PART 1 – INTRODUCTION

Ⓒ Ⓓ

TABLE OF CONTENTS

The symbol * indicates an illustration

SCOPE AND ARRANGEMENT

The charts contained in this Appendix present the performance of the Ⓒ and Ⓓ airplanes in a graphical form. They are based on ICAO standard atmospheric conditions; however, nomograms are provided to allow corrections for non-standard conditions as necessary. The charts are arranged in a logical sequence in seven basic divisions for planning general phases of each flight.

PART 1 – INTRODUCTION

PART 2 – ENGINE DATA

PART 3 – TAKEOFF

PART 4 – CLIMB

PART 5 – CRUISE

PART 6 – APPROACH AND LANDING

PART 7 – MISSION PLANNING

Descriptive text in each part discusses and explains the use of the charts provided. A sample problem at the end of the Appendix shows how the individual performance charts for each phase of a flight can be combined for flight planning purposes.

GLOSSARY OF TERMS AND ABBREVIATIONS

ABSOLUTE CEILING – Maximum altitude at which level flight can be maintained with zero feet per minute rate of climb.

ACCELERATION CHECK SPEED, TIME/DISTANCE – A means of checking airplane acceleration during takeoff roll using time or distance. The acceleration time check provides the most accurate check of acceleration. With this method, an even 10 knot increment not less than 5 and not more than 15 knots below refusal speed will normally be used as an acceleration check speed. As a secondary procedure, on marked runways the acceleration check may be made at a distance marker. For this method, the acceleration check point will normally be the first 1000 foot marker at least 500 feet but no more than 1500 feet prior to the refusal distance.

AIRSPEED

IAS – Indicated airspeed; observed airspeed corrected for instrument error.

CAS – Calibrated airspeed: IAS corrected for installation error in the pitot system.

EAS — Equivalent airspeed; CAS corrected for compressibility error. For all practical purposes at altitudes below 15,000 feet, the compressibility factor is negligible for this airplane.

TAS — True airspeed; EAS corrected for relative density.

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

BEST CLIMB SPEED — The airspeed which results in the best angle of climb (climb gradient). Except when minimum control speed is involved, the best climb speed for obstacle clearance is 1.2 stall speed for the gross weight and wing flap setting.

BHP — Brake horsepower.

CAT — Carburetor air temperature.

CRITICAL ALTITUDE — The altitude at which full throttle is required to maintain a given BHP at a set RPM.

CRITICAL ENGINE FAILURE SPEED (Vcrit) — The speed at which failure of one engine permits acceleration to takeoff in the same distance that the airplane may be decelerated to a stop using brakes only.

CRITICAL FIELD LENGTH — The total length of runway required to accelerate on all engines to the critical engine failure speed, lose one engine, and then continue takeoff, or stop.

CRUISE CEILING — Maximum altitude at which a rate of climb of 300 feet per minute can be maintained with METO power.

DENSITY ALTITUDE — Pressure altitude corrected for temperature. When conditions are standard, pressure altitude and density altitude are the same. Consequently, if the temperature is above standard, the density altitude will be higher than the pressure altitude. If the temperature is below standard, the density altitude will be lower than the pressure altitude.

DEWPOINT — The temperature at which, under ordinary conditions, condensation begins in a cooling mass of air. The temperature is used as the basis for calculating the effect produced by humidity on the power output of the engines.

EXPECTED TORQUE PRESSURE — The torque pressure which the engine may be expected to develop when the effects of altitude and atmospheric conditions are considered.

LANDING GROUND ROLL — Distance from touchdown to complete stop, utilizing brakes only, on a dry hard surface with propellers windmilling.

MAP — Engine absolute manifold pressure (in. Hg).

MAXIMUM DRY POWER — The maximum power permissible from the engine when the water injection system is not used; limited to five minutes.

MAXIMUM WET POWER — The maximum power permissible from the engine utilizing the water injection system; limited to five minutes.

METO (MAXIMUM EXCEPT TAKEOFF) POWER — The maximum power at which the engine can be operated continuously without damage.

MILITARY POWER — The same as maximum dry power except that the time limit is 30 minutes. An airplane engine can actually be run continuously under overload conditions of power and speed for much longer periods than those permitted by the ratings. However, the period of reliable operation is thereby reduced to an impractically short time. By imposing a time limit on maximum and military power ratings, the cumulative effect of the overloads is distributed evenly over the period between overhauls and the useful life of the engine accordingly lengthened. When use of military power is absolutely required for longer than 30 minutes, a notation must be made on Form 781.

MINIMUM CONTROL SPEED (V_{mc}) — Speed required to provide sufficient control to enable the airplane to fly a straight flight path over the ground with takeoff configuration, one engine windmilling, maximum power on other engine and no more than 5° bank angle away from the failed engine.

MINIMUM PERFORMANCE TORQUE PRESSURE — 95% of expected torque pressure.

MINIMUM SAFE SINGLE-ENGINE SPEED — Speed that will permit the airplane to maintain a minimum 100 fpm rate of climb in clean configuration (sea level, standard atmosphere) with the propeller on the inoperative engine feathered and maximum power on the operating engine.

OAT (FAT) — Outside or free air temperature; denoted as runway air temperature when observed at the runway.

PRESSURE ALTITUDE — The height or vertical distance from the standard datum plane. This is a theoretical plane where air pressure is equal to 29.92 in. Hg. at 15°C (59°F).

REFUSAL SPEED V_R — The maximum speed to which the airplane can be accelerated and still be stopped on the remaining runway using brakes only.

RUNWAY HEADWIND COMPONENT — Resultant headwind parallel to runway, as a result of wind direction and velocity.

SIGMA (σ) = Density ratio ($\rho/\rho o$). The ratio between ambient density and standard sea level density. $\frac{1}{\sqrt{\sigma}}$ is the correction factor for air density applied to EAS to obtain TAS. Sigma is commonly known as "smoe".

SERVICE CEILING — Maximum altitude at which a rate of climb of 100 feet per minute can be maintained.

STALL SPEED (V_{STALL}) — Speed at which the airplane starts to drop because of separation of airflow over the wings due to insufficient airspeed or excessive angle of attack.

STANDARD ATMOSPHERE — An arbitrary variation of air density, pressure, and temperature with altitude used for comparing engine and airplane performance. Standard air at sea level is represented by a barometric pressure of 29.92 in. Hg at 59°F (15°C).

TAKEOFF DISTANCE — Distance from start of takeoff to takeoff speed with both engines operating.

TAKEOFF SPEED — Speed at which main wheels leave the ground.

TORQUE PRESSURE (TPSI) — An indication of power being delivered to the propeller shaft by the engine.

WING ACCOUNTABILITY — The wind correction nomograms on the carts are calculated on the basis of 100% wind accountability. Reported headwinds should be used at 50% of their value and reported tail winds should be used at 150% of their value if the wind is measured at a source other than the runway.

DISCUSSION OF STANDARD CHARTS

The standard charts (figures 2A1-1 through 2A1-7) are provided for ready reference in determining standard and non-standard atmospheric conditions, and in determining compressibility and position error corrections to airspeed readings. For all normal flight planning compressibility effect on airspeed and altitude indication is negligible. Nevertheless, the airplane commander should study the standard charts and their limitations and be ready to apply them as necessary to satisfy any specific detail problem.

DENSITY ALTITUDE CHART

Density altitude may be found from this chart (figure 2A1-1), for a given temperature and pressure altitude condition.

EXAMPLE

a. Outside air temperature = 25°C.

b. Pressure altitude = 3500 feet.

c. $\frac{1}{\sqrt{\sigma}}$ = 1.083.

d. Density altitude = 5400 feet.

This chart also provided a $\frac{1}{\sqrt{\sigma}}$ value necessary to change equivalent airspeed to true airspeed. Enter the chart with the given temperature condition, proceed vertically to the pressure altitude, and read horizontally to the right to obtain the $\frac{1}{\sqrt{\sigma}}$ value. True airspeed (TAS) may then be obtained from equivalent airspeed (EAS) by multiplying the given EAS by the $\frac{1}{\sqrt{\sigma}}$ value.

DENSITY ALTITUDE VERSUS $\frac{1}{\sqrt{\sigma}}$

This chart (figure 2A1-2) gives values of $\frac{1}{\sqrt{\sigma}}$ accurately for every 100-foot increment in density altitude.

STANDARD ALTITUDE TABLE

A Standard Altitude Table (figure 2A1-3) shows standard atmospheric values as defined by ICAO. The standard atmosphere defined by ICAO represents an approximation to the average atmosphere of the world. The ICAO assumes a temperature of 15°C (59°F) and a pressure of 29.92 in. Hg. for sea level conditions. The temperature variation with height is approximately uniform from 15°C (59°F) at sea level to -56.5°C (-69.7°F) at 36,089 feet. This altitude is assumed to be the beginning of the isothermal region or stratosphere. For all practical purposes the temperature will remain constant as altitude is increased above 36,089 feet. The corresponding pressures and densities are shown on the Standard Altitude Table. ICAO standard atmosphere values have been used in preparation of all performance charts in this Appendix. Data for nonstandard conditions are shown as variations from the ICAO standard atmosphere.

