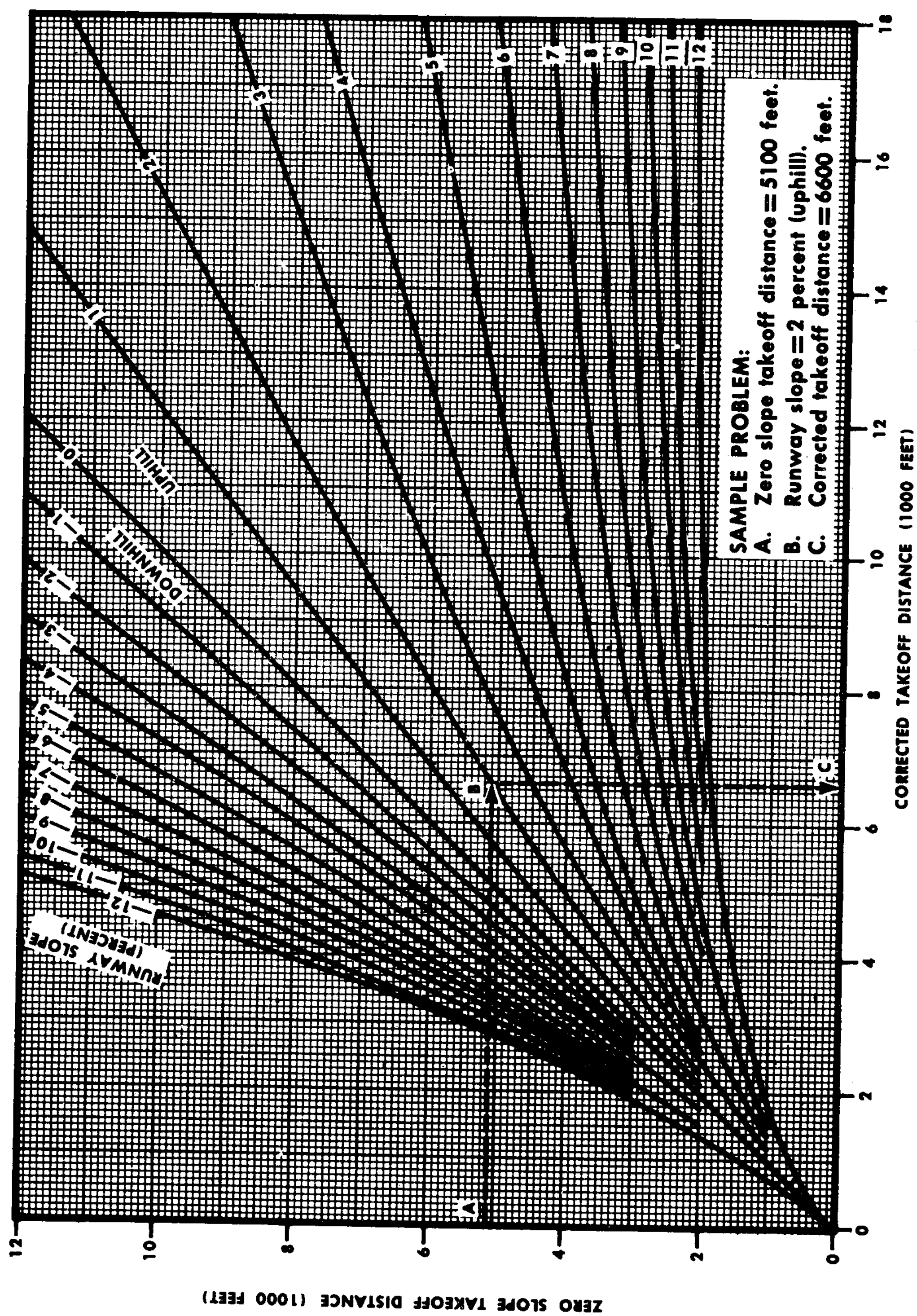
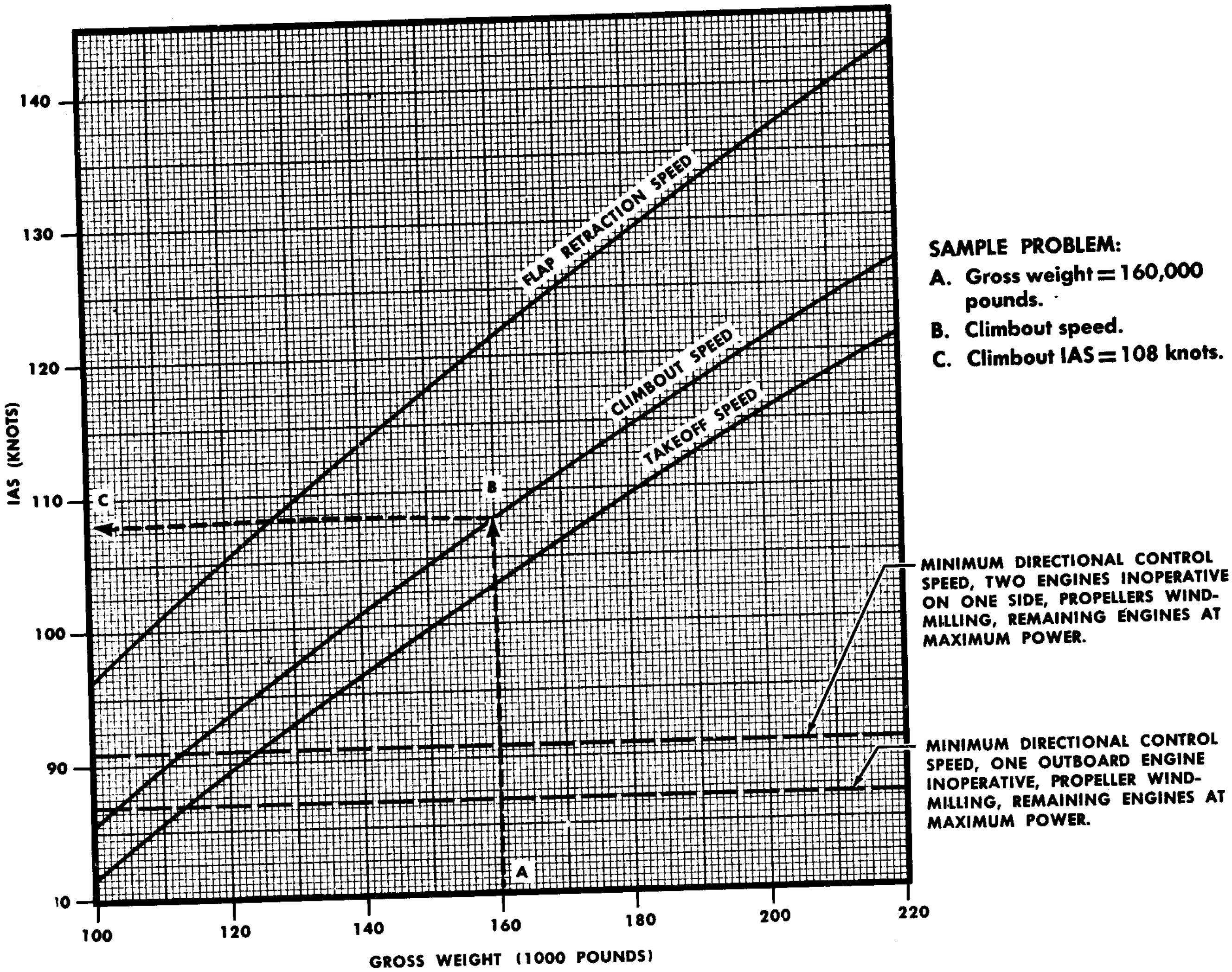


Figure A3-18. Effect of Runway Slope on Takeoff Distance

TAKEOFF, CLIMBOUT, AND FLAP RETRACTION SPEEDS
WING FLAPS = 20 DEGREES
AF49-232 THROUGH AF51-182
FULL SPAN FLAP CONFIGURATION

MODEL: C-124A/C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-20WD/-63A
FUEL GRADE: 115/145 & 100/130



SAMPLE PROBLEM:

A. Gross weight = 160,000 pounds.
B. Climbout speed.
C. Climbout IAS = 108 knots.

NOTE:

1. Flap retraction speed based on 110 percent of power-off stall speed with flaps retracted.
2. Takeoff speed based on 105 percent of power-off stall speed, climbout speed based on 110 percent of power-off stall speed.
3. Multiply speeds by 1.06 to obtain takeoff and climbout speeds with wing flaps equal 10 degrees.
4. Multiply speeds by 1.13 to obtain takeoff and climbout speeds with wing flaps equal zero degrees.

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Figure B3-19. Takeoff, Climbout, and Flap Retraction Speed—Wing Flaps = 20 Degrees

TAKEOFF ACCELERATION

MODEL: C-124 A/C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-20WD/-63A
FUEL GRADE: 115/145 & 100/130

NOTE:

1. Enter chart with takeoff ground run (corrected for wind and slope) and takeoff speed. Follow wind correction guide lines to velocity of wind.
2. Time values are correct as presented for sea level Standard Day only. For other altitudes and temperatures, divide by $1/\sqrt{\sigma}$ to obtain true time.

SAMPLE PROBLEM:

A. Ground run (corrected for wind and slope) = 5300 feet.
B. Takeoff IAS = 117 knots.
C. Headwind = 10 knots.
D. Point that determines acceleration guide line.
E. Refusal IAS (corrected for wind and slope) = 112 Knots.
F. Same as C.
G. Acceleration guide line.
H. Refusal distance = 4600 feet.
I. Acceleration check distance = 4000 feet.
J. Acceleration guide line. Time = 43 seconds. Acceleration check time corrected for altitude (4000 feet) and OAT (27°C) = $t \div 1/\sqrt{\sigma} = 43 \div 1.098 = 39$ seconds.
K. Same as C.
L. Acceleration check IAS = 107 knots.

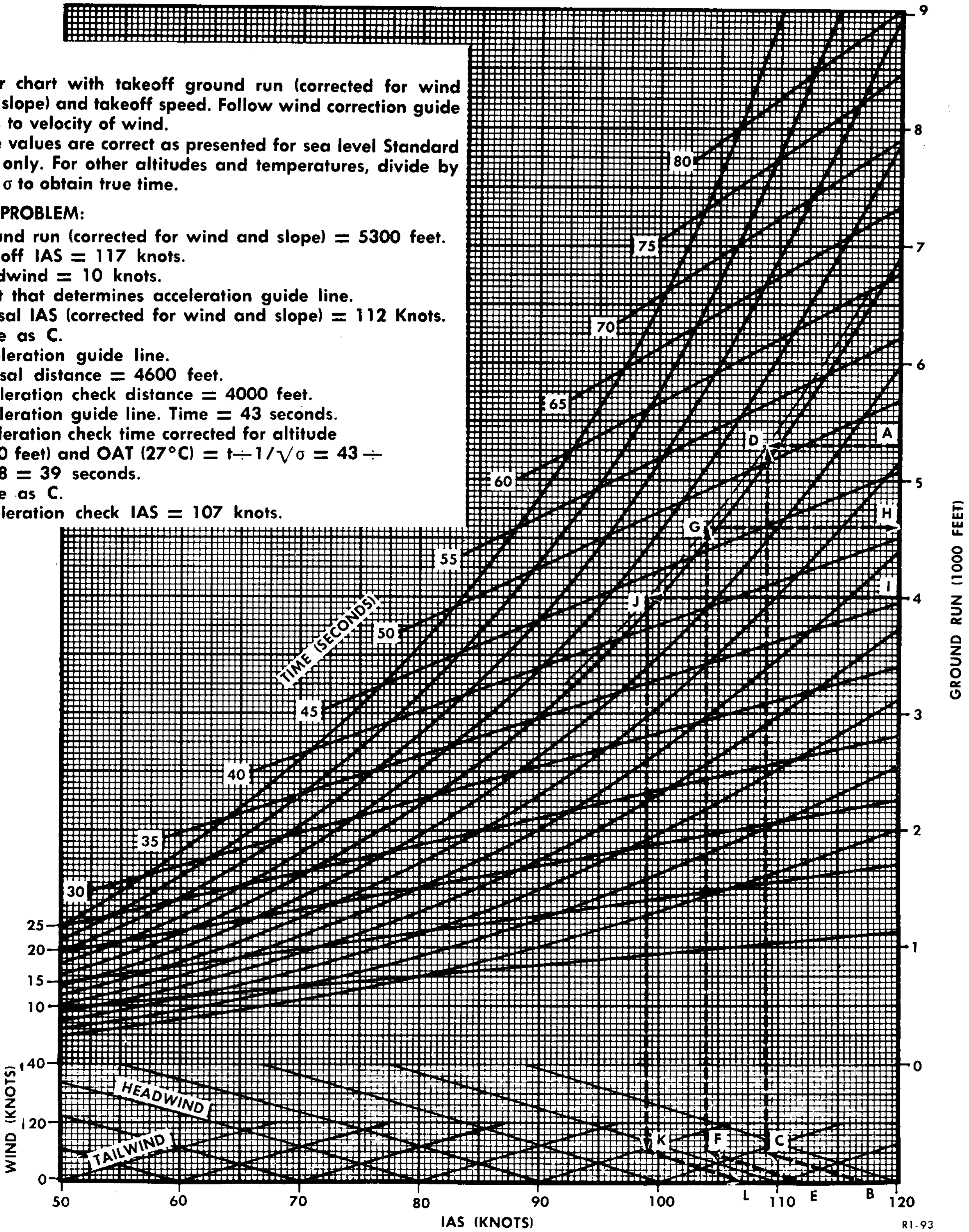

Figure B3-20. Takeoff Acceleration

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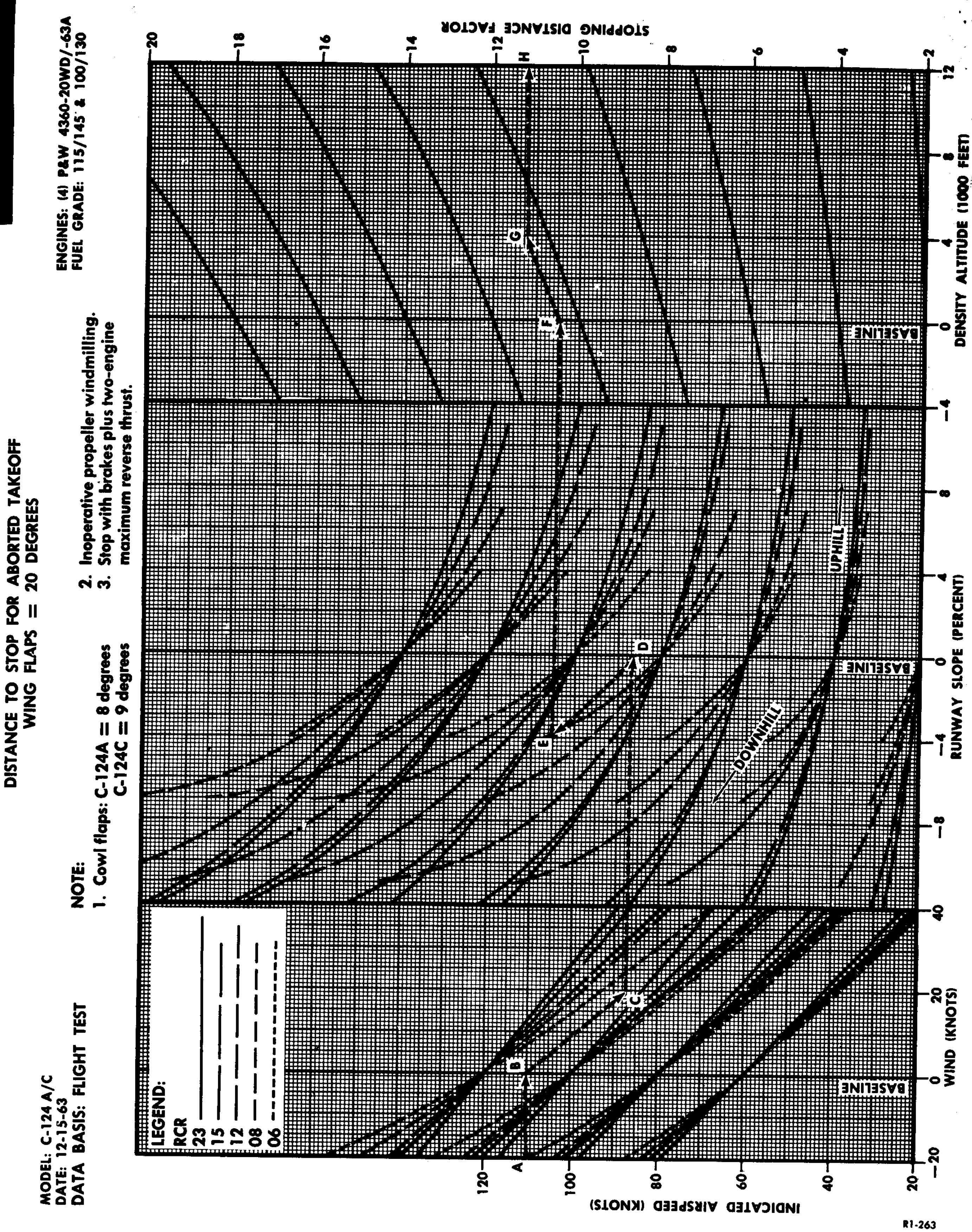

Figure B3-21. Distance to Stop for Aborted Takeoff — Wing Flaps = 20 Degrees (Sheet 1 of 2)

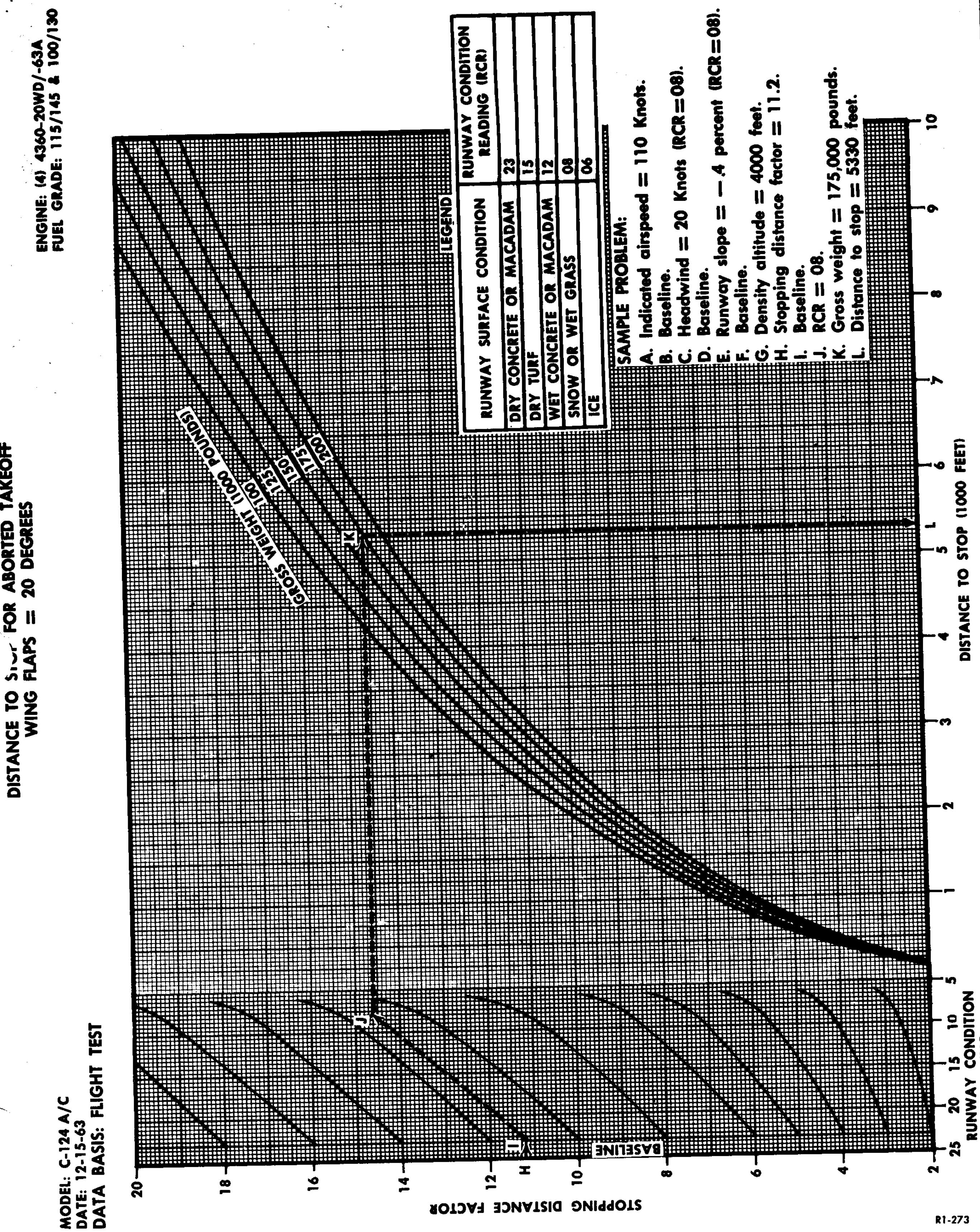

Figure B3-21. Distance to Stop for Aborted Takeoff—Wing Flaps=20 Degrees (Sheet 2 of 2)

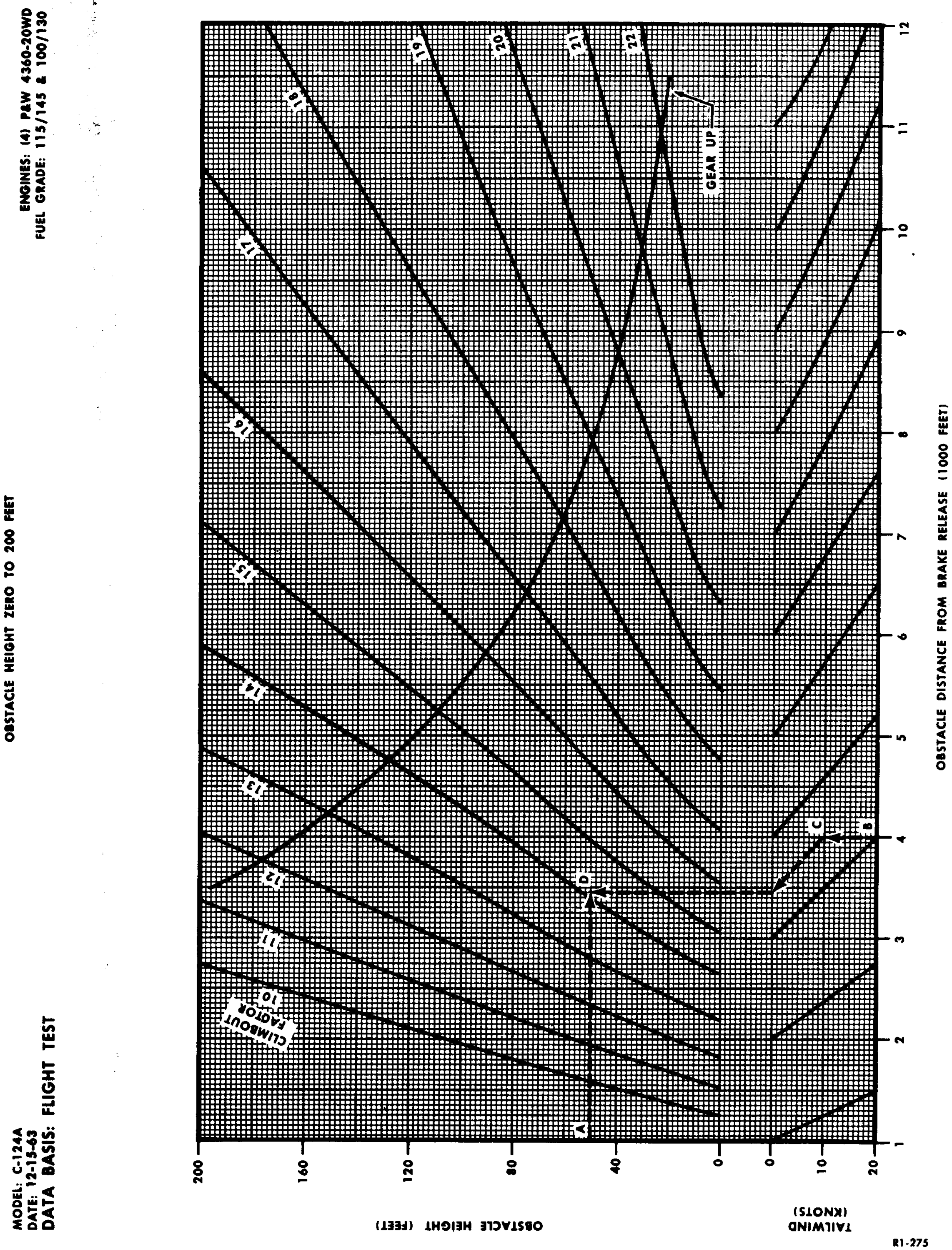

Figure B3-22. Climbout Factor — Three-Engine — Wing Flaps = 20 Degrees (Sheet 1 of 2)

CLIMBOUT FACTOR—THREE-ENGINE
WING FLAPS = 20 DEGREES
OBSTACLE HEIGHT ZERO TO 800 FEET

MODEL: C-124A
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W4360-20WD
FUEL GRADE: 115/145 & 100/130

SAMPLE PROBLEM:

A. Obstacle height = 50 feet.
B. Obstacle distance from brake release = 4000 feet.
C. Tailwind = 10 knots.
D. Climbout factor = 14.1.

NOTE:

1. V_{climb} = 105 percent power-off stall speed.
2. Cowl flaps = 8 degrees.
3. Ground effect included.
4. Inoperative propeller feathered.
5. Distance from brake release to takeoff is based on critical field length for a hard, dry runway surface, zero wind, and zero slope. To account for other conditions, see Discussion of Charts, this part.

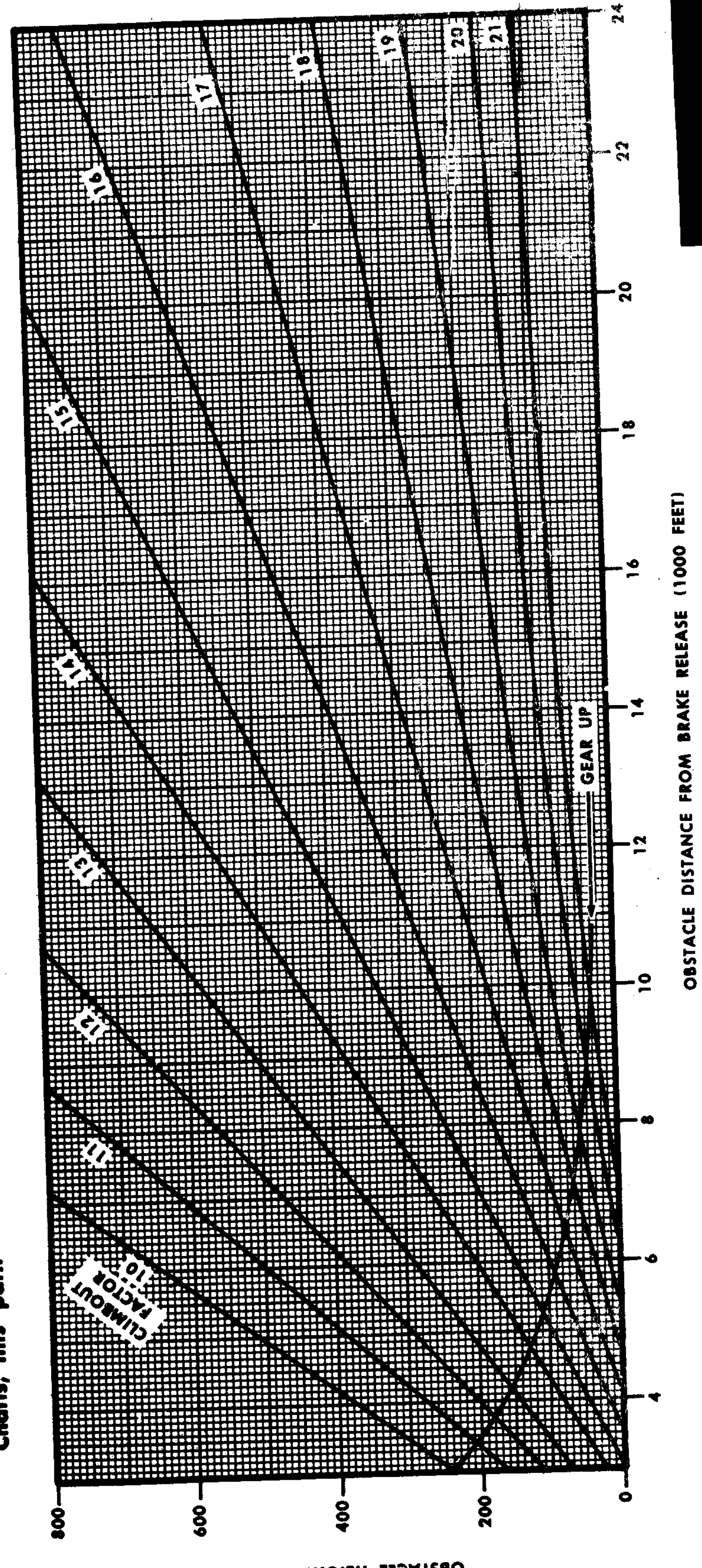

Figure B-22. Climbout Factor — Three-Engine — Wing Flaps = 20 Degrees (Sheet 2 of 2)

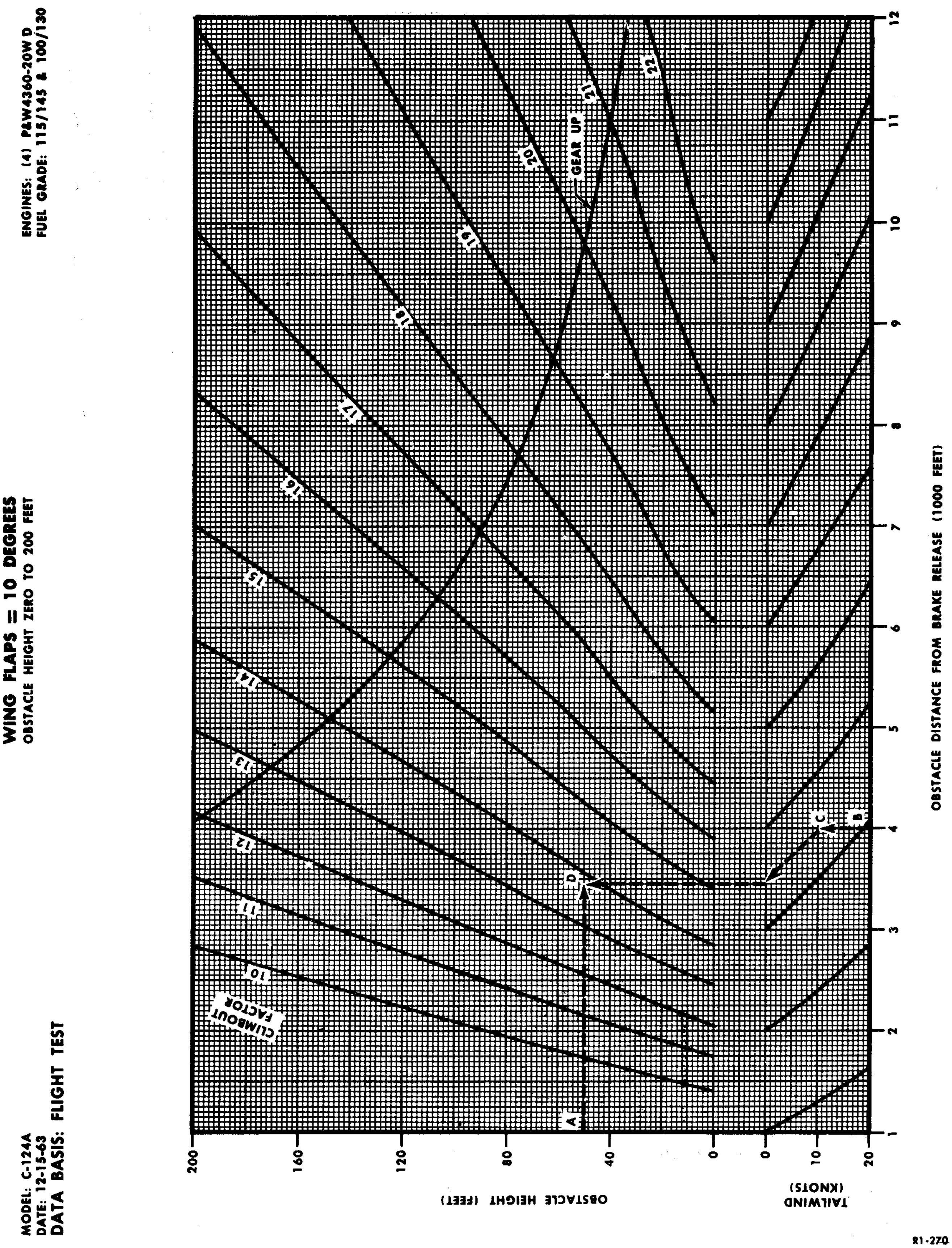

Figure B-23. Climbout Factor — Three-Engine — Wing Flaps = 10 Degrees (Sheet 1 of 2)

CLIMBOUT FACTOR—THREE-ENGINE
WING FLAPS = 10 DEGREES
OBSTACLE HEIGHT ZERO TO 800 FEET

MODEL: C-124A
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W4360-20WD
FUEL GRADE: 115/145 & 100/130

NOTE:

1. V_{climb} = 105 percent power-off stall speed.
2. Cowl flaps = 8 degrees.
3. Ground effect included.
4. Inoperative propeller feathered.
5. Distance from brake release to takeoff is based on critical field length for a hard, dry runway surface, zero wind, and zero slope. To account for other conditions, see Discussion of Charts, this part.

SAMPLE PROBLEM:

A. Obstacle height = 50 feet.
B. Obstacle distance from brake release = 4000 feet.
C. Tailwind = 10 knots.
D. Climbout factor = 13.8.

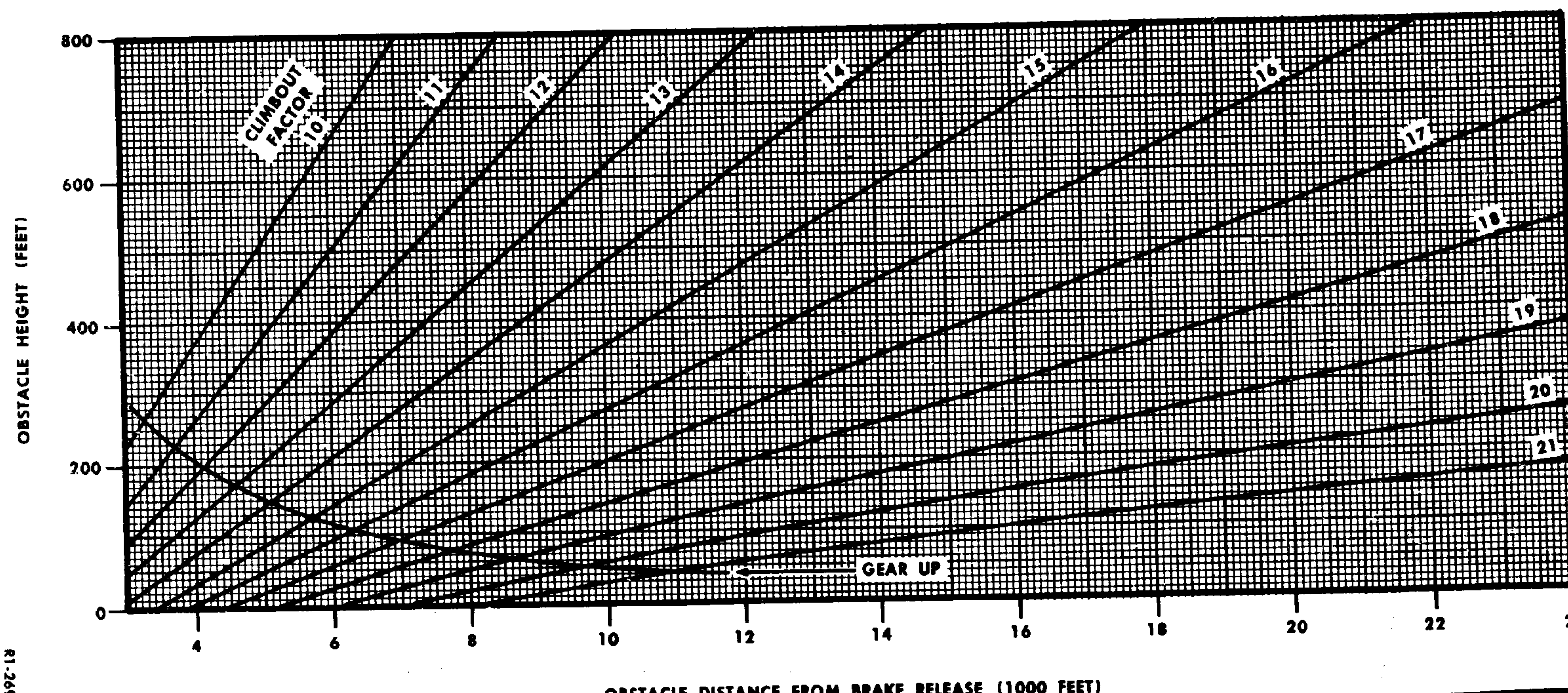

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Figure B3-23. Climbout Factor — Three-Engine — Wing Flaps = 10 Degrees (Sheet 2 of 2)

GROSS WEIGHT LIMITED BY CLIMBOUT OVER OBSTACLE

MODEL: C-124A
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W4360-20WD
FUEL GRADE: 115/145 & 100/130

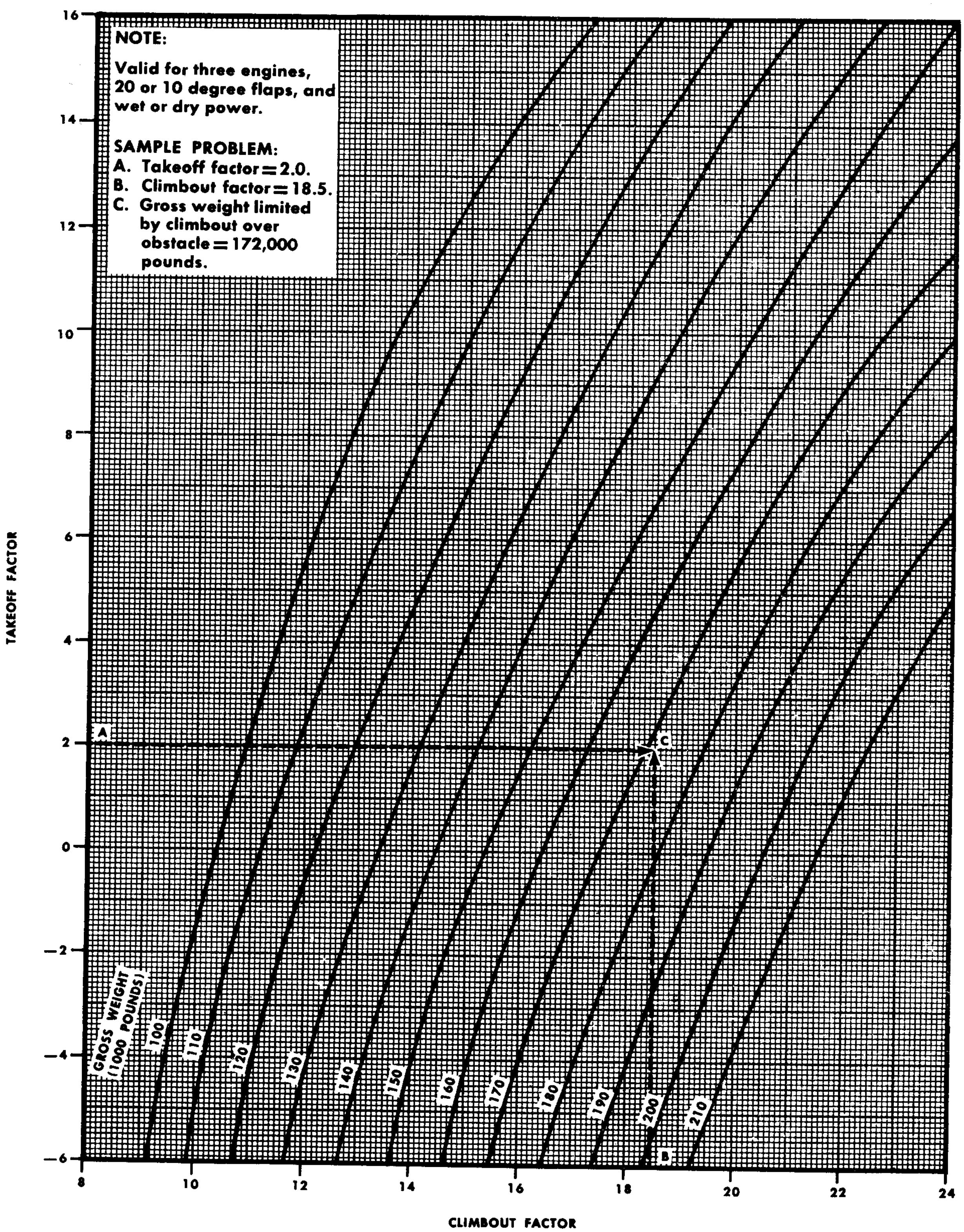


Figure B3-24. Gross Weight Limited by Climbout Over Obstacle

PART IV

CLIMB

TABLE OF CONTENTS

LIST OF CHARTS

CLIMB PERFORMANCE.

The climb performance presented has been modified to provide for sufficient engine cooling. From the climb data, it was determined that the highest rate of climb at 175,000 pounds gross weight without cooling consideration is obtained at 140 knots IAS, as shown on the accompanying sketch of Constant Power Climb.

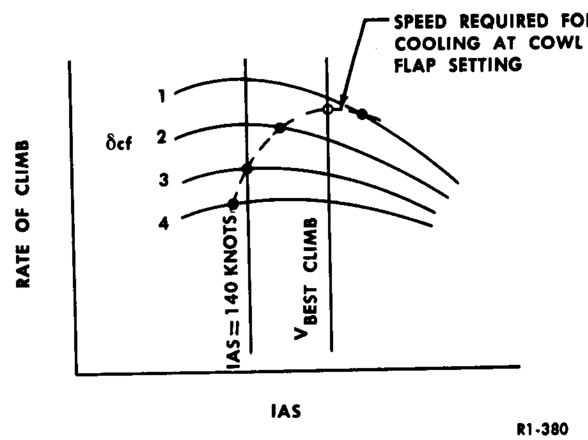
However, when engine cooling requirements are considered, speed for best climb shifts. The dashed line on the preceding plot represents the speed required for cooling purposes at each cowl flap setting, and the maximum point on this determines the optimum rate of climb and the best climbing speed. Refer to T.O. 1C-124A-1, Section V, for desired operating limits.

BLOWER SHIFT.

The altitudes indicated on the climb charts, at which the blower shift should be made, are determined by the point at which the limiting power in high blower is available. These altitudes vary with power setting, fuel grade, and temperature. When the shift altitude is reached, reduce manifold pressure 3 to 4 inches Hg, then shift to high blower. Re-adjust the throttle to the power level indicated on the individual climb charts.

NOTE:

$V_{Best\ climb}$ = speed required where rate of climb is a maximum with proper engine cooling.



DISCUSSION OF CHARTS.

NORMAL CLIMB CHARTS.

The climb charts (figures B4-1 through B4-10) are presented for engine operation in RICH Mixture. These charts are used to predict time and fuel to climb and the horizontal distance traveled during climb. An auxiliary curve on each chart indicates the best climb speed and recommended cowl flap position. Several combinations of number of engines operating, engine RPM, atmospheric conditions and fuel grade have been chosen to cover normal climb operations. Charts designating three-engine operation are based on propeller being feathered on the inoperative engine. A sample problem is given on the first chart of this series to illustrate the use of the data. To obtain data for atmospheric conditions between ICAO Standard Day and Army Hot Day, compute all data (EAS, cowl flap position, and time, distance, and fuel to climb) for both standard day and hot day conditions, and interpolate for the variation from standard day (Army Hot Day = Standard Day + 23°C).

The reduced power climb performance of 2350 RPM is included to show the capabilities of the aircraft at an alternate power setting suitable for climb on normal missions. This power setting is permissible and desirable when the gross weight is not excessively high, and when all four engines are operating. Reduced power results in longer engine life and lowers the vibration level of the aircraft and engine accessories during climb.

CEILINGS CHART.

The Ceilings chart (figure B4-11) presents emergency ceilings (100 fpm rate of climb capability) and cruise ceilings (300 fpm) for four, three, and two engines at METO power. The ceilings are based on speed and cowl flap setting for best climb, and any inoperative propellers feathered. A sample problem is given on this chart to illustrate the use of the data.

EMERGENCY CLIMB CHARTS.

The emergency climb charts (figures B4-12 through B4-25) show rates of climb at different IAS for various configurations with four, three and two engines operating. A correction plot is included on each chart to permit the determination of rate of climb for various torque pressures and density altitudes. The emergency climb data serves fundamentally as an indication of the speed for best rate of climb, which occurs at the peak of each curve, and general level of climb capability; it is not applicable to takeoff climbout characteristics since the effect of climbing near the ground is not included.

EMERGENCY TWO-ENGINE CLIMB CHART.

The Emergency Two-Engine Climb Chart (figure B4-26) supplements the information presented on the Emergency Climb Two-Engine Charts (figures B4-22 through B4-25). The chart shows the rate of climb and speed for maximum rate of climb in the clean configuration (wing flaps = zero degrees and landing gear up) for gross weights from 110,000 to 180,000 pounds, with corrections for various density altitudes and torque pressures. Data are based on climb at maximum RPM, cowl flaps open to 8 degrees, oil cooler doors full open, and propellers feathered on the inoperative engines. Ground effect is not included on this chart.

RECOMMENDED SPEED FOR BEST RATE OF CLIMB AND BEST ANGLE OF CLIMB CHART.

The recommended speed for best rate of climb and best angle of climb at maximum wet power can be determined from figure B4-27. Speed for best rate of climb is presented for three-engine operation with landing gear up and wing flaps at either zero or 20 degrees, and with landing gear down and wing flaps at 20 degrees. The recommended speed for best angle of climb is presented for two- three- or four-engine operation for 105 percent of power-off stall speed with wing flaps at 20 degrees. The best rate of climb is experienced when the increase in altitude per unit time is a maximum value. The best angle of climb is experienced when the increase in altitude per unit horizontal distance is a maximum value. The best angle of climb curve is based on 105 percent of the power-off stall speed, since the best angle of climb occurs at this speed or below. During takeoff when an obstacle must be cleared, the velocity for best angle of climb will enable the aircraft to attain the highest altitude in the shortest horizontal distance.