PRESSURE ALTITUDE TABLE

The Pressure Altitude Table (figure 2A1-4) provides the necessary corrections to field elevation to obtain pressure altitude from the altimeter setting. To determine pressure altitude, find the altitude correction (Δ ALT) for the given altimeter setting. Add this correction algebraically to the field elevation to obtain pressure altitude.

TEMPERATURE CONVERSION CHART

The Temperature Conversion Chart (figure 2A1-5) is presented in degrees centigrade versus degrees Fahrenheit to facilitate the conversion of given temperatures as desired.

AIRSPEED CALIBRATION

Airspeed Calibration (figure 2A1-6) for the airspeed system shows indicated airspeed versus calibrated airspeed to account for the location of the static pressure pickup. The effects of airplane attitude are negligible to the position error in terms of wing flap setting, landing gear position, and gross weight.

AIRSPEED COMPRESSIBILITY CORRECTION CHART

This chart (figure 2A1-7) presents calibrated airspeed versus equivalent airspeed to account for the compressibility of the atmosphere.

ALTIMETER POSITION ERROR CORRECTION

Altimeter errors due to static port location are negligible and no correction is necessary.

DENSITY ALTITUDE CHART

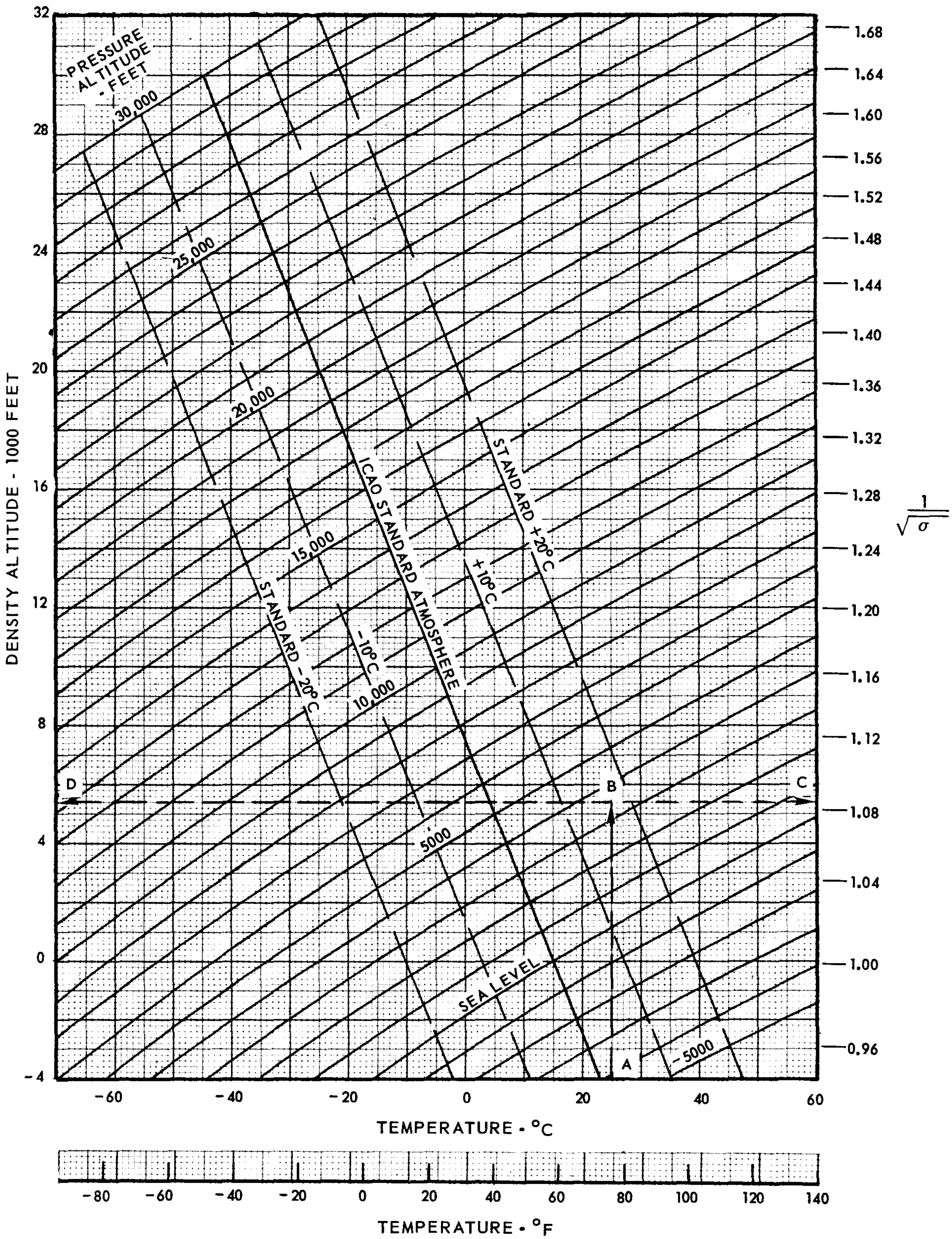


Figure 2A1-1

DENSITY ALTITUDE VS $\frac{1}{\sqrt{\sigma}}$

TRUE AIRSPEED = EQUIVALENT AIRSPEED × $\frac{1}{\sqrt{\sigma}}$

DENSITY ALTITUDE (FEET)	$\frac{1}{\sqrt{\sigma}}$	DENSITY ALTITUDE (FEET)	$\frac{1}{\sqrt{\sigma}}$	DENSITY ALTITUDE (FEET)	$\frac{1}{\sqrt{\sigma}}$	DENSITY ALTITUDE (FEET)	$\frac{1}{\sqrt{\sigma}}$	DENSITY ALTITUDE (FEET)	$\frac{1}{\sqrt{\sigma}}$	DENSITY ALTITUDE (FEET)	$\frac{1}{\sqrt{\sigma}}$	DENSITY ALTITUDE (FEET)	$\frac{1}{\sqrt{\sigma}}$	DENSITY ALTITUDE (FEET)	$\frac{1}{\sqrt{\sigma}}$
100	1.0014	3300	1.0501	6500	1.1023	9700	1.1582	12900	1.2186	16100	1.2837	19300	1.3541	22400	1.4277
200	1.0029	3400	1.0516	6600	1.1039	9800	1.1600	13000	1.2206	16200	1.2858	19400	1.3564	22500	1.4302
300	1.0044	3500	1.0531	6700	1.1056	9900	1.1618	13100	1.2225	16300	1.2879	19500	1.3587	22600	1.4327
400	1.0059	3600	1.0548	6800	1.1073	10000	1.1637	13200	1.2245	16400	1.2901	19600	1.3609	22700	1.4351
500	1.0074	3700	1.0563	6900	1.1090	10100	1.1655	13300	1.2265	16500	1.2922	19700	1.3632	22800	1.4376
600	1.0088	3800	1.0579	7000	1.1107	10200	1.1674	13400	1.2285	16600	1.2943	19800	1.3655	22900	1.4401
700	1.0103	3900	1.0595	7100	1.1124	10300	1.1692	13500	1.2305	16700	1.2965	19900	1.3678	23000	1.4426
800	1.0118	4000	1.0611	7200	1.1141	10400	1.1711	13600	1.2324	16800	1.2986	20000	1.3701	23100	1.4451
900	1.0133	4100	1.0627	7300	1.1158	10500	1.1729	13700	1.2337	16900	1.3007	20100	1.3724	23200	1.4477
1000	1.0148	4200	1.0643	7400	1.1176	10600	1.1748	13800	1.2364	17000	1.3029	20200	1.3748	23300	1.4502
1100	1.0163	4300	1.0659	7500	1.1193	10700	1.1766	13900	1.2385	17100	1.3050	20300	1.3771	23400	1.4528
1200	1.0178	4400	1.0675	7600	1.1210	10800	1.1785	14000	1.2404	17200	1.3072	20400	1.3795	23500	1.4553
1300	1.0193	4500	1.0692	7700	1.1228	10900	1.1803	14100	1.2424	17300	1.3094	20500	1.3819	23600	1.4579
1400	1.0208	4600	1.0707	7800	1.1245	11000	1.1822	14200	1.2444	17400	1.3116	20600	1.3842	23700	1.4604
1500	1.0223	4700	1.0724	7900	1.1262	11100	1.1841	14300	1.2465	17500	1.3138	20700	1.3866	23800	1.4630
1600	1.0238	4800	1.0704	8000	1.1280	11200	1.1860	14400	1.2485	17600	1.3159	20800	1.3889	23900	1.4656
1700	1.0253	4900	1.0756	8100	1.1297	11300	1.1879	14500	1.2506	17700	1.3181	20900	1.3913	24000	1.4681
1800	1.0268	5000	1.0773	8200	1.1315	11400	1.1893	14600	1.2526	17800	1.3203	21000	1.3937	24100	1.4706
1900	1.0283	5100	1.0789	8300	1.1332	11500	1.1917	14700	1.2546	17900	1.3225	21100	1.3961	24200	1.4732
2000	1.0299	5200	1.0806	8400	1.1350	11600	1.1926	14800	1.2567	18000	1.3247	21200	1.3985	24300	1.4758
2100	1.0314	5300	1.0822	8500	1.1368	11700	1.1955	14900	1.2587	18100	1.3267	21300	1.4009	24400	1.4784
2200	1.0329	5400	1.0839	8600	1.1385	11800	1.1974	15000	1.2608	18200	1.3292	21400	1.4033	24500	1.4810
2300	1.0344	5500	1.0855	8700	1.1403	11900	1.1993	15100	1.2628	18300	1.3314	21500	1.4068	24600	1.4836
2400	1.0360	5600	1.0872	8800	1.1420	12000	1.2012	15200	1.2649	18400	1.3337	21600	1.4082	24700	1.4862
2500	1.0375	5700	1.0888	8900	1.1438	12100	1.2031	15300	1.2670	18500	1.3360	21700	1.4106	24800	1.4888
2600	1.0390	5800	1.0905	9000	1.1456	12200	1.2050	15400	1.2691	18600	1.3382	21800	1.4130	24900	1.4914
2700	1.0406	5900	1.0921	9100	1.1474	12300	1.2070	15500	1.2712	18700	1.3405	21900	1.4154	25000	1.4940
2800	1.0421	6000	1.0936	9200	1.1492	12400	1.2089	15600	1.2732	18800	1.3427	22000	1.4179		
2900	1.0436	6100	1.0954	9300	1.1510	12500	1.2109	15700	1.2753	18900	1.3450	22100	1.4203		
3000	1.0454	6200	1.0971	9400	1.1528	12600	1.2128	15800	1.2774	19000	1.3473	22200	1.4228		
3100	1.0469	6300	1.0988	9500	1.1546	12700	1.2147	15900	1.2795	19100	1.3493	22300	1.4253		
3200	1.0485	6400	1.1005	9600	1.1564	12800	1.2167	16000	1.2816	19200	1.3518				

46,256

Figure 2A1-2

Standard Altitude Table

Standard Sea Level Air:
T = 15° C. W = .07651 lb/cu. ft. ρ_0 = .002378 slugs/cu. ft.
P = 29.921 in. of Hg. 1" of Hg. = 70.732 lb/sq. ft. = 0.4912 lb/sq. in.
This table is based on NACA Technical Report No. 218 a_0 - 1116 ft./sec.

Altitude feet	Density Ratio ρ/ρ_0	$\frac{1}{\sqrt{\sigma}}$	Temperature Deg. C	Temperature Deg. F	Speed of Sound Ratio a/a_0	Pressure In. of Hg.	Pressure Ratio P/Po
0	1.0000	1.0000	15.000	59.000	1.0000	29.92	1.0000
1000	.9710	1.0148	13.019	55.434	.997	28.86	.9644
2000	.9428	1.0299	11.038	51.868	.993	27.82	.9298
3000	.9151	1.0454	9.056	48.301	.990	26.81	.8962
4000	.8881	1.0611	7.075	44.735	.986	25.84	.8636
5000	.8616	1.0773	5.094	41.169	.983	24.89	.8320
6000	.8358	1.0938	3.113	37.603	.979	23.98	.8013
7000	.8106	1.1107	1.132	34.037	.976	23.09	.7716
8000	.7859	1.1280	-0.850	30.471	.972	22.22	.7427
9000	.7619	1.1456	-2.831	26.904	.968	21.38	.7147
10000	.7384	1.1637	-4.812	23.338	.965	20.58	.6876
11000	.7154	1.1822	-6.793	19.772	.962	19.79	.6614
12000	.6931	1.2012	-8.774	16.206	.958	19.03	.6359
13000	.6712	1.2206	-10.756	12.640	.954	18.29	.6112
14000	.6499	1.2404	-12.737	9.074	.950	17.57	.5873
15000	.6291	1.2608	-14.718	5.507	.947	16.88	.5642
16000	.6088	1.2816	-16.699	1.941	.943	16.21	.5418
17000	.5891	1.3029	-18.680	-1.625	.940	15.56	.5202
18000	.5698	1.3247	-20.662	-5.191	.936	14.94	.4992
19000	.5509	1.3473	-22.643	-8.757	.932	14.33	.4790
20000	.5327	1.3701	-24.624	-12.323	.929	13.75	.4594
21000	.5148	1.3937	-26.605	-15.890	.925	13.18	.4405
22000	.4974	1.4179	-28.586	-19.456	.922	12.63	.4222
23000	.4805	1.4426	-30.568	-23.022	.917	12.10	.4045
24000	.4640	1.4681	-32.549	-26.588	.914	11.59	.3874
25000	.4480	1.4940	-34.530	-30.154	.910	11.10	.3709
26000	.4323	1.5209	-36.511	-33.720	.906	10.62	.3550
27000	.4171	1.5484	-38.493	-37.287	.903	10.16	.3397
28000	.4023	1.5768	-40.474	-40.853	.899	9.720	.3248
29000	.3879	1.6056	-42.455	-44.419	.895	9.293	.3106
30000	.3740	1.6352	-44.436	-47.985	.891	8.880	.2968
31000	.3603	1.6659	-46.417	-51.551	.887	8.483	.2834
32000	.3472	1.6971	-48.399	-55.117	.883	8.101	.2707
33000	.3343	1.7295	-50.379	-58.684	.879	7.732	.2583
34000	.3218	1.7628	-52.361	-62.250	.875	7.377	.2465
35000	.3098	1.7966	-54.342	-65.816	.871	7.036	.2352
36000	.2962	1.8374	-55.000	-67.000	.870	6.708	.2242
37000	.2824	1.8818	-55.000	-67.000	.870	6.395	.2137
38000	.2692	1.9273	-55.000	-67.000	.870	6.096	.2037
39000	.2566	1.9738	-55.000	67.000	.870	5.812	.1943
40000	.2447	2.0215	-55.000	-67.000	.870	5.541	.1852
41000	.2332	2.0707	-55.000	-67.000	.870	5.283	.1765
42000	.2224	2.1207	-55.000	-67.000	.870	5.036	.1683
43000	.2120	2.1719	-55.000	-67.000	.870	4.802	.1605
44000	.2021	2.2244	-55.000	-67.000	.870	4.578	.1530
45000	.1926	2.2785	-55.000	-67.000	.870	4.364	.1458
46000	.1837	2.3332	+55.000	-67.000	.870	4.160	.1391
47000	.1751	2.3893	-55.000	-67.000	.870	3.966	.1325
48000	.1669	2.4478	-55.000	-67.000	.870	3.781	.1264
49000	.1591	2.5071	-55.000	-67.000	.870	3.604	.1205
50000	.1517	2.5675	-55.000	-67.000	.870	3.436	.1149