TIME, DISTANCE AND FUEL TO CLIMB

MODEL: C-124A
DATA BASIS: ESTIMATED
DATA AS OF: 16 MAY 1963

4 ENGINES; 2550 RPM; 115/145 GRADE FUEL
STANDARD DAY
⊡ R/C = 100 FT/MIN

ENGINES: (4) P&W 4360 - 20W

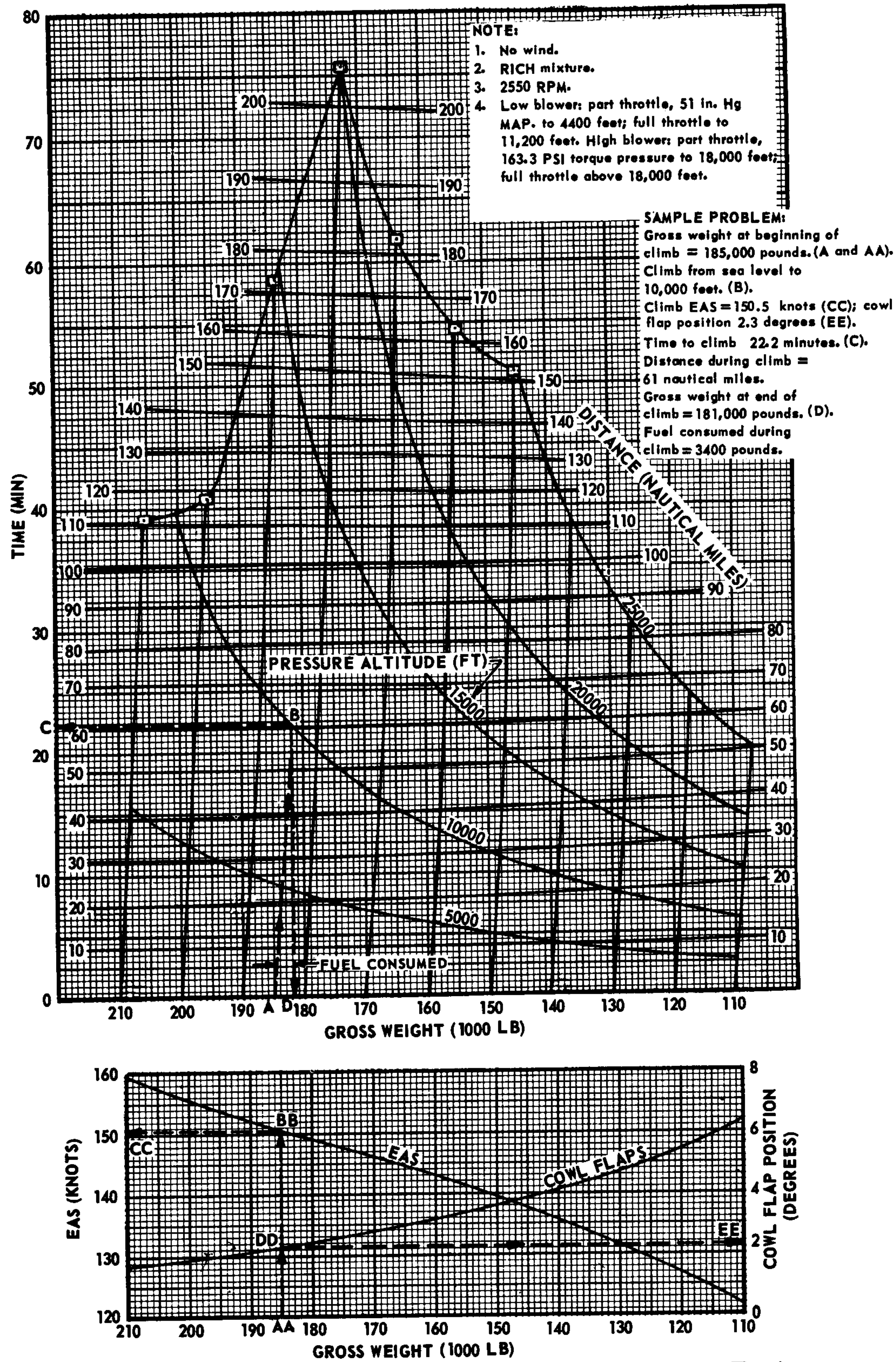


Figure B4-1. Time, Distance, and Fuel to Climb — Four — Engines — 2550 RPM — Fuel Grade 115/145 — Standard Day

R1-344

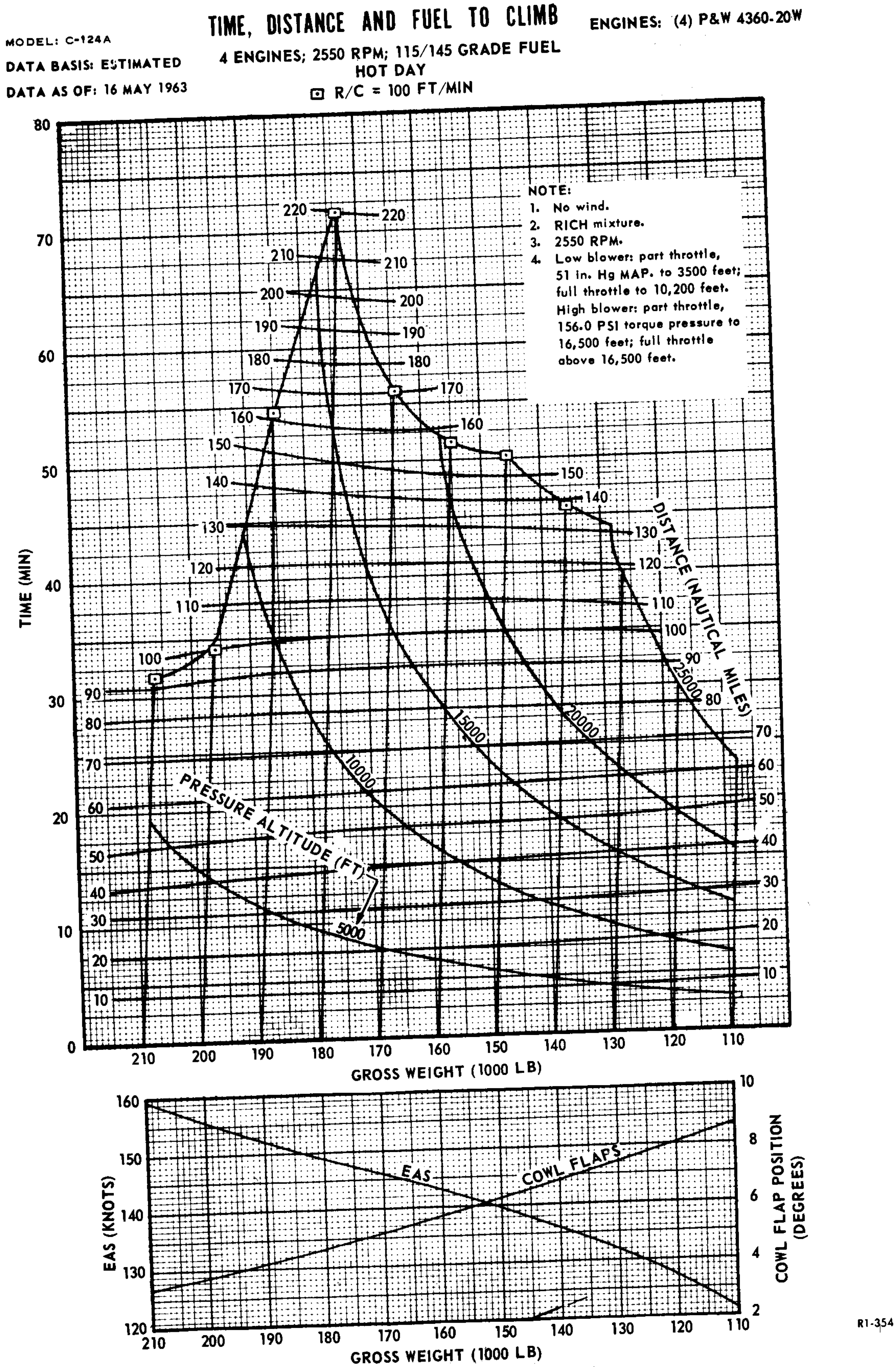


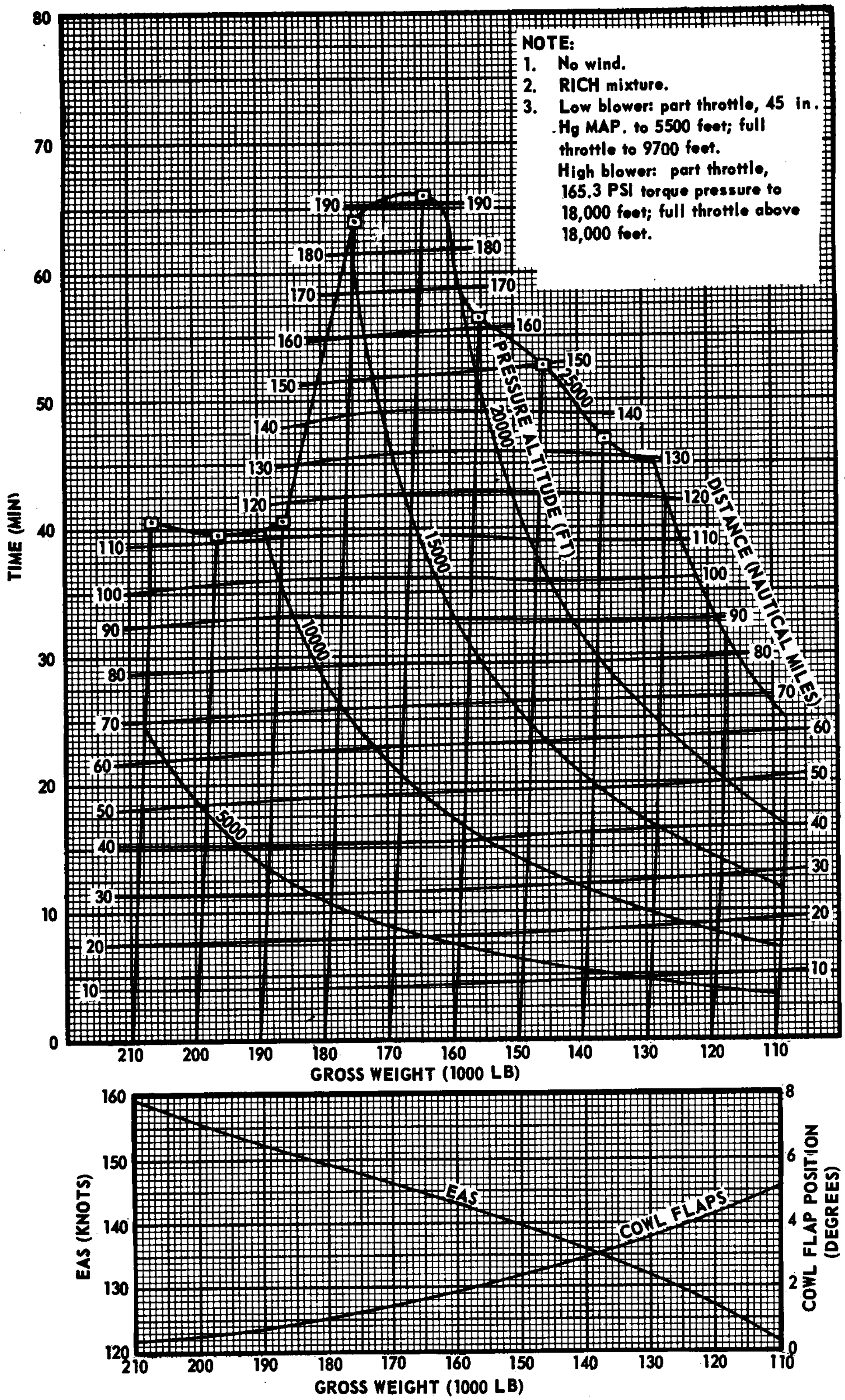
Figure B4-2. Time, Distance, and Fuel to Climb — Four — Engine — 2550 RPM — Fuel Grade 115/145 — Hot Day

TIME, DISTANCE AND FUEL TO CLIMB

MODEL: C-124A
DATA BASIS: ESTIMATED
DATA AS OF: 16 MAY 1963

4 ENGINES; 2350 RPM; FUEL GRADE 115/145
STANDARD DAY
⊡ R/C = 100 FT/MIN

ENGINES: (4) P&W 4360-20W



R1-345

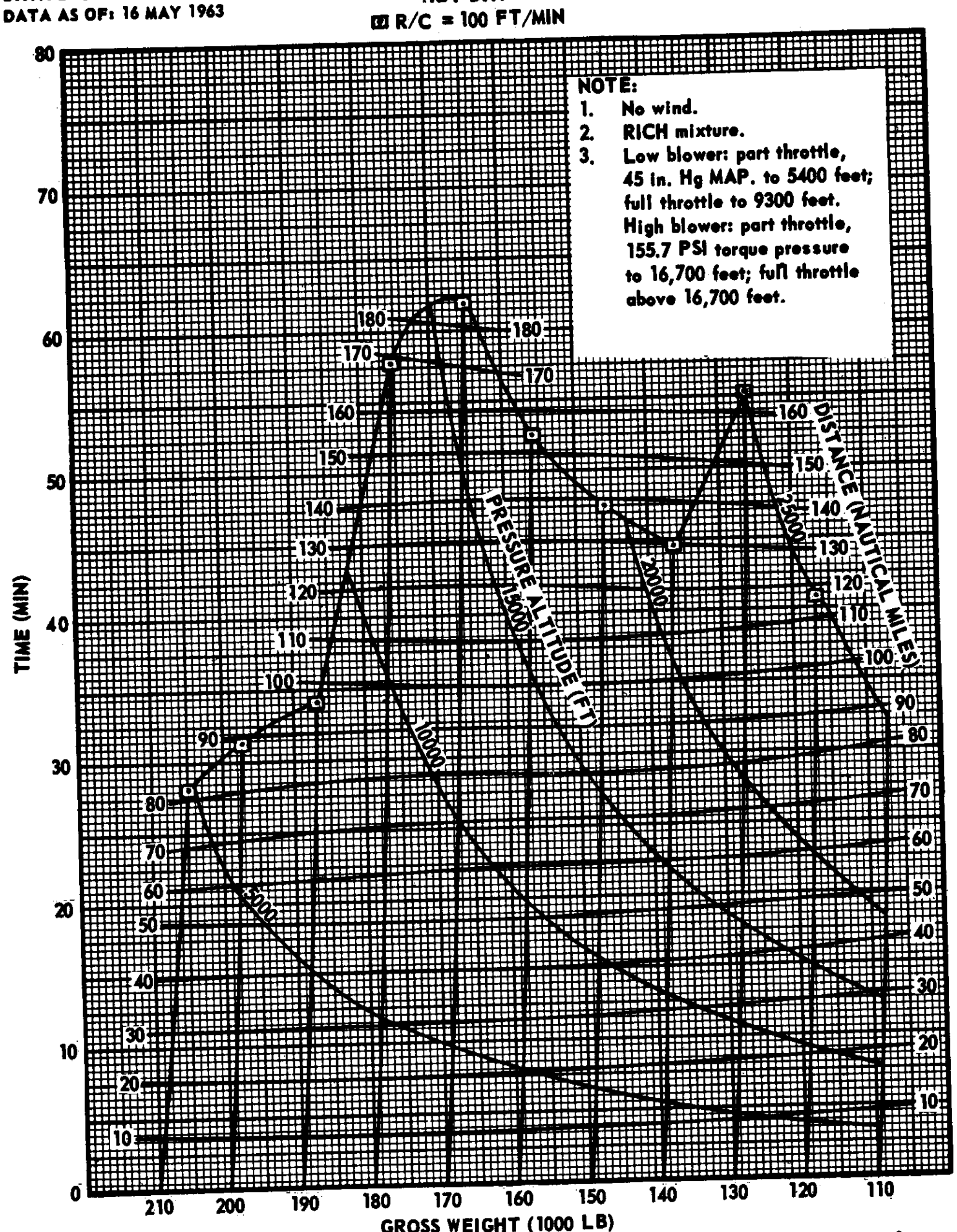
Figure B4-3. Time, Distance, and Fuel to Climb — Four — Engine — 2350 RPM — Fuel Grade 115/145 — Standard Day

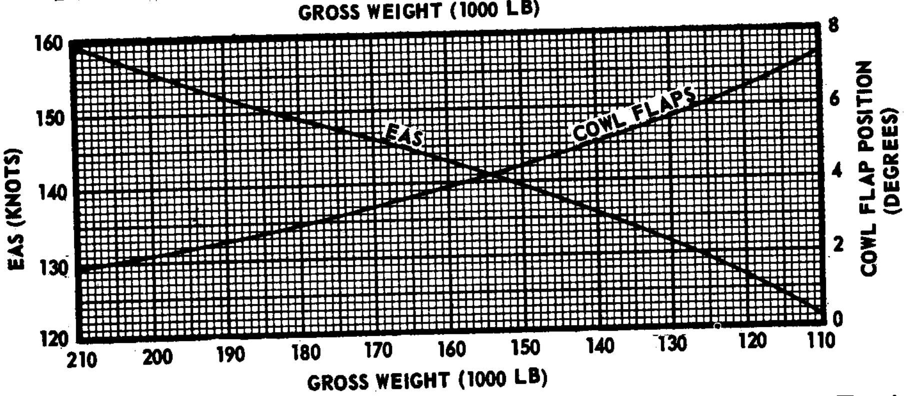
TIME, DISTANCE AND FUEL TO CLIMB

4 ENGINE; 2350 RPM; FUEL GRADE 115/145
HOT DAY
▣ R/C = 100 FT/MIN

MODEL: C-124A
DATA BASIS: ESTIMATED
DATA AS OF: 16 MAY 1963

ENGINES: (4) P&W 4360-20W





R1-346

Figure B4-4. Time, Distance, and Fuel to Climb — Four— Engine — 2350 RPM — Fuel Grade 115/145 — Hot Day

TIME, DISTANCE AND FUEL TO CLIMB

MODEL: C-124A
DATA BASIS: ESTIMATED
DATA AS OF: 16 MAY 1963

3 ENGINE; 2550 RPM; 115/145 GRADE FUEL
STANDARD DAY
▣ R/C = 100 FT/MIN

ENGINES: (4) P&W 4360-20W

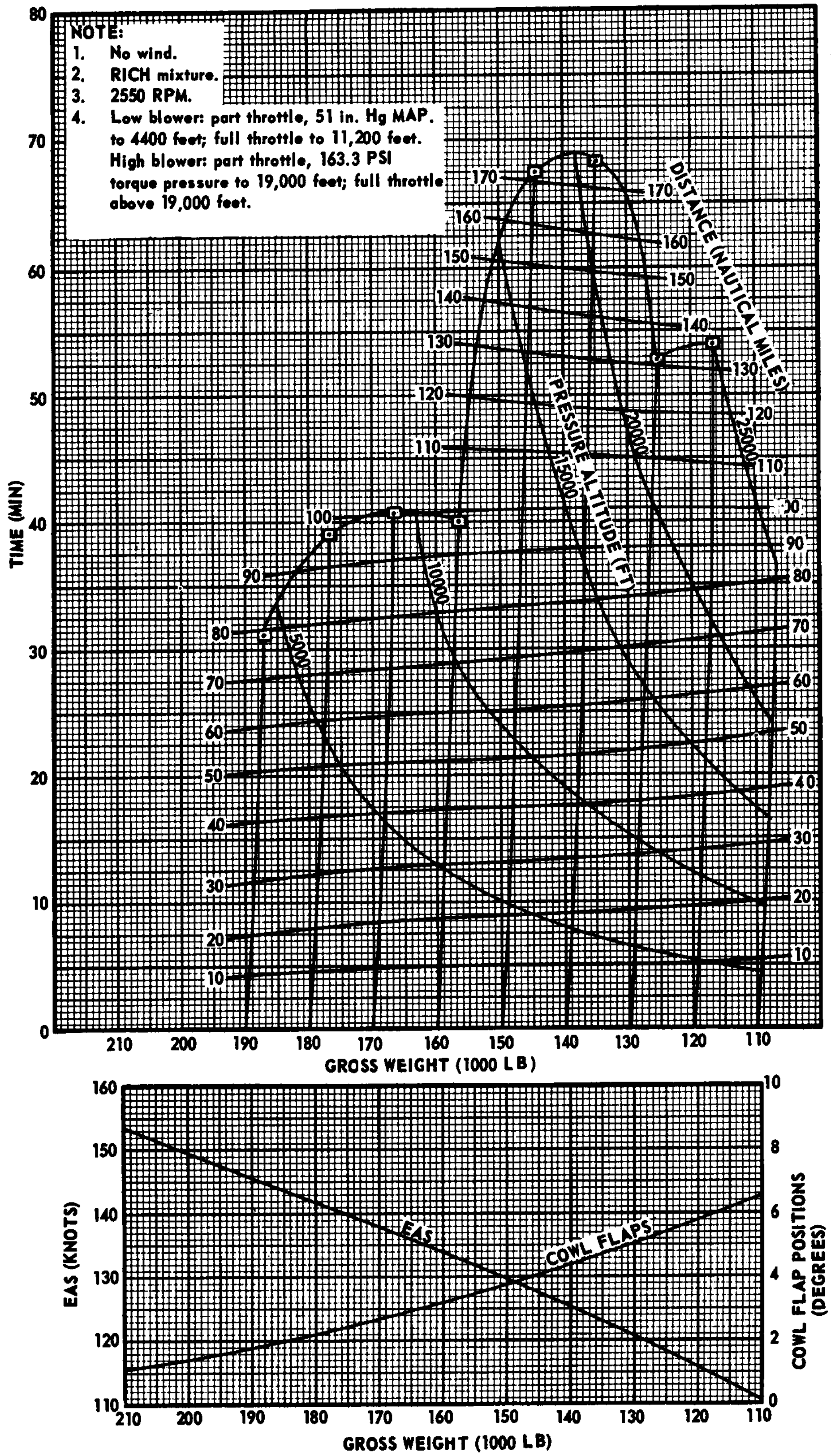


Figure B4-5. Time, Distance, and Fuel to Climb — Three Engine — 2550 RPM — Fuel Grade 115/145 — Standard Day

R1-347

TIME, DISTANCE AND FUEL TO CLIMB

MODEL: C-124A
DATA BASIS: ESTIMATED
DATA AS OF: 16 MAY 1963

3 ENGINE; 2550 RPM; 115/145 GRADE FUEL
HOT DAY
⊡ R/C = 100 FT/MIN

ENGINES: (4) P&W 4360-20W

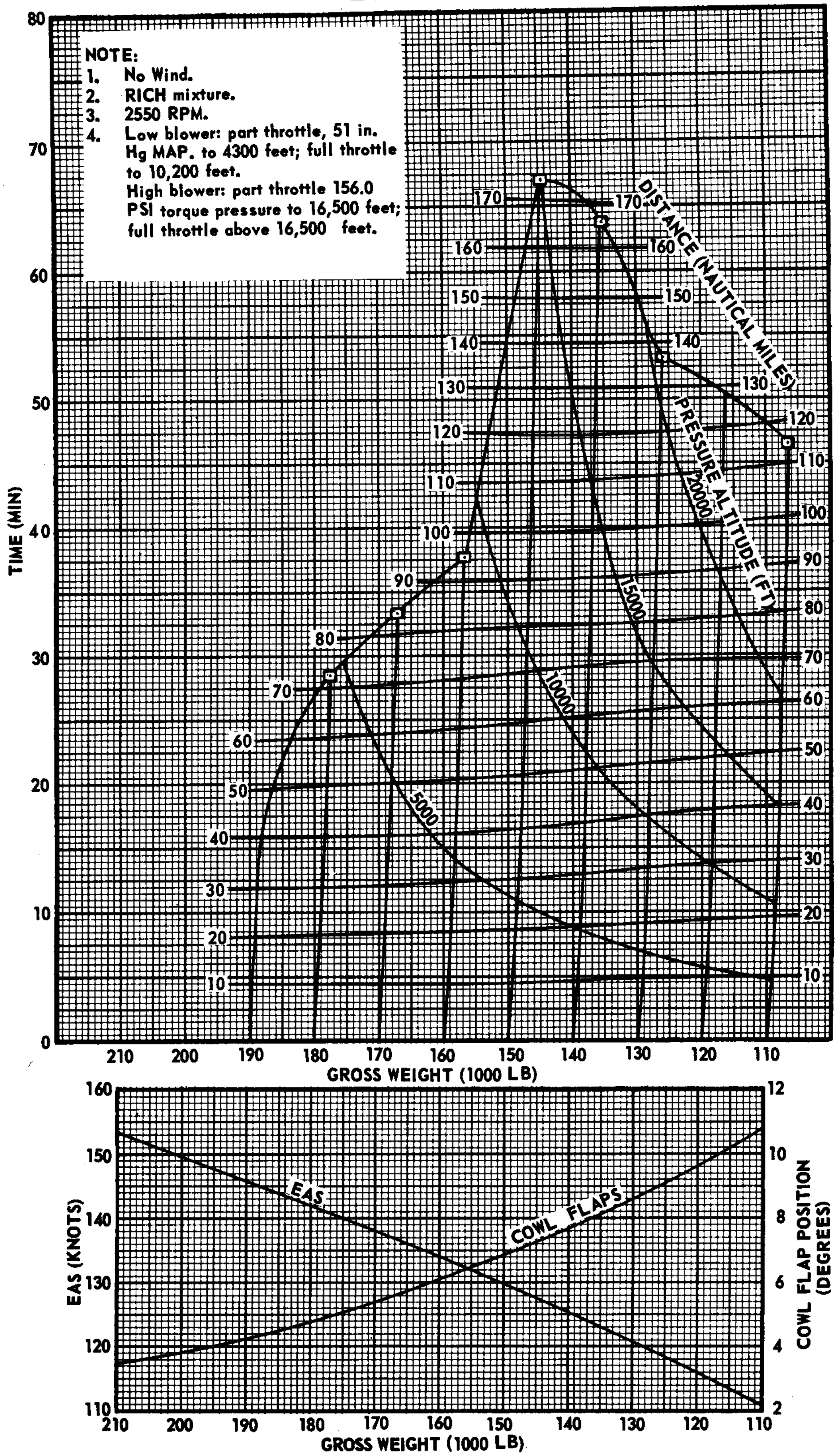


Figure B4-6. Time, Distance, and Fuel to Climb — Three Engine — 2550 RPM — Fuel Grade 115/145 — Hot Day

R1-364

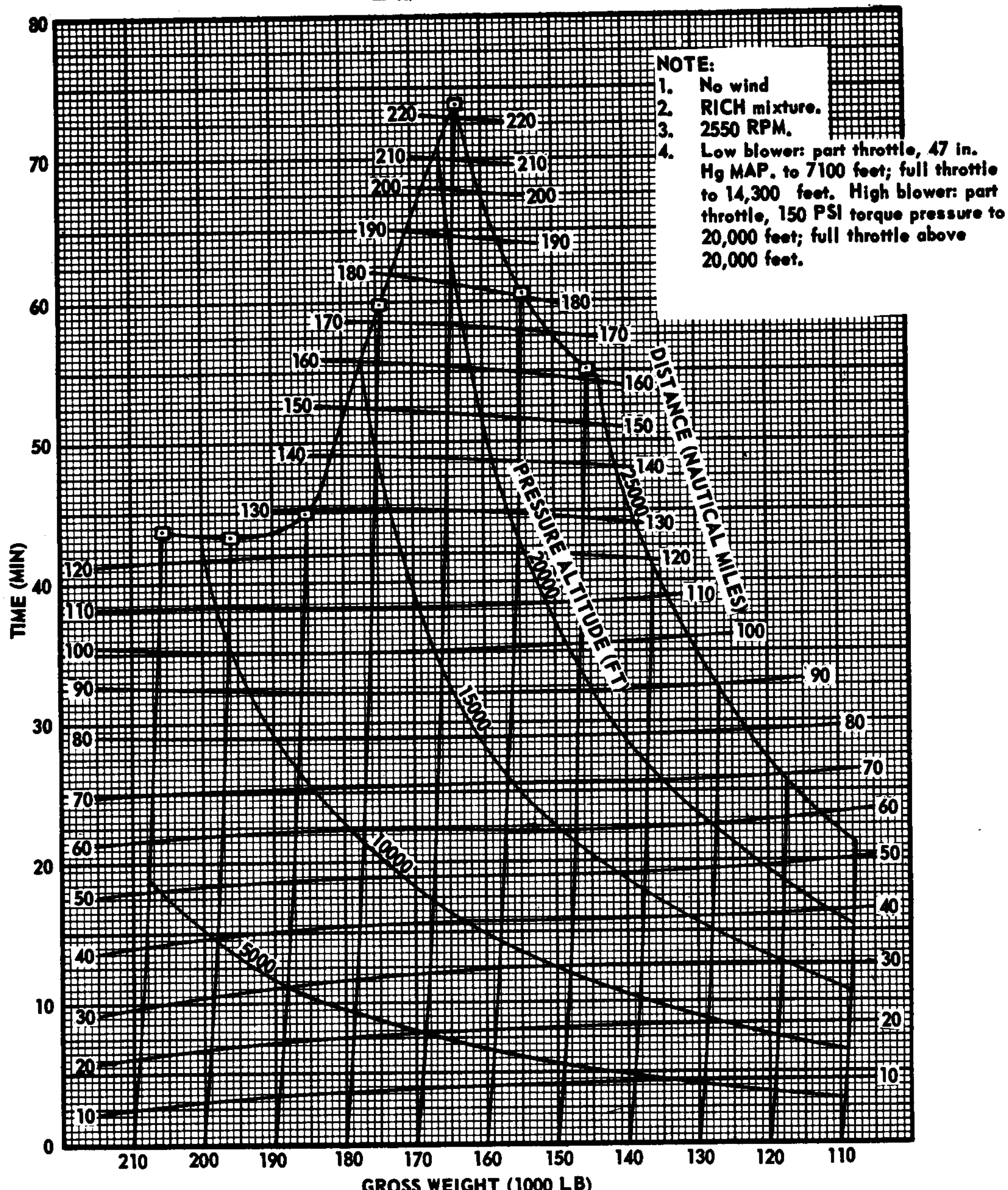
TIME, DISTANCE AND FUEL TO CLIMB

MODEL: C-124A
DATA BASIS: ESTIMATED
DATA AS OF: 16 MAY 1963

4 ENGINE; 2550 RPM; 100/130 FUEL GRADE
STANDARD DAY
⊡ R/C = 100 FT/MIN

ENGINES: (4) P&W 4360-20W

NOTE:
1. No wind
2. RICH mixture.
3. 2550 RPM.
4. Low blower: part throttle, 47 in. Hg MAP. to 7100 feet; full throttle to 14,300 feet. High blower: part throttle, 150 PSI torque pressure to 20,000 feet; full throttle above 20,000 feet.



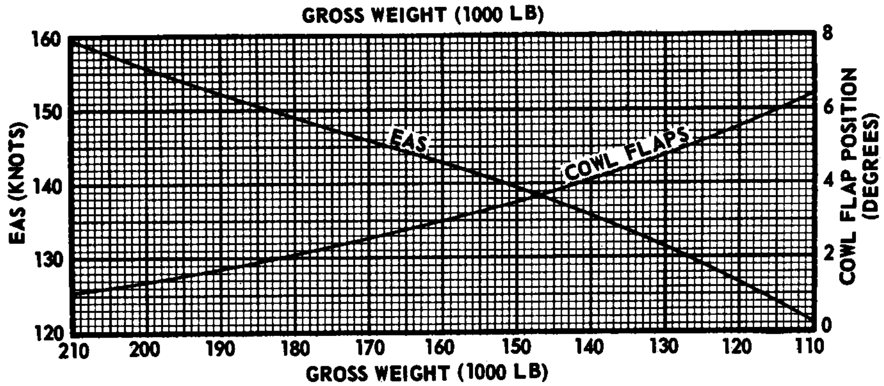


Figure B4-7. Time, Distance, and Fuel to Climb — Four —Engine— 2550 RPM —Fuel Grade 100/130— Standard Day

R1-365

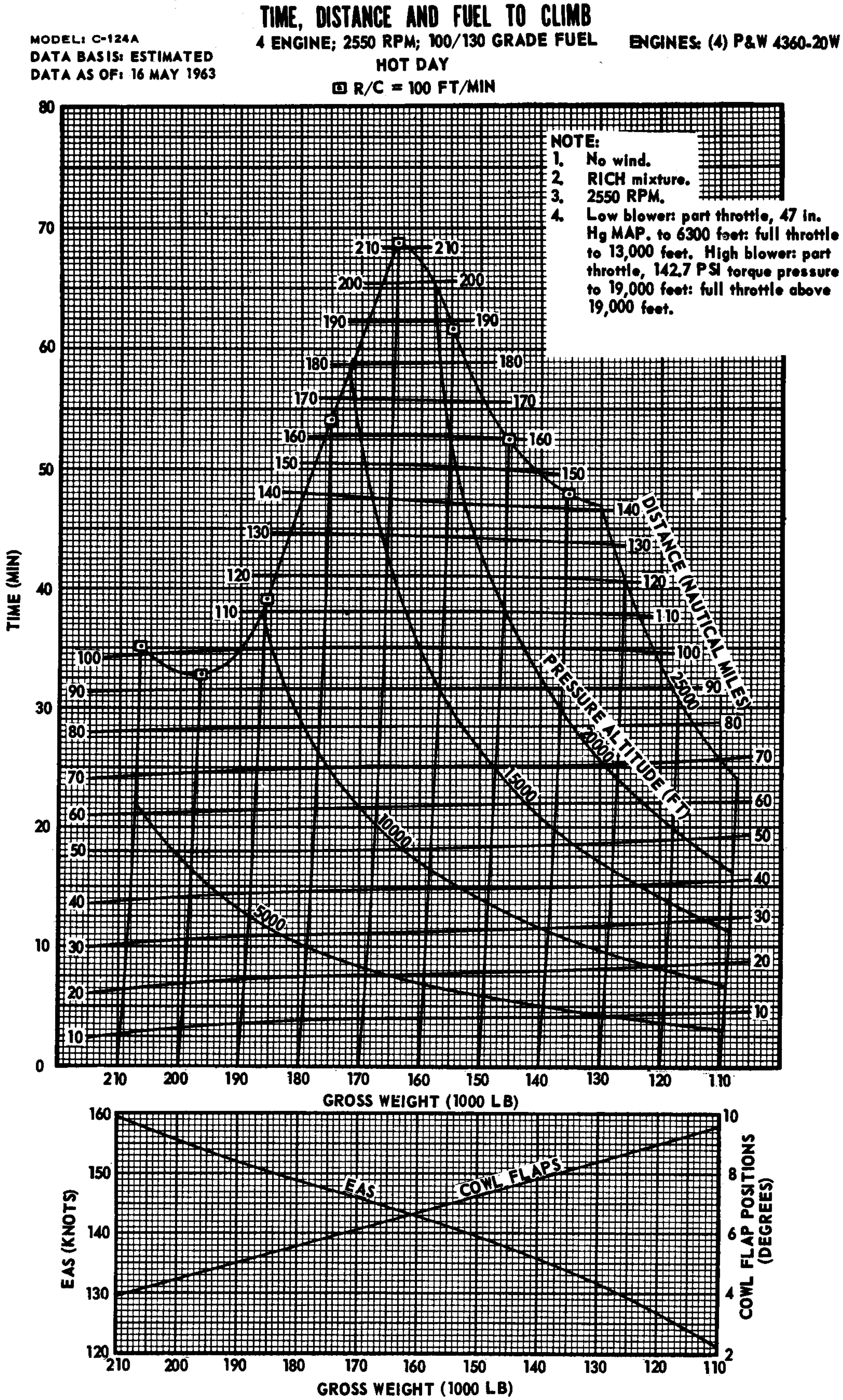


Figure B4-8. Time, Distance, and Fuel to Climb — Four — Engine — 2550 RPM — Fuel Grade 100/130 — Hot Day

R1-373

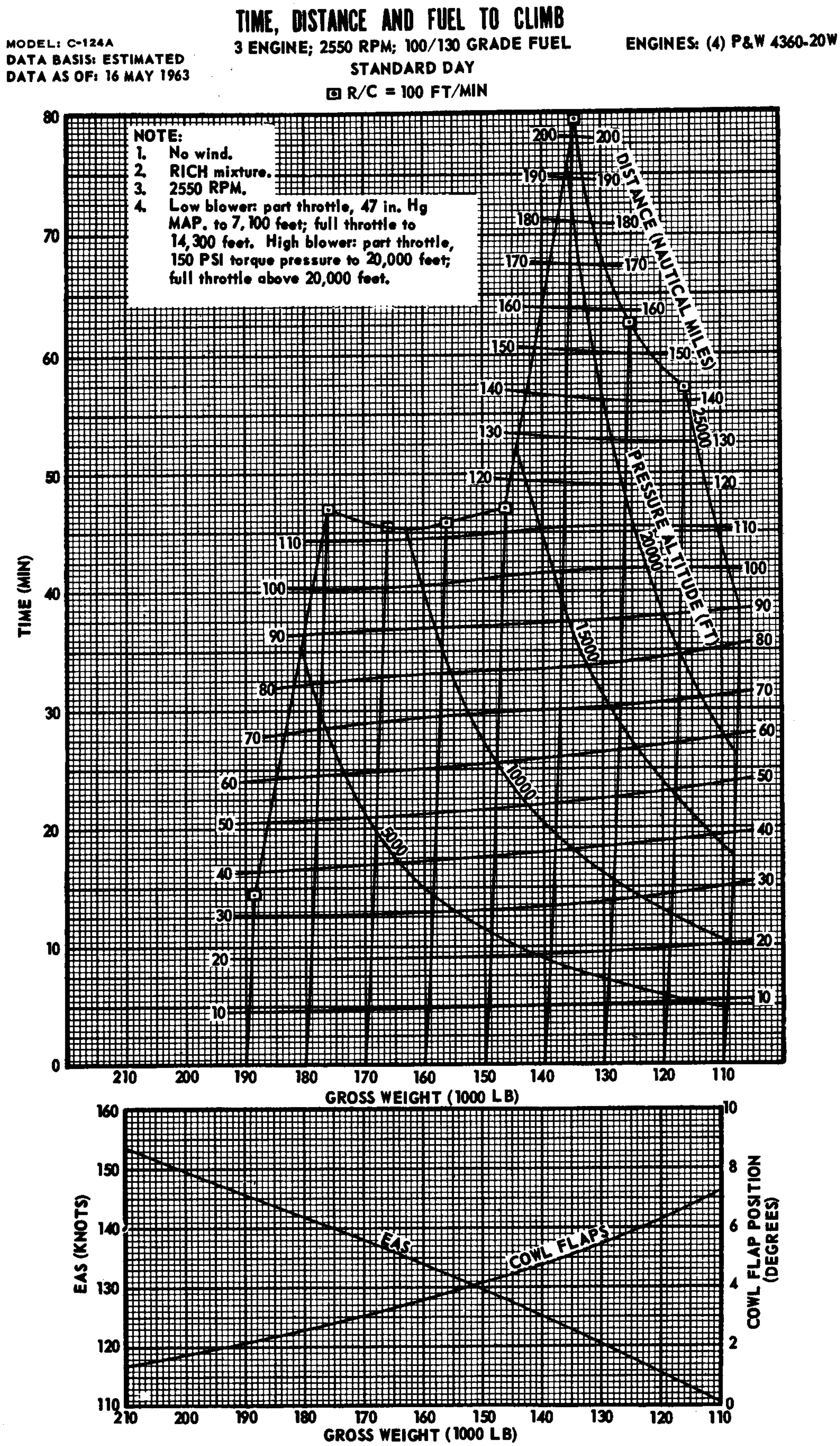


Figure B4-9. Time, Distance, and Fuel to Climb — Three — Engine — 2550 RPM — Fuel Grade 100/130 — Standard Day

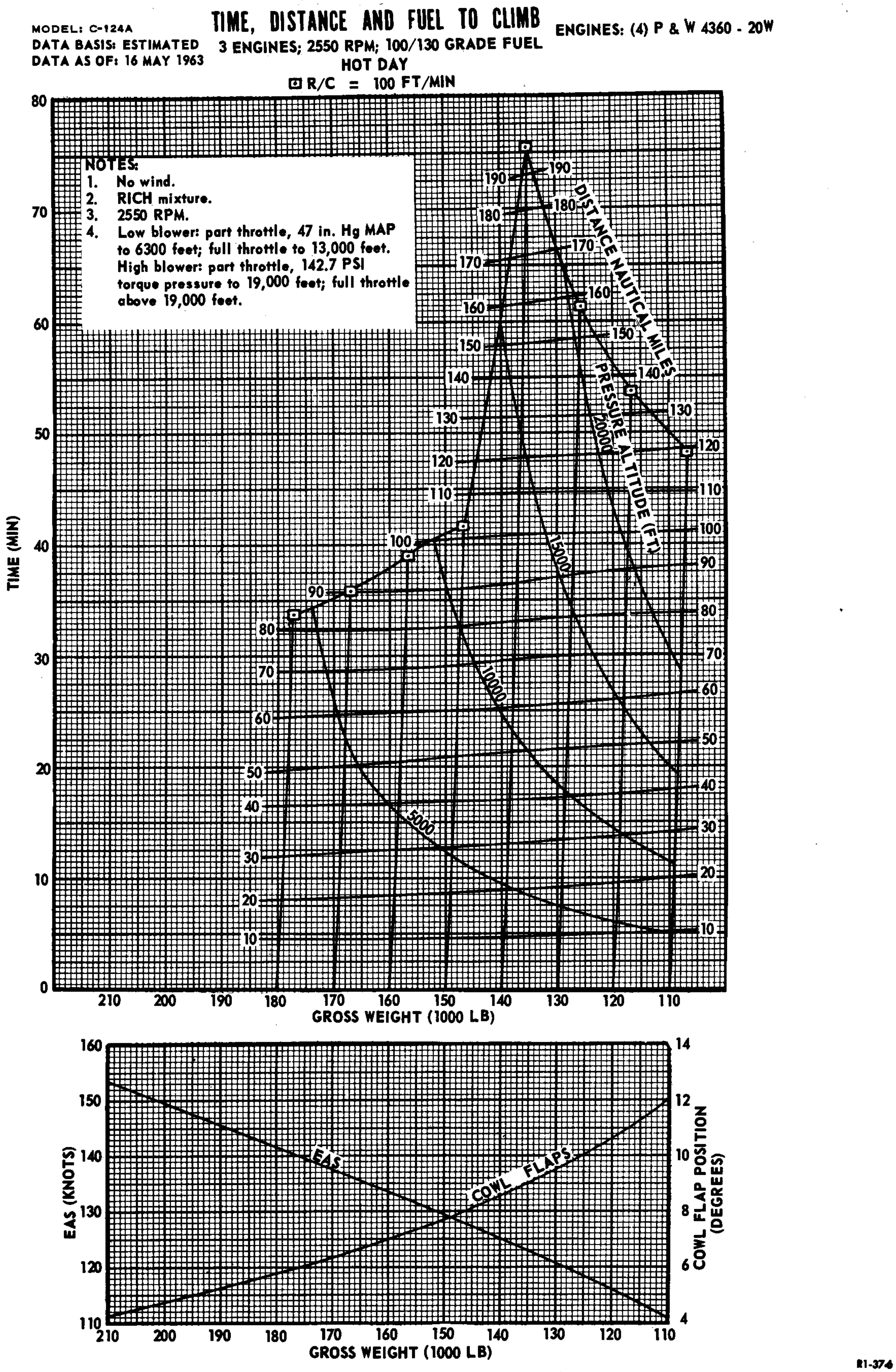


Figure B4-10. Time, Distance, and Fuel to Climb — Three — Engine — 2550 RPM — Fuel Grade 100/130 — Hot Day

CEILINGS — METO POWER
ICAO STANDARD DAY

MODEL: C-124A
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P & W R4360 -20WD
FUEL GRADE: 115/145 & 100/130

NOTE:
1. RICH Mixture
2. 2550 RPM
3. 115/145 grade fuel — Low Blower: Part throttle, 51 in. Hg MAP to 4400 feet; full throttle to 11,200 feet. High Blower: Part throttle, 163.3 psi torque pressure to 18,000 feet; full throttle above 18,000 feet.
4. 100/130 grade fuel — Low blower: Part throttle, 47 in. Hg MAP to 7100 feet; full throttle to 14,300 feet. High blower: Part throttle, 150 psi torque pressure to 20,000 feet; full throttle above 20,000 feet.