25,750A

Figure 2A1-3

PRESSURE ALTITUDE TABLE

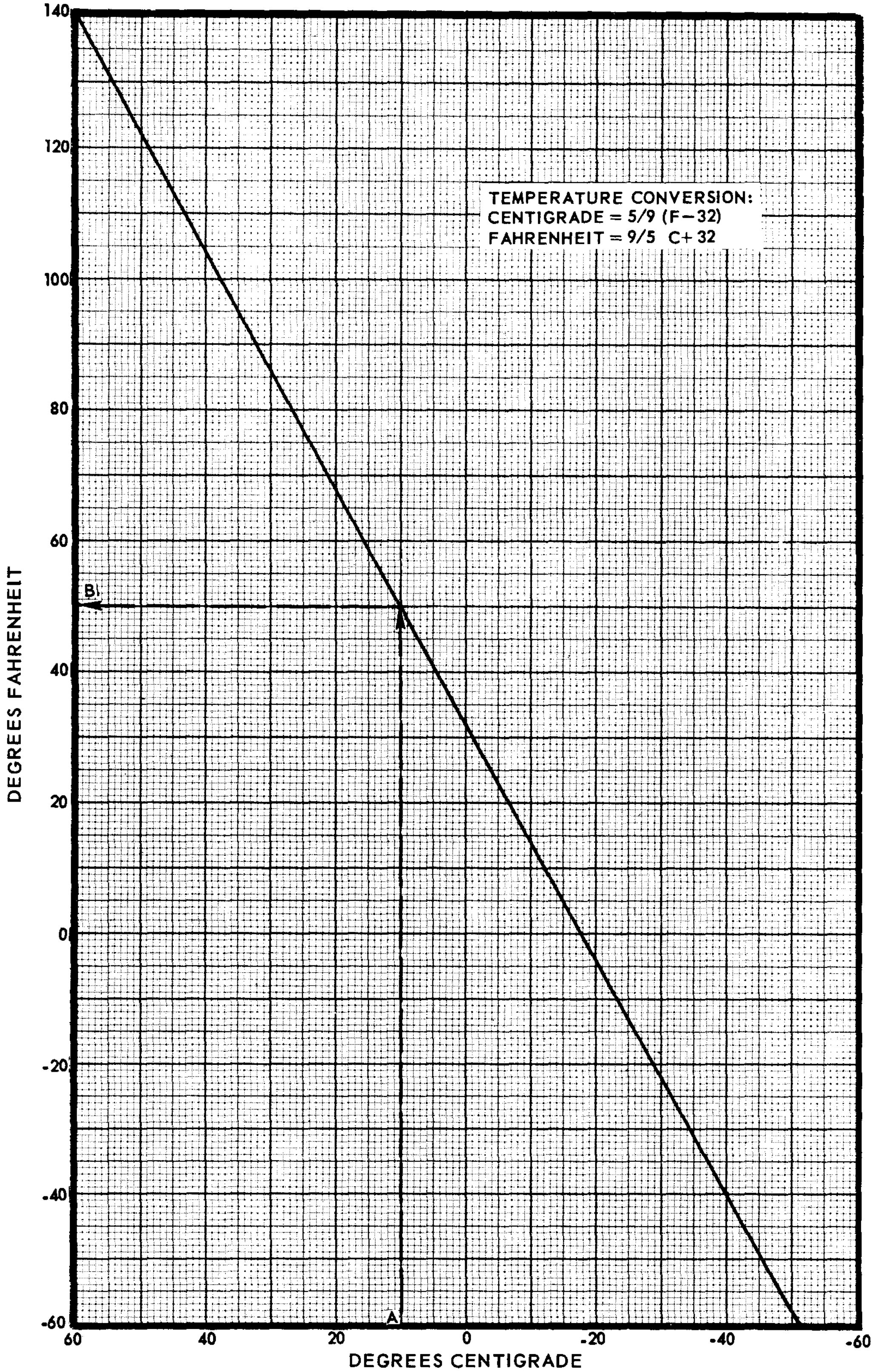
PRESSURE ALTITUDE = FIELD ELEVATION + Δ ALTITUDE

ALTIMETER SETTING IN. HG	Δ ALT FT	ALTIMETER SETTING IN. HG	Δ ALT FT	ALTIMETER SETTING IN. HG	Δ ALT FT	ALTIMETER SETTING IN. HG	Δ ALT FT	ALTIMETER SETTING IN. HG	Δ ALT FT	ALTIMETER SETTING IN. HG	Δ ALT FT	ALTIMETER SETTING IN. HG	Δ ALT FT
28.00	1824	28.50	1340	29.00	863	29.50	392	30.00	−73	30.50	−531	31.00	−983
.01	1814	.51	1330	.01	853	.51	382	.01	−82	.51	−540	.01	−992
.02	1805	.52	1321	.02	844	.52	373	.02	−91	.52	−549	.02	−1001
.03	1795	.53	1311	.03	834	.53	364	.03	−100	.53	−558	.03	−1010
.04	1785	.54	1302	.04	825	.54	354	.04	−110	.54	−567	.04	−1019
.05	1776	.55	1292	.05	815	.55	345	.05	−119	.55	−576	.05	−1028
.06	1766	.56	1282	.06	806	.56	336	.06	−128	.56	−585	.06	−1037
.07	1756	.57	1273	.07	796	.57	326	.07	−137	.57	−594	.07	−1046
.08	1746	.58	1263	.08	787	.58	318	.08	−146	.58	−604	.08	−1055
.09	1737	.59	1254	.09	777	.59	308	.09	−156	.59	−613	.09	−1064
28.10	1727	28.60	1244	29.10	768	29.60	298	30.10	−165	30.60	−622	32.00	−1073
.11	1717	.61	1234	.11	758	.61	289	.11	−174	.61	−631		
.12	1707	.62	1225	.12	749	.62	280	.12	−183	.62	−640		
.13	1698	.63	1215	.13	739	.63	270	.13	−192	.63	−649		
.14	1688	.64	1206	.14	730	.64	261	.14	−202	.64	−658		
.15	1678	.65	1196	.15	721	.65	252	.15	−211	.65	−667		
.16	1668	.66	1186	.16	711	.66	242	.16	−220	.66	−676		
.17	1659	.67	1177	.17	702	.67	233	.17	−229	.67	−685		
.18	1649	.68	1167	.18	692	.68	224	.18	−238	.68	−694		
.19	1639	.69	1158	.19	683	.69	215	.19	−248	.69	−703		
28.20	1630	28.70	1148	29.20	673	29.70	205	30.20	−257	30.70	−712		
.21	1620	.71	1139	.21	664	.71	196	.21	−266	.71	−721		
.22	1610	.72	1129	.22	655	.72	187	.22	−275	.72	−730		
.23	1601	.73	1120	.23	645	.73	177	.23	−284	.73	−740		
.24	1591	.74	1110	.24	636	.74	168	.24	−293	.74	−749		
.25	1581	.75	1100	.25	626	.75	159	.25	−303	.75	−758		
.26	1572	.76	1091	.26	617	.76	149	.26	−312	.76	−767		
.27	1562	.77	1081	.27	607	.77	140	.27	−321	.77	−776		
.28	1552	.78	1072	.28	598	.78	131	.28	−330	.78	−785		
.29	1542	.79	1062	.29	589	.79	122	.29	−339	.79	−794		
28.30	1533	28.80	1053	29.30	579	29.80	112	30.30	−348	30.80	−803		
.31	1523	.81	1043	.31	570	.81	103	.31	−358	.81	−812		
.32	1513	.82	1034	.32	560	.82	94	.32	−367	.82	−821		
.33	1504	.83	1024	.33	551	.83	85	.33	−376	.83	−830		
.34	1494	.84	1015	.34	542	.84	75	.34	−385	.84	−839		
.35	1484	.85	1005	.35	532	.85	66	.35	−394	.85	−848		
.36	1475	.86	995	.36	523	.86	57	.36	−403	.86	−857		
.37	1465	.87	986	.37	514	.87	47	.37	−412	.87	−866		
.38	1456	.88	976	.38	504	.88	38	.38	−421	.88	−875		
.39	1446	.89	967	.39	495	.89	29	.39	−431	.89	−884		
28.40	1436	28.90	957	29.40	485	29.90	20	30.40	−440	30.90	−893		
.41	1427	.91	948	.41	476	.91	10	.41	−449	.91	−902		
.42	1417	.92	938	.42	467	.92	1	.42	−458	.92	−911		
.43	1407	.93	929	.43	457	.93	−8	.43	−467	.93	−920		
.44	1398	.94	919	.44	448	.94	−17	.44	−476	.94	−929		
.45	1388	.95	910	.45	439	.95	−26	.45	−485	.95	−938		
.46	1378	.96	900	.46	429	.96	−36	.46	−494	.96	−947		
.47	1369	.97	891	.47	420	.97	−45	.47	−504	.97	−956		
.48	1359	.98	881	.48	410	.98	−54	.48	−513	.98	−965		
.49	1350	.99	872	.49	401	.99	−63	.49	−522	.99	−974		

46,257

Figure 2A1-4

TEMPERATURE CONVERSION CHART



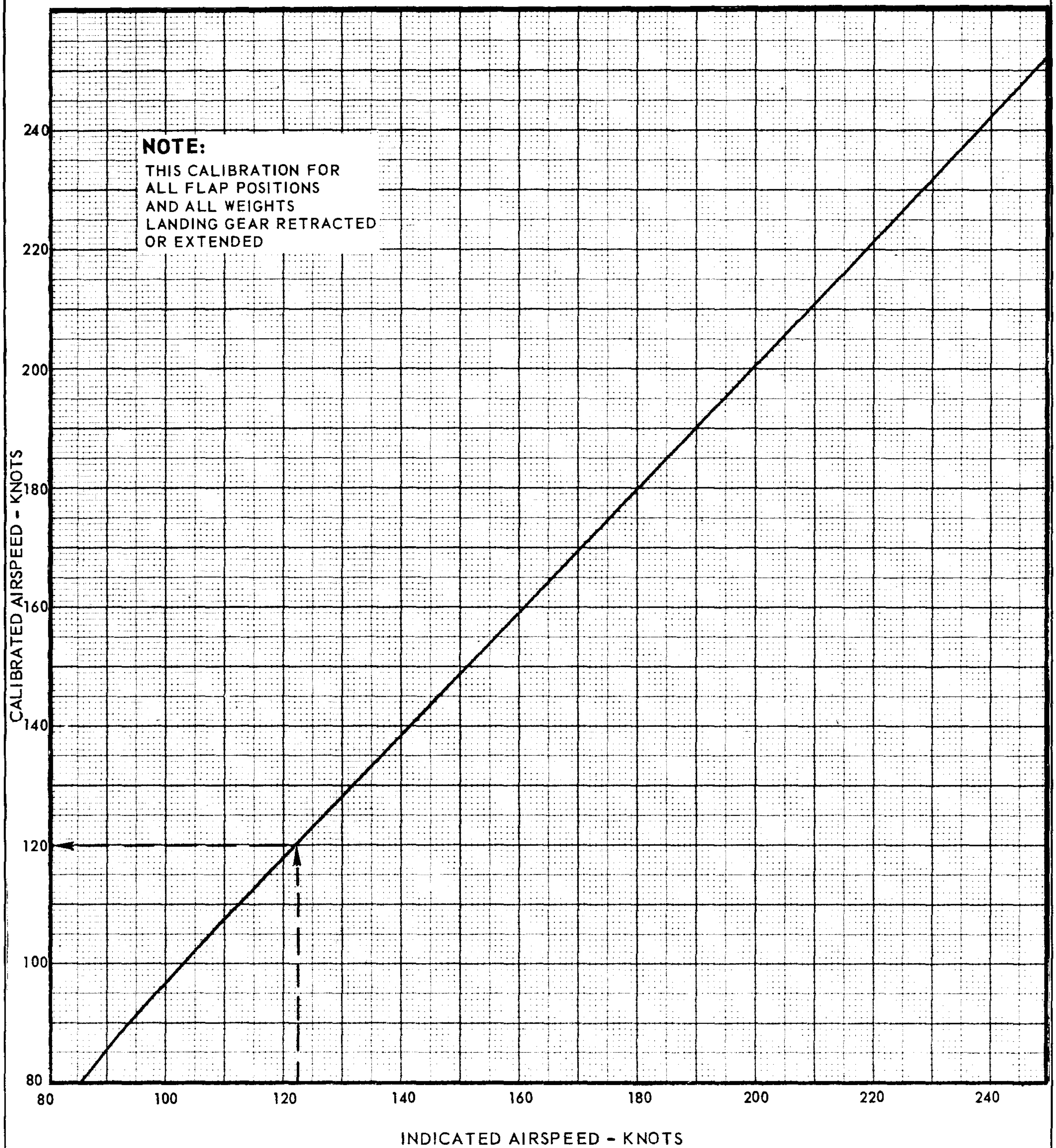
46,258A

Figure 2A1-5

MODEL: T-29C/D
DATE: 15 MARCH 1955
DATA BASIS: FLIGHT TEST

AIRSPEED CALIBRATION

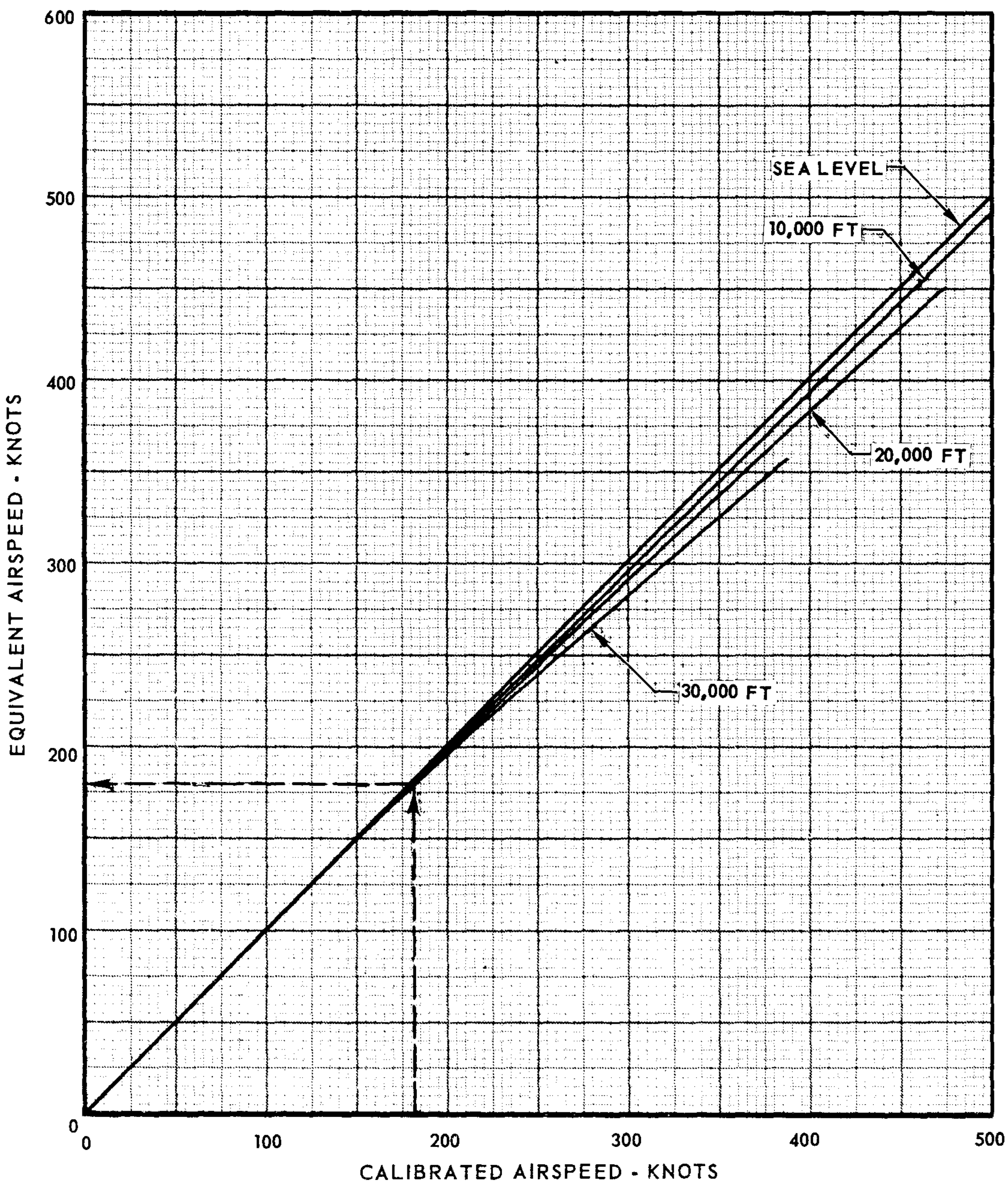
ENGINES: R2800-99W



24,174A

Figure 2A1-6

AIRSPEED COMPRESSIBILITY CORRECTION



45,502C

Figure 2A1-7

PART 2 — ENGINE DATA

Ⓒ Ⓓ

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The symbol * indicates an illustration

ENGINE DATA

ENGINE POWER TIME LIMITATIONS

The engines are approved by the manufacturer for five minutes of operation at maximum wet power, five minutes at maximum dry power, and 30 minutes at MILITARY power. There is no time limit for operations at METO power or less. Maximum power is determined during the normal preflight planning by reference to the maximum power available curves.

ENGINE RATINGS, LIMITS, AND THE CONTROL OF POWER

The standard engine ratings are Maximum Wet, Maximum Dry, Military, and METO. Each is expressed in terms of power (bhp), engine speed (rpm) and pressure altitude (ft above sea level). The operating limits which apply to each rating include such variables as spark advance, mixture strength, manifold pressure, torque pressure, carburetor air temperature, cylinder head temperature, oil inlet temperature, oil pressure and fuel pressure. These limits must be observed individually and collectively to stay within the envelope of conditions which determines reliable engine performance, and to avoid malfunction. For power settings below the engine ratings, such as those used for climb and cruise flight, the operating limits are conservative from the viewpoint of engine reliability and are set to achieve long engine life and economical maintenance. The control of power is established primarily by setting rpm and manifold pressure. Power available curves and power charts show the rpm and manifold pressure required for the full range of engine performance under specific operating conditions. The charts show a range of carburetor air temperature and the manifold pressure required to obtain a selected power corrected to the observed temperature conditions. This correction for non-standard conditions of carburetor air temperature amounts to an increase in manifold pressure of approximately 1.0 percent for each 5.5°C that the temperature exceeds standard altitude temperature (15°C at sea level). If the carburetor air temperature is colder than standard, a corresponding decrease in manifold pressure is shown for accurate power setting. The rules for application of this manifold pressure correction vary depending on the power level and on the operating condition. The maximum manifold pressure specified in Section V for each of the engine ratings is regarded as a never-exceed limit under all operating conditions, except for the allowable manifold pressure increase to partially offset the loss of power due to humidity. These limits appear in Section V and on the power available charts. This means that no upward correction to manifold pressure is allowed at any of the standard engine ratings to compensate for power loss due to hotter than standard temperature conditions. However, an upward correction to manifold pressure to compensate for power loss due to high humidity is allowed provided the increase is in accordance with the correction graphs on the power charts. For takeoff in colder than standard conditions (with carubretor air temperatures below 15°C) and particularly under extremely cold arctic conditions, it is desirable to avoid overpowering the engine beyond its ratings. Two alternate procedures for adjusting power at the engine ratings are suggested under cold weather conditions: (1) Reduce the takeoff manifold pressure approximately 1.0 inch Hg for each 10°C below standard carburetor air temperature (15°C at sea level). (2) Observe both manifold pressure and torque pressure as a limit, adjusting the throttle to whichever limit occurs first. The torque pressure limit established should account for normal tolerances of accuracy to torque-meter instrumentation and should make allowance for engine accessory power requirements by subtracting this amount (four psi for right engine) from the maximum allowable torque pressure. At lower power levels, below the engine ratings, such as at climb and cruise power settings, manifold pressure has been corrected either up or down for variation of carburetor air temperature from standard altitude air temperature in accordance with the methods outlined above. Once the correct manifold pressure is established, it is usually regarded as a maximum operating limit to avoid the possibility of overboosting a malfunctioning engine. At these power settings, torque pressure can also be used as a limit in conjunction with manifold pressure.

RECOMMENDED CONTINUOUS CRUISE OPERATION

It is permissible to use up to METO power for continuous cruise operation; however, this procedure yields range values that are considerably less than maximum. A detailed study of the power charts and the endurance summary chart reveals that optimum cruise performance requires a gradual increase in cruise altitude as the flight progresses. The optimum cruise profile can be attained by using altitude and airspeed as the most important cruise parameters, while using the MAP, TPSI, rpm, and fuel flow indication only to monitor the engine operation. For best airplane performance at a given altitude, engine controls must be adjusted so that a gradual decrease in power is accomplished. If the predetermined BHP, as defined by the cruise charts, does not give the recommended cruise airspeed, then the MAP should be adjusted until the correct airspeed is obtained. Do not exceed engine operating limits in making this adjustment.