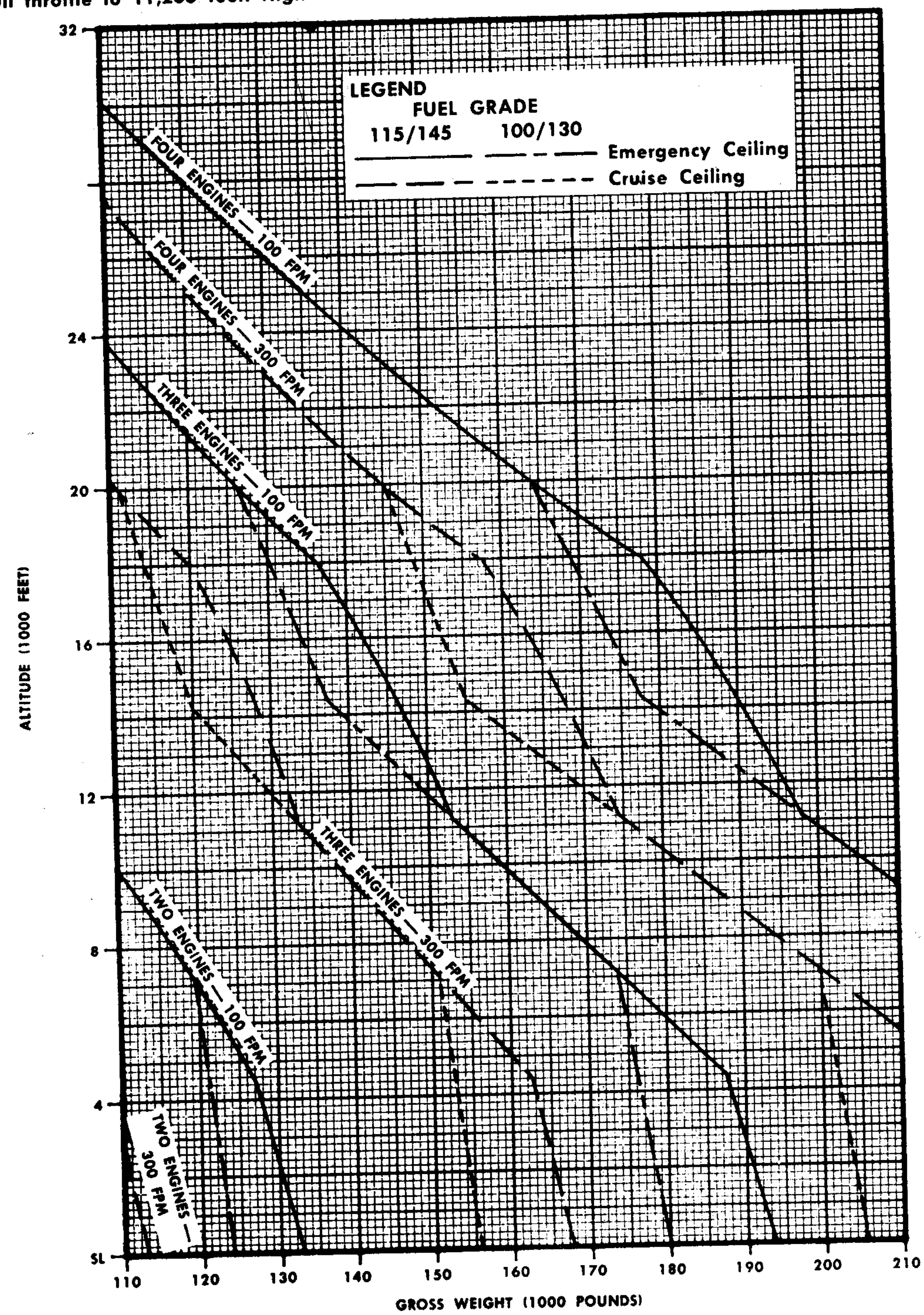


Figure B4-11. Ceilings —METO Power —ICAO Standard Day

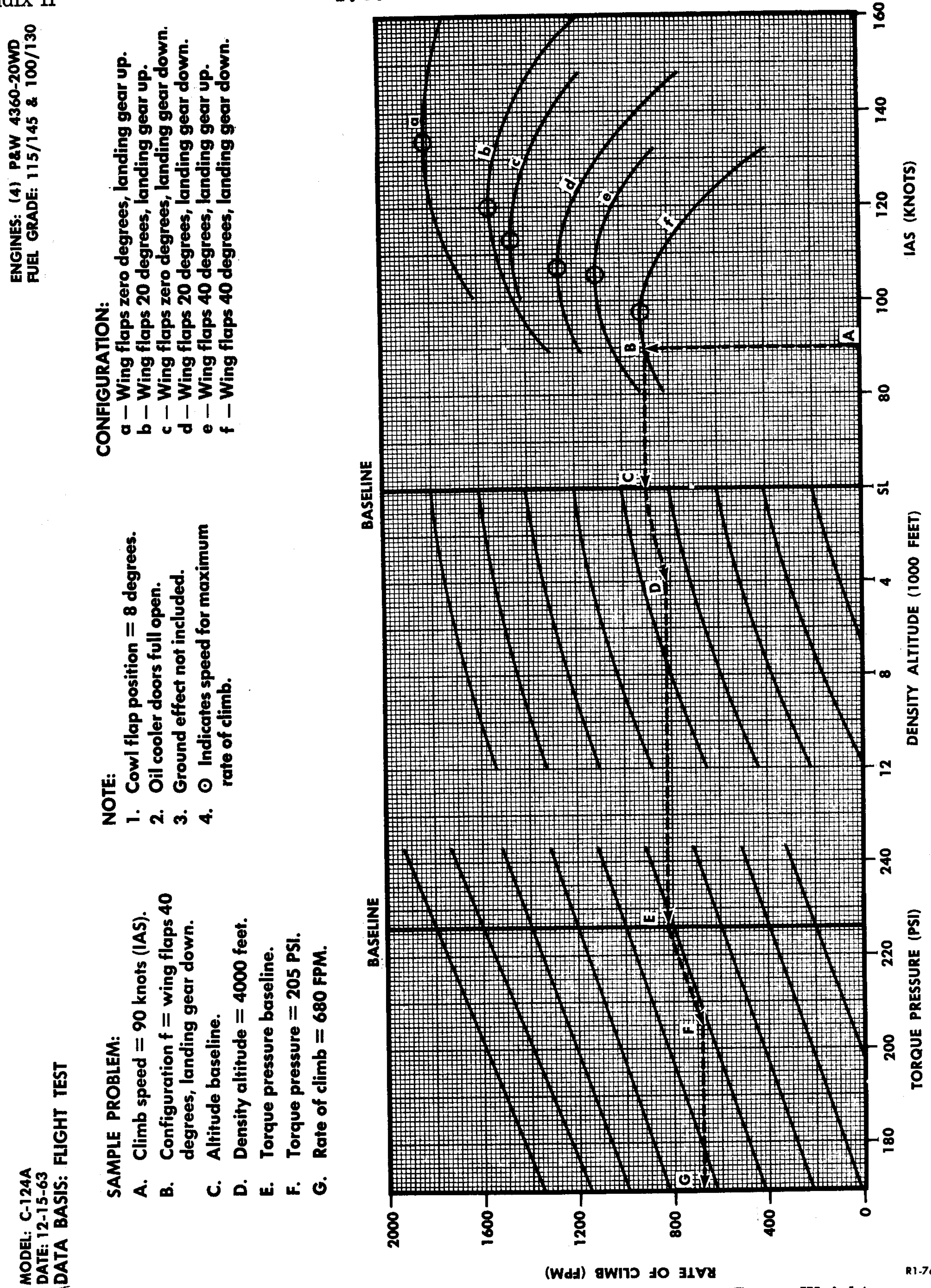


Figure B4-12. Emergency Climb — Four-Engine — 120,000 Pounds Gross Weight

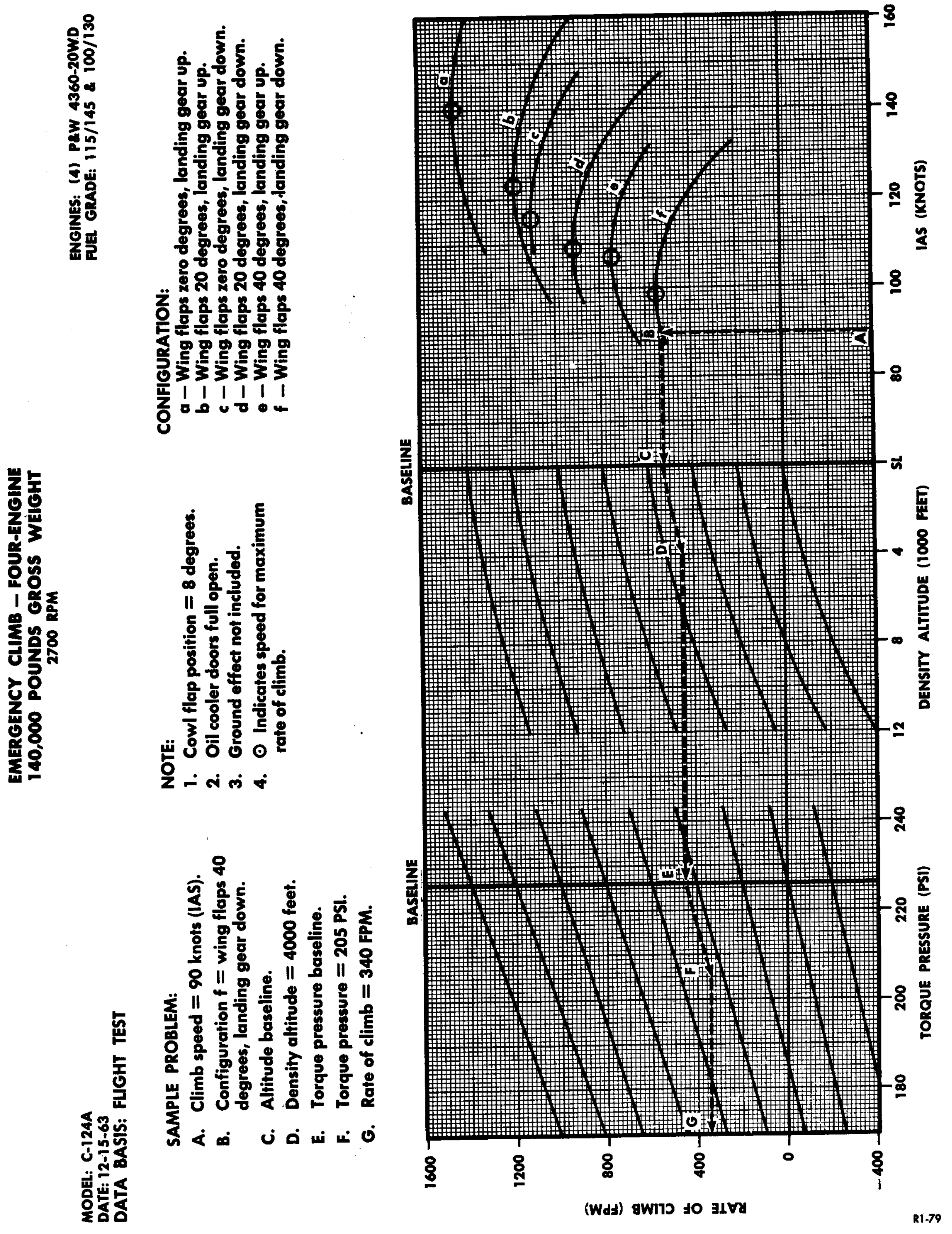


Figure B4-13. Emergency Climb — Four-Engine — 140,000 Pounds Gross Weight

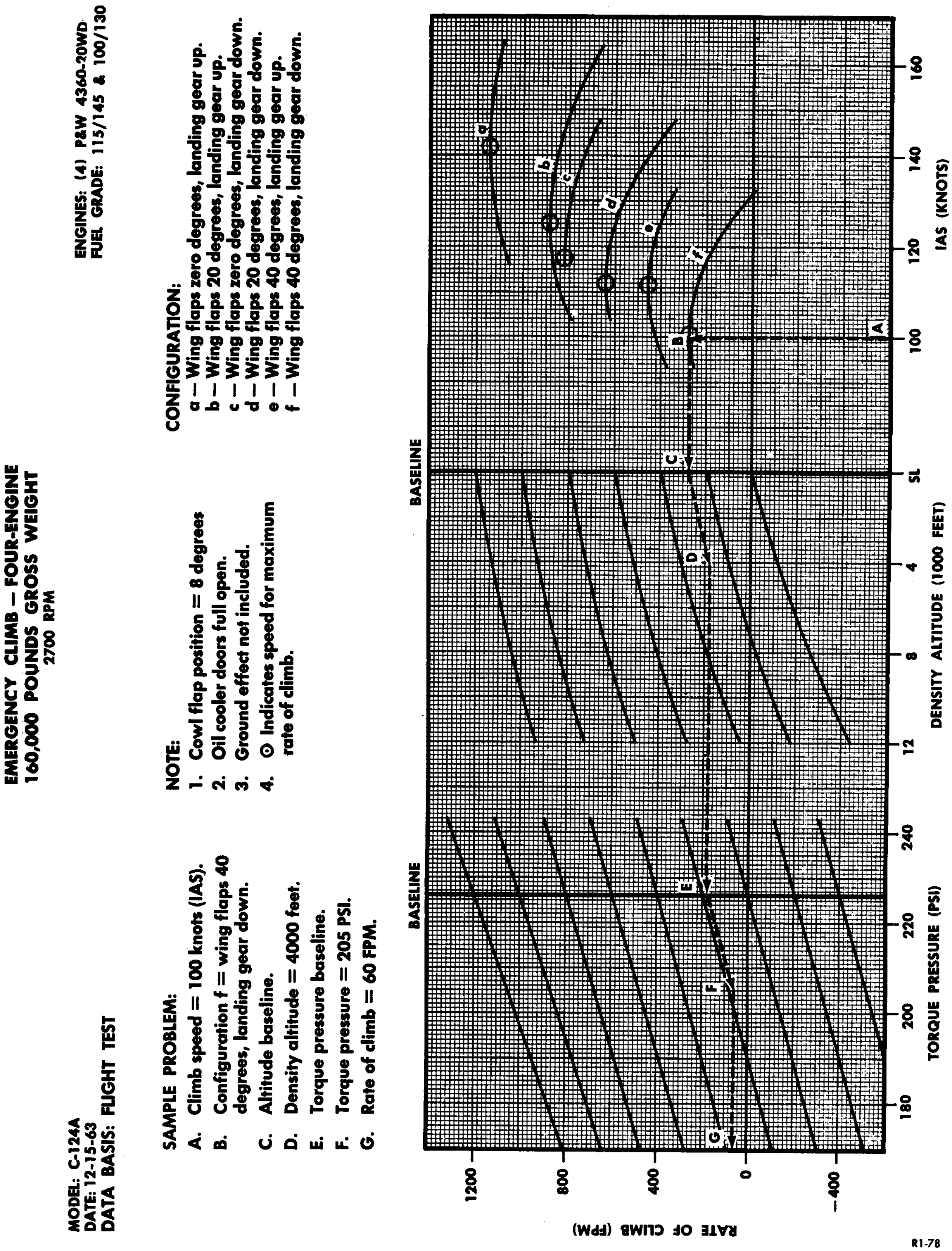


Figure B4-14. Emergency Climb — Four-Engine — 160,000 Pounds Gross Weight

EMERGENCY CLIMB — FOUR-ENGINE
180,000 POUNDS GROSS WEIGHT
2700 RPM

MODEL: C-124A
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-20WD
FUEL GRADE: 115/145 & 100/130

SAMPLE PROBLEM:

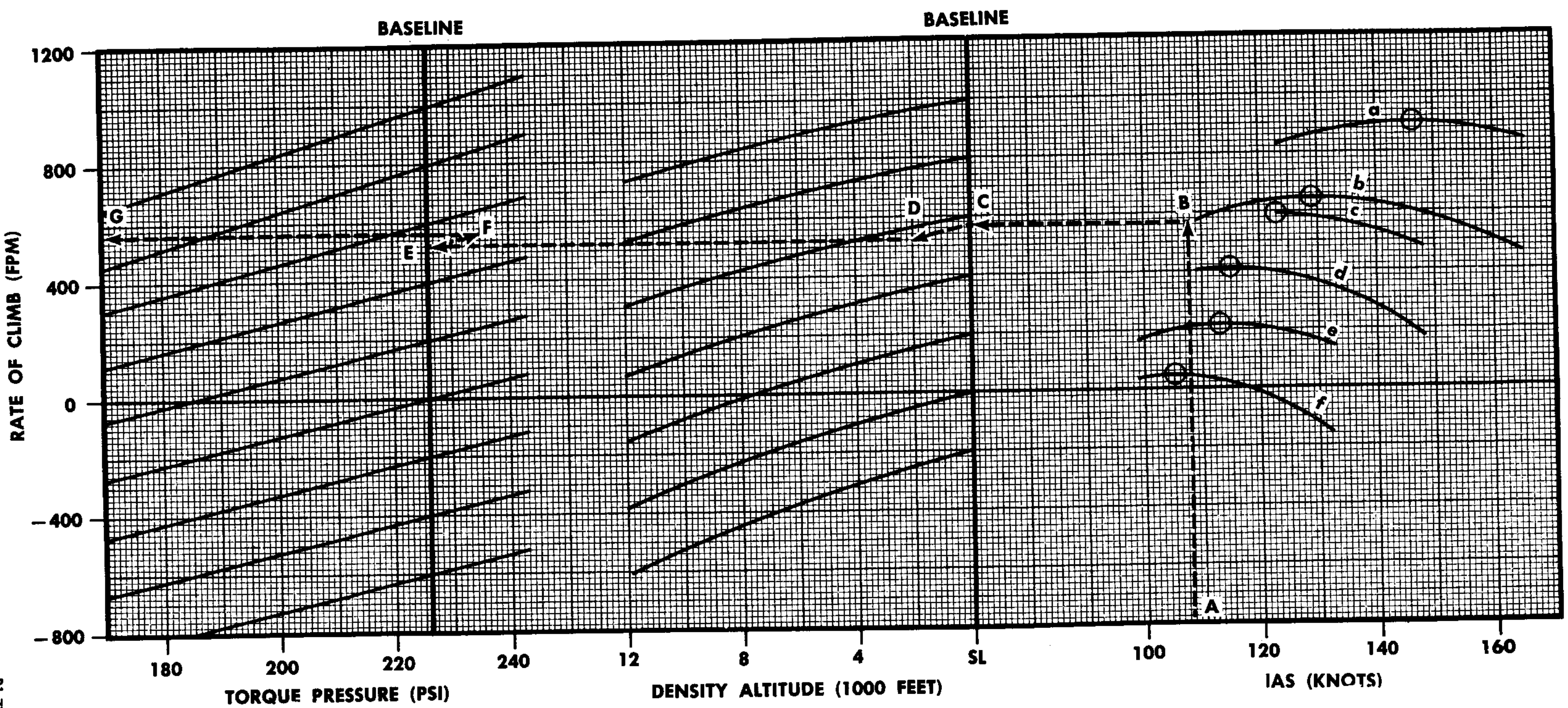
- A. Climb speed = 108 knots (IAS).
- B. Configuration b = wing flaps 20 degrees, landing gear up.
- C. Altitude baseline.
- D. Density altitude = 2000 feet.
- E. Torque pressure baseline.
- F. Torque pressure = 235 PSI.
- G. Rate of climb = 560 FPM.

NOTE:

1. Cowl flap position = 8 degrees.
2. Oil cooler doors full open.
3. Ground effect not included.
4. ⊙ Indicates speed for maximum rate of climb.

CONFIGURATION:

- a — Wing flaps zero degrees, landing gear up.
- b — Wing flaps 20 degrees, landing gear up.
- c — Wing flaps zero degrees, landing gear down.
- d — Wing flaps 20 degrees, landing gear down.
- e — Wing flaps 40 degrees, landing gear up.
- f — Wing flaps 40 degrees, landing gear down.



R1-77

Figure B4-15. Emergency Climb — Four-Engine — 180,000 Pounds Gross Weight

EMERGENCY CLIMB — FOUR-ENGINE
200,000 POUNDS GROSS WEIGHT
2700 RPM

MODEL: C-124A
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-20WD
FUEL GRADE: 115/145 & 100/130

SAMPLE PROBLEM:

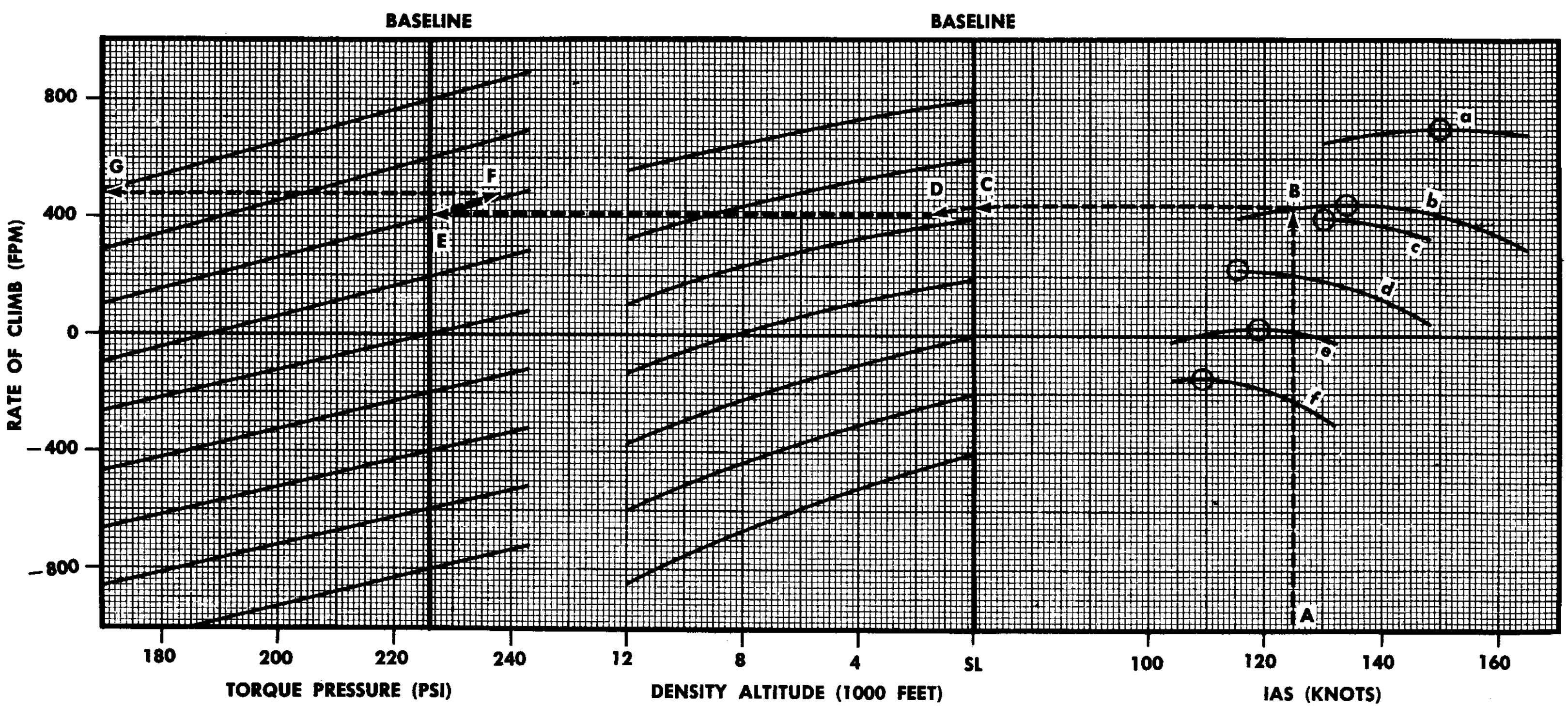
A. Climb speed = 125 knots (IAS).
B. Configuration b = wing flaps 20 degrees, landing gear up.
C. Altitude baseline.
D. Density altitude = 1500 feet.
E. Torque pressure baseline.
F. Torque pressure = 238 PSI.
G. Rate of climb = 480 FPM.

NOTE:

1. Cowl flap position = 8 degrees.
2. Oil cooler doors full open.
3. Ground effect not included.
4. ⊙ Indicates speed for maximum rate of climb.

CONFIGURATION:

a — Wing flaps zero degrees, landing gear up.
b — Wing flaps 20 degrees, landing gear up.
c — Wing flaps zero degrees, landing gear down.
d — Wing flaps 20 degrees, landing gear down.
e — Wing flaps 40 degrees, landing gear up.
f — Wing flaps 40 degrees, landing gear down.



R1-80

Figure B4-16. Emergency Climb — Four-Engine — 200,000 Pounds Gross Weight

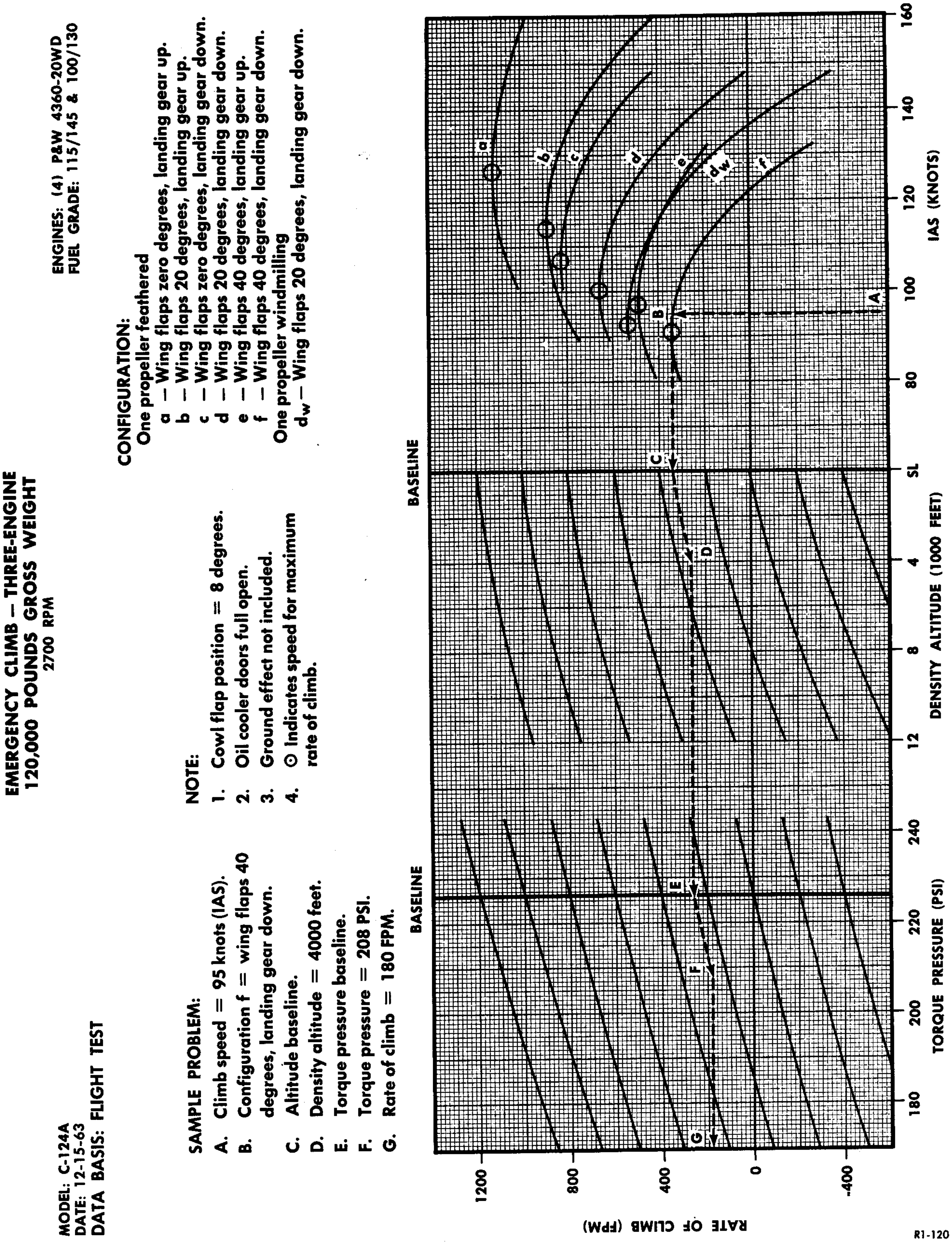


Figure B4-17. Emergency Climb — Three-Engine — 120,000 Pounds Gross Weight

EMERGENCY CLIMB — THREE-ENGINE
140,000 POUNDS GROSS WEIGHT
2700 RPM

MODEL: C-124A
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-20WD
FUEL GRADE: 115/145 & 100/130

CONFIGURATION:

One propeller feathered
- a — Wing flaps zero degrees, landing gear up.
- b — Wing flaps 20 degrees, landing gear up.
- c — Wing flaps zero degrees, landing gear down.
- d — Wing flaps 20 degrees, landing gear down.
- e — Wing flaps 40 degrees, landing gear up.
- f — Wing flaps 40 degrees, landing gear down.

One propeller windmilling
- d_w — Wing flaps 20 degrees, landing gear down.

SAMPLE PROBLEM:

A. Climb speed = 130 knots (IAS).
B. Configuration a = wing flaps zero degrees, landing gear up.
C. Altitude baseline.
D. Density altitude = 10,000 feet.
E. Torque pressure baseline.
F. Torque pressure = 190 PSI.
G. Rate of climb = 460 FPM.

NOTE:

1. Cowl flap position = 8 degrees.
2. Oil cooler doors full open.
3. Ground effect not included.
4. ⊙ Indicates speed for maximum rate of climb.

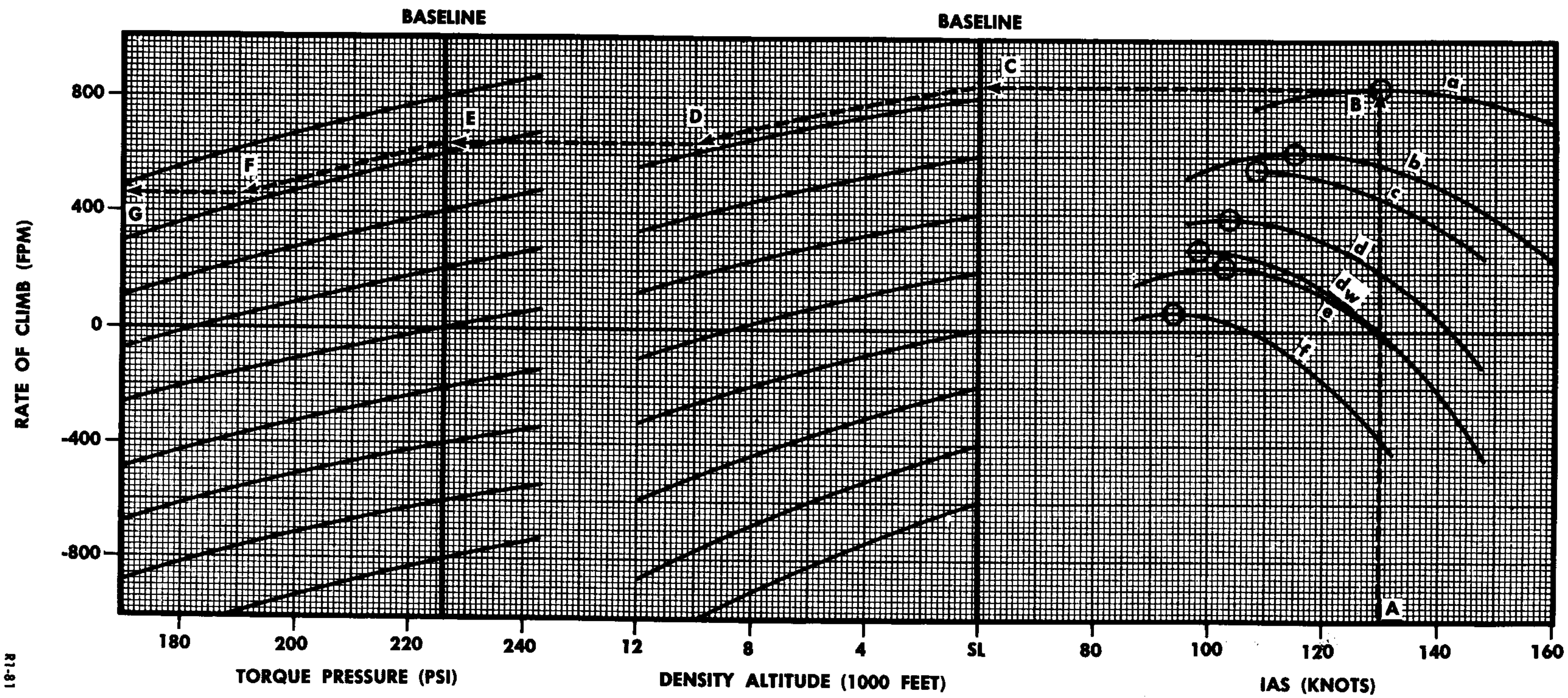


Figure B4-18. Emergency Climb — Three-Engine — 140,000 Pounds Gross Weight

EMERGENCY CLIMB — THREE-ENGINE
160,000 POUNDS GROSS WEIGHT
2700 RPM

MODEL: C-124A
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-20WD
FUEL GRADE: 115/145 & 100/130

CONFIGURATION:

One propeller feathered
- a — Wing flaps zero degrees, landing gear up.
- b — Wing flaps 20 degrees, landing gear up.
- c — Wing flaps zero degrees, landing gear down.
- d — Wing flaps 20 degrees, landing gear down.
- e — Wing flaps 40 degrees, landing gear up.
- f — Wing flaps 40 degrees, landing gear down.

One propeller windmilling
- d_w — Wing flaps 20 degrees, landing gear down.

SAMPLE PROBLEM:

A. Climb speed = 110 knots (IAS).
B. Configuration b = wing flaps 20 degrees, landing gear up.
C. Altitude baseline.
D. Density altitude = 5000 feet.
E. Torque pressure baseline.
F. Torque pressure = 205 PSI.
G. Rate of climb = 170 FPM.

NOTE:

1. Cowl flap position = 8 degrees.
2. Oil cooler doors full open.
3. Ground effect not included.
4. ⊙ Indicates speed for maximum rate of climb.

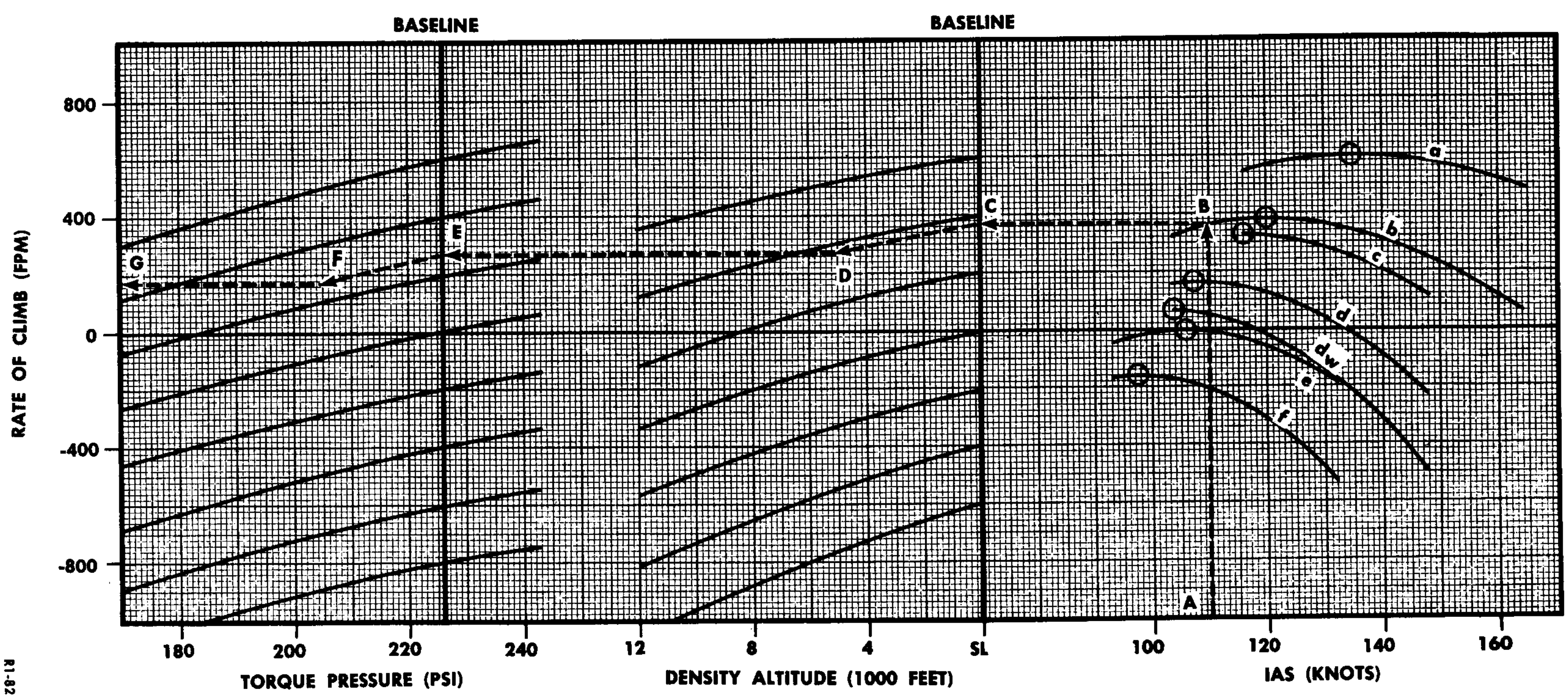


Figure B4-19. Emergency Climb — Three-Engine — 160,000 Pounds Gross Weight

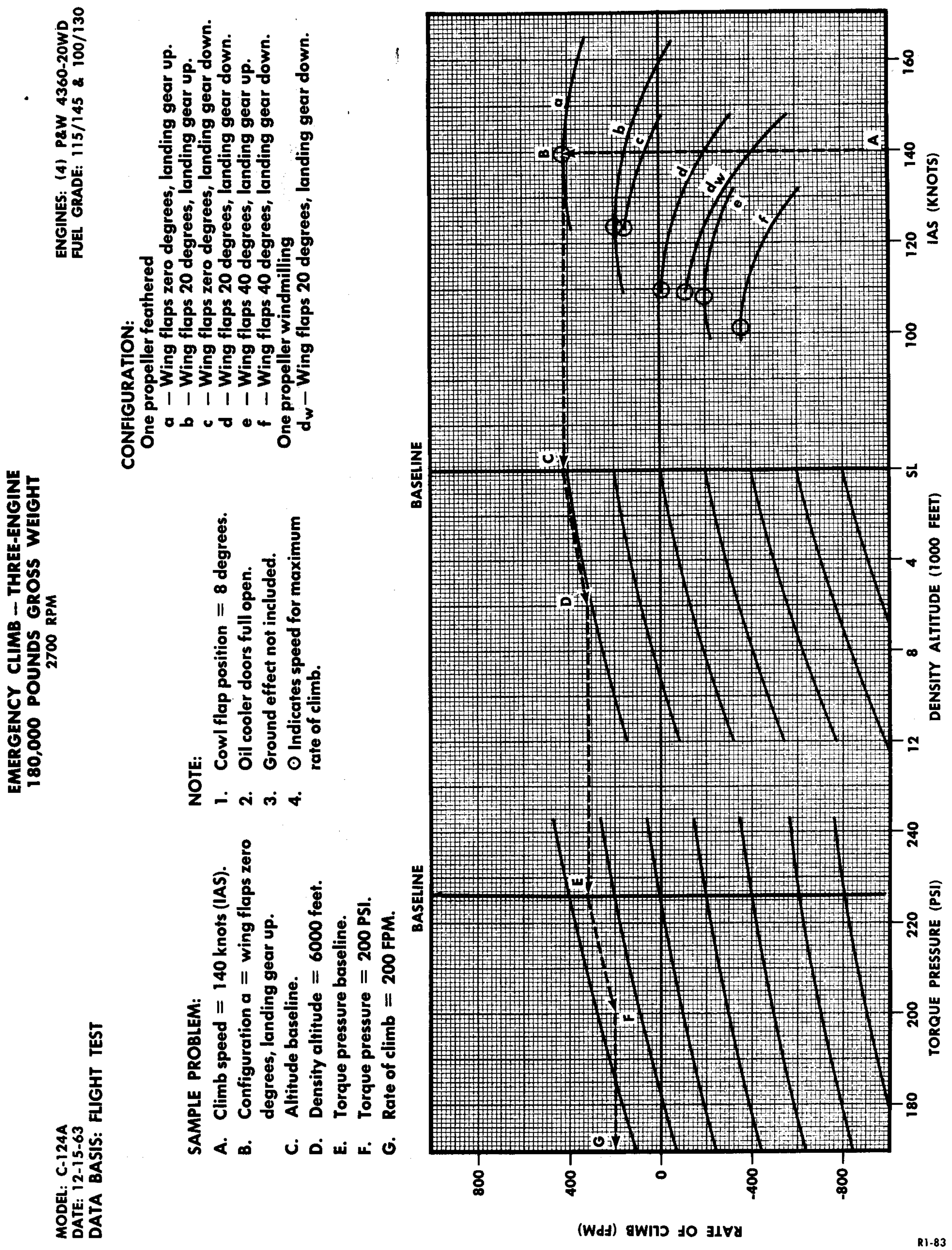


Figure B4-20. Emergency Climb — Three-Engine — 180,000 Pounds Gross Weight

MODEL: C-124A
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

EMERGENCY CLIMB — THREE-ENGINE
200,000 POUNDS GROSS WEIGHT
2700 RPM

ENGINES: (4) P&W 4360-20WD
FUEL GRADE: 115/145 & 100/130

SAMPLE PROBLEM:

A. Climb speed = 125 knots (IAS).
B. Configuration b = wing flaps 20 degrees, landing gear up.
C. Altitude baseline.
D. Density altitude = 1000 feet.
E. Torque pressure baseline.
F. Torque pressure = 243 PSI.
G. Rate of climb = 80 FPM.

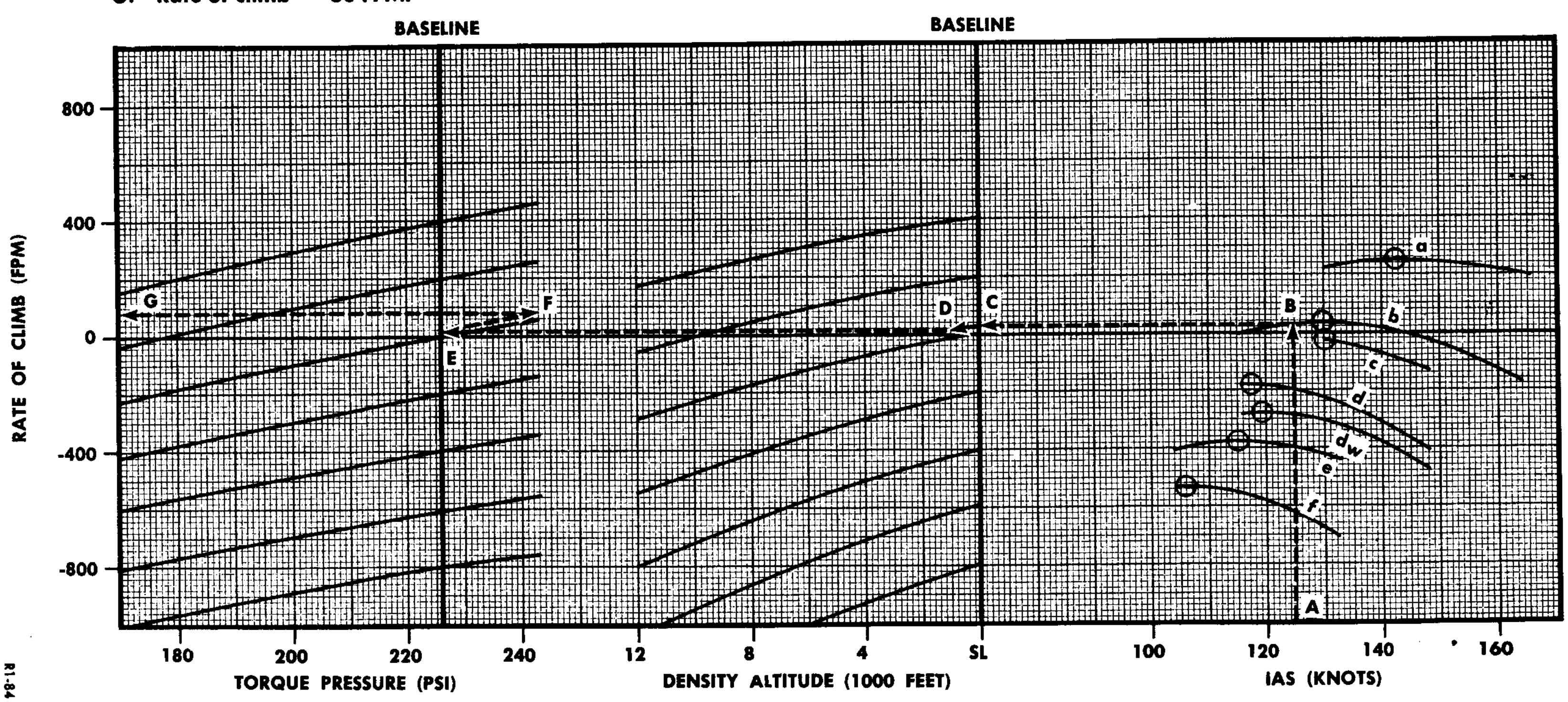
NOTE:

1. Cowl flap position = 8 degrees.
2. Oil cooler doors full open.
3. Ground effect not included.
4. ⊙ Indicates speed for maximum rate of climb.

CONFIGURATION:

One propeller feathered
- a — Wing flaps zero degrees, landing gear up.
- b — Wing flaps 20 degrees, landing gear up.
- c — Wing flaps zero degrees, landing gear down.
- d — Wing flaps 20 degrees, landing gear down.
- e — Wing flaps 40 degrees, landing gear up.
- f — Wing flaps 40 degrees, landing gear down.

One propeller windmilling
- d_w — Wing flaps 20 degrees, landing gear down.



R1-84

Figure B4-21. Emergency Climb — Three-Engine — 200,000 Pounds Gross Weight

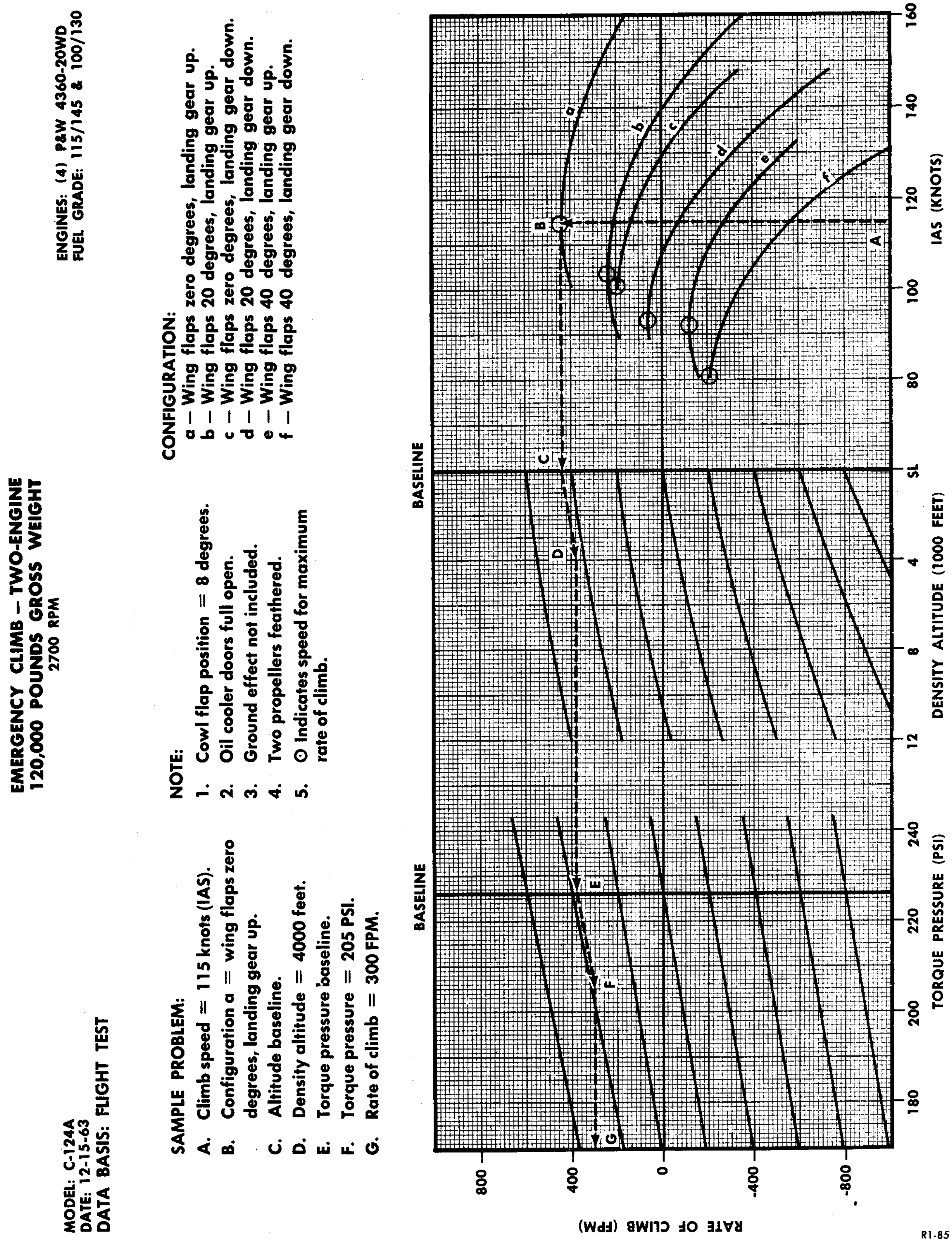


Figure B4-22. Emergency Climb — Two-Engine — 120,000 Pounds Gross Weight

MODEL: C-124A
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

EMERGENCY CLIMB – TWO-ENGINE
140,000 POUNDS GROSS WEIGHT
2700 RPM

ENGINES: (4) P&W 4360-20WD
FUEL GRADE: 115/145 & 100/130

SAMPLE PROBLEM:

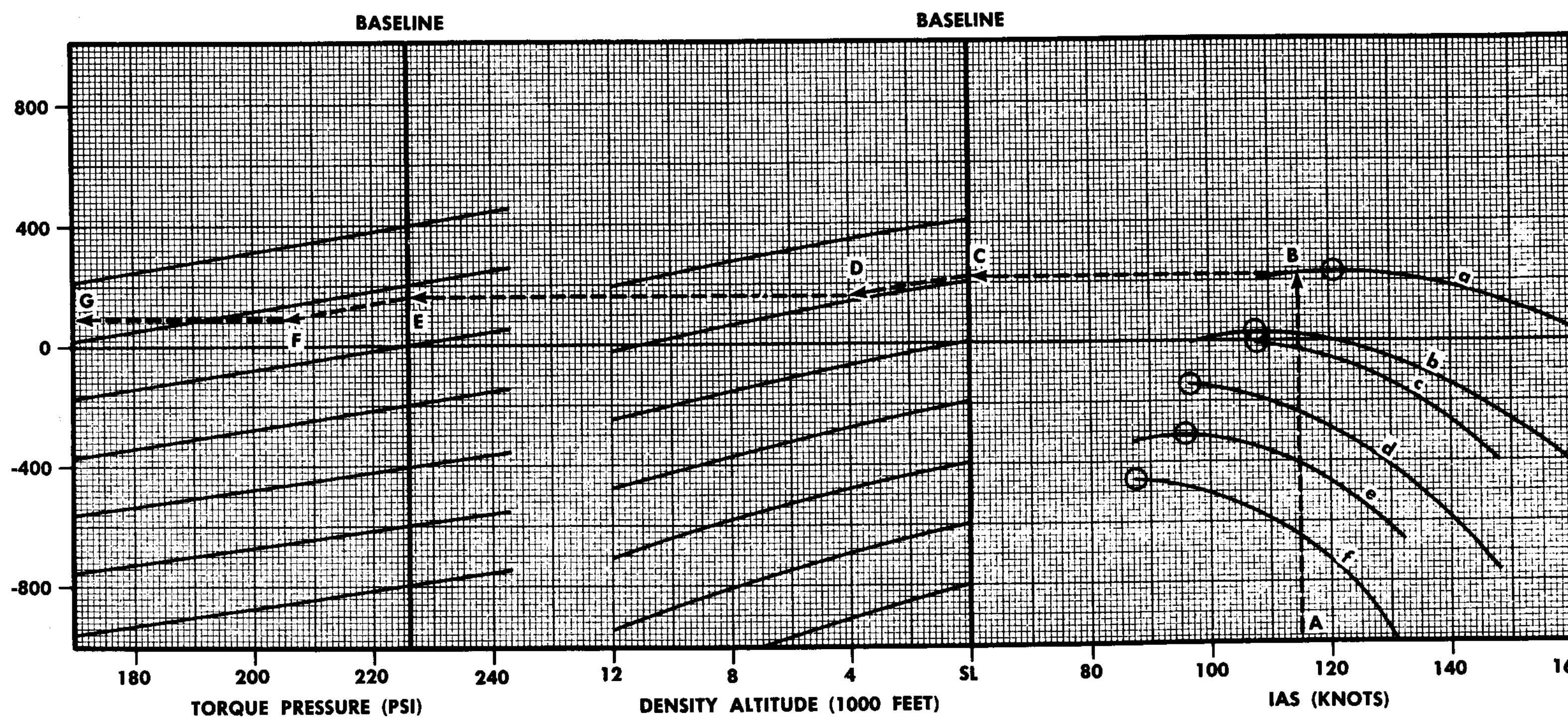
A. Climb speed = 115 knots (IAS).
B. Configuration a = wing flaps zero degrees, landing gear up.
C. Altitude baseline.
D. Density altitude = 4000 feet.
E. Torque pressure baseline.
F. Torque pressure = 205 PSI.
G. Rate of climb = 90 FPM.

NOTE:

1. Cowl flap position = 8 degrees.
2. Oil cooler doors full open.
3. Ground effect not included.
4. Two propellers feathered.
5. O Indicates speed for maximum rate of climb.

CONFIGURATION:

a – Wing flaps zero degrees, landing gear up.
b – Wing flaps 20 degrees, landing gear up.
c – Wing flaps zero degrees, landing gear down.
d – Wing flaps 20 degrees, landing gear down.
e – Wing flaps 40 degrees, landing gear up.
f – Wing flaps 40 degrees, landing gear down.



R1-86

Figure B4-23. Emergency Climb — Two-Engine — 140,000 Pounds Gross Weight

MODEL: C-124A
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

EMERGENCY CLIMB — TWO-ENGINE
160,000 POUNDS GROSS WEIGHT
2700 RPM

ENGINES: (4) P&W 4360-20WD
FUEL GRADE: 115/145 & 100/130

SAMPLE PROBLEM:

A. Climb speed = 125 knots (IAS).
B. Configuration a = wing flaps zero degrees, landing gear up.
C. Altitude baseline.
D. Density altitude = 1000 feet.
E. Torque pressure baseline.
F. Torque pressure = 243 PSI.
G. Rate of climb = 110 FPM.

NOTE:

1. Cowl flap position = 8 degrees.
2. Oil cooler doors full open.
3. Ground effect not included.
4. Two propellers feathered.
5. ⊙ Indicates speed for maximum rate of climb.

CONFIGURATION:

a — Wing flaps zero degrees, landing gear up.
b — Wing flaps 20 degrees, landing gear up.
c — Wing flaps zero degrees, landing gear down.
d — Wing flaps 20 degrees, landing gear down.
e — Wing flaps 40 degrees, landing gear up.
f — Wing flaps 40 degrees, landing gear down.

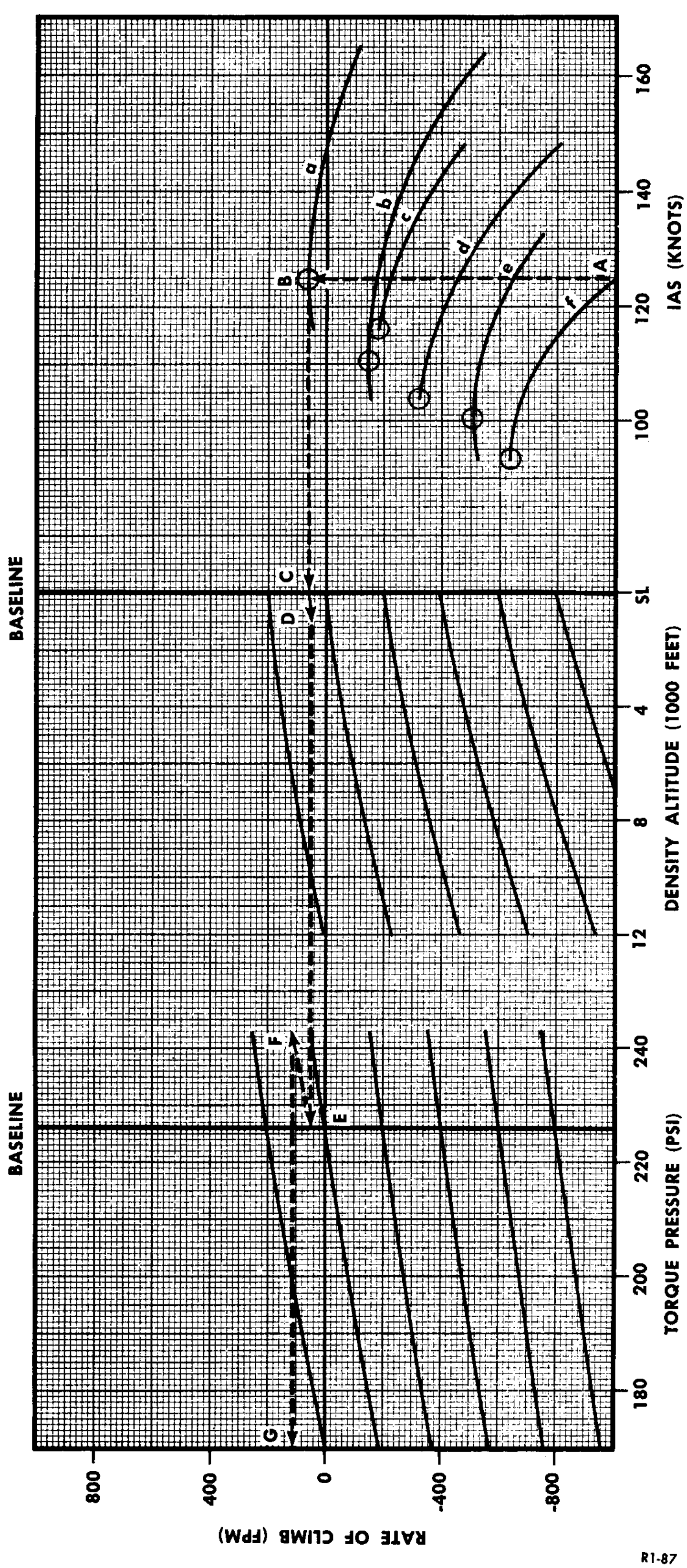


Figure B4-24. Emergency Climb — Two-Engine — 160,000 Pounds Gross Weight

EMERGENCY CLIMB — TWO-ENGINE
180,000 POUNDS GROSS WEIGHT
2700 RPM

MODEL: C-124A
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-20WD
FUEL GRADE: 115/145 & 100/130

SAMPLE PROBLEM:

A. Climb speed = 127 knots (IAS).
B. Configuration a = wing flaps zero degrees, landing gear up.
C. Altitude baseline.
D. Density altitude = 2000 feet.
E. Torque pressure baseline.
F. Torque pressure = 235 PSI.
G. Rate of climb = —80 FPM.

NOTE:

1. Cowl flap position = 8 degrees.
2. Oil cooler doors full open.
3. Ground effect not included.
4. Two propellers feathered.
5. O Indicates speed for maximum rate of climb.

CONFIGURATION:

a — Wing flaps zero degrees, landing gear up.
b — Wing flaps 20 degrees, landing gear up.
c — Wing flaps zero degrees, landing gear down.
d — Wing flaps 20 degrees, landing gear down.
e — Wing flaps 40 degrees, landing gear up.
f — Wing flaps 40 degrees, landing gear down.

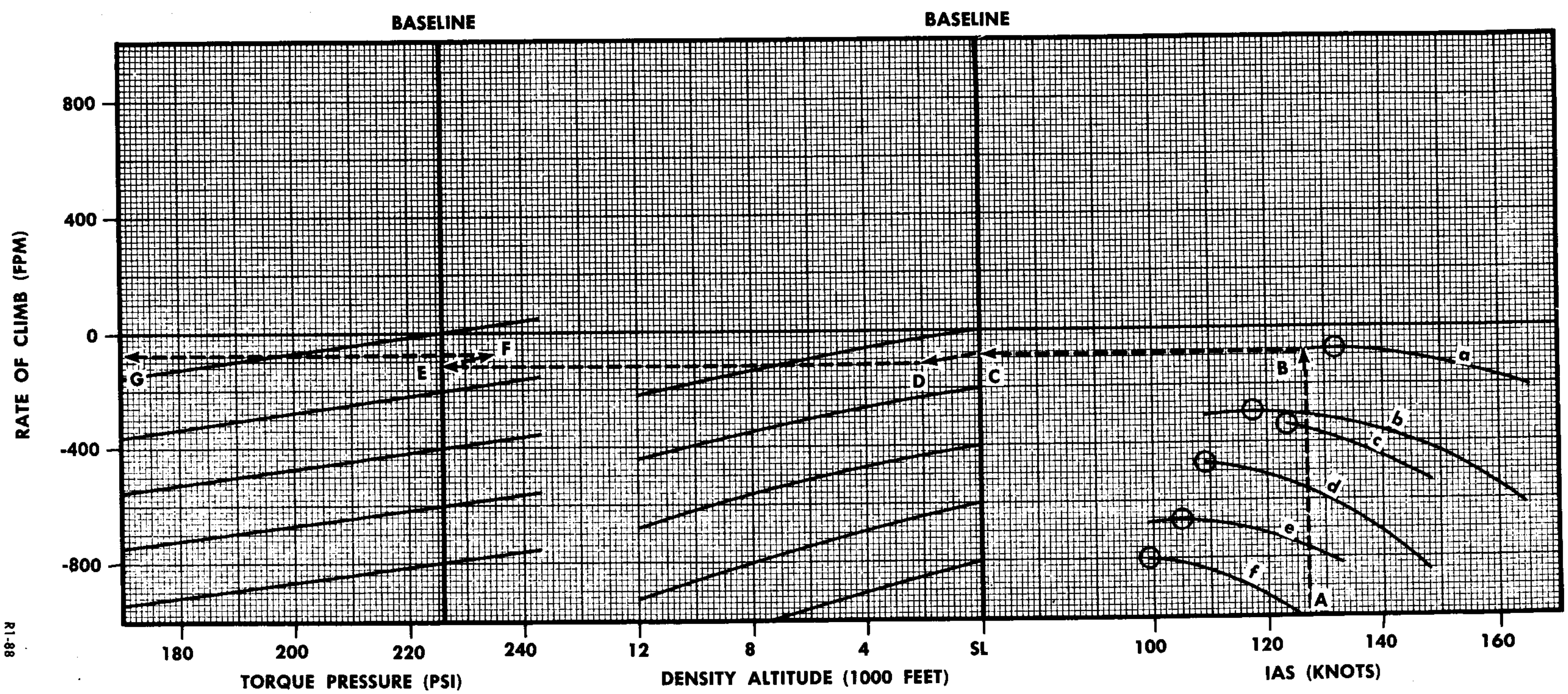


Figure B4-25. Emergency Climb — Two-Engine — 180,000 Pounds Gross Weight

EMERGENCY TWO-ENGINE CLIMB

MODEL: C-124A
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-20WD
FUEL GRADE: 115/145 & 100/130

NOTE:

1. 2700 RPM.
2. Wing flaps zero degrees, landing gear up.
3. Cowl flap position = 8 degrees.
4. Oil cooler doors full open.
5. Ground effect not included.
6. Two propellers feathered.

SAMPLE PROBLEM:

A. Gross weight = 164,000 pounds.
B. Speed for best rate of climb = 127 knots IAS.
C. Density altitude = 1000 feet.
D. Torque pressure = 235 feet.
E. Rate of climb = 40 FPM.

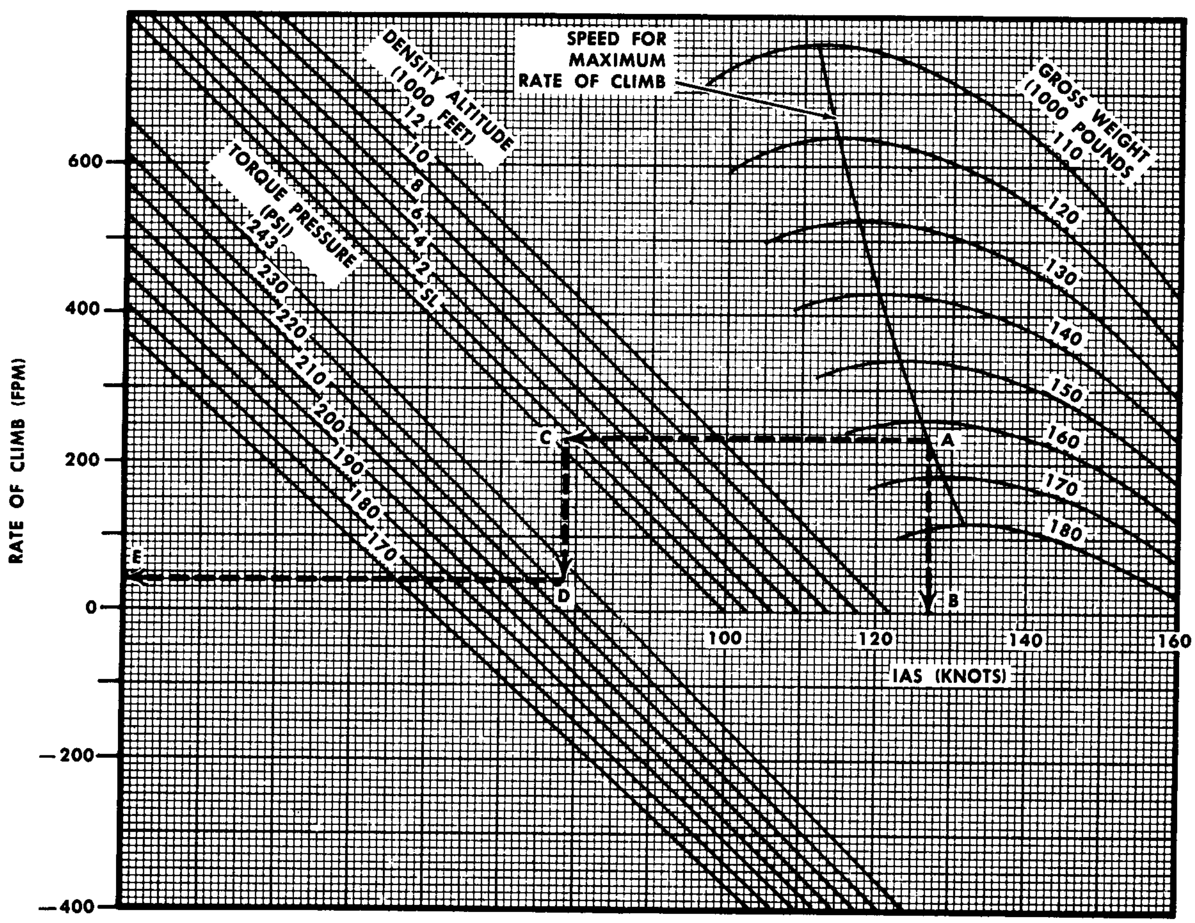


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Figure B4-26. Emergency Two-Engine Climb

RECOMMENDED SPEEDS FOR BEST RATE OF CLIMB AND BEST ANGLE OF CLIMB

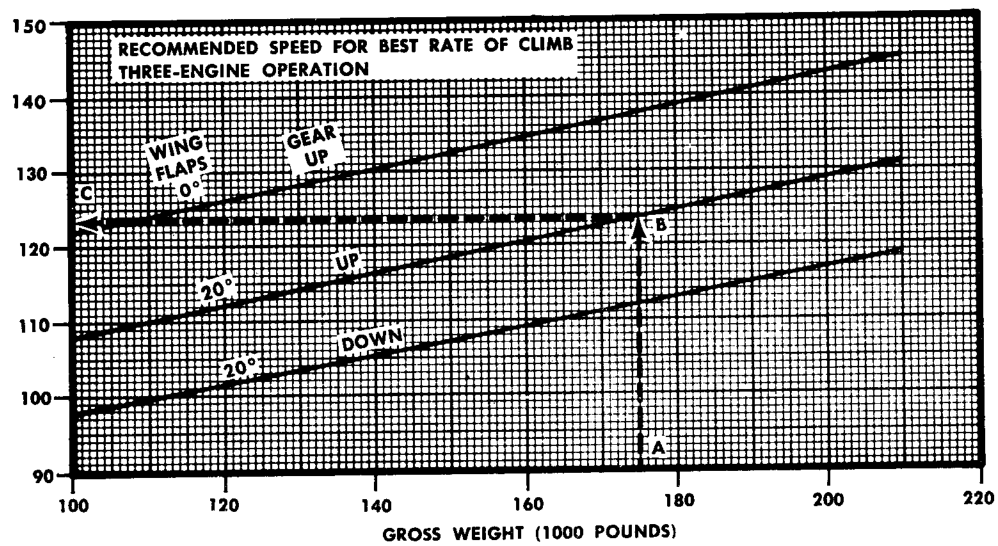
MAXIMUM POWER

MODEL: C-124A
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-20WD
FUEL GRADE: 115/145 & 110/130

SAMPLE PROBLEM:

A. Gross weight = 175,000 pounds.
B. Wing flaps = 20°, gear up.
C. Speed for best rate of climb = 124 knots IAS.
D. Speed for best angle of climb = 108 knots IAS.



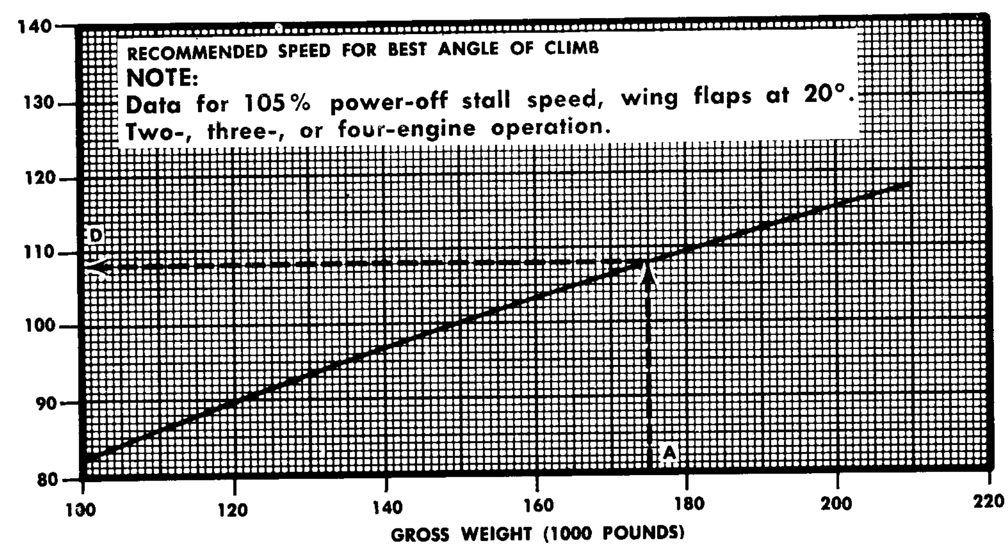


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Figure B4-27. Recommended Speed for Best Rate of Climb and Best Angle of Climb

PART V

RANGE

TABLE OF CONTENTS

LIST OF CHARTS

RANGE PERFORMANCE.

The range performance is presented for ICAO Standard Day atmospheric conditions. Any exceptions to this are presented in the DISCUSSION OF CHARTS. The data included are the Nautical Miles per Pound of Fuel charts (figures B5-1 through B5-13), Long-Range Prediction charts (figures B5-14 through B5-19), and Long-Range Summary charts (figures B5-20 through B5-22). Two-Engine Cruise Data with Ground Effect (figures B5-23 and B5-24) and a Cowl Flap Drag chart (figure B5-25) are included to allow adjustment of cruise performance data if cowl flap angles other than those required for recommended CHT values are used.

Range performance charts in this Appendix are based on performance of aircraft with wing tip pod heaters. To obtain cruise performance, use 10 BHP per engine less than charted BHP.

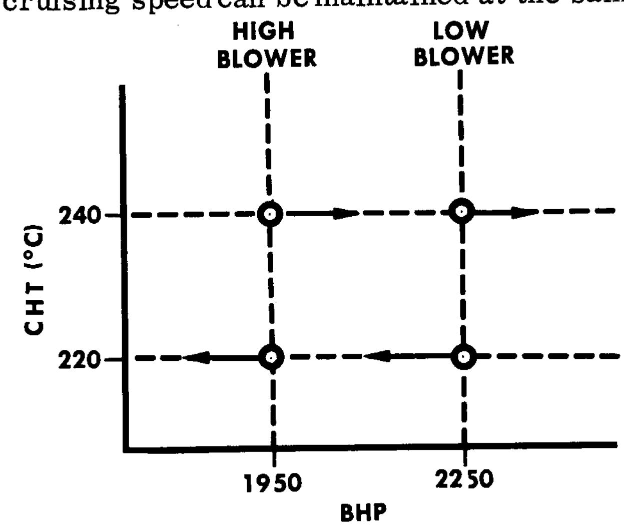
DISCUSSION OF CHARTS.

NAUTICAL MILES PER POUND OF FUEL CHARTS.

The Nautical Miles per Pound of Fuel charts (figures B5-1 through B5-13) show the nautical miles that can be traveled for each pound of fuel consumed and the airspeed that can be expected for various gross weights and altitudes when recommended operating conditions from the Power Schedule charts (Part 2) are followed. Note that data at 20,000 feet are presented for high blower operation. All other data are given for low blower operation. All charts are based on operation with fuel grade 115/145. Limits for operation with fuel grade 100/130 are included in notes on each chart where applicable. When operating with fuel grade 100/130, nautical miles per pound of fuel for BHP's between the Manual Lean limit for 100/130 grade fuel and the Manual Lean limit for 115/145 grade fuel must be computed from the Normal Mixture Fuel Flow charts in Part 2.

The charts have been calculated using cowl flap position between zero degrees (trail) and full open, as necessary, to maintain cylinder head temperatures within desired operating limits (refer to T.O. 1C-124A-1, Section V). During cruise, if ambient conditions permit, it is desirable to operate CHT's between 220°C and 232°C for improved engine performance and reliability. When the operating cylinder head temperatures are equal to minimum cowl flap position of zero degrees is maintained, the data as presented on the charts are correct. If the desired temperature is maintained by closing the cowl flaps inside the trail position, the data on the charts are slightly conservative. In some instances of operation when the cowl flaps are full open, the temperature will exceed the desired values. The data are correct when this condition occurs. It may be possible to decrease excessive temperatures by reducing power or increasing airspeed. For maximum limit CHT's see T. O. 1C-124A-1, Section V (Operating Limitations).

If operating at cylinder head temperatures below the desired values, the added cowl flap angle required for the additional cooling to the lower temperature will require more BHP per engine. The Cowl Flap Drag chart (figure B5-25) is used in determining the change in BHP for any given change in cowl flap angle. The result of operating with less than the desired temperatures will be a reduction in the maximum gross weight at which the required cruising speed can be maintained at the same



power, or, the necessity of adding power sufficient to maintain the same speed at the same gross weight.

The Nautical Miles per Pound of Fuel charts (figures B5-1, -2, -4, and -6 through B5-13) are given for four-, three-, and two-engine operation at various altitudes for ICAO Standard Day conditions. Charts designating two or three-engine operation are based on propeller being feathered on the inoperative engine(s). The two remaining charts (figures B5-3 and B5-5) present specific range data between 160 and 180 knots EAS for 6000, 7000, 8000, 9000; and 11,000, 12,000, 13,000, 14,000 feet. These data are for ICAO Standard Day and are based upon the same criteria as the rest of the Nautical Miles per Pound of Fuel charts. All charts are presented for both Manual Lean and Normal mixture settings with two exceptions; two-engine operation at sea level and 5000 feet is for Normal Mixture only, the power required being too high for Manual Lean operation.

These charts are the basis for the long-range summary and prediction charts which are based on recommended cruise EAS. In addition to the recommended long-range operation, the Nautical Miles per Pound of Fuel charts are useful in scheduling missions at constant speed or constant power. RPM, manifold pressures and torque pressures necessary to obtain the cruise powers from the charts are determined from the BHP-RPM Schedules (figures B2-3 through B2-5). The BHP-MAP Schedules (figures B2-6 through B2-9), and Torque Pressure versus RPM and BHP (figure B2-10). These charts should be entered with the desired BHP selected from the Nautical Miles per Pound of Fuel charts as outlined in Part 7, Mission Planning.

LONG-RANGE PREDICTION CHARTS.

The Long-Range Prediction charts (figures A5-14 through A5-19) are used to predict distance traveled and elapsed time when operation is at the recommended EAS. The charts are presented for four-, three-, and two-engine operation at ICAO Standard Day atmospheric conditions.

LONG-RANGE SUMMARY CHARTS.

The Long-Range Summary charts (figures B5-20 through B5-22) are also presented for four-, three-, and two-engine operation at ICAO Standard Day atmospheric conditions. These charts summarize the nautical miles per pound of fuel, cruising speeds, and the required brake horsepower for various gross weights and altitudes at recommended EAS.

TWO-ENGINE CRUISE OPERATION IN GROUND EFFECT CHARTS.

The Maximum Gross Weight for Level Flight — Two-Engine Operation in Ground Effect chart (figure B5-23) presents data for the maximum weight for level flight versus height above the ground for two-engine maximum dry power, METO power, and reduced climb power for ICAO Standard Day and Army Hot Day. At any gross weight, the power required to maintain level flight with ground effect can be determined.

The Required Speed for Two-Engine Operation in Ground Effect chart (figure B5-24) shows the airspeed required for level flight on two engines with ground effect at the power setting required to maintain level flight obtained from figure B5-23.

COWL FLAP DRAG CHART.

The Cowl Flap Drag chart (figure B5-25) is provided to allow adjustment of cruise performance data if cowl flap angles other than those required to maintain the desired temperatures mentioned in a previous paragraph are used. If conditions arise where cooling to the proper cylinder head temperatures cannot be accomplished without decreasing airspeed as a result of opening the cowl flaps for more cooling, then more power will be required to regain and maintain the desired airspeed. By entering the Cowl Flap Drag chart with the original and new cowl flap angles and a given speed, the change in brake horsepower required can be obtained for any atmospheric conditions. This additional brake horsepower at the same cruising speed will result in less nautical miles per pound of fuel. This change can be approximated by entering the appropriate Nautical Miles per Pound of Fuel chart at the desired speed and new total brake horsepower per engine to obtain the new nautical miles per pound of fuel.

RECOMMENDED CONTINUOUS CRUISE OPERATION.

It is permissible to use up to METO power when necessary to obtain aircraft performance requirements. However, experience has shown that improved engine operation, engine reliability, and longer engine life can be expected if continuous cruise operation at powers above 1700 BHP in lower blower and 1550 BHP in high blower is kept to a minimum. This recommendation is applicable when using fuel grade 115/145.

NAUTICAL MILES PER POUND OF FUEL
FOUR-ENGINE — SEA LEVEL

MODEL: C-124A
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-20WD
FUEL GRADE: 115/145 & 110/130

CONDITIONS:

1. Sea level pressure altitude.
2. $1\sqrt{\sigma} = 1.000$.
1. Cowl flaps 0°
4. Mixture: Normal above 1900 BHP, MANUAL LEAN below 1900 BHP.
5. With 100/130 grade fuel, do not exceed 2500 BHP in NORMAL mixture, or 1650 BHP MANUAL LEAN mixture.
6. 110% of maximum range EAS is recommended for headwinds of over 45 knots.
7. Use 10 BHP per engine less than charted BHP to obtain cruise performance without wing tip pod heaters.

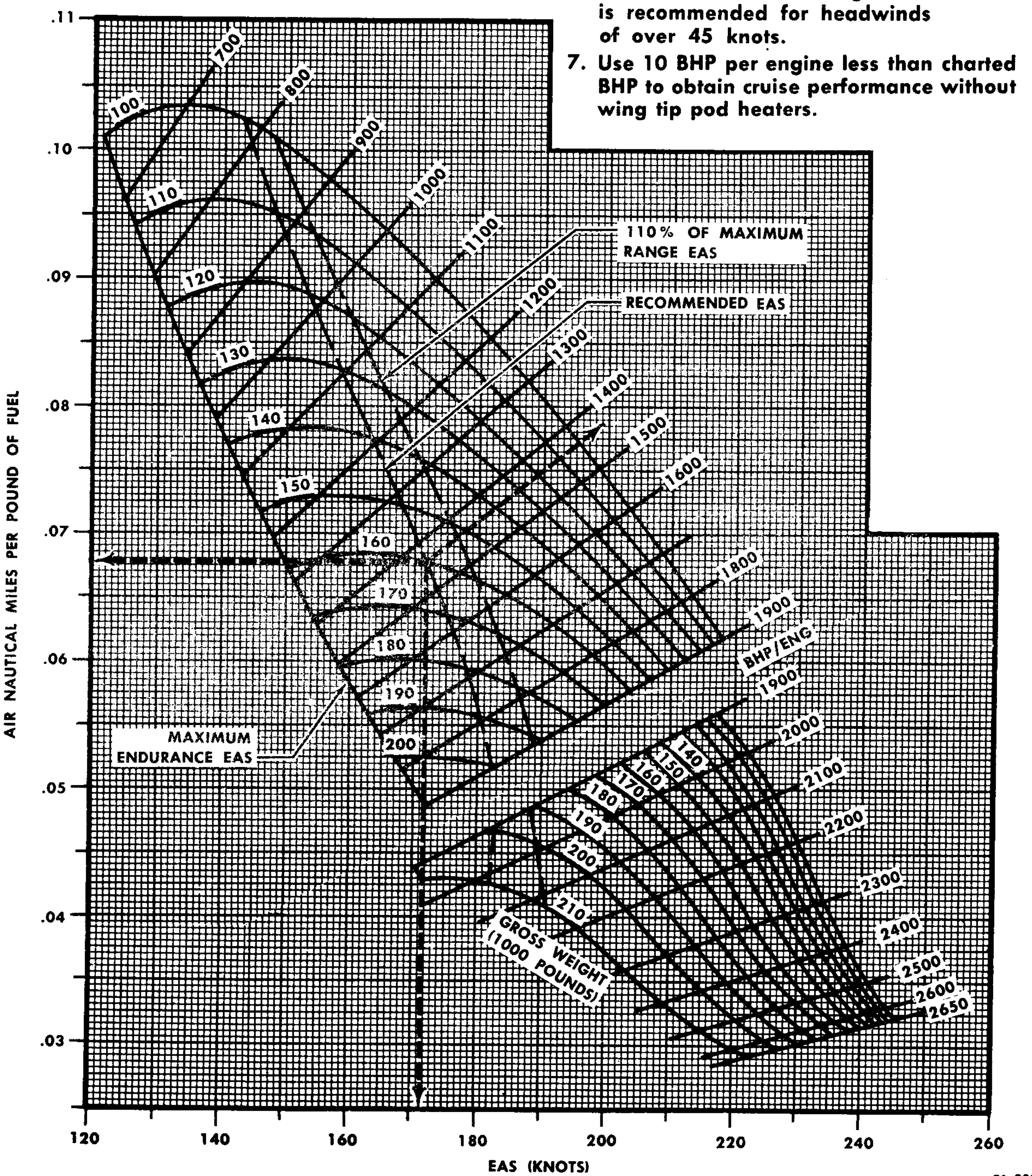


Figure B5-1. Nautical Miles Per Pound of Fuel — Four-Engine — Sea Level

NAUTICAL MILES PER POUND OF FUEL
FOUR-ENGINE — 5000 FEET

MODEL: C-124A
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-20WD
FUEL GRADE: 115/145 & 100/130

CONDITIONS:

1. 5000 feet pressure altitude.
2. $1/\sqrt{\sigma} = 1.0773$.
3. Cowl flaps 0 degrees.
4. Mixture: NORMAL above 1900 BHP, MANUAL LEAN below 1900 BHP.
5. With 100/130 grade fuel, do not exceed 1650 BHP in MANUAL LEAN mixture nor 2500 BHP in NORMAL mixture.
6. 110 percent of maximum range EAS is recommended for headwinds of over 45 knots.
7. Use 10 BHP per engine less than charted BHP to obtain cruise performance without wing tip pod heaters.

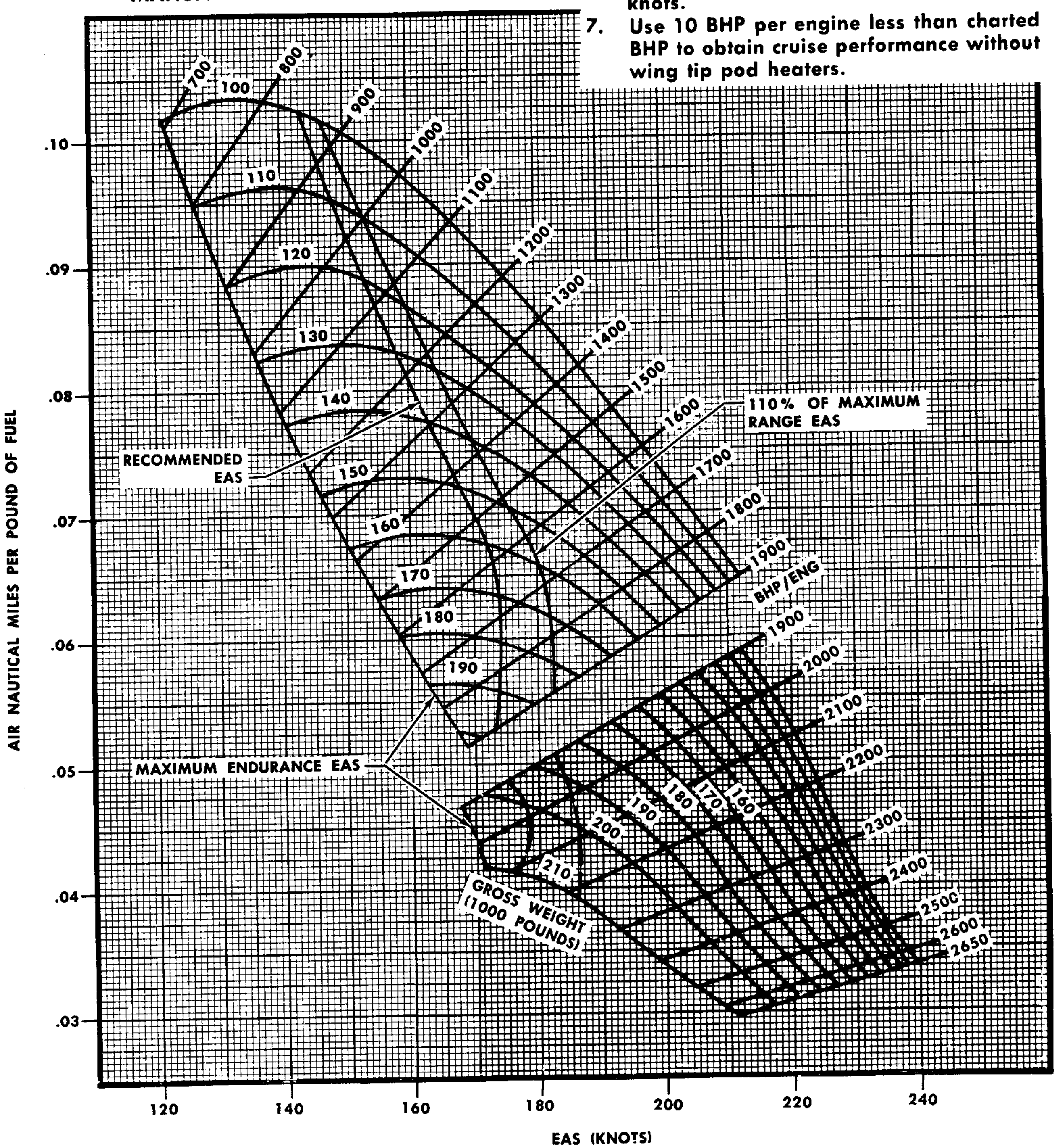


Figure B5-2. Nautical Miles Per Pound of Fuel — Four-Engine — 5000 Feet

MODEL: C-124A
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

NAUTICAL MILES PER POUND OF FUEL
FOUR-ENGINE — 6000; 7000; 8000; 9000 FEET
ICAO STANDARD DAY

NOTE:
1. With 100/130 grade fuel, do not exceed 1650 BHP in MANUAL LEAN mixture.

ENGINES: (4) P & W 4360-20WD
FUEL GRADE: 115/145 & 100/130

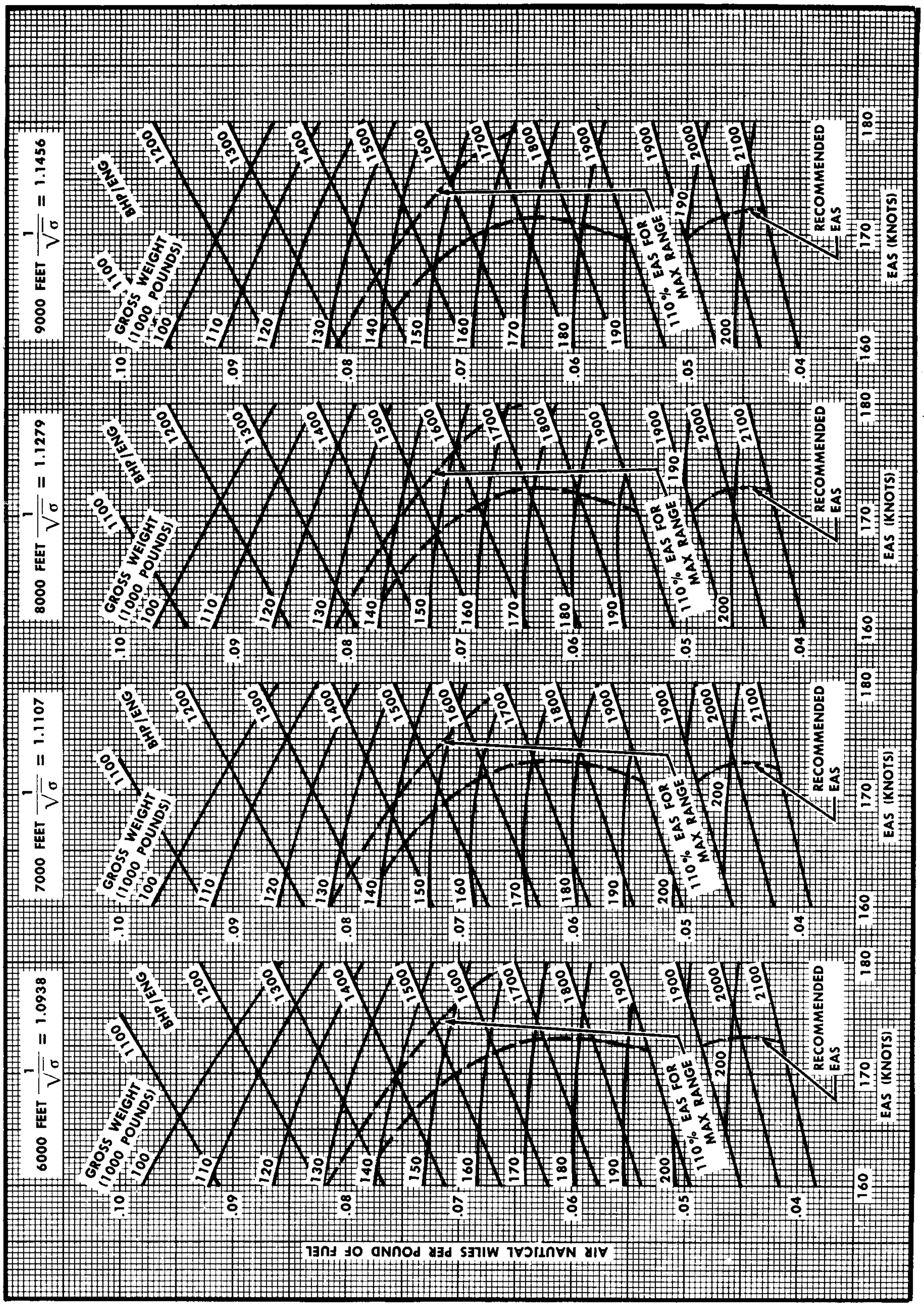


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Figure B5-3. Nautical Miles Per Pound of Fuel — Four-Engine — 6000, 7000, 8000, 9000 Feet — ICAO Standard Day

NAUTICAL MILES PER POUND OF FUEL
FOUR-ENGINE — 10,000 FEET

MODEL: C-124A
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P & W 4360-20WD
FUEL GRADE: 115/145 & 100/130

SAMPLE PROBLEM:

A. Recommended EAS at gross weight = 140,000 pounds.
B. EAS = 162 knots.
C. Required BHP/Eng = 1380.
D. Air nautical miles per pound of fuel = .0775.

CONDITIONS:

1. 10,000 feet pressure altitude.
2. $1/\sqrt{\sigma} = 1.1637$.
3. Cowl flaps 0°.
4. Mixture: NORMAL above 1900 BHP, MANUAL LEAN below 1900 BHP.
5. With 100/130 grade fuel, do not exceed 1650 BHP in MANUAL LEAN mixture.
6. 110 percent of maximum range EAS is recommended for headwinds of over 45 knots.
7. Use 10 BHP per engine less than charted BHP to obtain cruise performance without wing tip pod heaters.