DISCUSSION OF CHARTS

MAXIMUM POWER AVAILABLE

The Maximum Power Available Charts (figure 2A2-1 through 2A2-5) include nomograms correcting engine delivered power to nonstandard conditions both with and without water-alcohol injection (wet or dry) for normal fuel grade 115/145 and alternate fuel grade 100/130. The charts show the maximum power available for given conditions of pressure altitude, CAT., and dew point temperature. An expected TPSI scale is included and a minimum performance TPSI scale which incorporates a 5% margin for operational use. The maximum power available charts are based upon operation at 2800 rpm and full throttle except where manifold pressure (MAP) is limited by the engine manufacturer's recommendations. In operation at higher elevations, use all available power but do not exceed limits. An Alternate Maximum Power Available Chart is based on operation at 2700 rpm when using alternate fuel grade 100/130.

CAUTION

For takeoff in colder than standard conditions (with carburetor air temperature below 15°C sea level) avoid overboosting the engines beyond their ratings. Observe torque pressure limits during takeoff and reduce manifold pressure approximately 0.5 in. Hg. for each 5° below standard CAT (15°C sea level). A nomogram above the maximum power limit on each chart provides the necessary correction to expected manifold pressure for colder than standard conditions.

To partially offset the loss of power due to humidity, the expected MAP for takeoff powers as provided in the applicable power available chart may be increased due to the existing water vapor pressure up to a maximum of 1.5 inches Hg. This correction may only be made when the combination of pressure altitude and carburetor air temperature indicate that takeoff power may be developed with less than full throttle setting.

The maximum power available curves are to be used to determine the minimum performance TPSI for computing takeoff performance. These computations are to be accomplished as a part of the preflight planning.

EXAMPLE

Given:

CAT (OAT + 1°C) = 20°C.

Pressure altitude = 3500 feet.

Dew point = 55°F.

Power condition = Wet, 2800 rpm, AUTO RICH.

Note

The values of OAT should be obtained whenever possible from the tower. Indicated OAT is less desirable because of radiation effects when the airplane is on the ground.

Select the proper power available curve (figure 2A2-1). Enter the chart at pressure altitude of 3500 feet (A) and read up to CAT of 20° (B). Note manifold pressure 58 in. Hg. at full throttle. Read across to dew point base line and parallel guide line to 55°F, corrected for altitude (C). Read across to find expected TPSI 126 (D); and minimum performance TPSI 119 (E).

Note

- If the BHP obtained by the chart is greater than the limiting BHP because of CAT below standard conditions, proceed horizontally to the MAP correction nomogram (A). Parallel the guide lines to the limiting BHP and TPSI (B), then vertically to read MAP correction for low CAT (C).

- When operating at part throttle, a manifold pressure increase may be allowable due to humidity. Determine allowable manifold pressure increase on the separate graph. Proceed horizontally to the correction nomogram baseline (A), parallel the guide lines to the allowable correction (B), then proceed horizontally to BHP and torque pressure.

MANIFOLD PRESSURE LIMITS

A manifold pressure limits curve (figure 2A2-6) is presented to determine the limiting manifold pressure that can be used with any given rpm on a standard day. Curves for manual lean and auto rich operation in high or low blower at various rpm and pressure altitude values are provided. Engine operation above indicated MAP/rpm combinations may result in exceeding torque pressure limits on a standard day. This chart may be used to cross-check MAP settings when power settings are changed during climb or cruise.

CLIMB POWER SCHEDULES

Three climb power schedules (figures 2A2-7, 2A2-8 and 2A2-9) are presented for use in establishing power for two engine operational climb at 1400 BHP/ENG, 1500 BHP/ENG, and METO power. These tables are based on operating with AUTO RICH mixture setting.

Note

METO power is 2700 rpm in low blower and 2500 rpm in high blower. The propellers are restricted in the 2500 to 2700 rpm range (at 30 in. Hg MAP and above) except to pass through this range.

WARNING

High power (30 in. Hg MAP and above) engine operation at speeds between 2500 and 2700 rpm may cause propeller blade fatigue failure induced by resonant vibration stresses.

POWER SCHEDULES

Power schedules (figures 2A2-10 through 2A2-25) are presented in tabular form for a range of cruise powers from 500 BHP to 1700 BHP. Each schedule presents the manifold pressure, blower setting, and rpm necessary to maintain a constant BHP under various conditions of pressure altitude and carburetor air temperature. In addition, the schedules provide the TPSI and fuel flow which should be obtained when the mixture is manually leaned at cruise power settings of 1200 BHP (low blower) and below. For cruise power settings above 1200 BHP in high blower, the minimum fuel flow figures represent the fuel flow tolerance of the carburetor based on engine manufacturer's data. The desired fuel flow values are based on flight tests and represent the fuel flow obtained by manually adjusting the mixture.

Note

In cases where appreciable power losses are encountered due to carburetors running too rich, the mixture may be manually adjusted to correct the power deficiency. If the mixture is manually adjusted to correct such a power deficiency, the resulting fuel flow must never be less than the applicable minimum fuel flow at the designated power setting.

The power schedules are based upon operating both engines at the same rpm and MAP. This procedure results in slightly different horsepower being delivered to each propeller, and a little less than maximum performance from the airplane, because of the unbalanced accessory loads in the engines. The right engine carries the additional load of the cabin compressor. These effects are small, however, and are not likely to cause a noticeable difference in control or performance. Since any particular combination of blower setting and rpm may be associated with many different manifold pressure values (depending on pressure altitude and carburetor air temperature), a heavy line across the table separates the HIGH and LOW blower positions and light lines are used to separate the different rpm values. To use the schedules, enter the table at the pressure altitude and read the manifold pressure horizontally to the right under the appropriate carburetor air temperature. Then follow the rpm lines and read the blower position, rpm, TPSI, and fuel flow to the right in the same rpm channel.

EFFECT OF RAM. In flight, at a given indicated airspeed, an effective boost is given to the quantity of air received by the induction system. This increase is commonly referred to as ram. The effect is the same as an increase to whatever supercharging is produced by the engine blower. The engine manufacturer's data used in preparing the power schedules do not include the effects of ram. The full throttle settings given in the tables will not be at the full throttle position under flight conditions due to the effect of ram. At a given altitude, rpm and full throttle position, the BHP developed will be increased in proportion to the amount of ram. Also if the BHP is held constant the effect of ram will increase the altitude at which this power can be developed at the full throttle position.

FUEL FLOW PER ENGINE

Fuel flow per engine charts (figures 2A2-26 and 2A2-27) are presented to determine fuel flow, corresponding to any selected brake horsepower. Curves for manual lean and manual adjust operation in high or low blower at various rpm values are provided. The desired fuel flows on these charts were obtained by flight test and are approximately 5% richer than the engine manufacturer's minimum fuel flow listed on the power schedules.

EXAMPLE

Given:

BHP per engine = 800 bhp.

RPM = 1800.

Blower = LOW.

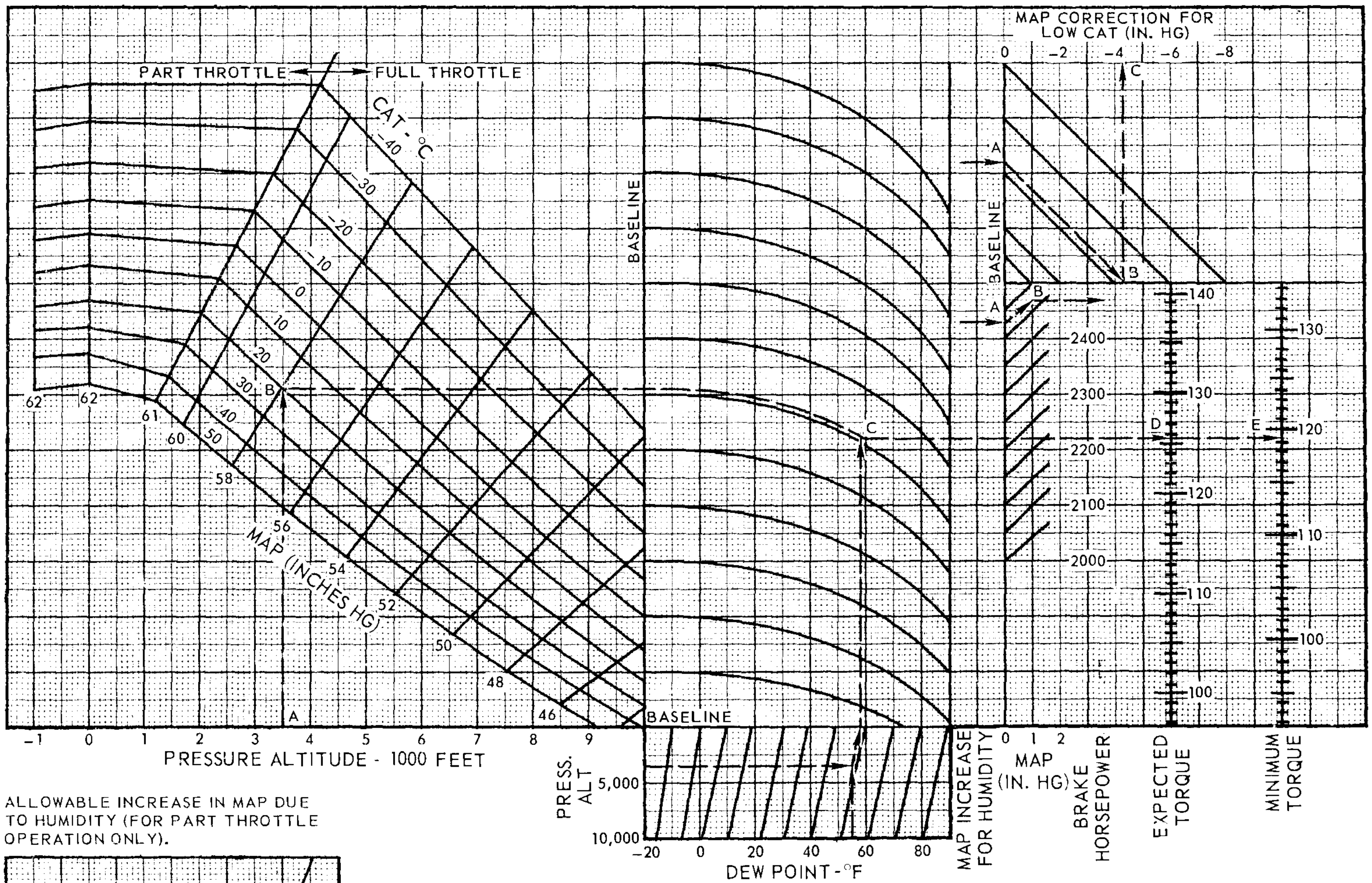
Enter chart (figure 2A2-26) at 800 bhp (A) and read up to rpm 1800 (B). Read across to the left and read fuel flow 364 pph (C). Note that mixture is manual lean from best power.

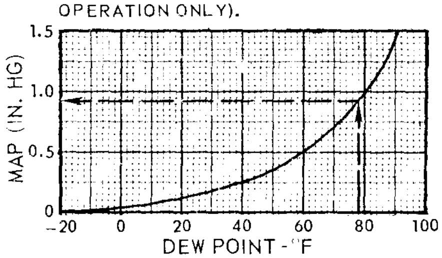
MAXIMUM WET POWER AVAILABLE

MODEL: T-29 C/D
DATE: 5 DECEMBER 1967
DATA BASIS: ESTIMATED

LOW BLOWER 2800 RPM AUTO RICH
FUEL GRADE: 115/145

ENGINES: R2800-99W





NOTES:

(1) CAT EQUALS OAT + 1°C.

(2) NO CABIN PRESSURIZATION, WHEN OPERATING CABIN PRESSURE TORQUE PRESSURE FOR RIGHT ENGINE WILL BE 4.0 PSI LOWER.

(3) CHART BASED ON ZERO AIRSPEED. DO NOT EXCEED MAP LIMIT DURING TAKEOFF.

(4) FUEL FLOW IS (0.62 x BHP)LB/HR/ENG (APPROXIMATE).

24,202E

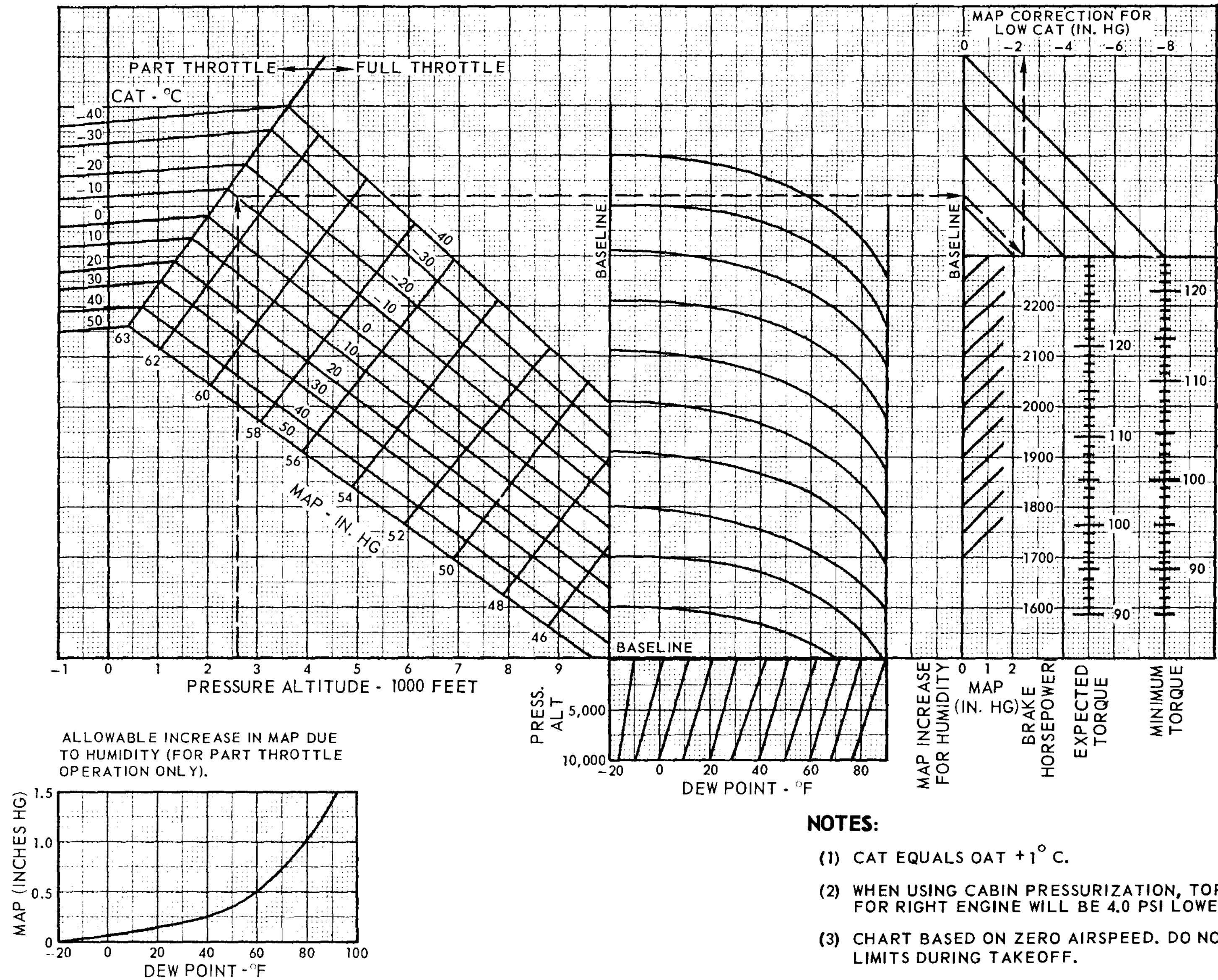
Figure 2A2-1

MAXIMUM DRY POWER AVAILABLE

MODEL: **T-29 C/D**
DATE: 10 SEPTEMBER 1965
DATA BASIS: **ESTIMATED**

LOW BLOWER 2800 RPM AUTO RICH
FUEL GRADE: 115/145

ENGINES: **R2800-99W**



24,175D

NOTES:

(1) CAT EQUALS OAT +1° C.

(2) WHEN USING CABIN PRESSURIZATION, TORQUE PRESSURE FOR RIGHT ENGINE WILL BE 4.0 PSI LOWER.

(3) CHART BASED ON ZERO AIRSPEED. DO NOT EXCEED MAP LIMITS DURING TAKEOFF.

(4) FUEL FLOW IS (0.84 x BHP)LB/HR/ENG (APPROXIMATE).