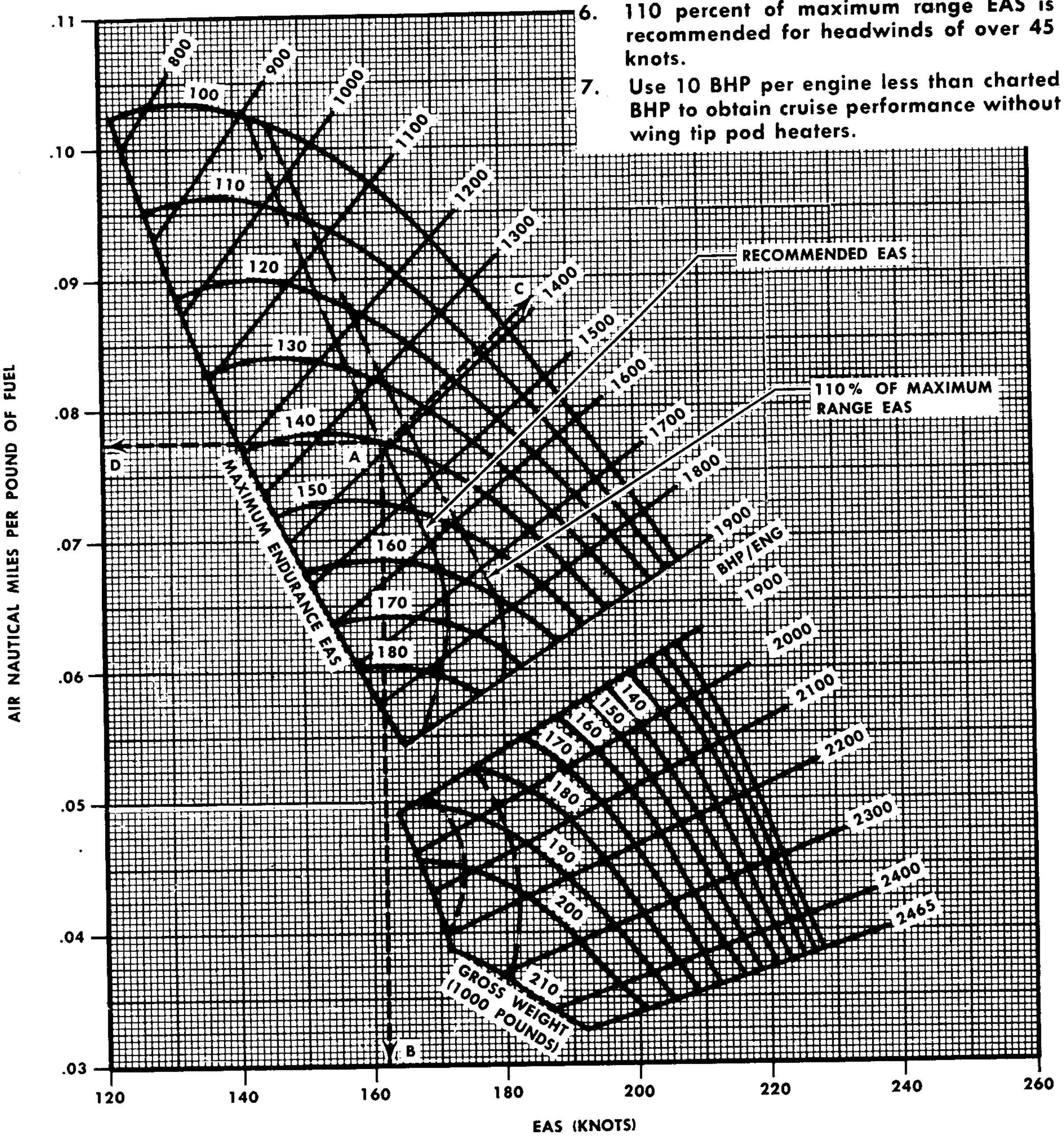
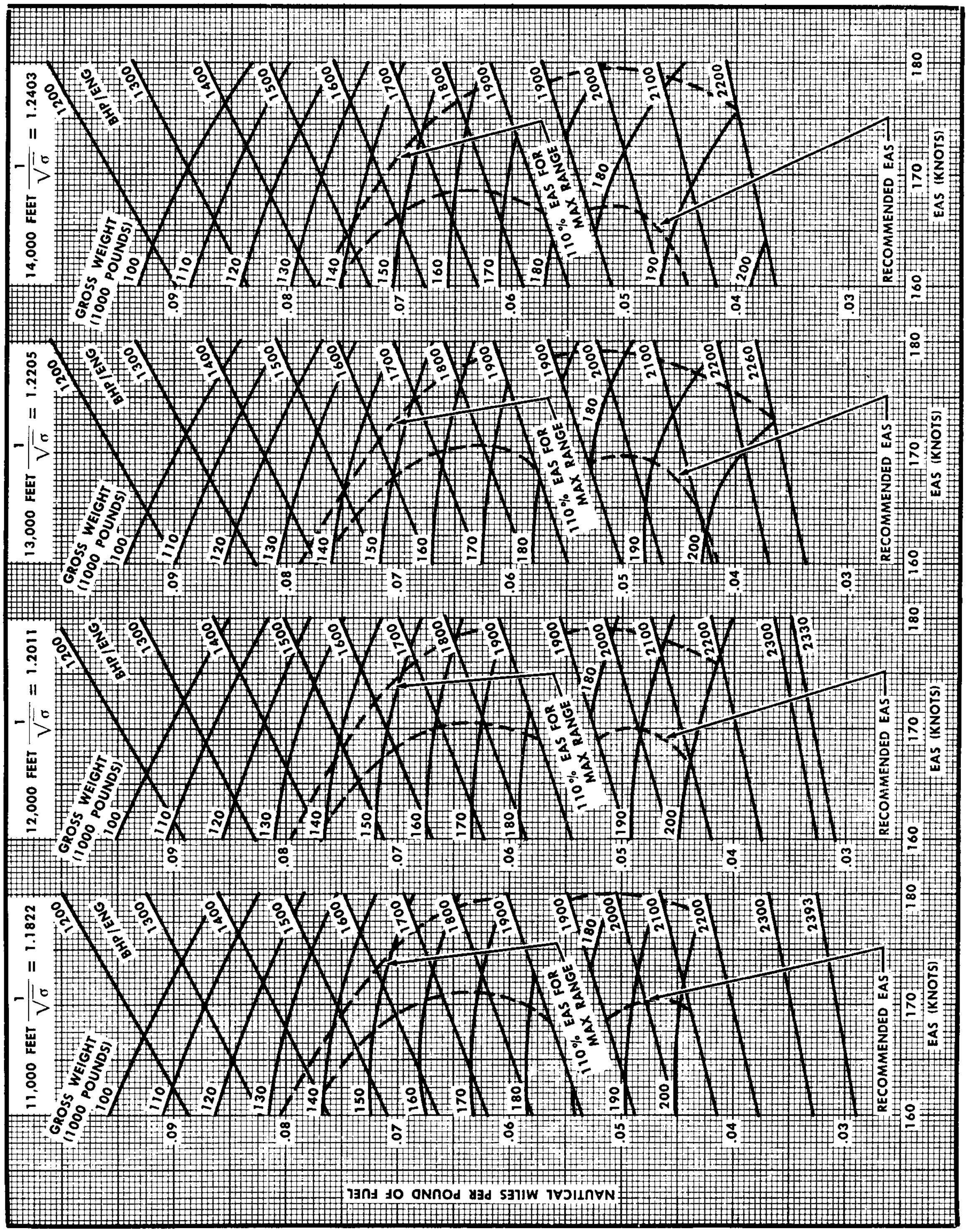


Figure B5-4. Nautical Miles Per Pound of Fuel — Four-Engine — 10,000 Feet

ENGINES: (4) P & W 4360-20WD
FUEL GRADE: 115/145 & 100/130

NAUTICAL MILES PER POUND OF FUEL — FOUR-ENGINE
11,000 FEET TO 14,000 FEET — ICAO STANDARD DAY

NOTE:
1. With 100/130 grade fuel, do not exceed 1650 BHP in MANUAL LEAN mixture.



MODEL: C-124A
DATE: 12-15-63
DATA BASIS: **FLIGHT TEST**

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Figure B5-5. Nautical Miles Per Pound of Fuel — Four-Engine — 11,000, 12,000, 13,000, 14,000 Feet — ICAO Standard Day

NAUTICAL MILES PER POUND OF FUEL
FOUR-ENGINE — 15,000 FEET

MODEL: C-124A
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P & W 4360-20WD
FUEL GRADE: 115/145 & 100/130

CONDITIONS:

1. 15,000 feet pressure altitude.
2. $1/\sqrt{\sigma} = 1.2606$.
3. Cowl flaps 0°.
4. Mixture: NORMAL above 1900 BHP, MANUAL LEAN below 1900 BHP.
5. With 100/130 grade fuel, do not exceed 1650 BHP in MANUAL LEAN mixture.
6. 110 percent of maximum range EAS is recommended for headwinds of over 45 knots.
7. Use 10 BHP per engine less than charted BHP to obtain cruise performance without wing tip pod heaters.

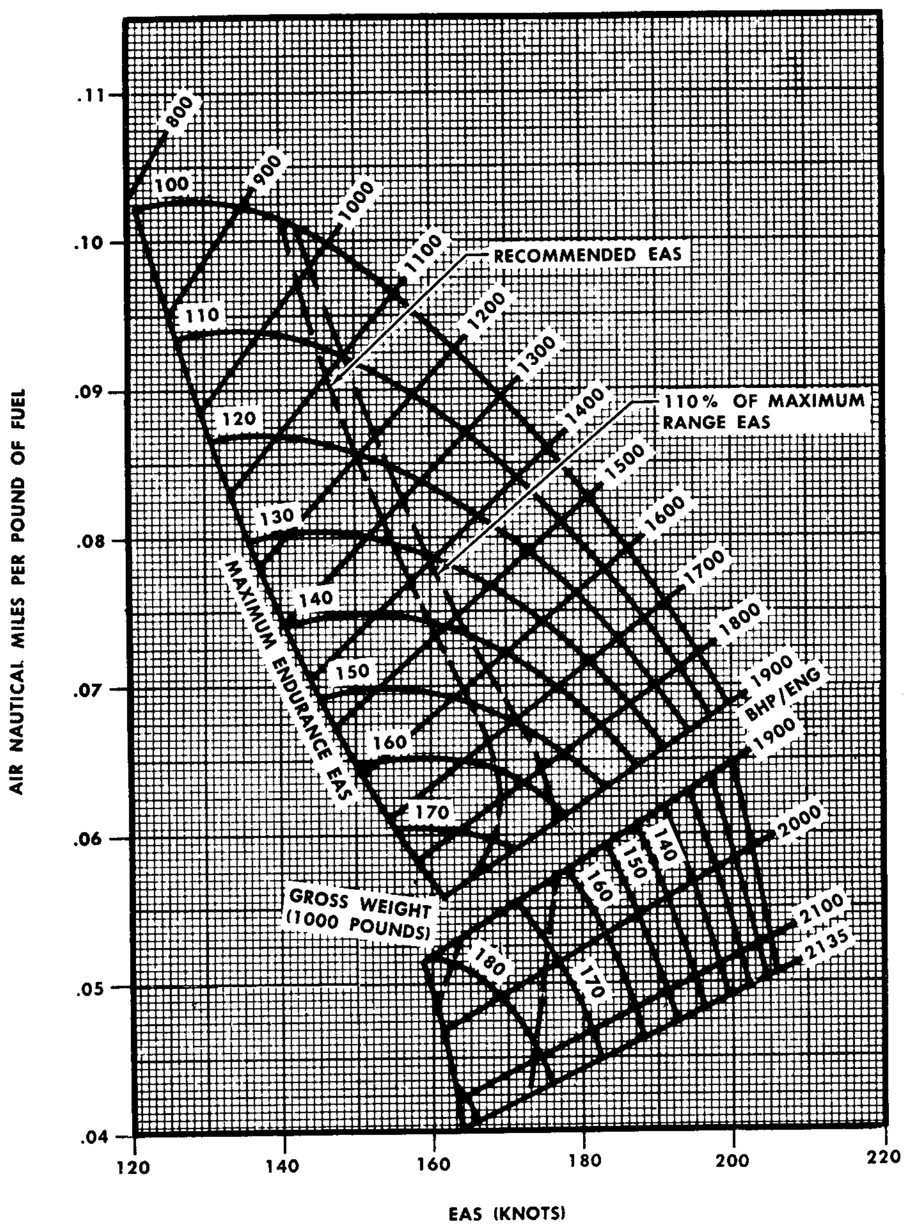

Figure B5-6. Nautical Miles Per Pound of Fuel — Four-Engine — 15,000 Feet

NAUTICAL MILES PER POUND OF FUEL FOUR-ENGINE — 20,000 FEET

MODEL: C-124A
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-20WD
FUEL GRADE: 115/145 & 100/130

CONDITIONS:

1. 20,000 feet pressure altitude.
2. $1/\sqrt{\sigma} = 1.3700$.
3. Cowl flaps 0° except as noted.
4. Mixture: NORMAL above 1700 BHP, MANUAL LEAN below 1700 BHP.
5. With 100/130 grade fuel, do not exceed 1510 BHP in MANUAL LEAN mixture nor 2100 BHP in NORMAL mixture.
6. High blower.
7. 110 percent of maximum range EAS is recommended for headwinds of over 45 knots.
8. Use 10 BHP per engine less than charted BHP to obtain cruise performance without wing tip pod heaters.

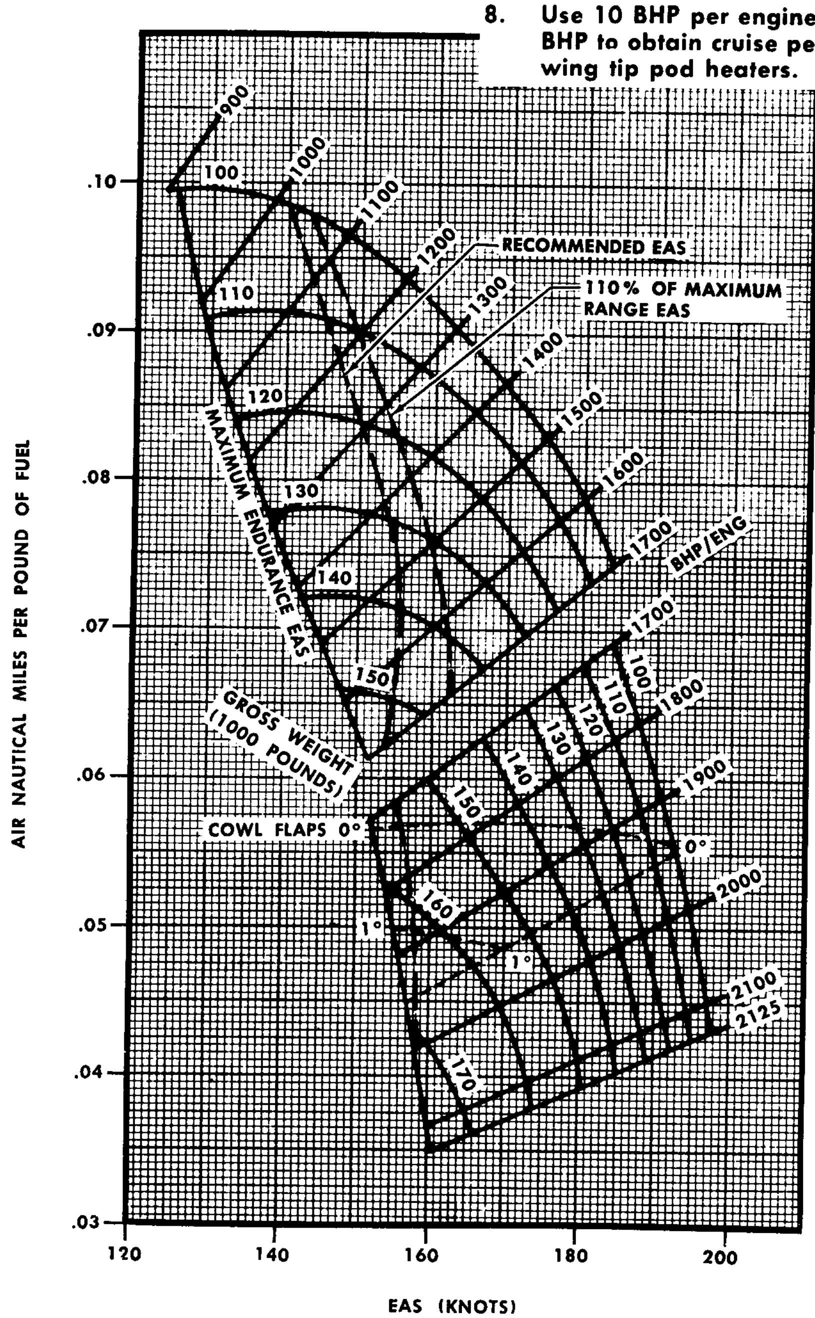

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Figure B5-7. Nautical Miles Per Pound of Fuel — Four-Engine — 20,000 Feet

NAUTICAL MILES PER POUND OF FUEL
THREE-ENGINE — SEA LEVEL

MODEL: C-124A
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P & W 4360-20WD
FUEL GRADE: 115/145 & 100/130

CONDITIONS:

1. Sea level pressure altitude.
2. $1/\sqrt{\sigma} = 1.000$.
3. Cowl flaps 0° except as noted.
4. Mixture: NORMAL above 1900 BHP, MANUAL LEAN below 1900 BHP.
5. With 100/130 grade fuel, do not exceed 2500 BHP in NORMAL mixture, or 1650 BHP in MANUAL LEAN mixture.
6. 110% of maximum range EAS is recommended for headwinds of over 45 knots.
7. Use 10 BHP per engine less than charted BHP to obtain cruise performance without wing tip pod heaters.

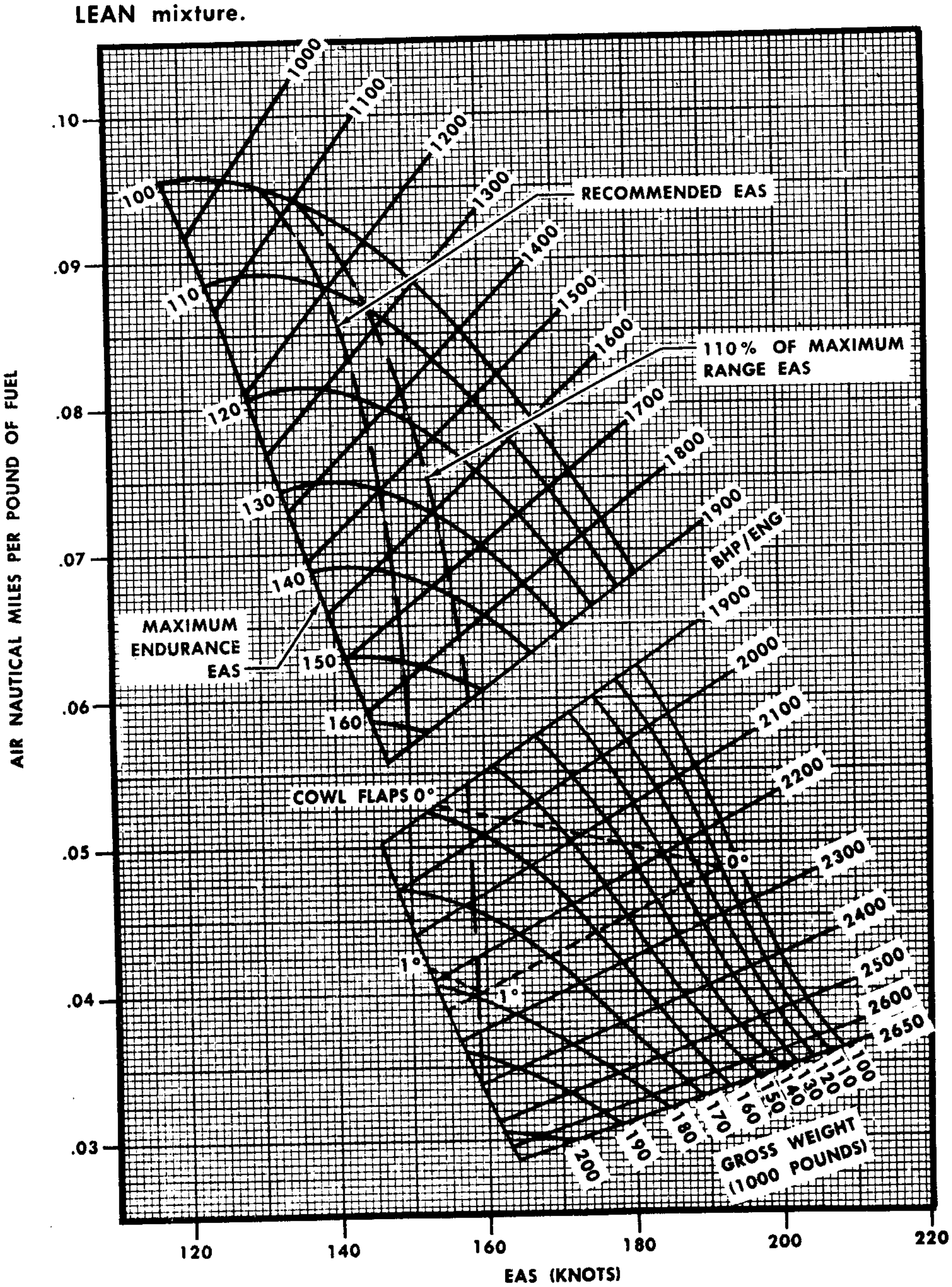

Figure B5-8. Nautical Miles Per Pound of Fuel — Three-Engine — Sea Level

NAUTICAL MILES PER POUND OF FUEL
THREE-ENGINE — 5000 FEET

MODEL: C-124A
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P & W 4360-20WD
FUEL GRADE: 115/145 & 100/130

CONDITIONS:

1. 5000 feet pressure altitude.
2. $1/\sqrt{\sigma} = 1.0773$.
3. Cowl flaps 0 degrees except as noted.
4. Mixture: NORMAL above 1900 BHP, MANUAL LEAN below 1900 BHP.
5. With 100/130 grade fuel, do not exceed 1650 BHP in MANUAL LEAN mixture nor 2500 BHP in NORMAL mixture.
6. 110% of maximum range EAS is recommended for headwinds of over 45 knots.
7. Use 10 BHP per engine less than charted BHP to obtain cruise performance without wing tip pod heaters.

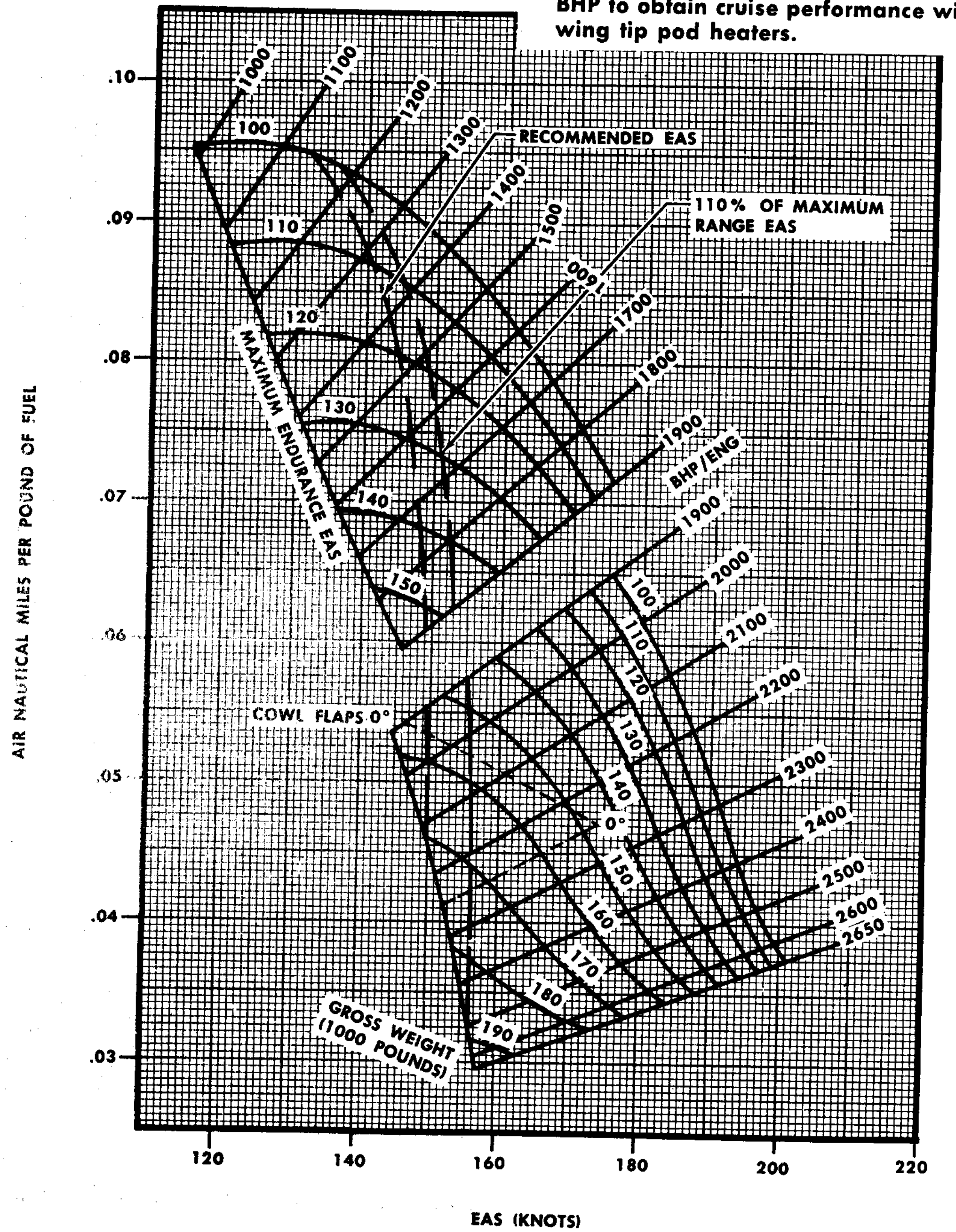

Figure B5-9. Nautical Miles Per Pound of Fuel — Three-Engine — 5000 Feet

NAUTICAL MILES PER POUND OF FUEL
THREE-ENGINE — 10,000 FEET

MODEL: C-124A
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-20WD
FUEL GRADE: 115/145 & 100/130

CONDITIONS:

1. 10,000 feet pressure altitude.
2. $1/\sqrt{\sigma} = 1.1637$.
3. Cowl flaps 0° except as noted.
4. Mixture: NORMAL above 1900 BHP, MANUAL LEAN below 1900 BHP.
5. With 100/130 grade fuel, do not exceed 1650 BHP in MANUAL LEAN mixture.
6. 110 percent of maximum range EAS is recommended for headwinds of over 45 knots.
7. Use 10 BHP per engine less than charted BHP to obtain cruise performance without wing tip pod heaters.

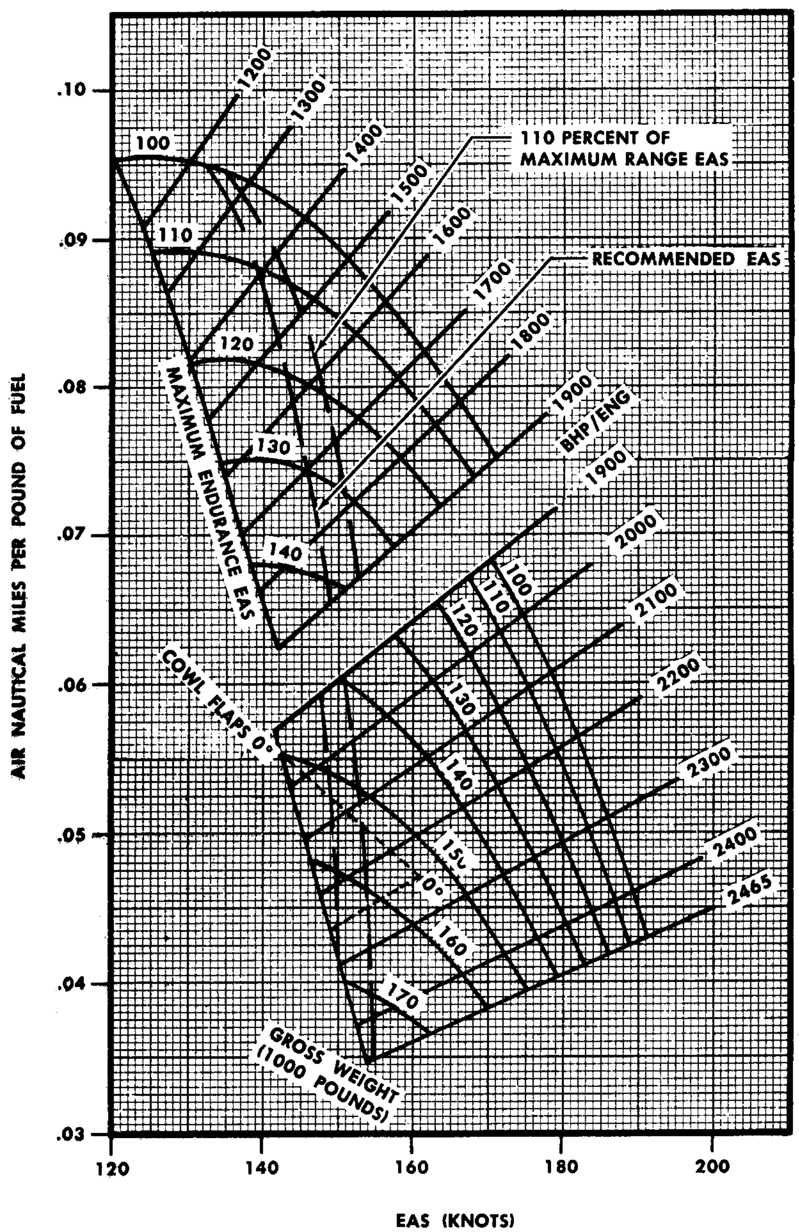

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Figure B5-10. Nautical Miles Per Pound of Fuel — Three-Engine — 10,000 Feet

NAUTICAL MILES PER POUND OF FUEL
THREE-ENGINE — 15,000 FEET

MODEL: C-124A
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P & W 4360-20WD
FUEL GRADE: 115/145 & 100/130

CONDITIONS:
1. 15,000 feet pressure altitude.
2. $1/\sqrt{\sigma} = 1.2606$.
3. Cowl flaps 0° except as noted.
4. Mixture: NORMAL above 1900 BHP, MANUAL LEAN below 1900 BHP.
5. With 100/130 grade fuel, do not exceed 1650 BHP in MANUAL LEAN mixture.
6. 110 percent of maximum range EAS is recommended for headwinds of over 45 knots.
7. Use 10 BHP per engine less than charted BHP to obtain cruise performance without wing tip pod heaters.

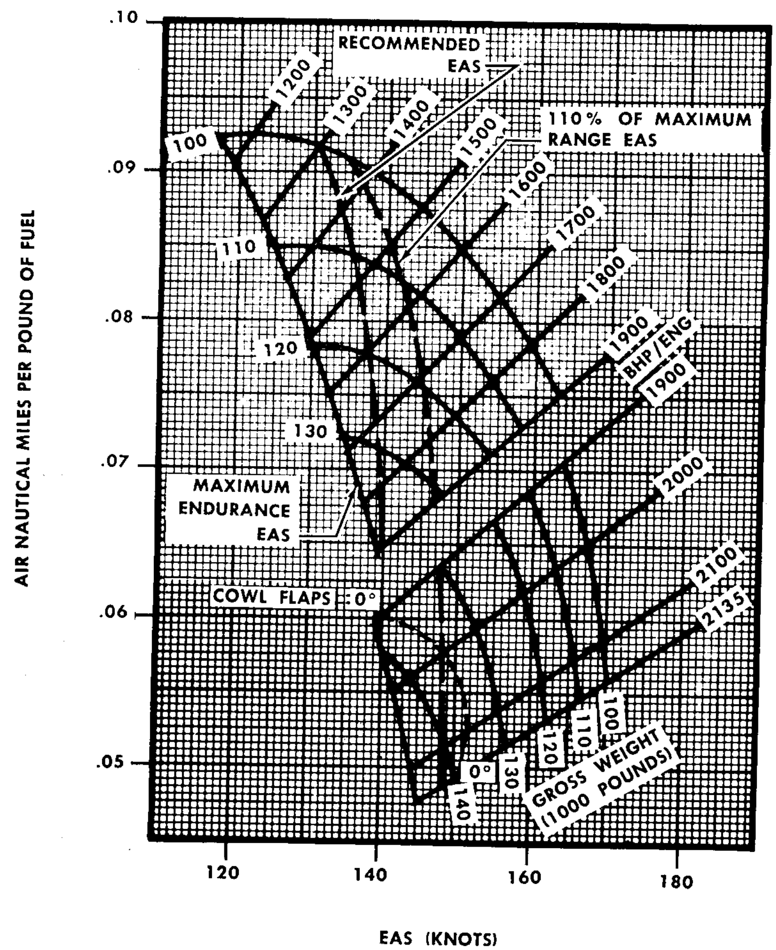

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Figure B5-11. Nautical Miles Per Pound of Fuel — Three-Engine — 15,000 Feet

NAUTICAL MILES PER POUND OF FUEL
TWO-ENGINE — SEA LEVEL

MODEL: C-124A
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-20WD
FUEL GRADE: 115/145 & 100/130

CONDITIONS:

1. Sea level pressure altitude.
2. $1/\sqrt{\sigma} = 1.000$.
3. Cowl flaps 0 degrees except as noted.
4. Mixture NORMAL.
5. With 100/130 grade fuel, do not exceed 2500 BHP.
6. 110% of maximum range EAS is recommended for headwinds of over 45 knots.
7. Use 10 BHP per engine less than charted BHP to obtain cruise performance without wing tip pod heaters.

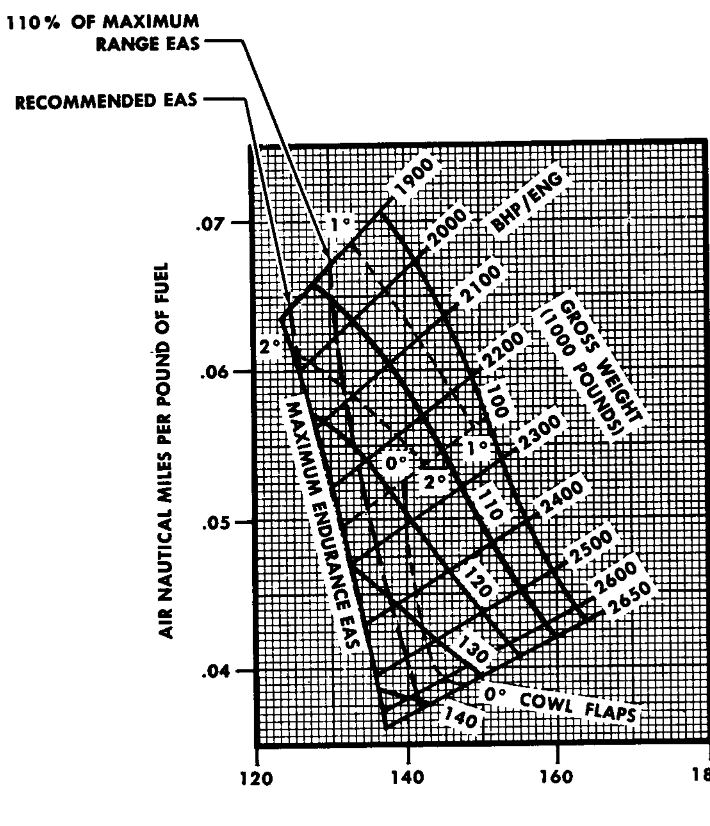

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Figure B5-12. Nautical Miles Per Pound of Fuel — Two-Engine — Sea Level

NAUTICAL MILES PER POUND OF FUEL
TWO-ENGINE — 5000 FEET

MODEL: C-124A
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P & W 4360-20WD
FUEL GRADE: 115/145 & 100/130

CONDITIONS:

1. 5000 feet pressure altitude.
2. $1/\sqrt{\sigma} = 1.0773$.
3. Cowl flaps 0 degrees execept as noted.
4. Mixture: NORMAL.
5. With 100/130 grade fuel, do not exceed 2500 BHP.
6. 110% of maximum range EAS is recommended for headwinds of over 45 knots.
7. Use 10 BHP per engine less than charted BHP to obtain cruise performance without wing tip pod heaters.

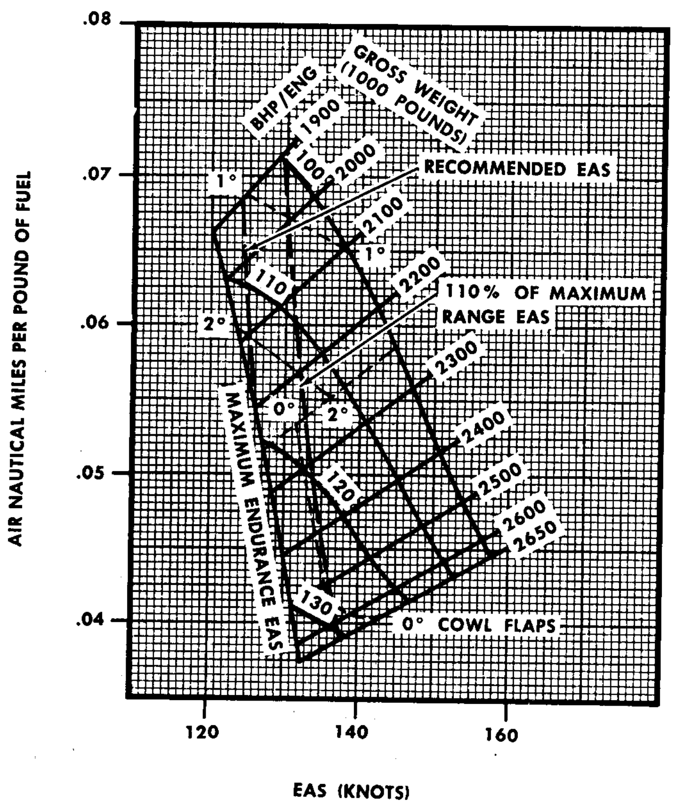

Figure B5-13. Nautical Miles Per Pound of Fuel — Two-Engine — 5000 Feet

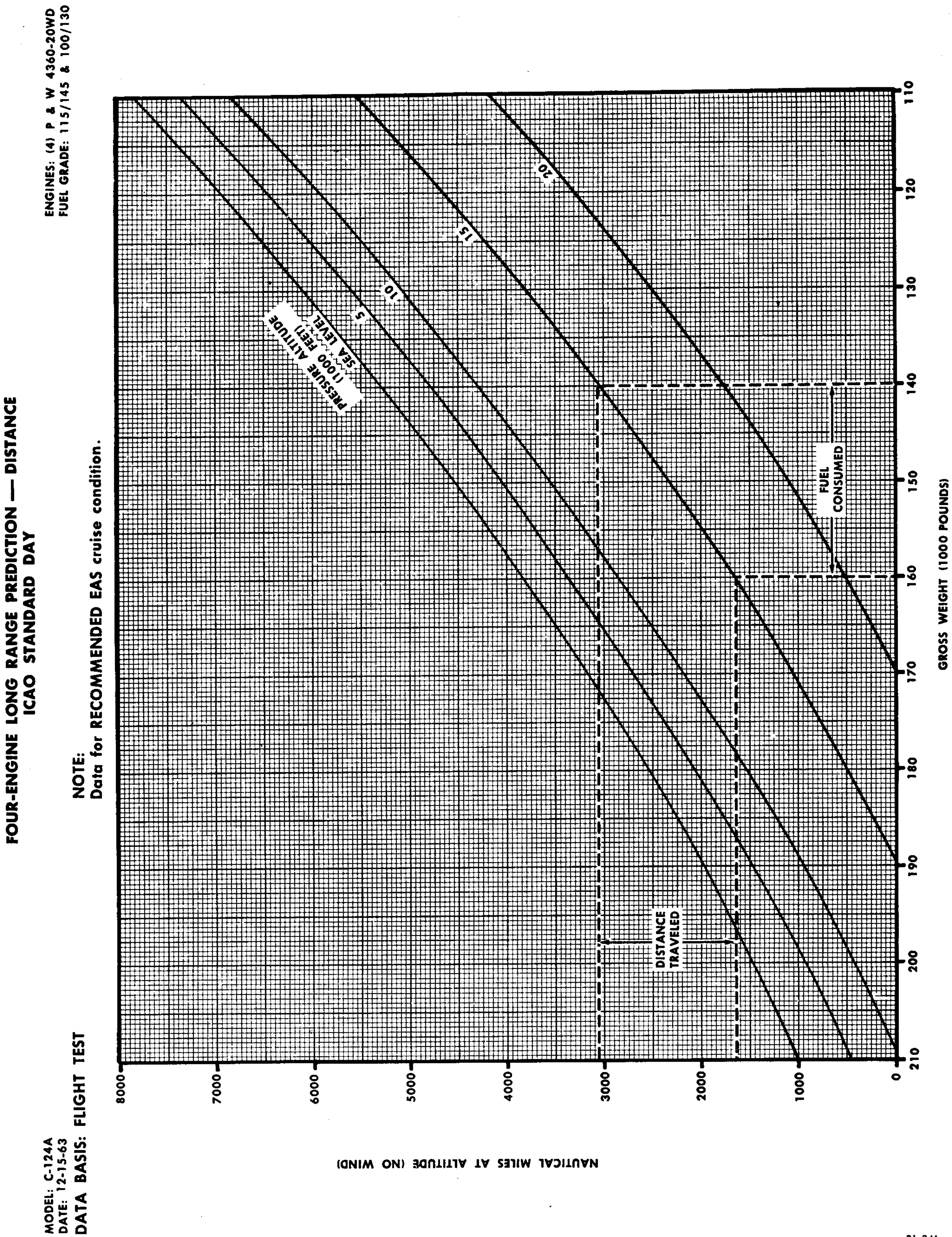

Figure B5-14. Four-Engine Long Range Prediction — Distance — ICAO Standard Day

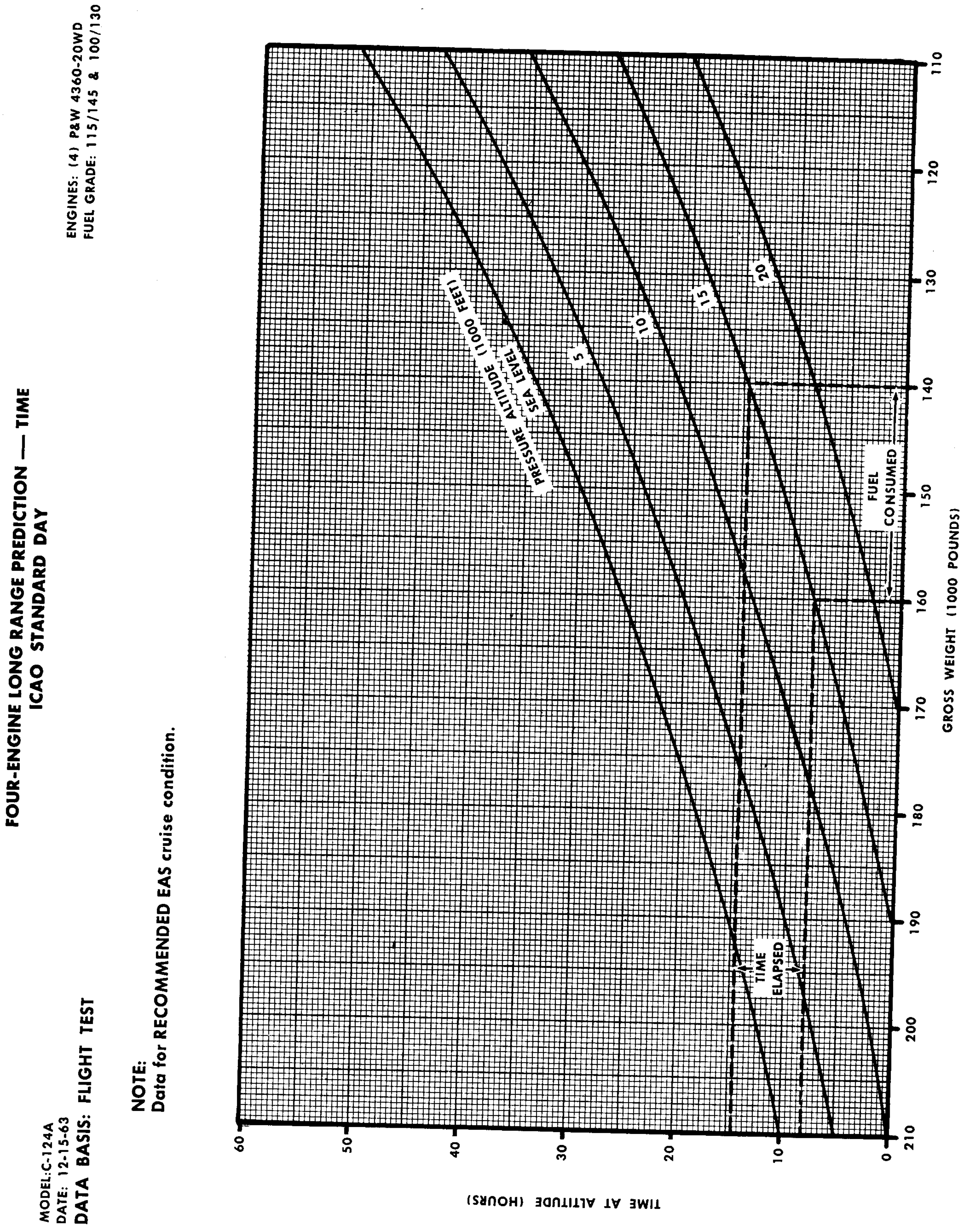

Figure B5-15. Four-Engine Long Range Prediction — Time — ICAO Standard Day

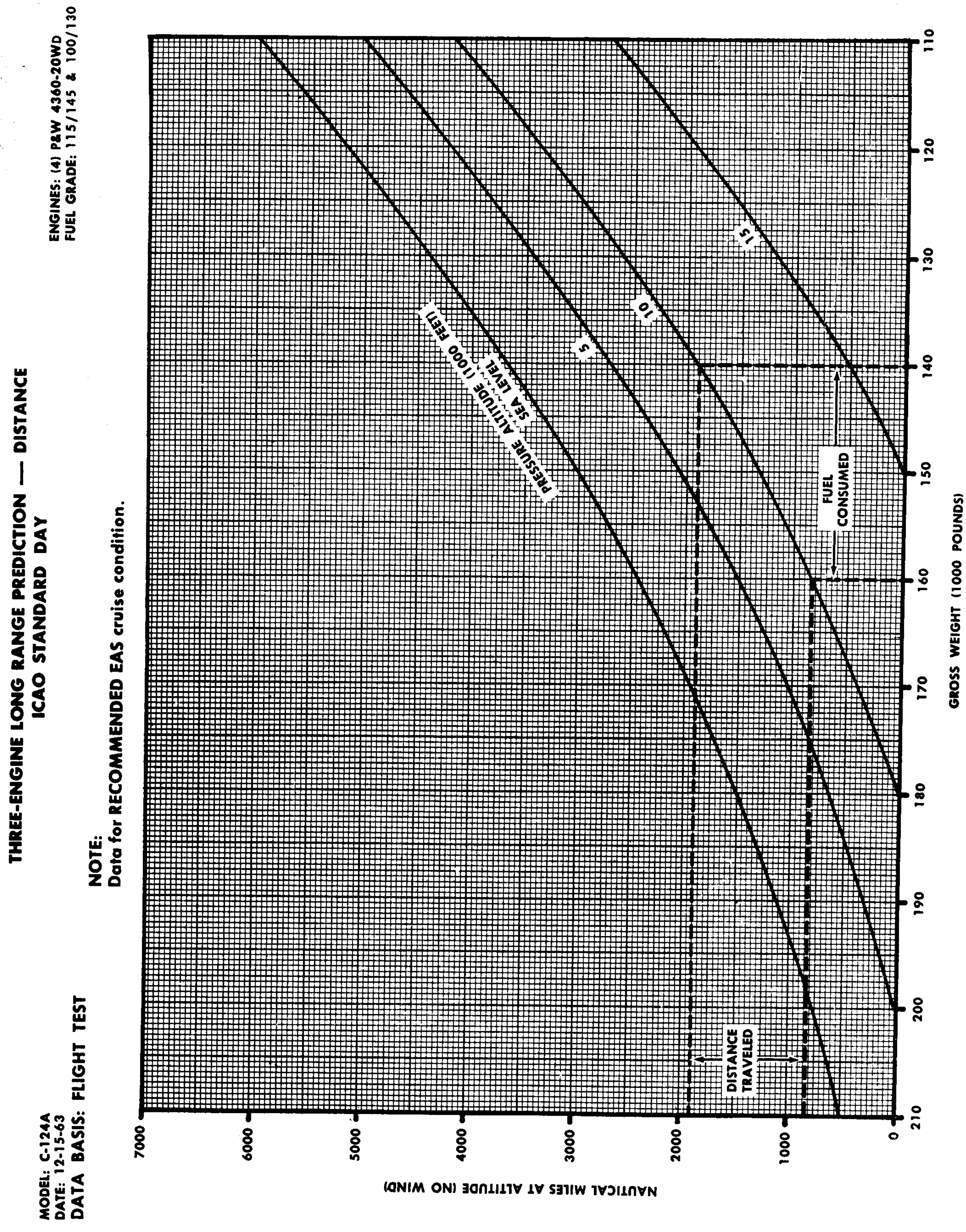

Figure B5-16. Three-Engine Long Range Prediction — Distance — ICAO Standard Day

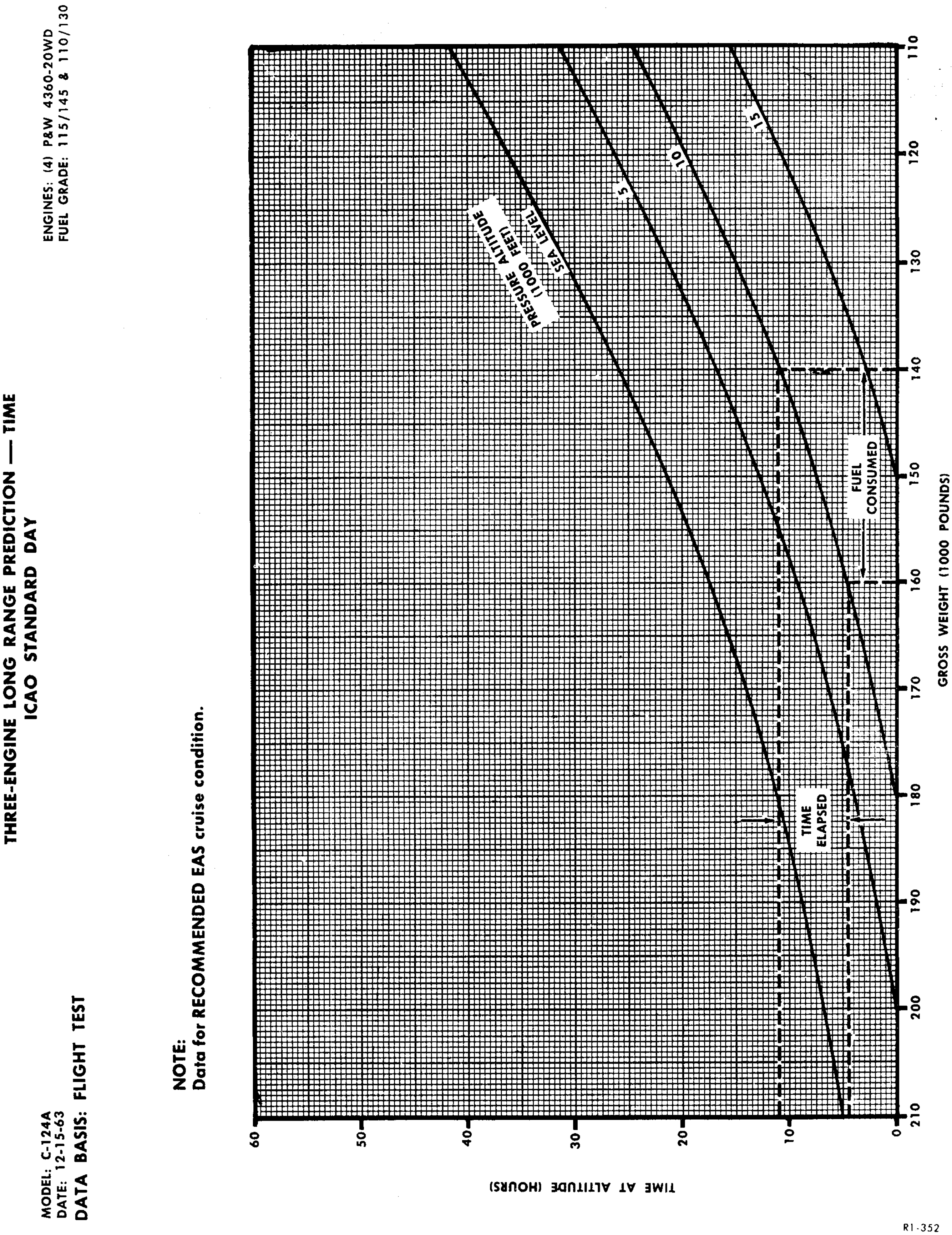

Figure B5-17. Three-Engine Long Range Prediction — Time — ICAO Standard Day

TWO-ENGINE LONG RANGE PREDICTION — DISTANCE
ICAO STANDARD DAY

MODEL: C-124A
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P & W 4360-20WD
FUEL GRADE: 115/145 & 100/130

NOTE:
Data for RECOMMENDED EAS cruise condition.

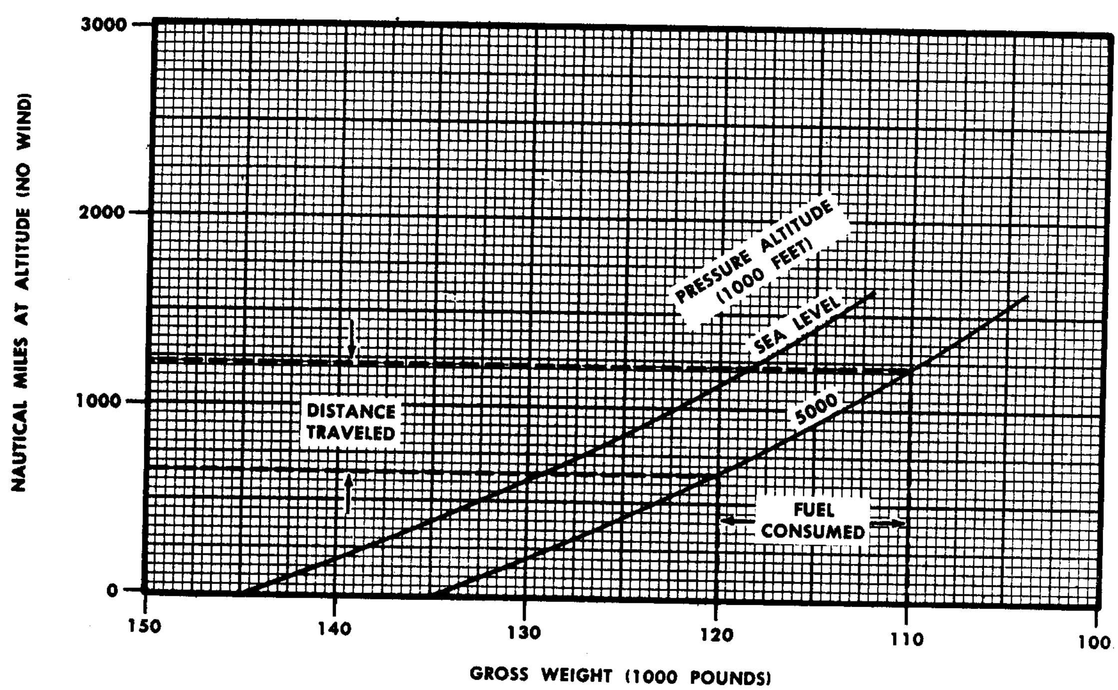

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Figure B5-18. Two-Engine Long Range Prediction — Distance — ICAO Standard Day

TWO-ENGINE LONG RANGE PREDICTION — TIME
ICAO STANDARD DAY

MODEL: C-124A
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P & W 4360-20WD
FUEL GRADE: 115/145 & 100/130

NOTE:
Data for RECOMMENDED EAS cruise condition.

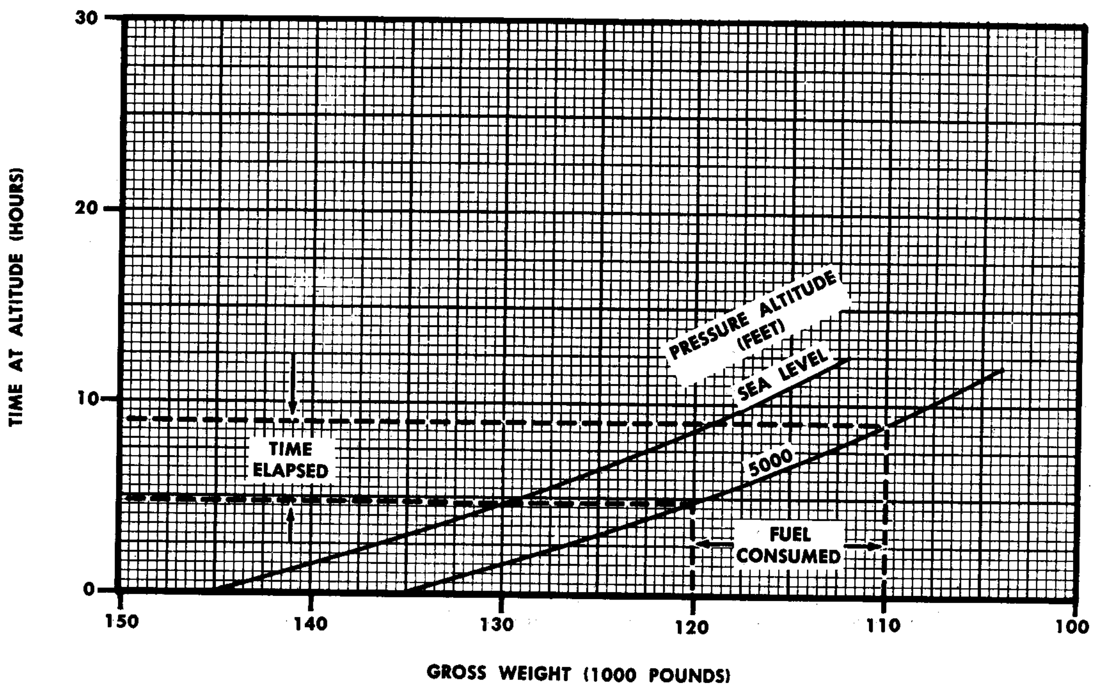

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Figure B5-19. Two-Engine Long Range Prediction — Time — ICAO Standard Day

FOUR-ENGINE LONG RANGE SUMMARY
ICAO STANDARD DAY

MODEL: C-124A
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P & W 4360-20WD
FUEL GRADE: 115/145 & 100/130

NOTE:
Data for RECOMMENDED EAS cruise condition.

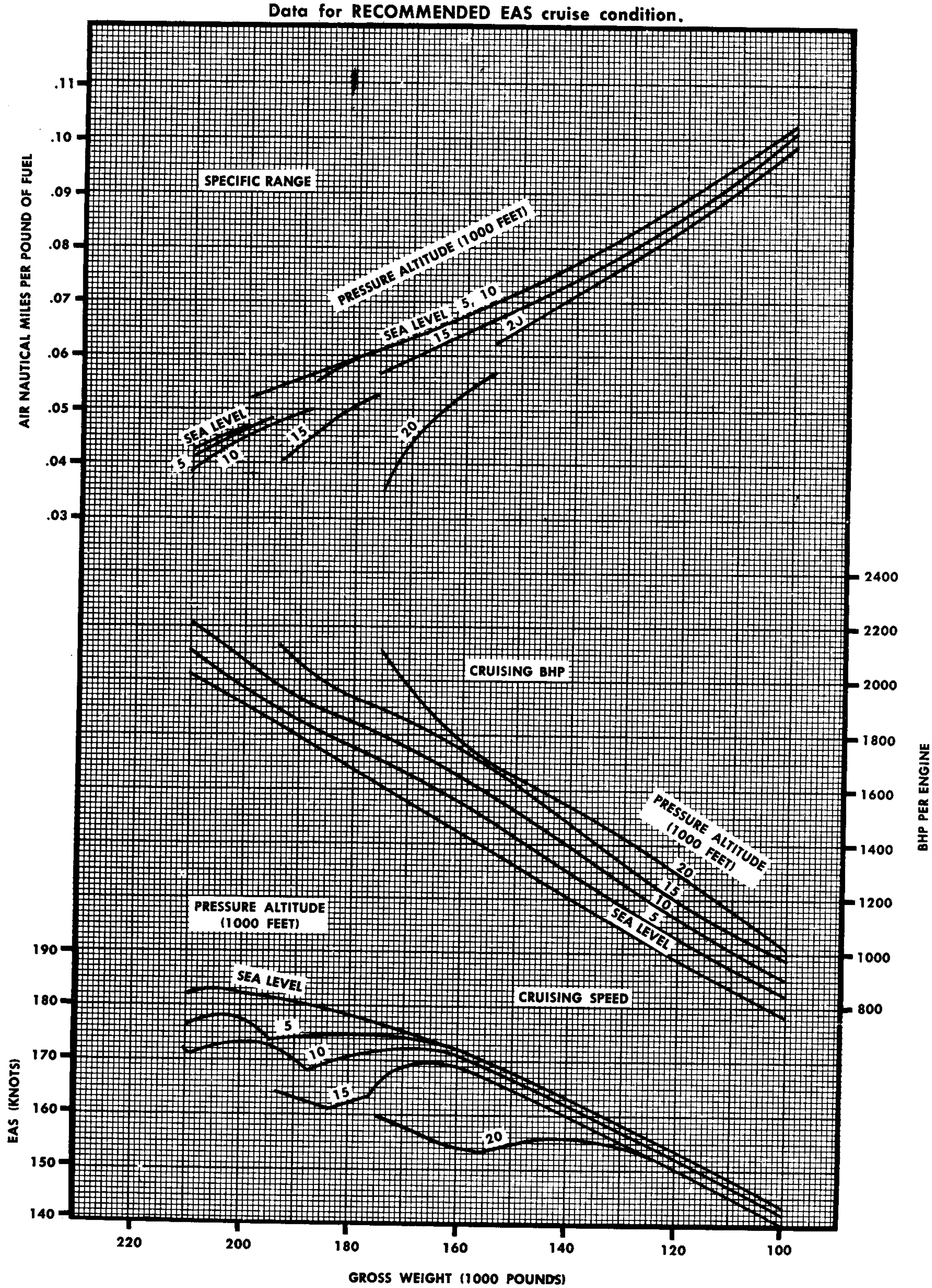

Figure B5-20. Four-Engine Long Range Summary — ICAO Standard Day

THREE-ENGINE LONG RANGE SUMMARY
ICAO STANDARD DAY

MODEL: C-124A
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-20WD
FUEL GRADE: 115/145 & 100/130

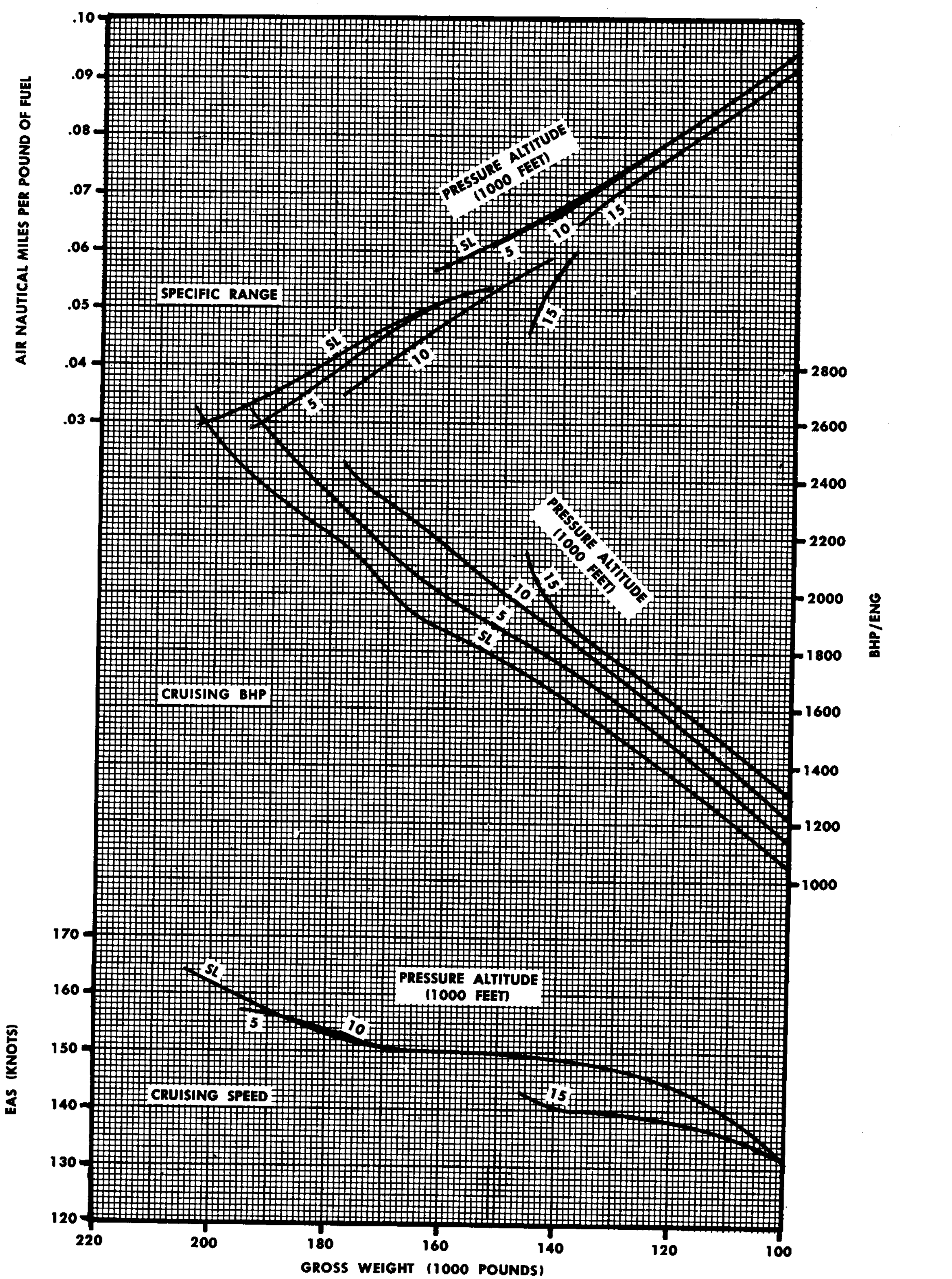

Figure B5-21. Three-Engine Long Range Summary — ICAO Standard Day

TWO-ENGINE LONG RANGE SUMMARY
ICAO STANDARD DAY

MODEL: C-124A
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P & W 4360-20WD
FUEL GRADE: 115/145 & 100/130

NOTE:
Data for RECOMMENDED EAS cruise condition.

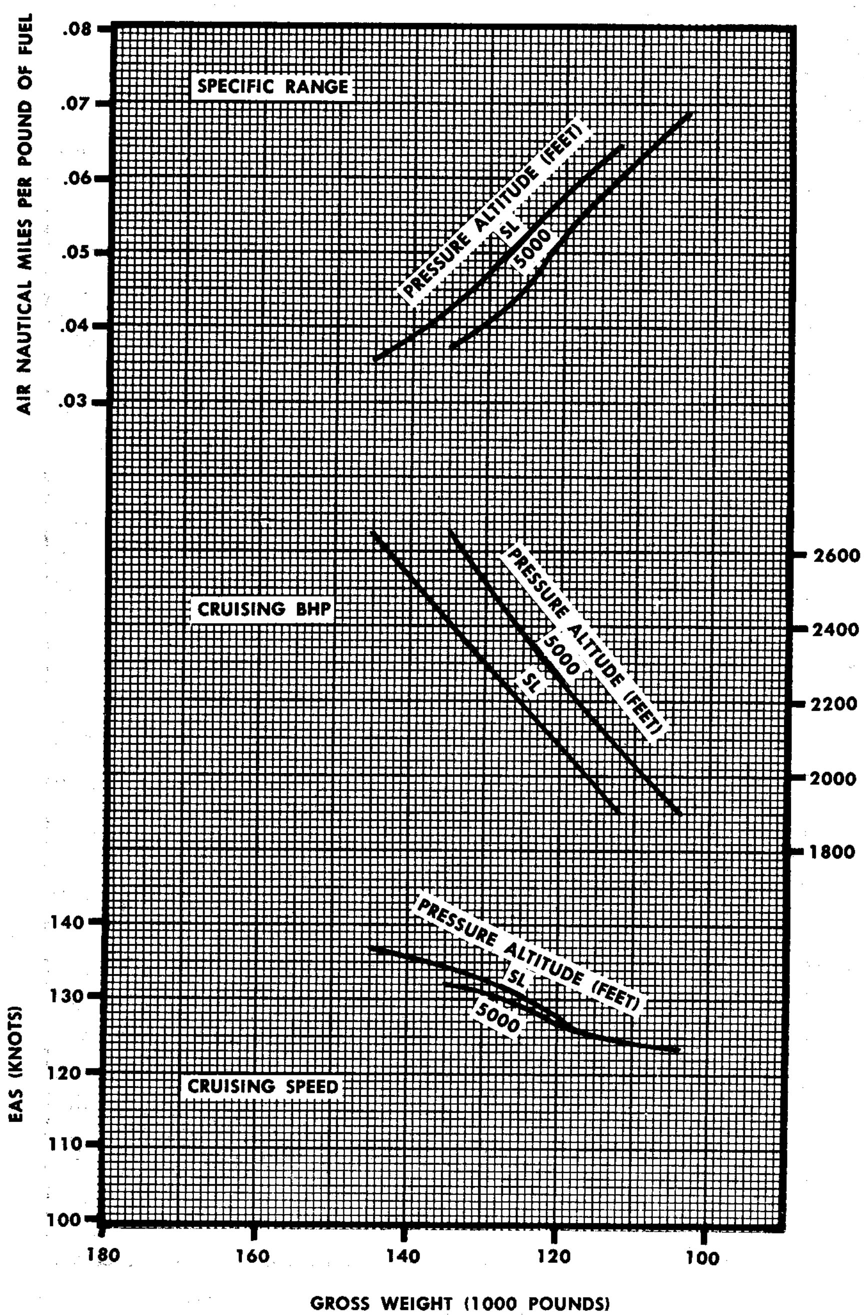

Figure B5-22. Two-Engine Long Range Summary — ICAO Standard Day

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MAXIMUM GROSS WEIGHT FOR LEVEL FLIGHT
TWO-ENGINE OPERATION IN GROUND EFFECT
WING FLAPS = ZERO DEGREES, GEAR UP
SEA LEVEL

MODEL: C-124A
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-20WD
FUEL GRADE: 115/145 & 100/130

NOTE:

1. Propellers on inoperative engines feathered.
2. Cowl flaps on inoperative engines closed.
3. Includes drag from cowl flaps on operating engines.
4. ———— Standard Day (15° C).
   — — Hot Day (38° C).
5. For 100/130 grade fuel, subtract 10,000 pounds at maximum power and 6500 pounds at METO power.

SAMPLE PROBLEM:

A. Gross weight = 165,000 pounds.
B. Power = METO power (Standard Day).
C. Maximum height above ground attainable = 60 feet.

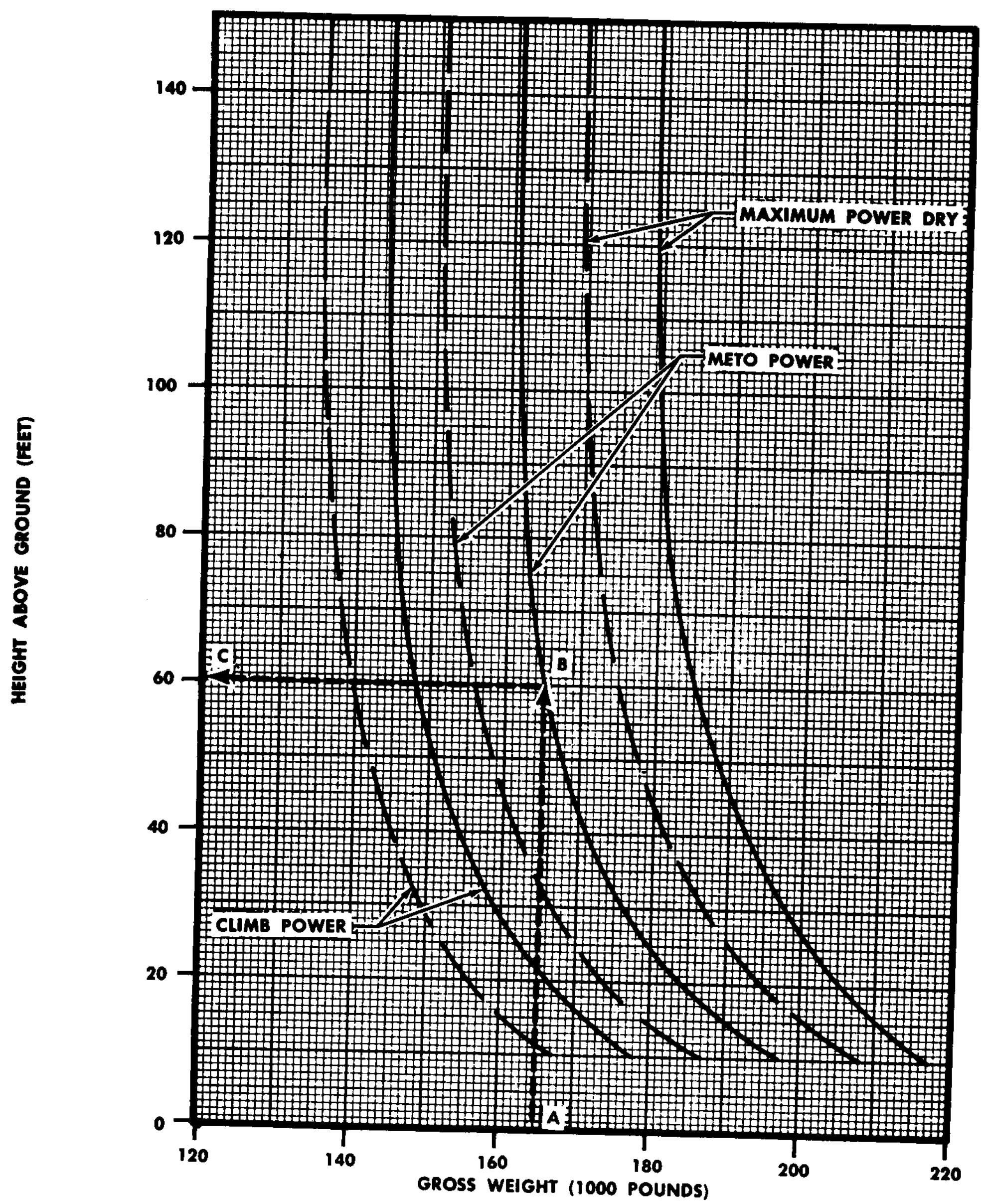


Figure B-23. Maximum Gross Weight for Level Flight — Two-Engine Operation in Ground Effect

REQUIRED SPEED FOR TWO-ENGINE OPERATION IN GROUND EFFECT

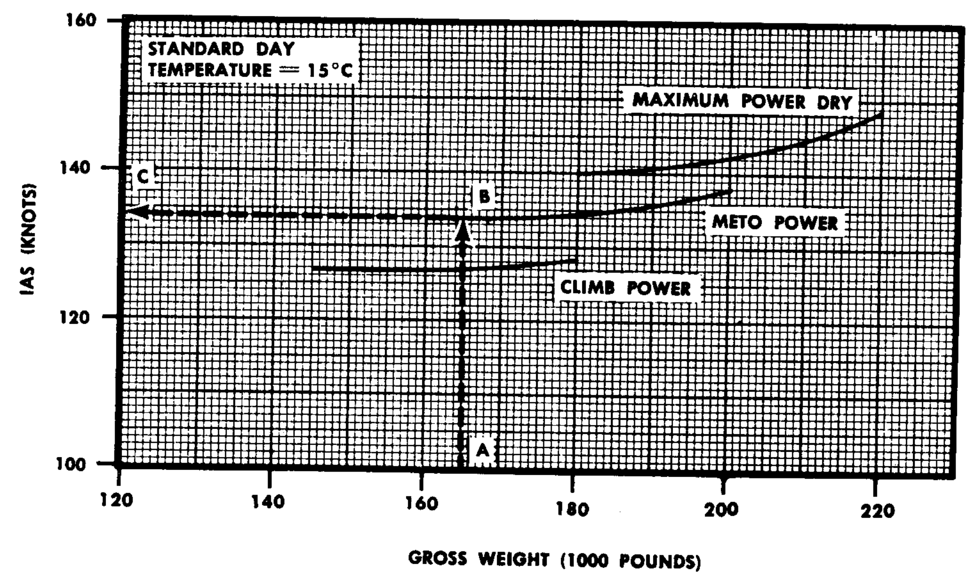
WING FLAPS = ZERO DEGREES, GEAR UP
SEA LEVEL

MODEL: C-124A
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-20WD
FUEL GRADE: 115/145 & 100/130

NOTE:
1. Propellers on inoperative engines feathered.
2. Cowl flaps on inoperative engines closed.
3. Includes drag from cowl flaps on operating engines.
4. For 100/130 grade fuel, subtract 3 knots at maximum power and 2 knots at METO power.

SAMPLE PROBLEM:
A. Gross weight = 165,000 pounds.
B. Power = METO power (Standard Day).
C. Required IAS to maintain altitude = 134 knots.



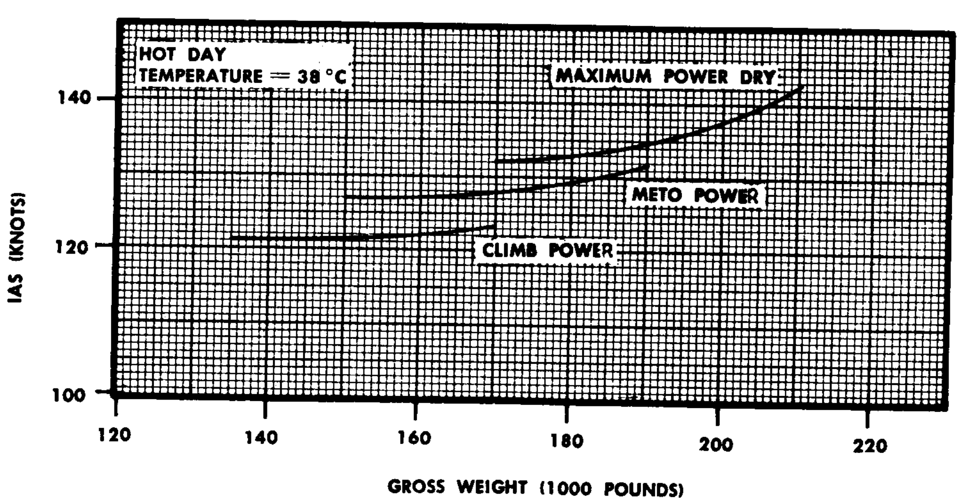


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Figure B5-24. Required Speed for Two-Engine Operation in Ground Effect

COWL FLAP DRAG

MODEL: C-124A
DATE: 2-15-60
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-20W
FUEL GRADE: 115/145

SAMPLE PROBLEM:

Given:

5000 feet density altitude $\left(\frac{1}{\sqrt{\sigma}} = 1.0773\right)$.

Four-engine cruise at 200 knots EAS.

Find:

Additional power required if cowl flap settings are increased from 5 degrees to 6 degrees.

Solution:

It is noted from curves that additional cowl flap opening results in increased power required of 168 × 1.0773 minus 135 × 1.0773 or 35.6 brake horsepower per engine. The total additional power required for the four-engine cruise conditions is 4 × 35.6 = 142.4.

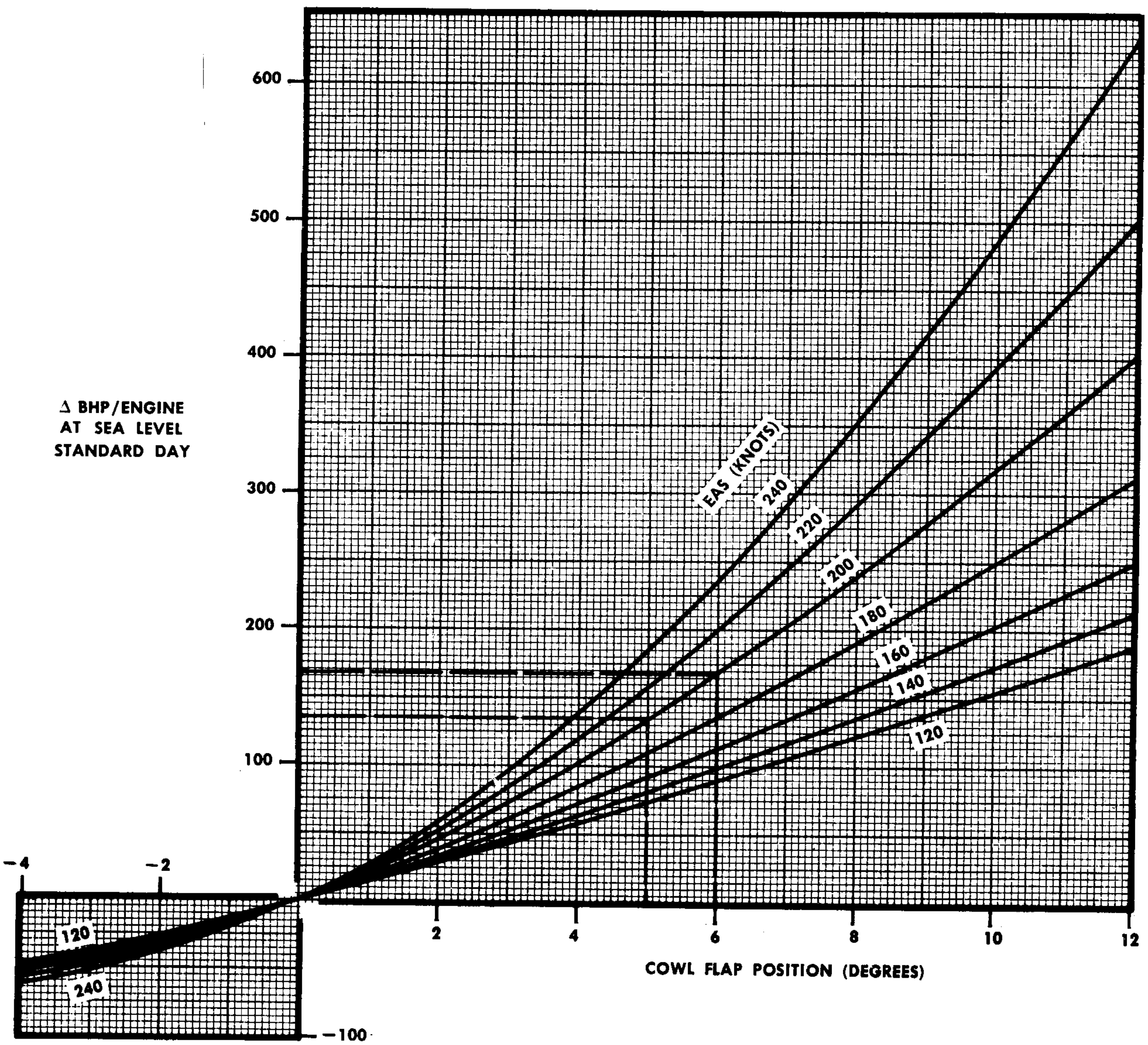


Figure B5-25. Cowl Flap Drag

PART VI

LANDING

TABLE OF CONTENTS

LIST OF CHARTS

LANDING PERFORMANCE.

Landing performance is presented for various wing flap deflections utilizing brakes plus maximum four-engine reverse thrust or brakes only. Data are included to correct for unusual runway conditions, varying number of engines with maximum reverse thrust, headwind, and density altitude. Also included are data to determine descent power, recommended approach and threshold speeds, and stalling speed.

The stopping distances are based on maximum braking without skidding. This creates the maximum coefficient of friction available between the tire and the runway surface. The coefficient of friction is given in terms of runway condition readings (RCR), as measured by the James brake decelerometer, and will vary from 23 for a dry hard surface runway to 06 for an icy surface runway.

The reverse thrust used herein is based on maximum power, not to exceed the engine limitations of RPM and manifold pressure (see T.O. 1C-124A-1, Section V, — Operating Limitation). Normally, 40 inches of manifold pressure is sufficient. The reverse thrust is more effective at higher speeds; therefore, on short runways, the nose should be lowered and reversing applied as soon as possible after the main wheels touch down.

A reaction distance corresponding to 3 seconds at touchdown speed is included in the landing distance to allow time for application of brakes and reverse thrust.

DISCUSSION OF CHARTS.

DESCENT POWER SCHEDULE CHART.

The Descent Power Schedule chart (figure B6-1 presents the reduction in brake horsepower per engine necessary to obtain a chosen rate of descent. For a given gross weight, EAS, and aircraft configuration, the BHP per engine required for level flight may be reduced by the Δ BHP per engine determined from the chart at the desired rate of descent. Then the aircraft will descent at the desired rate of descent as long as the EAS and configuration remain constant.

RECOMMENDED APPROACH AND THRESHOLD SPEEDS CHART.

Recommended Approach and Threshold Speeds are presented in figure B6-2. For any gross weight and flap deflection, the recommended indicated approach and threshold speeds may be obtained. The recommended approach airspeeds are based on 130 percent of power-off stall speeds and threshold airspeeds are based on 120 percent of power-off stall speeds.

STALLING SPEEDS — POWER-OFF CHART.

A Stalling Speeds — Power-Off chart is presented in figure B6-3. At any gross weight, flap setting and angle of bank with gear up or down, the power-off stalling speed may be obtained from this chart.

LANDING DISTANCE CHARTS.

Landing Distance charts (figures B6-4 through B6-10) are presented for the following conditions:

1. Wing Flaps = 40 Degrees — Brakes plus Four-Engine Reverse Thrust.
2. Wing Flaps = 40 Degrees — Brakes Only.
3. Wing Flaps = 30 Degrees — Brakes plus Four-Engine Reverse Thrust.
4. Wing Flaps = 30 Degrees — Brakes Only.
5. Wing Flaps = 20 Degrees — Brakes plus Four-Engine Reverse Thrust.
6. Wing Flaps = 20 Degrees — Brakes Only.
7. Wing Flaps = Zero Degrees — Brakes plus Four-Engine Reverse Thrust.

These charts present landing data for ground roll and total distance to clear a height of 50 feet. These data allow for 3 seconds delay after touchdown before application of brakes and/or reverse thrust. The airspeed at the 50-foot height is 120 percent of power-off stall speed and touchdown is at 110 percent of power-off stall speed. All the charts are prepared for landing on hard, dry runway surfaces. For any reasonable gross weight, density altitude and wind condition the landing distances may be determined. Sample problems are included on each chart.

EFFECT OF RUNWAY SLOPE ON LANDING GROUND ROLL.

The Effect of Runway Slope on Landing Ground Roll charts (figures B6-11 and B6-12) are provided to correct the ground roll distance when runway slope is other than zero percent, for brakes plus four-engine reverse thrust and for brakes only. Correction for runway slope is applied to the distances obtained from the appropriate landing distance charts after correction for wind velocity, and before correction for runway conditions. The brakes plus four-engine reverse thrust chart (figure B6-11) gives corrections with wing flaps at zero degrees, 20 degrees and full down; the brakes only chart (figure B6-12) gives corrections for wing flaps at 20 degrees and full down only.

EFFECT OF UNUSUAL RUNWAY CONDITIONS ON LANDING GROUND ROLL CHARTS.

These charts (figures B6-13 and B6-14) are presented to give corrected ground roll distances for landings made on dry turf, wet concrete or macadam, snow or wet grass, and ice covered runways as compared to landing distances on dry concrete or macadam. Coefficients of friction will be given in terms of runway condition readings (RCR) and will vary from 23 for a dry hard surface runway to 04. These data are given for brakes plus four-engine maximum reverse thrust and brakes only. The corrected ground roll distance is found by entering the appropriate chart with landing ground roll obtained from the Landing Distance charts (figures B6-4 through B6-10) and the runway condition, as shown in the sample problem included on the charts.

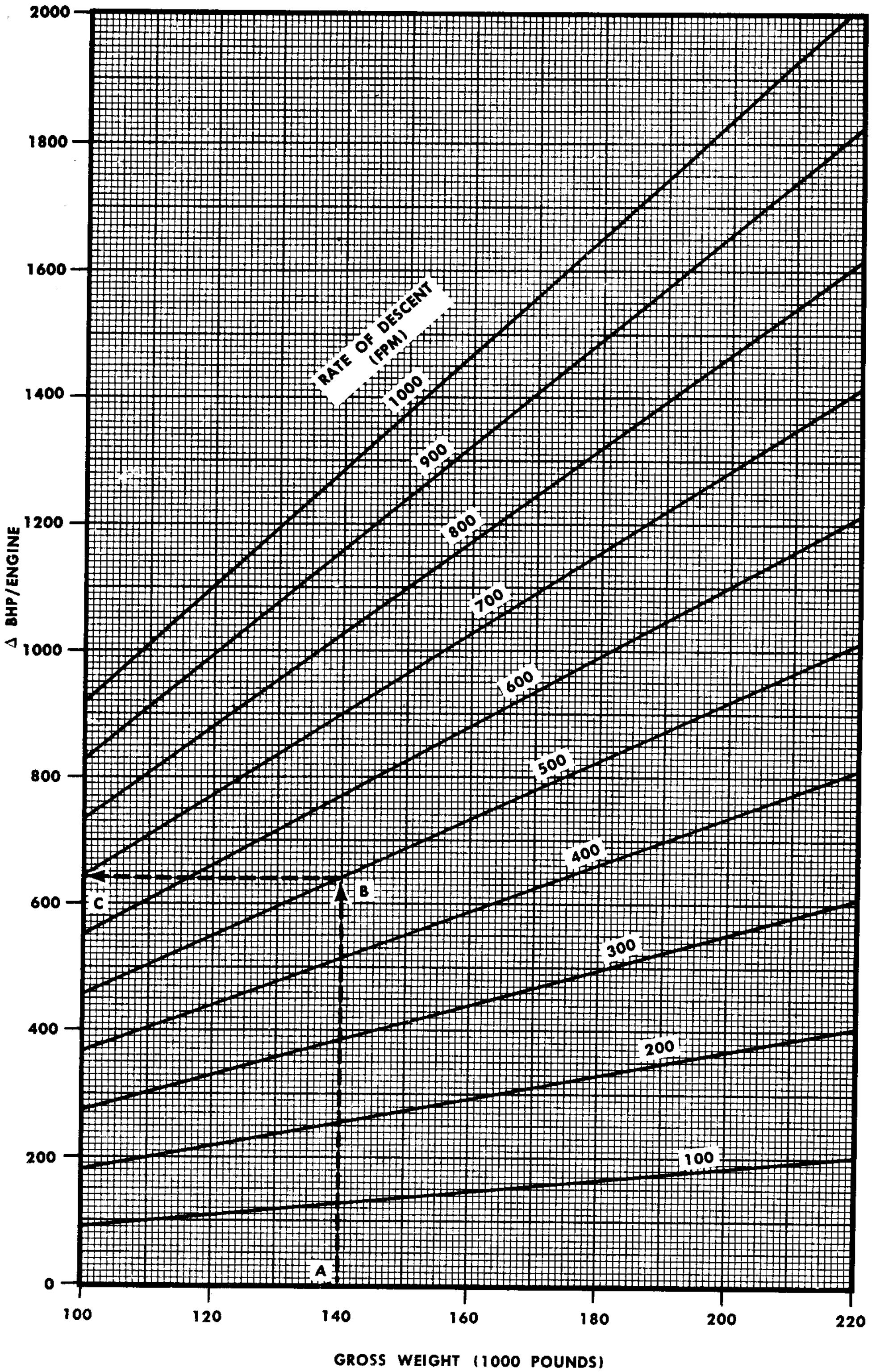
PERCENT OF LANDING GROUND ROLL DISTANCE WITH BRAKES ONLY VERSUS NUMBER OF ENGINES WITH FULL REVERSE THRUST.

The information on figure B6-15 is to provide data for landing ground roll distances with one or more engines inoperative and reverse thrust available on the remaining engines. An explanation is presented on how to obtain landing distance when the above conditions occur.

DESCENT POWER SCHEDULE
FOUR-ENGINE

MODEL: C-124A/C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-20WD/-63A



NOTE:

1. The ΔBHP/engine read from this chart is the power reduction required for a desired rate of descent for a given gross weight, configuration and equivalent airspeed remaining constant.
2. For a given gross weight, equivalent airspeed and configuration, BHP/engine for level flight minus ΔBHP/engine for rate of descent equals BHP/engine required for that rate of descent.
3. Δ BHP/Engine $= \dfrac{\text{Rate of Descent} \times \text{Wt.}}{108{,}900}$

SAMPLE PROBLEM:

A. Gross weight at start of descent = 140,000 pounds.

B. Desired rate of descent = 500 FPM.

C. Reduction of power required = 640 BHP/engine.

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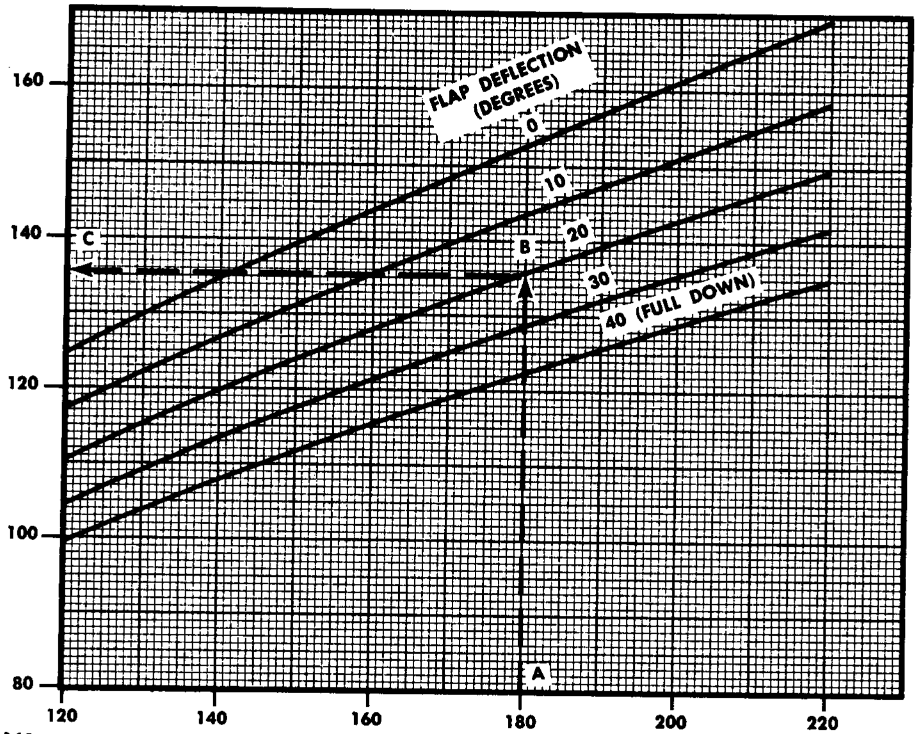
Figure B6-1. Descent Power Schedule

RECOMMENDED APPROACH AND THRESHOLD SPEEDS
AF49-232 THROUGH AF51-182
FULL SPAN FLAP CONFIGURATION

MODEL: C-124A/C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

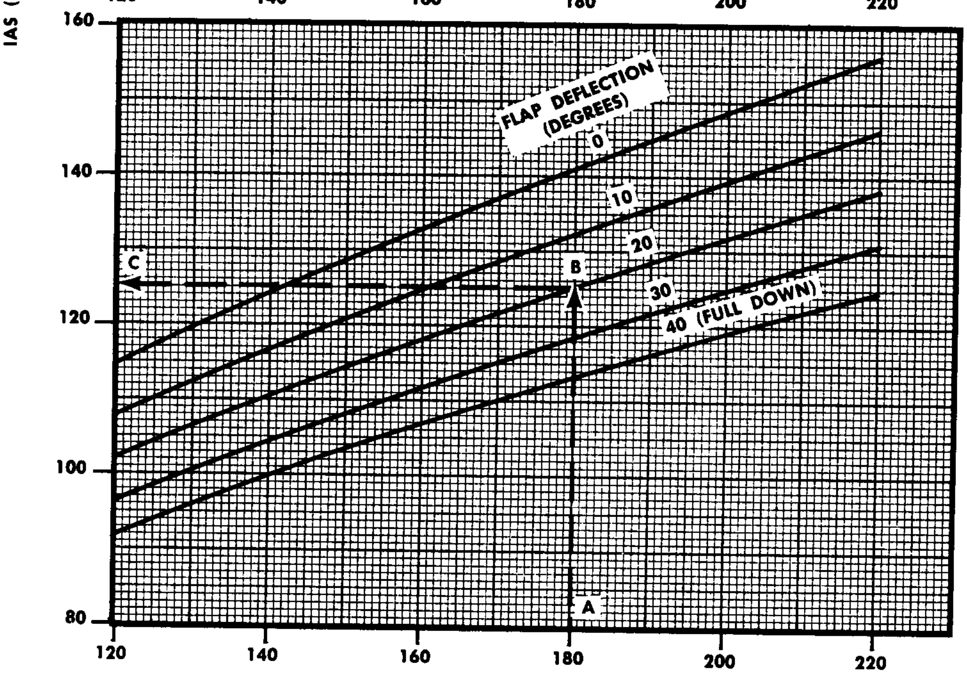
ENGINES: (4) P&W 4360-20WD/-63A



APPROACH SPEEDS
(130 PERCENT POWER-OFF STALL SPEED)

NOTE:
Do not exceed 132 knots IAS with flaps fully deflected.

SAMPLE PROBLEM:
- A. Gross weight = 180,000 pounds.
- B. Flap deflection = 20 degrees.
- C. Approach speed = 135 knots.



THRESHOLD SPEEDS
(120 PERCENT POWER-OFF STALL SPEED)

SAMPLE PROBLEM:
- A. Gross weight = 180,000 pounds.
- B. Flap deflection = 20 degrees.
- C. Threshold speed = 125 knots.

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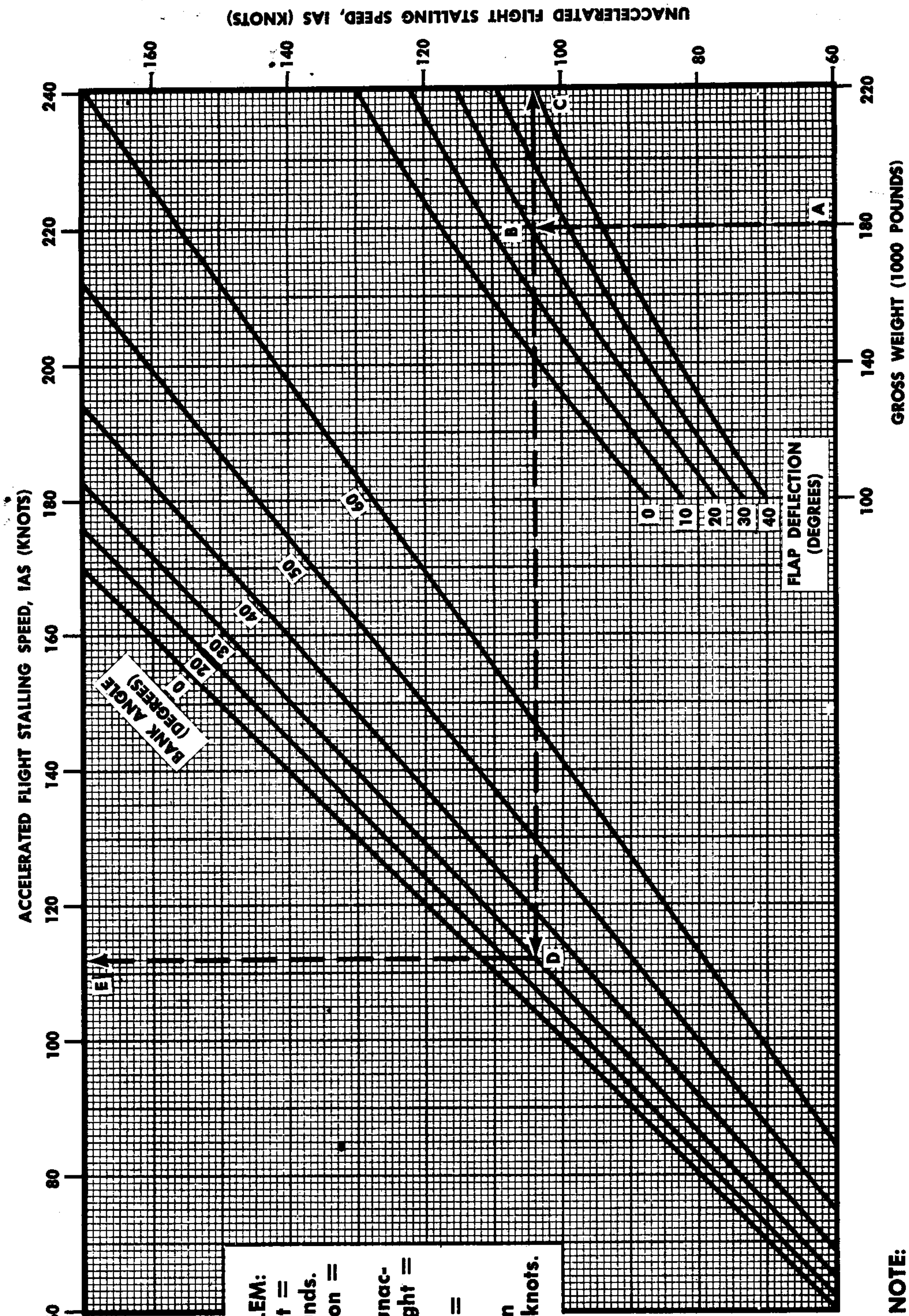
Figure B6-2. Recommended Approach and Threshold Speeds (AF49-232 through AF51-182)

STALLING SPEEDS — POWER OFF AF49-232 THROUGH AF51-182

FULL SPAN FLAP CONFIGURATION

ENGINES: (4) P&W 4360-20WD/-63A

MODEL: C-124A/C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST



SAMPLE PROBLEM:
- A. Gross weight = 180,000 pounds.
- B. Flap deflection = 20 degrees.
- C. Stall speed unaccelerated flight = 104 knots.
- D. Bank angle = 30 degrees.
- E. Stall speed in turn = 112 knots.

NOTE:
1. Gear up or gear down.
2. Full span flap configuration (outboard flap deflection is 50 percent of inboard flap).
3. IAS must be corrected for instrument error to obtain instrument reading.

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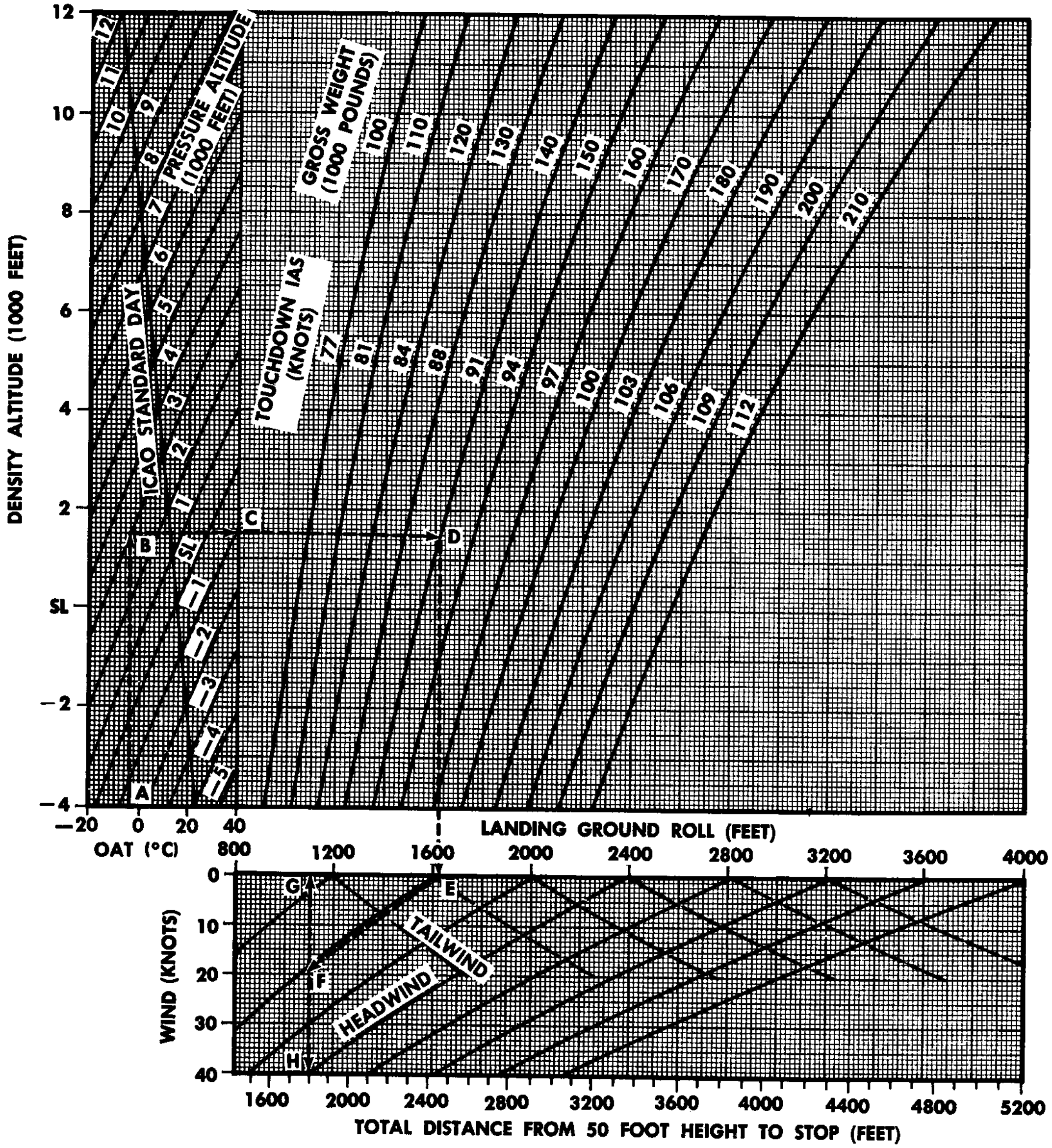
Figure B6-3. Stalling Speeds — Power Off (AF49-232 through AF51-182)

LANDING DISTANCE
WING FLAPS=40 DEGREES
BRAKES PLUS FOUR-ENGINE REVERSE THRUST

MODEL: C-124A
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-20WD
FUEL GRADE: 115/145 & 100/130



NOTE:

1. Threshold speed = 120 percent power-off stall speed.
2. Touchdown speed = 110 percent power-off stall speed.
3. Cowl flaps = 3 degrees.
4. Oil cooler doors full open.
5. Dry, hard runway surface.
6. 3 seconds time delay before brakes and reverse thrust are applied.

SAMPLE PROBLEM:

A. OAT = −4°C.
B. Pressure altitude = 3000 feet.
C. Density altitude = 1500 feet.
D. Gross weight = 140,000 pounds.
E. Zero wind ground roll = 1620 feet.
F. Headwind = 20 knots.
G. Landing ground roll = 1100 feet.
H. Total distance from 50 foot height to stop = 1800 feet.

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Figure B6-4. Landing Distance — Wing Flaps = 40 Degrees — Brakes Plus Four-Engine Reverse Thrust

MODEL: C-124A
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

LANDING DISTANCE
WING FLAPS=40 DEGREES
BRAKES ONLY

ENGINES: (4) P&W 4360-20WD
FUEL GRADE: 115/145 & 100/130

NOTE:
1. Threshold speed = 120 percent power-off stall speed.
2. Touchdown speed = 110 percent power-off stall speed.
3. Cowl flaps = 3 degrees.
4. Oil cooler doors full open.
5. Dry, hard runway surface.
6. 3 seconds time delay before brakes are applied.

SAMPLE PROBLEM:
A. OAT = 28°C
B. Pressure altitude = Sea Level
C. Density altitude = 1500 feet.
D. Gross weight = 140,000 pounds.
E. Zero wind ground roll = 2460 feet.
F. Headwind = 20 knots.
G. Landing ground roll = 1650 feet.
H. Total distance from 50 foot height to stop = 2350 feet.

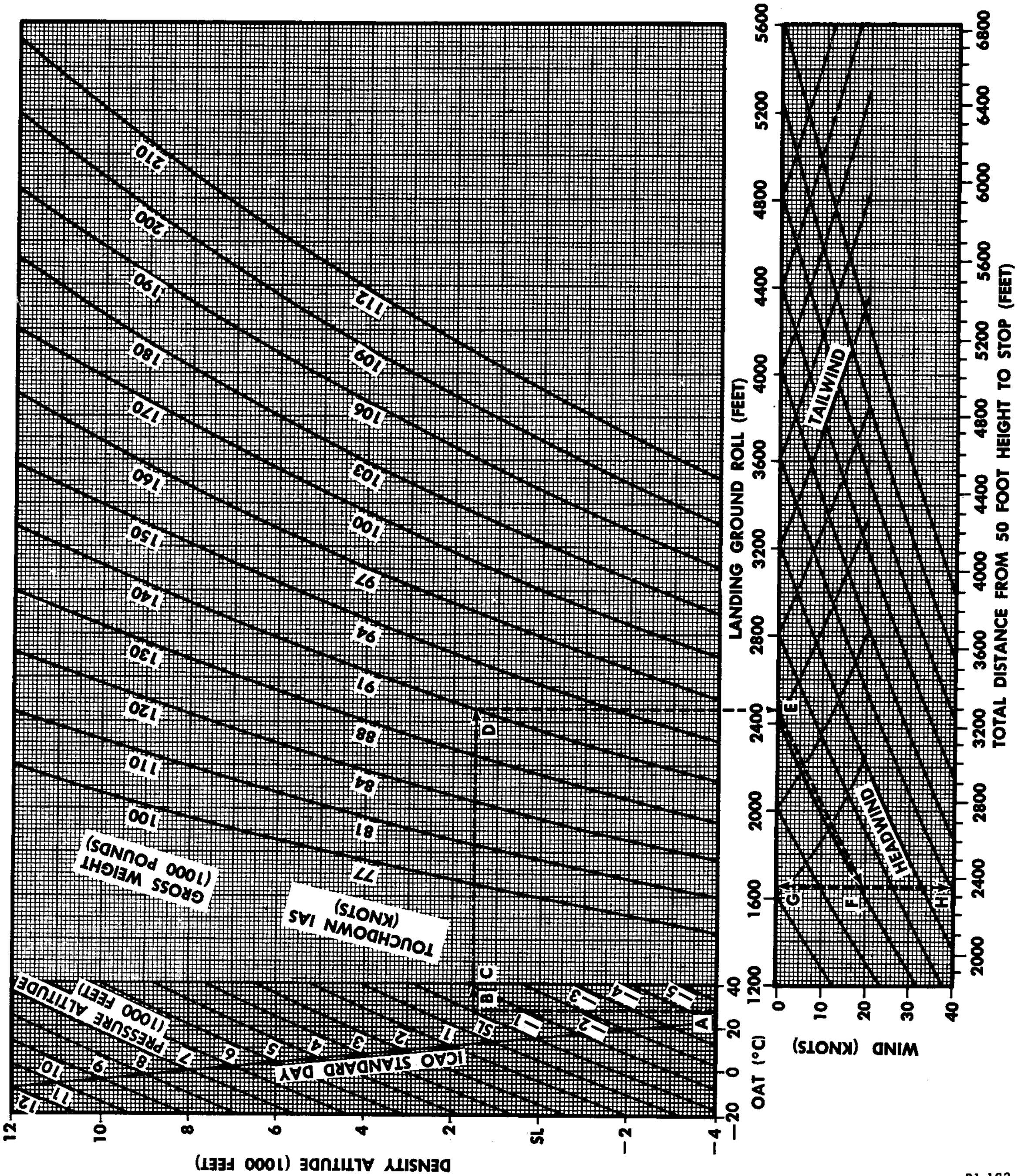

Figure B6-5. Landing Distance — Wing Flaps = 40 Degrees — Brakes Only

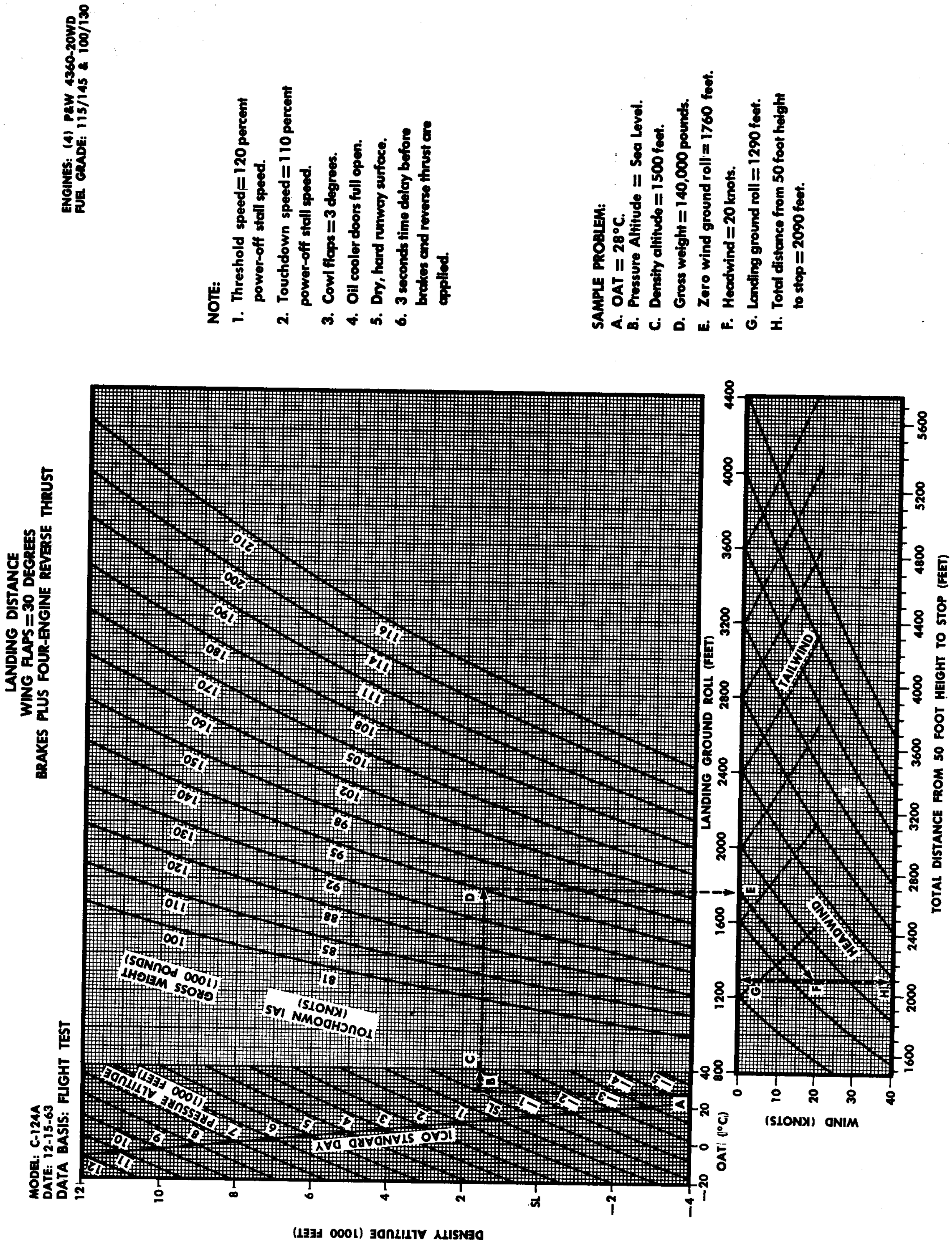

Figure B6-6. Landing Distance — Wing Flaps = 30 Degrees — Brakes Plus Four-Engine Reverse Thrust

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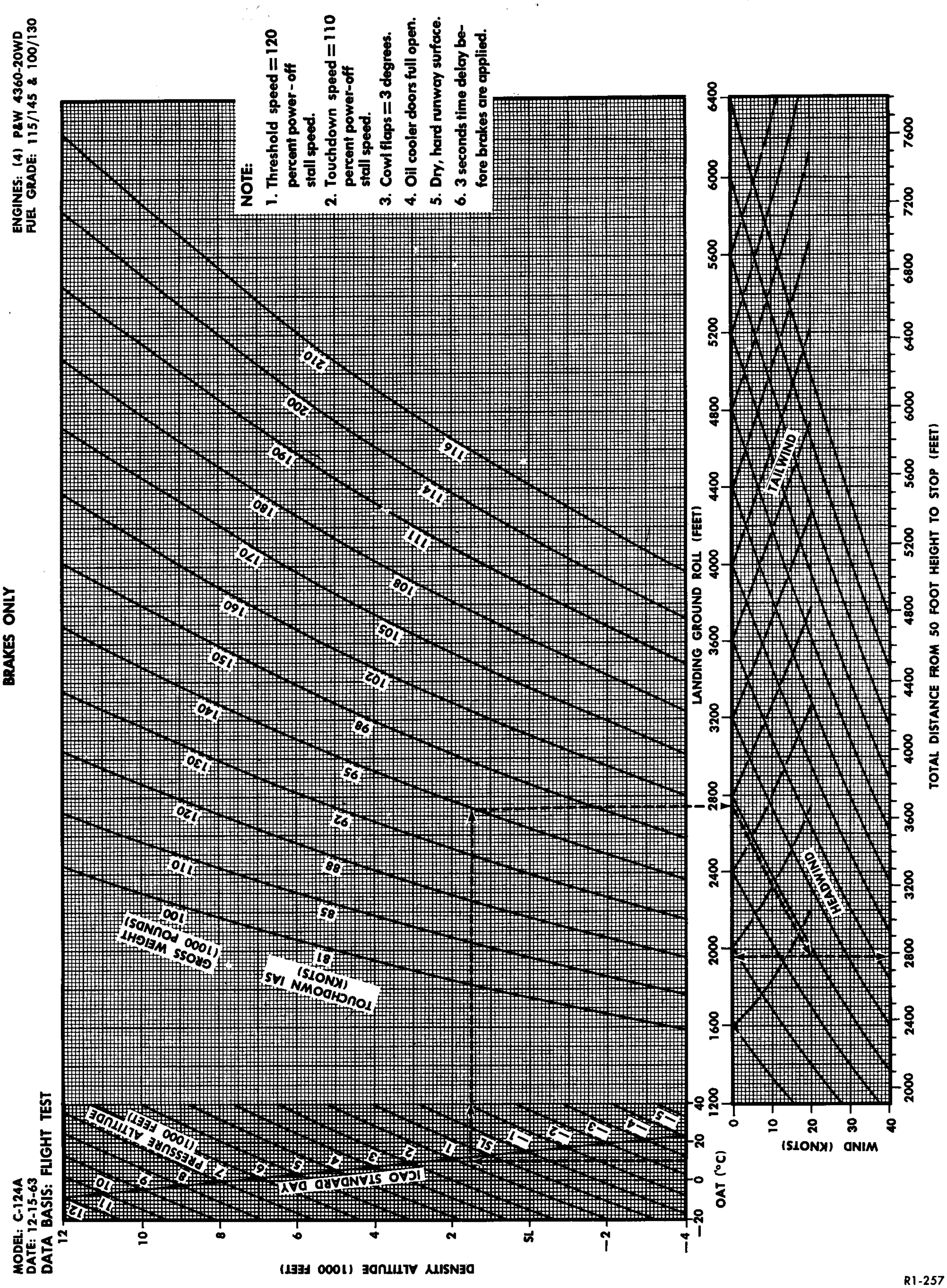

Figure B6-7. Landing Distance — Wing Flaps = 30 Degrees — Brakes Only

LANDING DISTANCE
WING FLAPS=20 DEGREES
BRAKES PLUS FOUR-ENGINE REVERSE THRUST

MODEL: C-124A
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-20WD
FUEL GRADE: 115/145 & 100/130

NOTE:
1. Threshold speed = 120 percent power-off stall speed.
2. Touchdown speed = 110 percent power-off stall speed.
3. Cowl flaps = 3 degrees.
4. Oil cooler doors full open.
5. Dry, hard runway surface.
6. 3 seconds time delay before brakes and reverse thrust are applied.

SAMPLE PROBLEM:
A. OAT = 28°C
B. Pressure altitude = Sea Level
C. Density altitude = 1500 feet.
D. Gross weight = 140,000 pounds.
E. Zero wind ground roll = 1910 feet.
F. Headwind = 20 knots.
G. Landing ground roll = 1320 feet.
H. Total distance from 50 foot height to stop = 2220 feet.

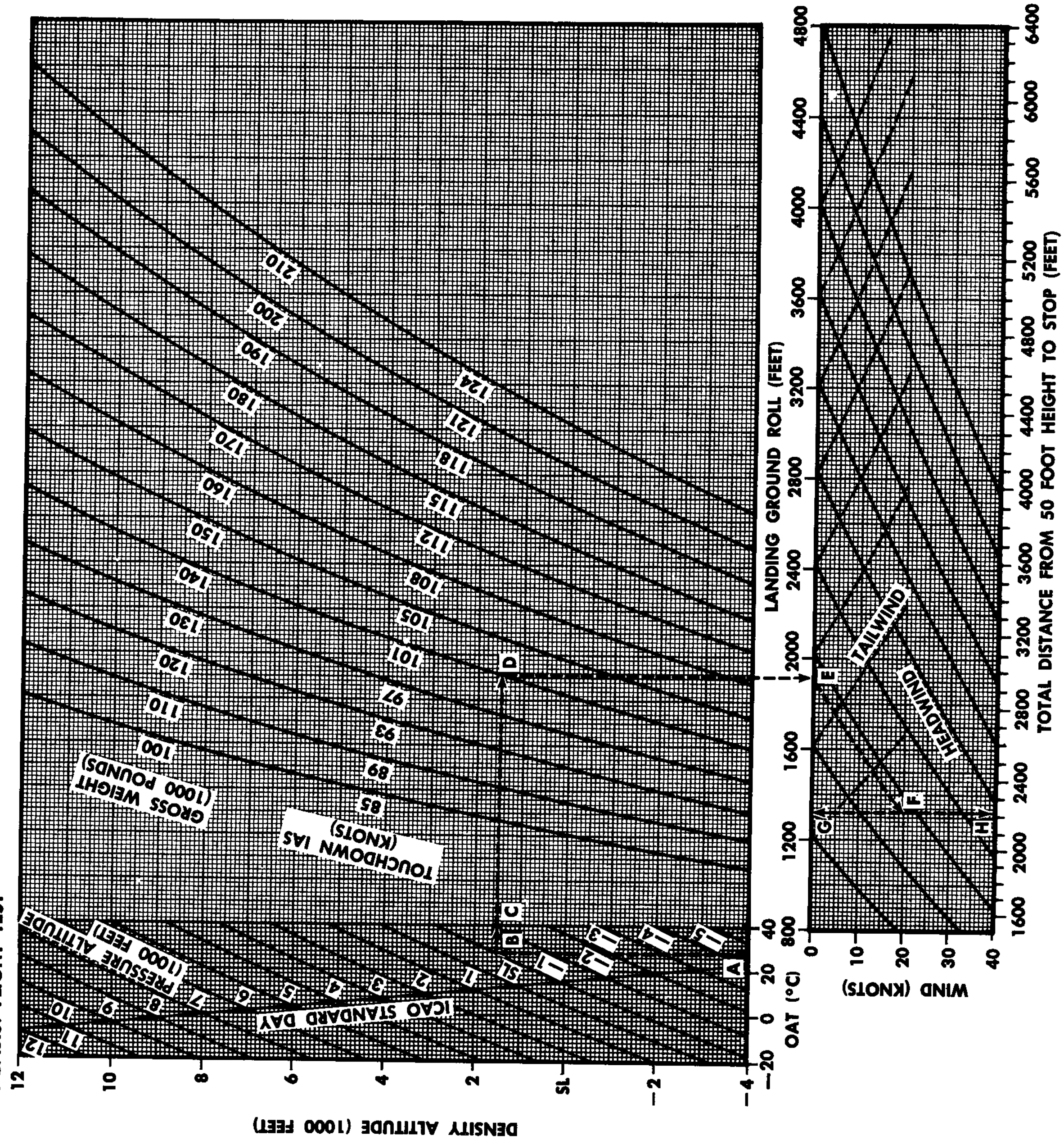

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Figure B6-8. Landing Distance — Wing Flaps = 20 Degrees — Brakes Plus Four-Engine Reverse Thrust

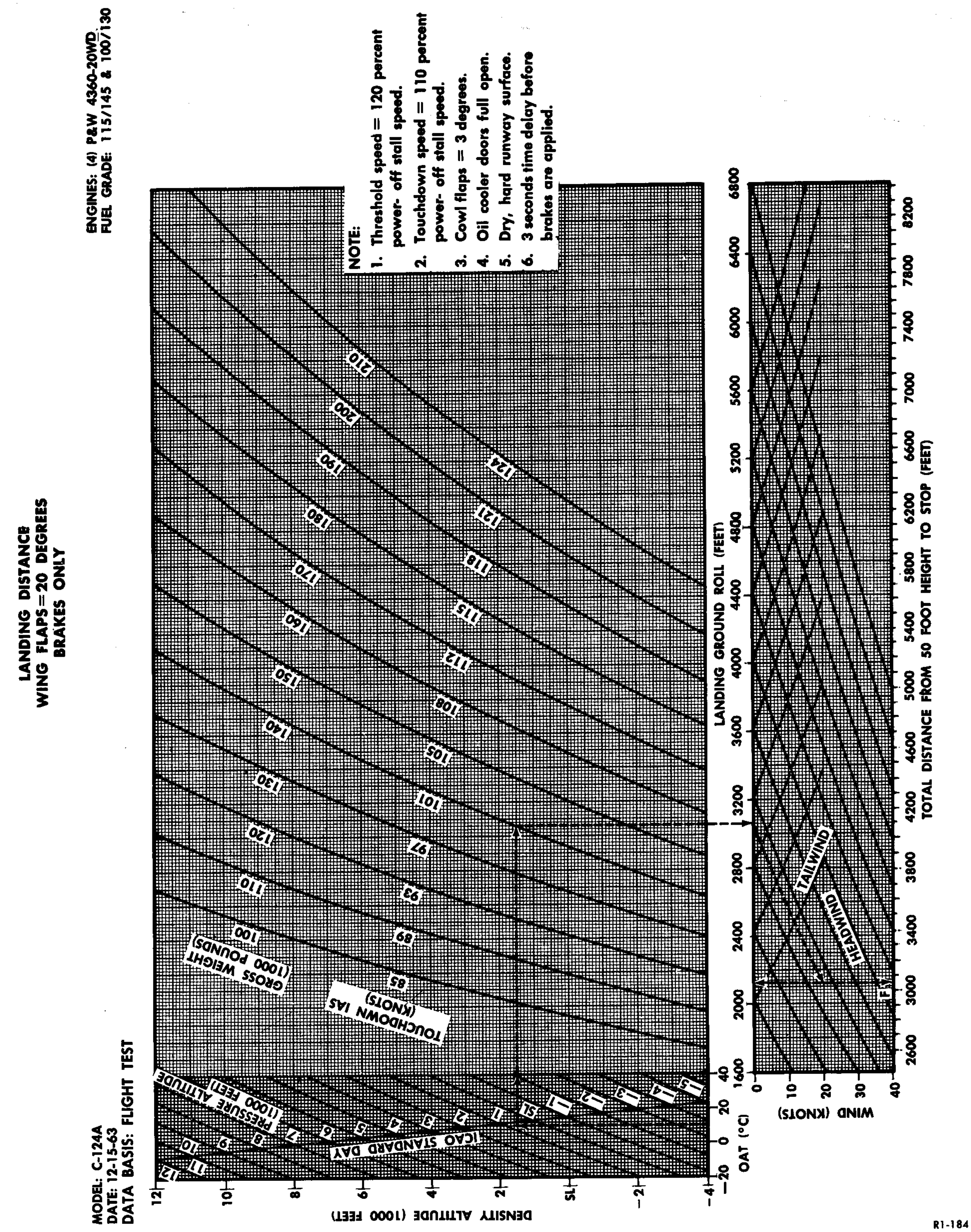

Figure B6-9. Landing Distance — Wing Flaps = 20 Degrees — Brakes Only

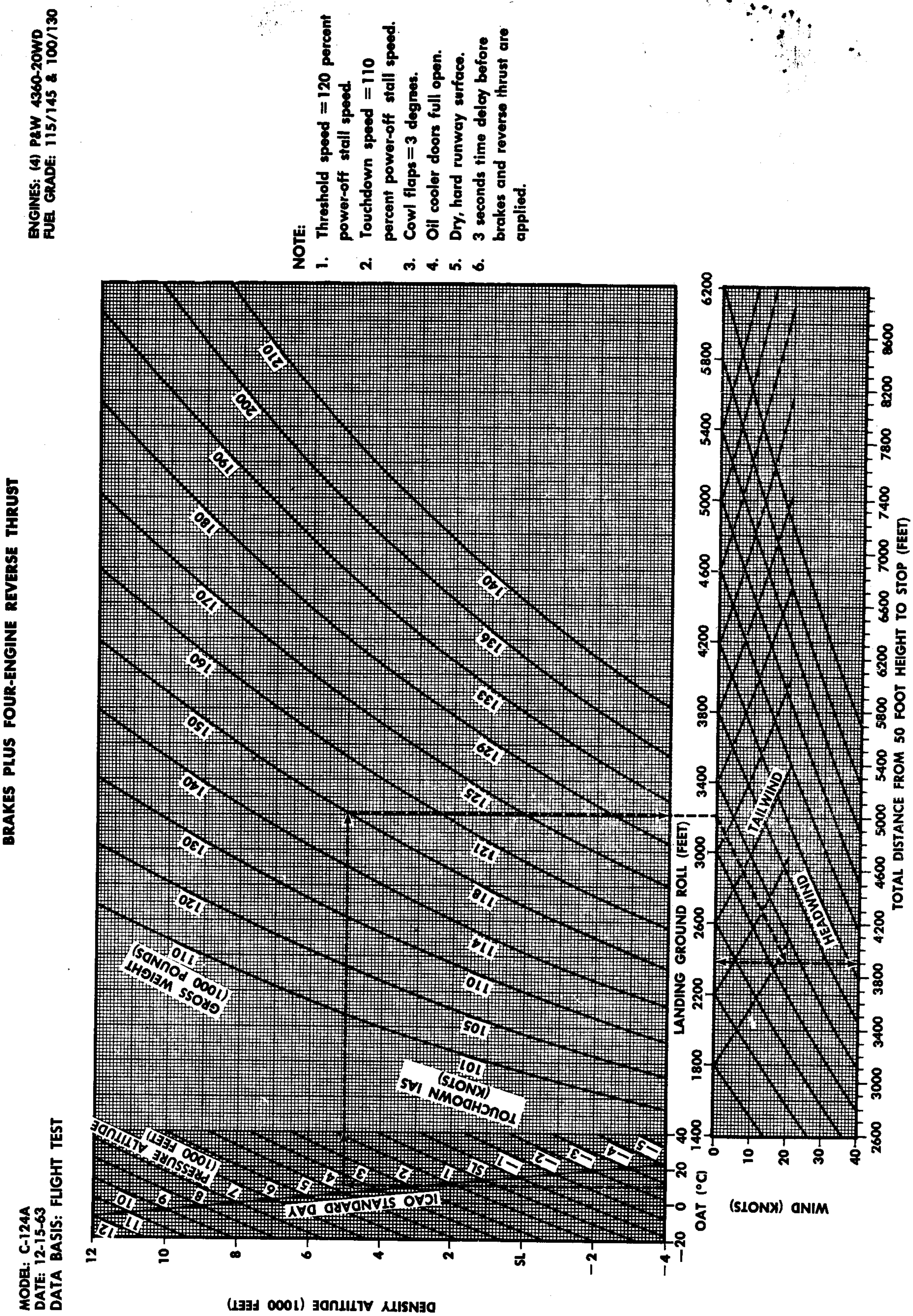

Figure B6-10. Landing Distance — Wing Flaps = Zero Degrees — Brakes Plus Four-Engine Reverse Thrust

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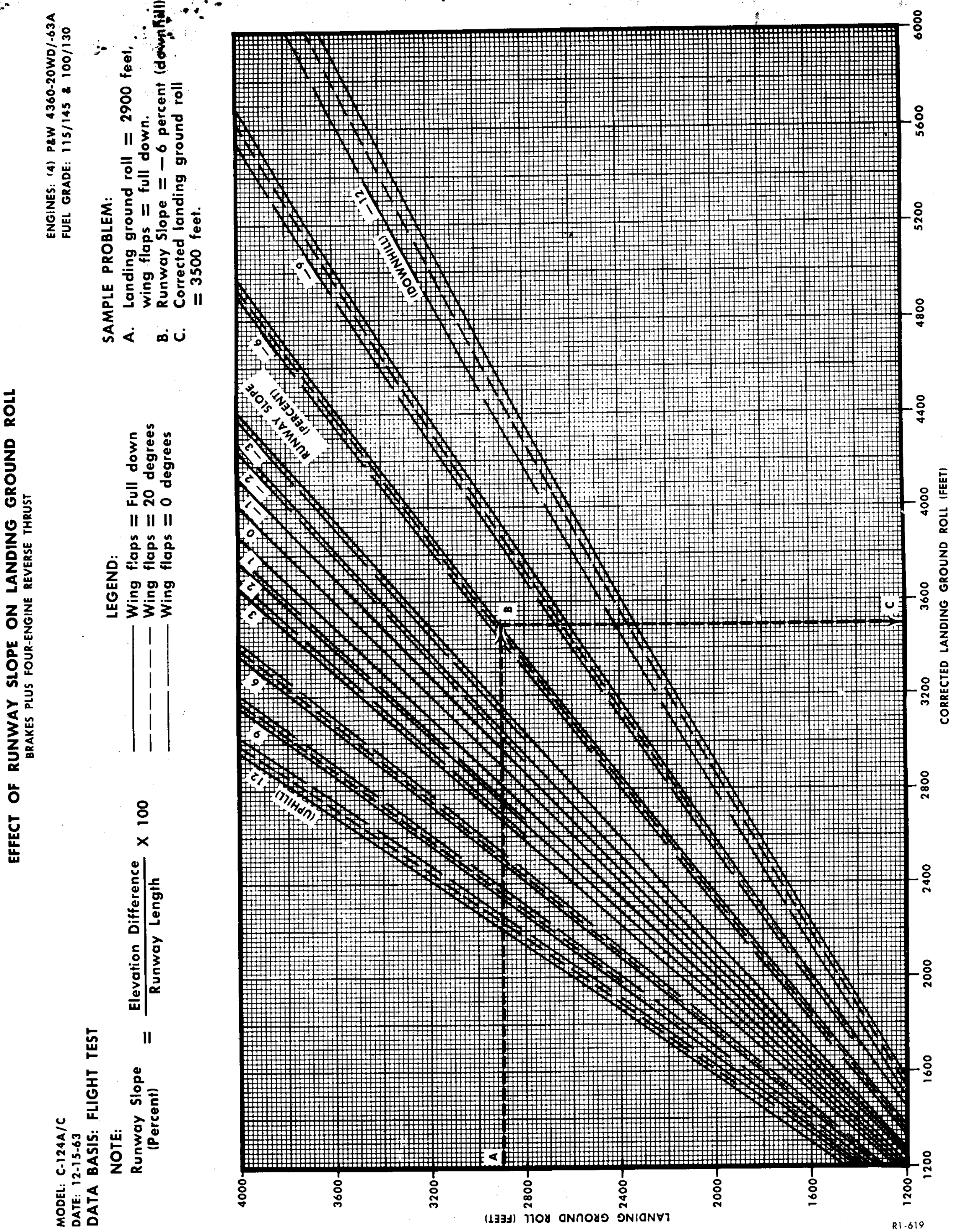


Figure B6-11. Effect of Runway Slope on Landing Ground Roll — Brakes Plus Four-Engine Reverse Thrust

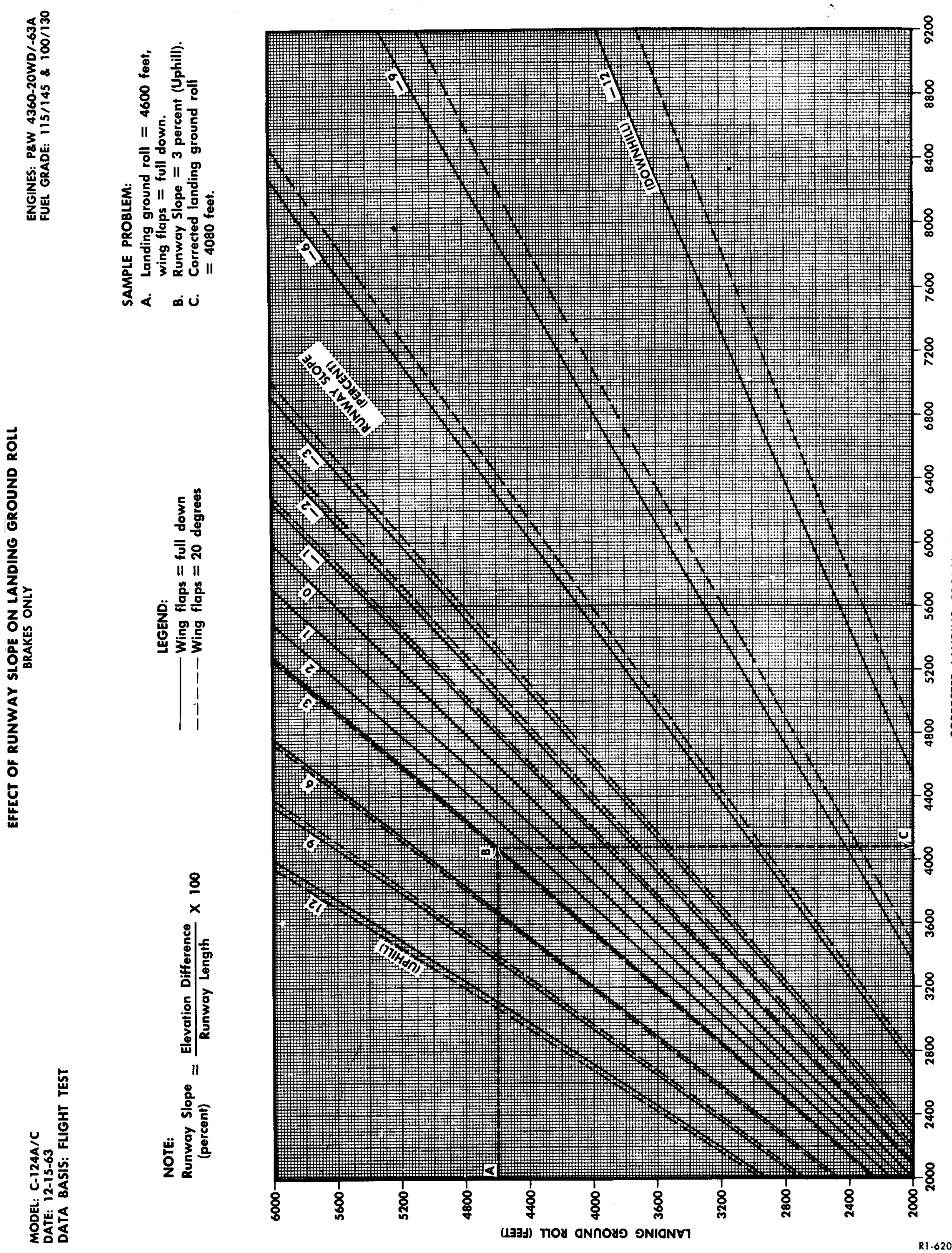


Figure B6-12. Effect of Runway Slope on Landing Ground Roll — Brakes Only

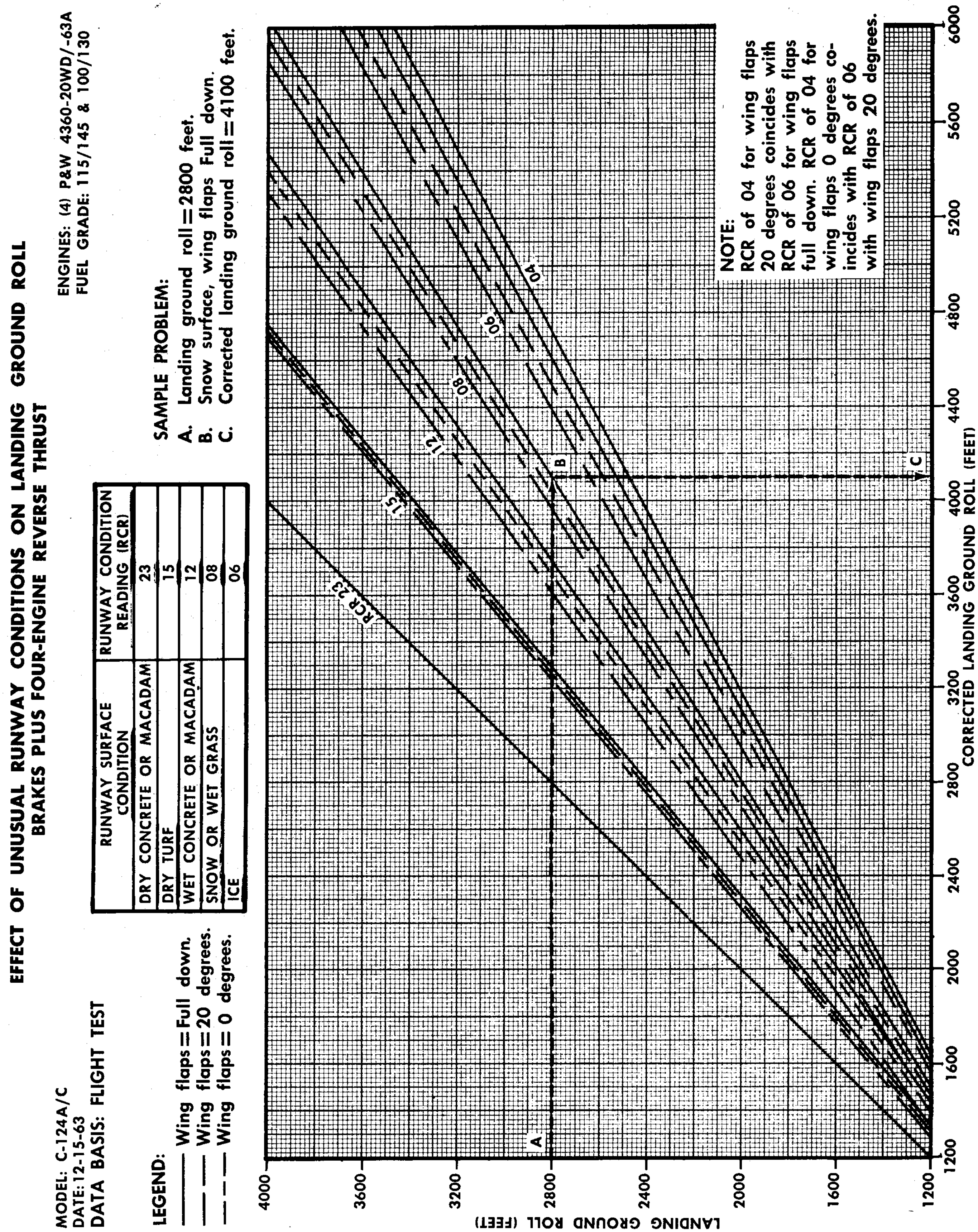


Figure B6-13. Effect of Unusual Runway Conditions on Landing Ground Roll — Brakes Plus Four-Engine Reverse Thrust

EFFECT OF UNUSUAL RUNWAY CONDITIONS ON LANDING GROUND ROLL
BRAKES ONLY

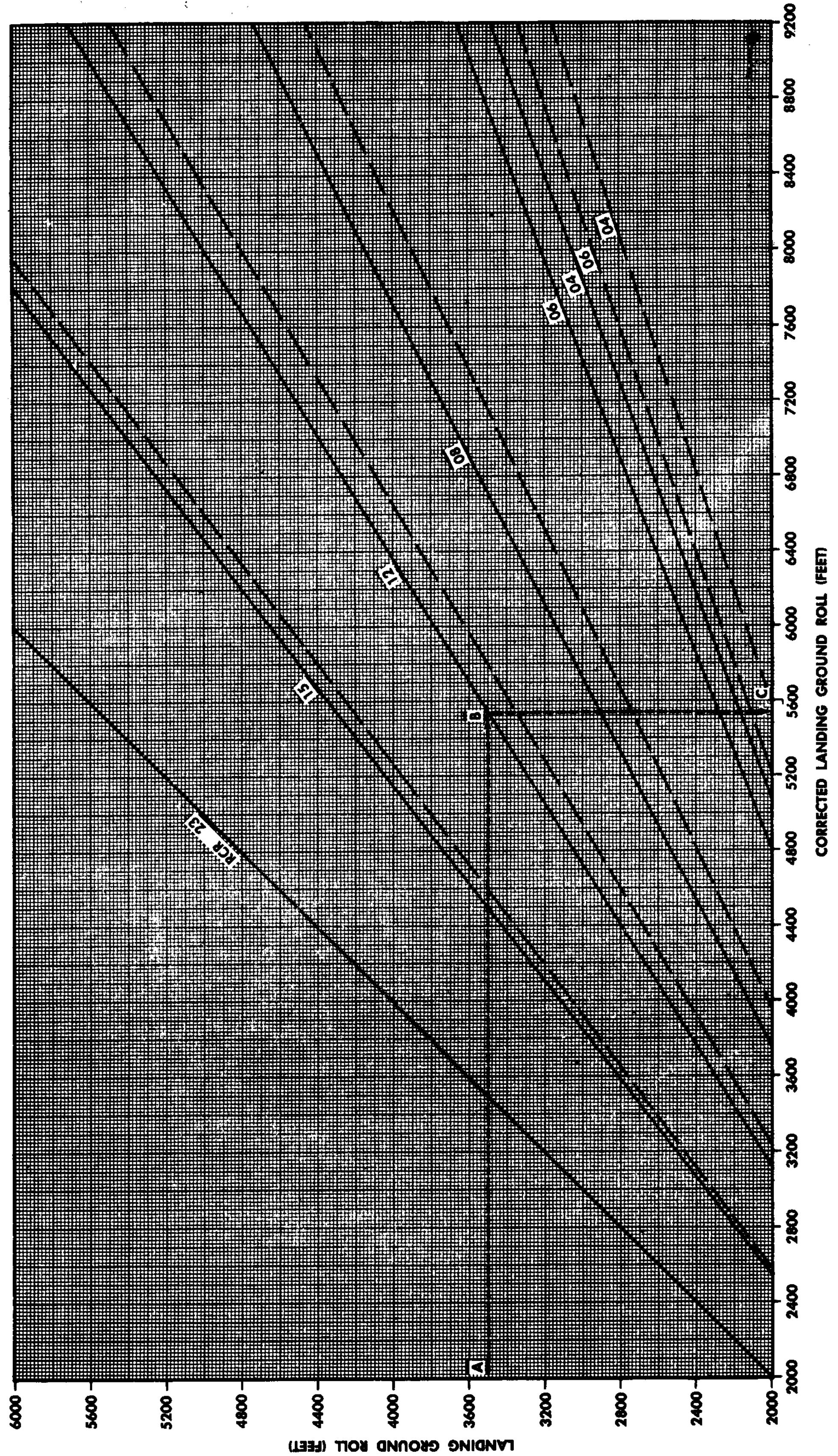
MODEL: C-124A/C
DATE: 12-15-63
DATA BASIS: FLIGHT TEST

ENGINES: (4) P&W 4360-20WD/-63A
FUEL GRADE: 115/145 & 100/130

RUNWAY SURFACE CONDITION	RUNWAY CONDITION READING (RCR)
DRY CONCRETE OR MACADAM	23
DRY TURF	15
WET CONCRETE OR MACADAM	12
SNOW OR WET GRASS	08
ICE	06

LEGEND:
1. ——— Wing flaps=Full down.
2. — — — Wing flaps=20 degrees.

SAMPLE PROBLEM:
A. Landing ground roll=3500 feet.
B. Wet, hard runway surface (RCR 12); flaps full down.
C. Corrected landing ground roll=5540 feet.



R1-554

Figure B6-14. Effect of Unusual Runway Conditions on Landing Ground Roll — Brakes Only

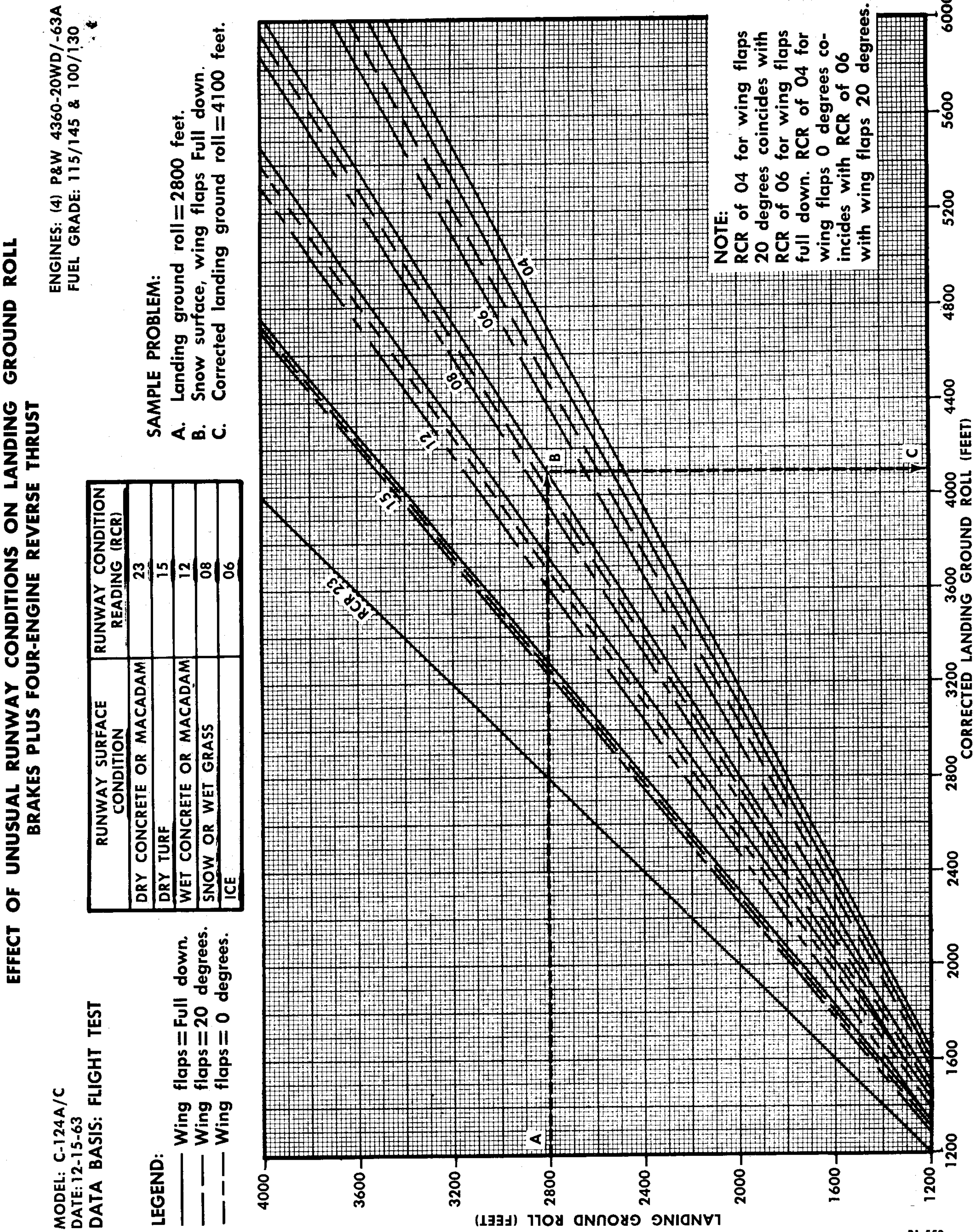
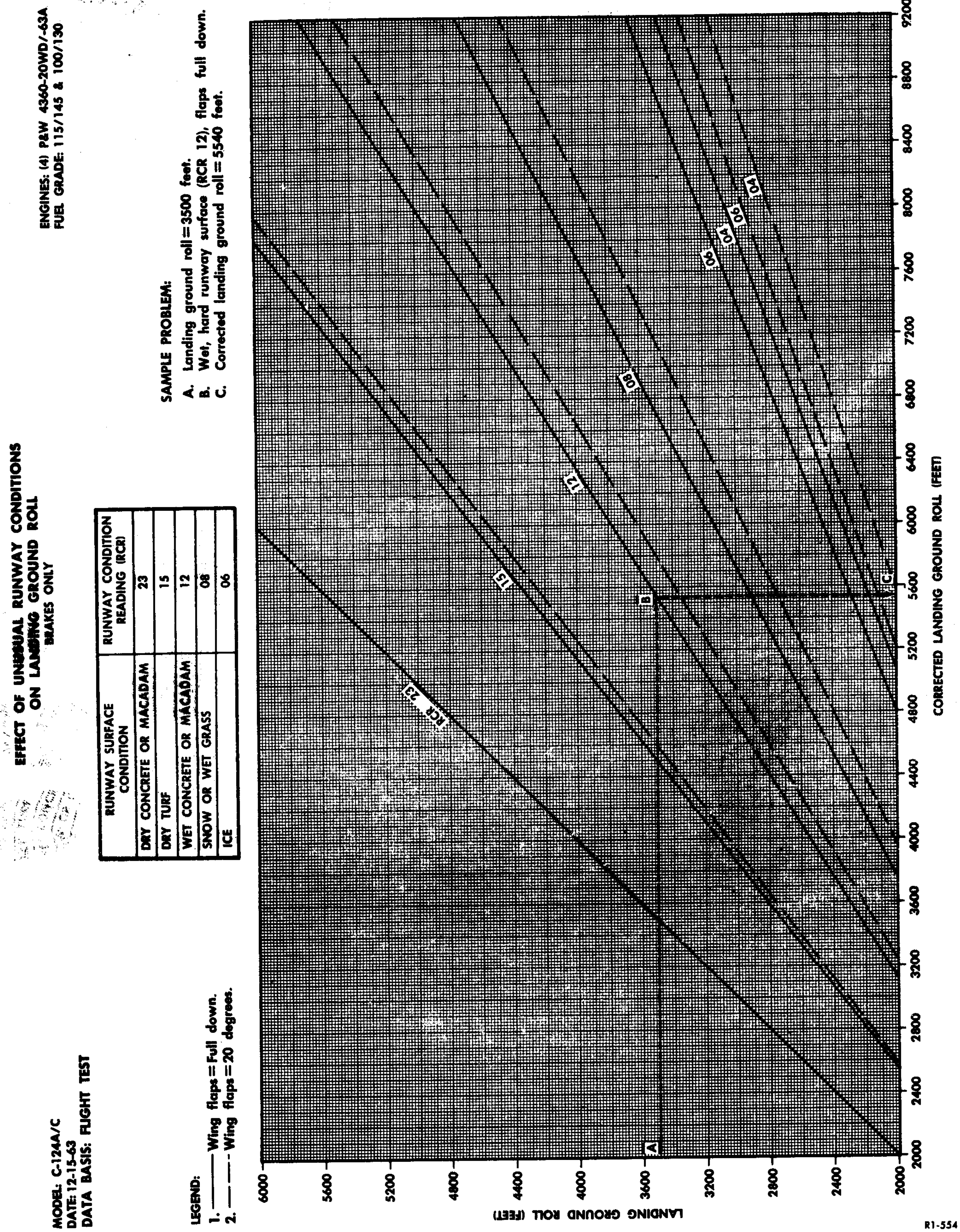


Figure B6-13. Effect of Unusual Runway Conditions on Landing Ground Roll — Brakes Plus Four-Engine Reverse Thrust



RUNWAY SURFACE CONDITION	RUNWAY CONDITION READING (RCR)
DRY CONCRETE OR MACADAM	23
DRY TURF	15
WET CONCRETE OR MACADAM	12
SNOW OR WET GRASS	08
ICE	06

Figure B6-14. Effect of Unusual Runway Conditions on Landing Ground Roll — Brakes Only

LANDING GROUND ROLL

PERCENT OF GROUND ROLL DISTANCE WITH BRAKES ONLY VERSUS NUMBER OF ENGINES WITH FULL REVERSE THRUST

Number of Engines with Full Reverse Thrust	*Percent of Ground Roll Distance with Brakes Only
0	100
2	80
4	65

*Data based on conditions of symmetrical power. If three engines are operating, base the landing requirements on data for two engines symmetrical power condition and apply as much power on asymmetric operating engine as possible to reduce ground roll. If two engines are inoperative on same side or three engines are inoperative, obtain landing ground roll from brakes only data. Again apply as much power as possible on asymmetric operating engines to reduce ground roll.

NOTES:

1. Dry, hard runway surface
2. Touchdown speed = 110 percent of power off stalling speed
3. Cowl flaps = 3 degrees
4. Oil cooler doors full open
5. Applicable for 40, 30 and 20 degrees wing flaps

Figure B6-15. Landing Ground Roll — Percent of Ground Roll Distance With Brakes Only Versus Number of Engines With Full Reverse Thrust

PART VII

MISSION PLANNING

TABLE OF CONTENTS

LIST OF CHARTS

DISCUSSION.

To obtain optimum use of the C-124A aircraft, mission planning prior to the flight and constant checking of the progress of the flight against a predicted flight plan are required. The following items are pertinent to mission planning and consideration should be given to each item by the pilot and engineer prior to each mission. Applicable data will be entered on the Takeoff and Landing data cards. Availability of this information (revised to reflect any changes in flight plans or conditions) at all times during the mission will insure the safest and most economical operation of the aircraft under all operating conditions.

NORMAL TAKEOFF (BASED ON REJECT TORQUE PRESSURE).

1. Gross weight, center of gravity position and Air Force serial number.
2. Pressure altitude.
3. Outside air temperature (OAT).
4. Carburetor air temperature (CAT).
5. Dew point temperature.
6. Density altitude (figure B1-4).
7. ADI — ON or OFF and fuel grade.
8. Region of low blower operation (figures B2-16 and B2-17).
9. Takeoff manifold pressure (figures B2-16 and B2-17).
10. Predicted torque pressure and brake horsepower available for takeoff under existing conditions (figures B2-16 and B2-17).
11. Reject torque pressure (figures B2-16 and B2-17).
12. Available runway length and condition.

13. Wing flap setting.
14. Wind velocity and component (figure B3-2).
15. Takeoff Factor (figure B3-3).
16. Runway slope (figures B3-7 and B3-18).
17. Takeoff speed (figures B3-14 through B3-17).
18. Takeoff ground run, zero slope (figures B3-14 through B3-17).
19. Takeoff ground run corrected for runway slope (figure B3-18).
20. Takeoff acceleration (figure B3-20).

EMERGENCY TAKEOFF DATA.

1. Gross weight limited by climb performance (figures B3-4 through B3-6).
2. Gross weight limited by critical field length (figures B3-7 through B3-10).
3. Refusal speed (figures B3-11 through B3-13).
4. Refusal distance (figure B3-20).
5. Acceleration check distance.
6. Acceleration check speed (figure B3-20).
7. Distance to stop for aborted takeoff (figure B3-21).

CLIMBOUT AND CLIMB TO CRUISING ALTITUDE.

1. Climbout speed for normal climbout (figure B3-19).
2. Climbout speed for obstacle clearance (figure B3-19).
3. Wing flap retraction speed (figure B3-19).
4. Climbout factor (figures B3-22 and B3-23).
5. Gross weight limited by climbout over obstacle (figure B3-24).
6. Gross weight before climb.
7. Climbing EAS (figures B4-1 through B4-10).
8. Cowl flap position for climb (figures B4-1 through B4-10).
9. Manifold pressure for climb (figures B4-1 through B4-10).
10. Time to climb (figures B4-1 through B4-10).
11. Distance to climb (figures B4-1 through B4-10).
12. Fuel to climb (figures B4-1 through B4-10).
13. Emergency and cruise ceiling (figure B4-11).
14. Emergency rate of climb (figures B4-12 through B4-26).
15. Recommended speed for best rate of climb (figure B4-27).
16. Recommended speed for best angle of climb (figure B4-27).

CRUISE.

1. Atmospheric conditions.
2. Initial cruise gross weight.
3. Aircraft operating weight.
4. Reserve fuel required.
5. Cruise distance.

6. Initial brake horsepower required for cruise at recommended airspeeds (figures B5-1 through B5-13 or B5-20 through B5-22).

7. Carburetor air temperature.

8. Initial cruise RPM (figures B2-2 through B2-5).

9. Initial cruise manifold pressure (figures B2-6 through B2-9).

10. Initial cruise torque pressure and BMEP (figure B2-10).

11. Nautical miles per pound of fuel at start of cruise (figures B5-1 through B5-13 or B5-20 through B5-22).

12. Initial recommended cruising speed (figures B5-1 through B5-13 or B5-20 through B5-22).

13. Gross weight at end of cruise (figures B5-14 through B5-18).

14. Cruising time (figures B5-14 through B5-18).

15. Total flight time.

16. Fuel burned for climb and cruise.

17. Reserve fuel (figures B5-14 through B5-18).

18. Total fuel required for mission.

19. Cargo carried.

20. Emergency two-engine cruise in ground effect, weight and speed (figures B5-23 and B5-24).

DESCENT.

1. Descent speed (speed at last cruising airspeed) (figures B5-1 through B5-13 or B5-20 through B5-22).

2. Descent fuel (see Fuel Flow charts discussion, Part 2 of Appendix).

3. Reduction in power required to obtain a given rate of descent (figure B6-1).

4. Time to descend.

5. Horizontal distance traveled during descent.

LANDING.

1. Available runway length, slope and RCR.

2. Pressure altitude of runway.

3. Outside air temperature.

4. Wind velocity (figure B3-2).

5. Wing flap setting.

6. Gross weight for landing = gross weight after descent (equivalent to gross weight at end of cruise by definition).

7. Recommended approach speed (figure B6-2).

8. Recommended threshold speeds (figure B6-2).

9. Power-off stalling speed (figure B6-3).

10. Landing distance, brakes only (figures B6-5, -7, -9, -12 and -14).

11. Landing distance, brakes plus four-engine reverse thrust (figures B6-4, -6, -8, -10, -11 and -13).

GO-AROUND.

1. Compute the best IAS and rate of climb at the field conditions and gross weight for four-engine go-around (figures B4-12 through B4-16).

2. Compute the best IAS and rate of climb at the field conditions and gross weight for three-engine go-around (figures B4-17 through B4-21 and B4-27).

3. Compute the best IAS and rate of climb at the field conditions and gross weight for two-engine go-around (figure B4-26).

COMPUTING FLIGHT PLAN DATA.

The following sample mission has been computed in order to illustrate proper use of the Appendix performance charts in preparing a flight plan.

NORMAL TAKEOFF (BASED ON REJECT TORQUE PRESSURE).

1. Gross weight = 175,000 pounds, center of gravity is within limits (see Section V, T.O. 1C-124A-1).
2. Pressure altitude = sea level.
3. Outside air temperature (OAT) = 20°C.
4. Carburetor air temperature (CAT) = OAT + 5°C = 25°C.
5. Dew point = 50°F.
6. Density altitude = 600 feet (figure B1-4).
7. ADI — ON, fuel grade 115/145.
8. Region of low blower operation is part throttle (wet power, figure B2-16).
9. Takeoff manifold pressure = 62 inches Hg (figure B2-16).
10. Predicted torque pressure and brake horsepower available for takeoff under existing conditions = 229.5 psi and 3305 BHP (figure B2-16).
11. Reject torque pressure = 218 psi (figure B2-16).
12. Available runway length and condition = 6000 feet, hard dry surface (RCR = 23).
13. Wing flap setting = 20 degrees.
14. Headwind velocity = 20 knots (figure B3-2).
15. Takeoff factor (Based on reject torque pressure = 218 psi) = 2.3 (figure B3-3).
16. Runway slope = 1 percent downhill (figure B3-18).
17. Takeoff speed at 175,000 pounds = 108 knots IAS (figure B3-14).
18. Takeoff ground run, zero slope (figure B3-14).
    a. Zero wind = 4050 feet.
    b. 20-knot headwind = 2850 feet.
19. Takeoff ground run corrected for a one percent downhill slope (10-foot decline per 1000 feet of runway) (figure B3-18).
    a. Zero wind = 3850 feet.
    b. 20-knot headwind = 2800 feet.
20. Takeoff acceleration (figure B3-20).
    a. Zero wind.
        (1) Velocity at 1000 feet = 63 knots.
        (2) Velocity at 3000 feet = 99 knots.
    b. 20-knot headwind.
        (1) 1000 feet = 78 knots.
        (2) 2000 feet = 97 knots.

EMERGENCY TAKEOFF DATA.

1. Gross weight limited by climb performance (figure B3-4).
    a. For 100 fpm rate of climb = 182,000 pounds.
    b. For 50 fpm rate of climb = 187,000 pounds.

2. Gross weight limited by critical field length (figure B3-7 and B3-8).

   a. Corrected actual field length = 6480 feet.

   b. Zero wind = 187,000 pounds.

   c. 20-knot headwind = 209,000 pounds.

Therefore, takeoff weight of 175,000 pounds is safe and critical field length is less than runway length.

Note

If the gross weight limited by critical field length is less than the predicted takeoff gross weight, then cargo and/or fuel should be off-loaded until gross weight equals the gross weight limited by critical field length. For this condition, see Gross Weight Limited by Critical Field Length Charts discussion (Part 3 of Appendix) for procedure.

3. Refusal speed (for a 6000-foot runway) (figure B3-11).

   a. Zero wind = 99 knots.

   b. 20-knot headwind = 114 knots (use takeoff speed of 108 knots).

4. Refusal distance (figure B3-20).

   a. Zero wind = 3000 feet.

   b. 20-knot headwind = 3300 feet (use takeoff distance of 2800 feet).

5. Desired acceleration check distance.

   a. Zero wind — 2000 feet.

   b. 20-knot headwind — 2000 feet.

6. Acceleration check speed (figure B3-20).

   a. Zero wind = 85 knots.

   b. 20-knot headwind = 97 knots.

7. Distance to stop for aborted takeoff (figure B3-21). For the condition where abort speed = refusal speed.

   a. Zero wind = 2500 feet (at 99 knots).

   b. 20-knot headwind = 2000 feet (at 108 knots).

8. Effects of unusual runway conditions on stopping distance (figure B3-21). Assume that concrete runway is wet (RCR = 12). For the zero wind case, the stopping distance = 4000 feet.

This exceeds the dry runway stopping distance from refusal speed by 1500 feet. Therefore, the refusal speed for the wet runway must be reduced such that the distance to accelerate to abort speed plus the distance to stop equals the runway available. The following sample problem is given to illustrate the solution of this problem.

   a. Assume some lower speed, i.e., 90 knots.

   b. Distance to accelerate to 90 knots = 2300 feet (figure B3-20). (Use acceleration curve previously determined.)

   c. Distance to stop from 90 knots = 3450 feet (figure B3-21).

   d. Total distance to accelerate and stop = (b) + (c) = 5750 feet. (This is less than the 6000 foot runway.)

   e. Assume higher speed, i.e., 95 knots.

   f. Repeat steps (b) through (d) as necessary until a speed is found which will allow the aircraft to stop in the remaining wet runway.

g. 92 knots will give a ground run of 2450 feet and a stopping distance of 3550 feet or a total of 6000 feet.

CLIMBOUT AND CLIMB TO CRUISING ALTITUDE.

1. Climbout speed for normal climbout (110% power-off V_S) = 113 knots (figure B3-19).
2. Climbout speed for obstacle clearance (105% power-off V_S = Takeoff speed) = 108 knots (figure B3-19).
3. Wing flap retraction speed = 127 knots (figure B3-19).
4. Climbout factor for 75-foot obstacle at 9500 feet (figure B3-22).

    a. Zero wind = 19.1.

    b. 10-knot tailwind = 18.5.

5. Gross weight limited by climb over obstacle (figure B3-24).

    a. Zero wind = 176,000 pounds.

    b. 10-knot tailwind = 170,000 pounds.

If no other climbout path were available, takeoff gross weight would have to be reduced in order to provide obstacle clearance if engine failure occurred at or near critical engine failure speed for the tailwind case.

6. Gross weight before climb = 175,000 pounds, gross weight before takeoff, less 1270 pounds of fuel for warmup, taxi, takeoff and climbout = 173,730 pounds.
7. Climbing EAS for Standard Day atmospheric condition, 2350 RPM, and RICH mixture = 148 knots (figure B4-3).
8. Cowl flap position for climb = 1.2 degrees (figure B4-3).
9. Manifold pressure for climb = 45 inches Hg (figure B4-3).
10. Time to climb to a cruising altitude of 10,000 feet = 22.5 minutes (0.37 hours) (Assume start of climb at sea level) (figure B4-3).
11. Distance to climb to 10,000 feet = 59 miles (Assume start of climb at sea level) (figure B4-3).
12. Fuel to climb to 10,000 feet = 2430 pounds (Assume start of climb at sea level) (figure B4-3).
13. Emergency and cruise ceiling at METO power (figure B4-11) (Assume gross weight = 150,000 pounds).

    a. Four-engine emergency ceiling (100 fpm) = 24,700 feet.

    b. Three-engine cruise ceiling (300 fpm) = 9,200 feet.

14. Emergency rate of climb (takeoff gross weight = 175,000 pounds, sea level, dew point 50°F, CAT = 25°C, 204 psi dry takeoff power — reject torque pressure (figure B2-17). Configuration "a" — gear and flaps up. (Interpolate between charts and use peaks of speed curves for "best" climb speed.)

    a. Four-engine — 146 knots; 820 fpm (figures B4-14 and B4-15).

    b. Three-engine — 139 knots; 365 fpm (figures B4-19 and B4-20).

    c. Two-engine — 131 knots; 120 fpm (figures B4-24 and B4-25).

15. Recommended speed for best rate of climb with maximum power at sea level on a standard day, flaps 20 degrees, gear down for both three- and four-engine operation at a takeoff gross weight of 175,000 pounds = 112 knots (figure B4-27).
16. Recommended speed for best angle of climb with the same conditions stated in 15. above = 108 knots (figure B4-27).

CRUISE.

1. Atmospheric conditions at cruise altitude of 10,000 feet = ICAO Standard Day.
2. Initial cruise gross weight = takeoff gross weight — wt of fuel for takeoff and climb = (175,000 - 1270 - 2430) = 171,300 pounds.
3. Aircraft operating weight = 105,000 pounds (gross weight less fuel and cargo).
4. Reserve fuel required (at long range speeds) = 2 hours holding at destination.
5. Cruise distance to destination = 2080 nautical miles.
6. Initial brake horsepower required for cruise at recommended air speeds = 1800 BHP per engine (figure B5-4 or B5-20).
7. Carburetor air temperature = 0°C (OAT +5°C = -5°C +5°C).
8. Initial cruise rpm = 2190 RPM (figure B2-3).
9. Initial cruise manifold pressure = 36.3 inches Hg (figure B2-7).
10. Initial torque pressure and BMEP (figure B2-10).
    a. Torque pressure = 154.2 psi.
    b. BMEP = 149.3 psi.
11. Nautical miles per pound of fuel at start of cruise = 0.0630 (figure B5-4 or B5-20).
12. Initial recommended cruising speed = 173.5 knots EAS (figure B5-4 or B5-20).
13. Gross weight at end of cruise = 141,500 pounds (figure B5-14).
14. Cruising time = 10.5 hours (figure B5-15).
15. Total flight time = 10.5 hours + 0.37 (Climb time) = 10.87 hours.
16. Fuel burned for climb and cruise = 175,000 - 141,500 = 33,500 pounds.
17. Reserve fuel (assumed as 2 hours holding at destination at long range speeds, if cruising time is extended 2 hours or 10.5 + 2 = 12.5 hours, the landing gross weight will be 136,750 pounds. Reserve fuel equals 141,500 - 136,750 = 4,750 pounds (figure B5-15).
18. Total fuel required for mission = 33,500 + 4750 = 38,250 pounds.
19. Cargo carried = landing gross weight less operating weight = 136,750 - 105,000 = 31,750 pounds of cargo.
20. Emergency two engine in ground effect cruise weight and speed (sample conditions are used to simplify solution). On standard day with METO power available, maintain 50 feet altitude.
    a. Maximum gross weight for level flight = 167,700 pounds (figure B5-23).
    b. Required speed to maintain 50 feet with METO power and 167,700 pounds = 134 knots (figure B5-24).

Note

These charts may be used to determine either the maximum gross weight to maintain a given height or the maximum height which can be maintained at a given gross weight.

DESCENT.

1. Descent speed at end of cruise airspeed and gross weight of 136,750 pounds = 160 knots (figure B5-4 or B5-20).
2. Descent fuel (see fuel flow charts discussion, Part 2 of Appendix).

3. Reduction in power required to obtain a given rate of descent at conditions stated in 1. above (figure B6-1). Assume 500 fpm rate of descent desired. Reduction of power required = 630 BHP/ENG.

4. Maintaining constant rate of descent = 500 fpm, time to descend = 10,000 feet ÷ 500 fpm = 20 minutes or 0.33 hours.

5. Horizontal distance traveled during descent = approximately 173 knots (average TAS) x 0.33 hr. or 57 nautical miles.

LANDING.

1. Available runway length and condition = 7000 feet, wet macadam surface; RCR = 12.

2. Pressure altitude of runway = sea level.

3. Outside air temperature = 15°C.

4. Runway slope = 3 percent (uphill).

5. Headwind velocity (figure B3-2). Assume:

   a. Landing runway is 024.

   b. Wind = 20 knots from 065 degrees magnetic.

   Resultant 41 degree crosswind of 20 knots. Headwind component = 15 knots. Crosswind component = 13.3 knots.

6. Wing flap setting = 40 degrees full down.

7. Gross weight at landing (equivalent to gross weight at end of descent or cruise by definition) = 136,750 pounds.

8. Recommended approach speed = 107 knots (figure B6-2).

9. Recommended threshold speed = 99 knots (figure B6-2).

10. Power-off stalling speeds (figure B6-3).

    a. Wing flaps 20 degrees.

       (1) Bank angle = zero degrees, stalling speed = 91 knots.

       (2) Bank angle = 30 degrees, stalling speed = 98 knots.

    b. Wing flaps 40 degrees.

       (1) Bank angle = zero degrees, stalling speed = 82 knots.

       (2) Bank angle = 30 degrees, stalling speed = 88 knots.

11. Landing distance with brakes only (figures B6-5, B6-12, and B6-14) (touchdown speed = 90 knots).

		Zero Wind	15-knot Headwind
a.	Ground roll — dry runway, zero slope.	2300 feet	1700 feet
b.	Ground roll — dry runway corrected for slope.	2060 feet	Chart not extended in this low region.
c.	Total distance from 50-foot height to stop — dry runway, zero slope.	3100 feet	2420 feet
d.	Total distance from 50-foot height to stop — dry runway corrected for slope = b + (c - a).	2860 feet	Chart not extended in this low region.
e.	Ground roll — wet runway (RCR = 12), zero slope.	3600 feet	Chart not extended in this low region.

		Zero Wind	15-knot Headwind
f.	Ground roll — wet runway, corrected for slope.	3210 feet	Chart not extended in this low region.
g.	Total distance from 50-foot height to stop — wet runway, zero slope = e + (c - a).	4400 feet	Chart not extended in this low region.
h.	Total distance from 50-foot height to stop — wet runway corrected for slope = f + (c - a).	4010 feet	Chart not extended in this low region.

12. Landing distance with brakes plus four-engine reverse thrust (figures B6-4, B6-11 and B6-13). (Touchdown speed = 90 knots).

		Zero Wind	15-knot Headwind
a.	Ground roll — dry runway, zero slope.	1500 feet	1100 feet
b.	Total distance from 50-foot height to stop — dry runway, zero slope.	2300 feet	1800 feet
c.	For wet runway and slope correction refer to 11 above.		

GO-AROUND.

1. Compute the best IAS and rate of climb at the field condition and gross weight for four-engine go-around (figure B4-13). Using 140,000 pounds landing weight, data will be slightly conservative. (Maximum dry power torque pressure available using sea level standard day, dew point = 50° F, and CAT = 20°C is 214.5 psi) (figure B2-17).

    a. Configuration "f", wing flaps 40 degrees — gear down; IAS for best rate of climb = 98.5 knots, rate of climb = 480 fpm.

    b. Configuration "b", wing flaps = 20 degrees — gear up; IAS for best rate of climb = 123 knots, rate of climb = 1100 fpm.

2. Compute the best IAS and rate of climb for three-engine go-around at the same conditions as for four-engine go-around (figure B4-18 or B4-27).

Note

IAS for best climb may be obtained from figure B4-27. To insure that positive rate of climb is available, see figure B4-18.

    a. Configuration "b", wing flap 20 degrees — gear up; IAS = 116 knots, rate of climb = 570 fpm.

    b. Configuration "a", wing flaps zero degrees — gear up; IAS = 130 knots, rate of climb = 790 fpm.

3. Compute the best IAS and rate of climb for two-engine go-around at the same conditions as for four-engine go-around (figure B4-23).

    a. Wing flaps zero degrees — gear up; IAS = 120 knots, rate of climb = 190 fpm.

4. Compute minimum flap retraction speed for 140,000 pounds (figure B3-19). Minimum flap retraction speed = 114 knots.

RUNWAY LOAD BEARING CHART.

The Runway Load Bearing chart (figure B7-2) is included to determine the load bearing capabilities for various combinations of gross weight and CG position. Values are given for tire contact pressure, equivalent single wheel load, load classification number, unit construction index, and California bearing ratio. The values determined from the chart may be used to compare with the load bearing capabilities listed in the applicable ENROUTE-SUPPLEMENT (flip chart) as a guide to determine maximum takeoff and landing gross weight when runway strength is a critical factor.

The load bearing capabilities shown on the chart provide an adequate safety factor for unlimited use. When necessary, a 25 percent overload factor can be used for occasional landings without damage to the runways. The data shown is based on tires inflated to 35 percent tire deflection in accordance with existing maintenance procedures.

Contact pressure is given in psi, and is the load per square inch that the tires exert on the runway. The Equivalent Single Wheel Load (ESWL) adjusts the load on each single wheel for the mutual action of two or more single wheels which are in close proximity.

Unit Construction Index (UCI), Load Classification Number (LCN), and California Bearing Ratio (CBR), are indexes which are used to indicate the strength of runways in various parts of the world. UCI and/or LCN are generally applied to concrete and flexible surface (macadam) runways, and CBR is generally applied to sod and unsurfaced runways.

The following example illustrates the method of obtaining runway load bearing information from the chart:

Given: Gross Weight = 128,200 pounds.

CG Position = 27 percent MAC.

Find: Contact pressure, ESWL, LCN, UCI, and CBR.

Enter the chart with the gross weight of 128,200 pounds (A) and read across to the CG position of 27 percent MAC (B). Read down to the contact pressure line (C) and to the left to find contact pressure of 46 psi (D). For equivalent single wheel load, read down to the correction curve at (E) and to the left to find the load of 37,000 pounds (F). Load classification number, unit construction index, and California bearing ratio are found in the same way, by reading down to the appropriate correction curve and to the left; LCN curve (G), LCN = 25(H); UCI curve (I), UCI = 24 (J); CBR curve (K), CBR = 4 (L).

TAKEOFF DATA

DATE 12-15-63 AIRCRAFT NR 49-240

ACCELERATION	2000 FT	– SEC	97 IAS
REFUSAL	2800 FT	–	108 IAS
TAKEOFF	2800 FT	–	108 IAS

CLIMBOUT	108 IAS (OBSTACLE)	113 IAS (NORMAL)
MINIMUM FLAP RETRACTION		127 IAS
CLIMBING SPEED		148 IAS

CONDITIONS

Hp S.L. 20°C (Oat °C) 50°F (Dewpoint) Hd 600 FEET

	WET	DRY
REJECT TPSI	218 PSI	–
TAKEOFF FACTOR	2.3	–

6000 FT 180 (Runway length — Heading) -1% (Slope) 23/210°20H (Wind) (Component)

CLIMB OUT FACTOR 19.1

GROSS WEIGHT

175,000 LBS (Actual) 182,000 LBS (Limited by 3-Engine Climb)

209,000 LBS (Limited by Critical Field Length) 176,000 LBS (Limited by Obstacle)

LANDING DATA

RECOMMENDED APPROACH SPEEDS
GEAR DOWN

FLAPS	1.3VS	1.2VS	1.1VS
20°	120	111	101
30°	113	104	96
FULL	108	100	91

LANDING GROUND ROLL*

	FLAPS	TOT. DIST. H50	GROUND ROLL
BRAKES ONLY	40°	4010 FT	3210 FT
BRAKES 2 ENG REV	40°	3370 FT	2570 FT

EMERGENCY 3-ENGINE GO AROUND

EMERGENCY CLIMB SPEED

GEAR UP, FLAP 20°	116 IAS
GEAR UP, FLAP 0°	130 IAS
MINIMUM FLAP RETRACTION	114 IAS

EMERGENCY 2-ENGINE GO AROUND

GEAR UP FLAPS UP 190 FPM 120 IAS

*As Applicable

R1-629

Figure B7-1. C-124A Takeoff and Landing Data Cards

RUNWAY LOAD BEARING CHART

MODEL: C-124A/C
DATE: 12-15-68
DATA BASIS: ESTIMATED

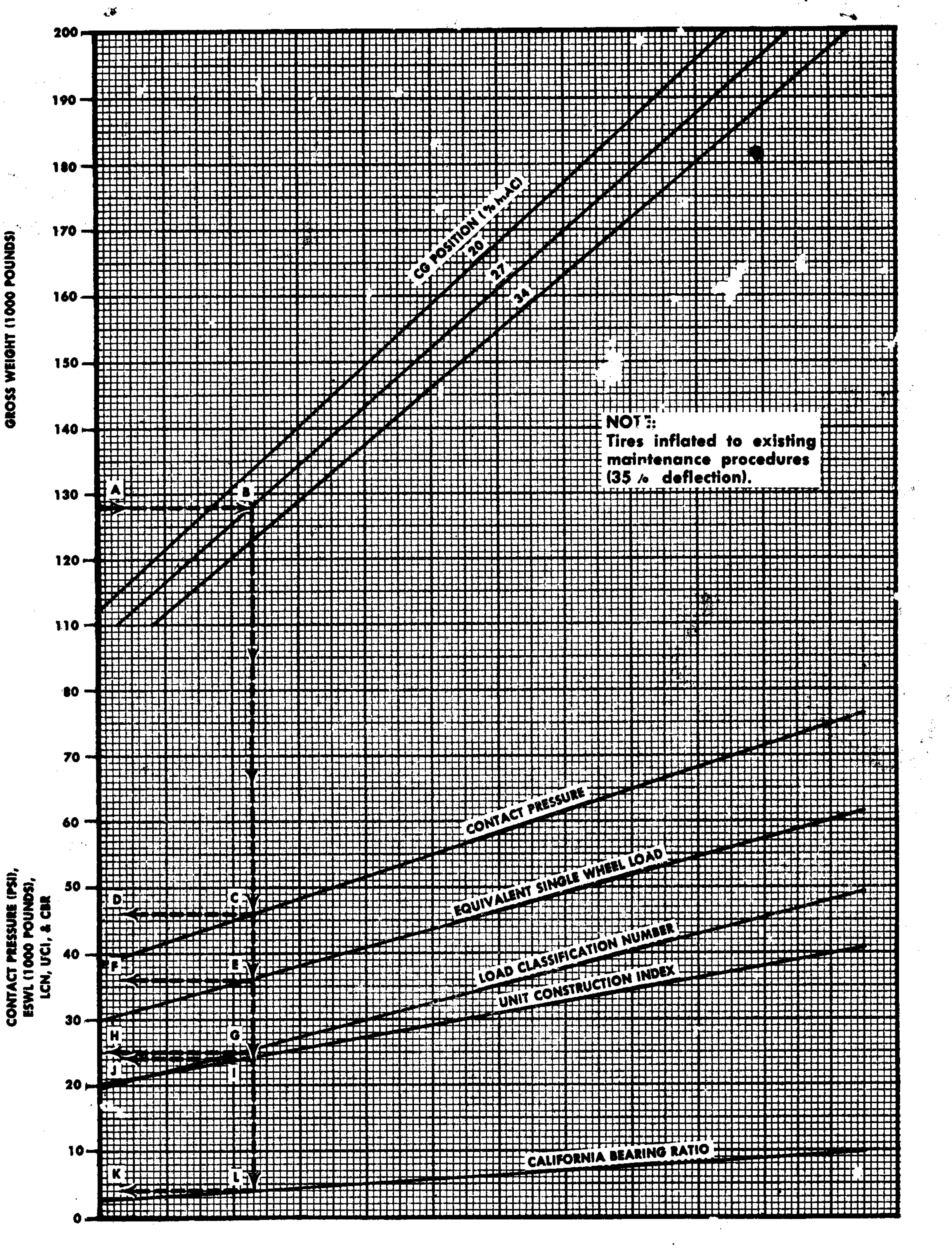


Figure B7-2. Runway Load Bearing Chart