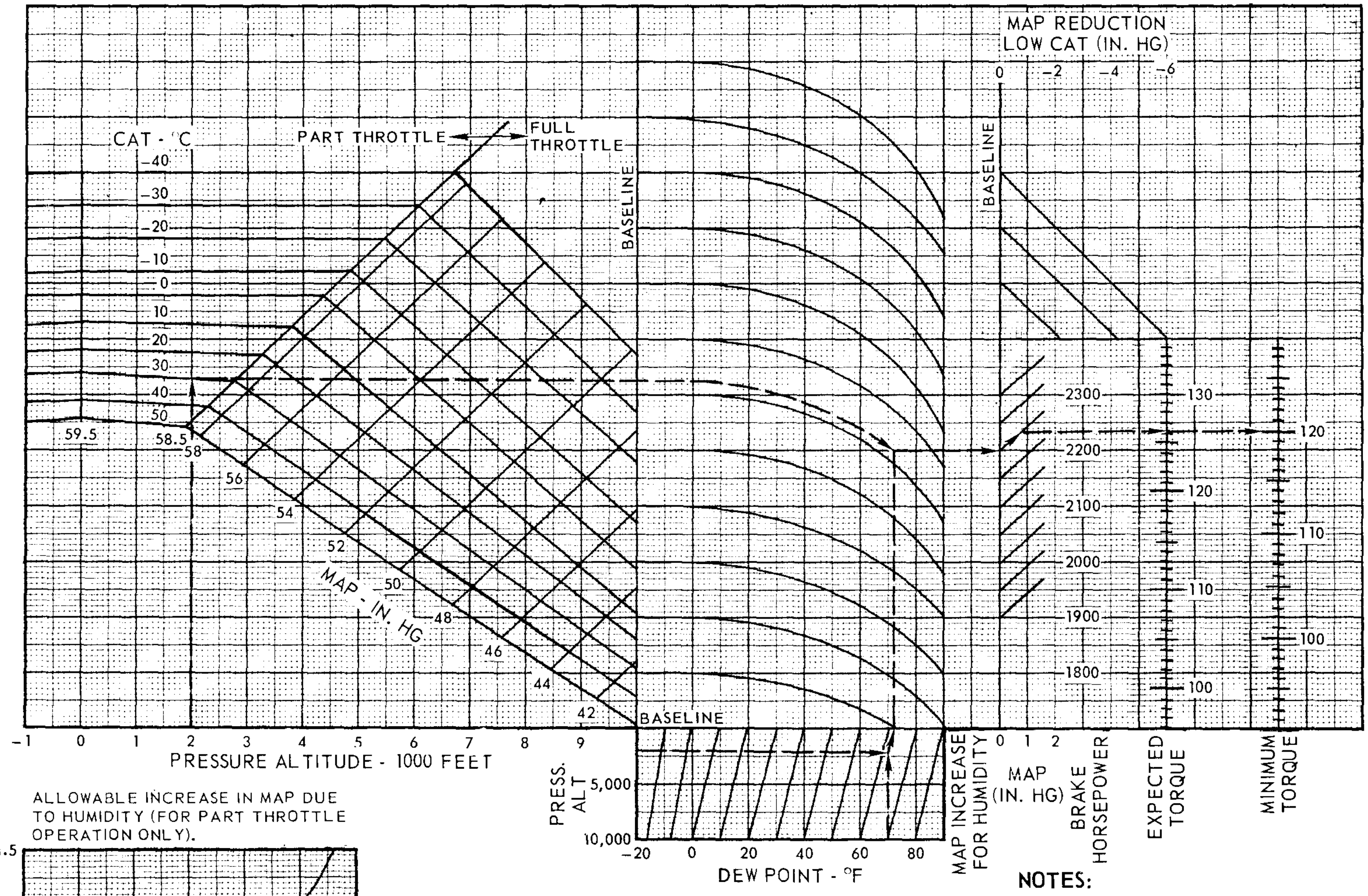
Figure 2A2-2

MAXIMUM WET POWER AVAILABLE

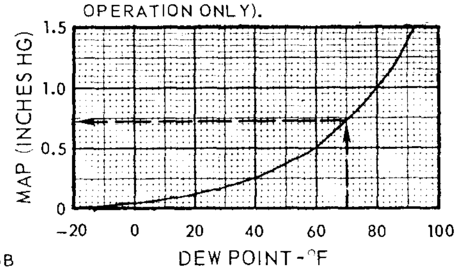
MODEL: **T-29 C/D**
DATE: 5 DECEMBER 1967
DATA BASIS: **ESTIMATED**

LOW BLOWER 2800 RPM AUTO RICH
FUEL GRADE: 100/130

ENGINES: **R2800-99W**



ALLOWABLE INCREASE IN MAP DUE TO HUMIDITY (FOR PART THROTTLE OPERATION ONLY).



24,176B

NOTES:

(1) CAT EQUALS OAT + 1°C.

(2) WHEN USING CABIN PRESSURIZATION, TORQUE PRESSURE WILL BE 4.0 PSI LOWER.

(3) CHART BASED ON ZERO AIRSPEED. DO NOT EXCEED MAP LIMITS DURING TAKEOFF.

(4) FUEL FLOW IS (0.62 x BHP)LB/HR/ENG (APPROXIMATE).

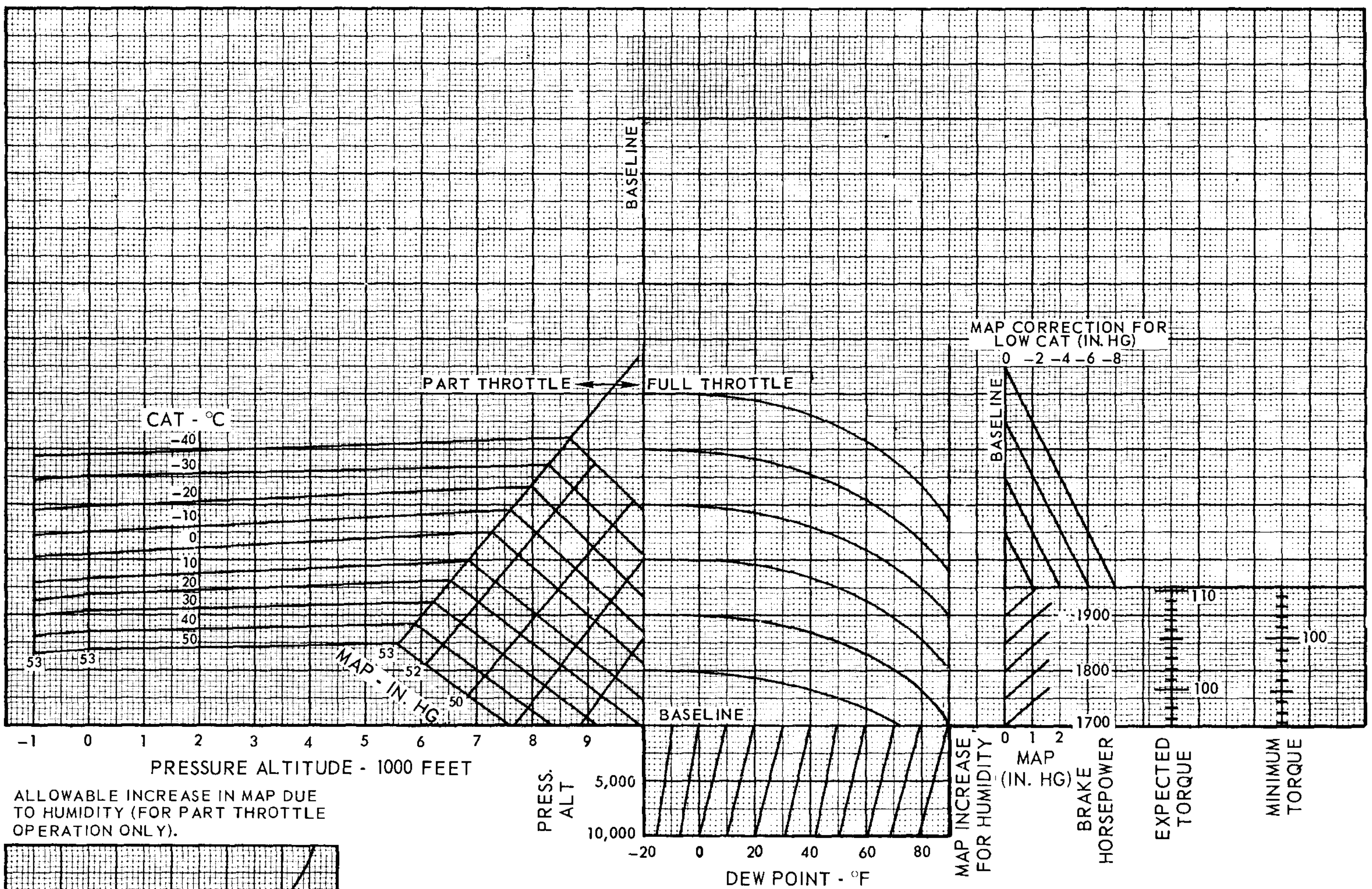
Figure 2A2-3

MAXIMUM DRY POWER AVAILABLE

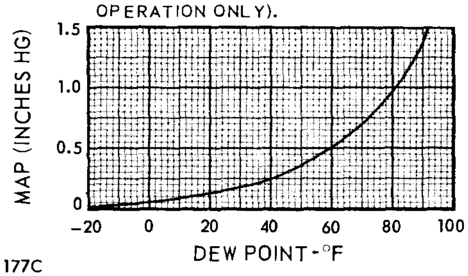
MODEL: **T-29 C/D**
DATE: 5 DECEMBER 1967
DATA BASIS: **ESTIMATED**

LOW BLOWER 2800 RPM AUTO RICH
FUEL GRADE 100/130

ENGINES: **R2800-99W**



ALLOWABLE INCREASE IN MAP DUE TO HUMIDITY (FOR PART THROTTLE OPERATION ONLY).



24,177C

NOTES:

(1) CAT EQUALS OAT + 1°C.

(2) WHEN USING CABIN PRESSURIZATION, TORQUE PRESSURE FOR RIGHT ENGINE WILL BE 4.0 PSI LOWER.

(3) CHART BASED ON ZERO AIRSPEED. DO NOT EXCEED MAP LIMITS DURING TAKEOFF.

(4) FUEL FLOW IS (0.84 x BHP)LB/HR/ENG (APPROXIMATE).

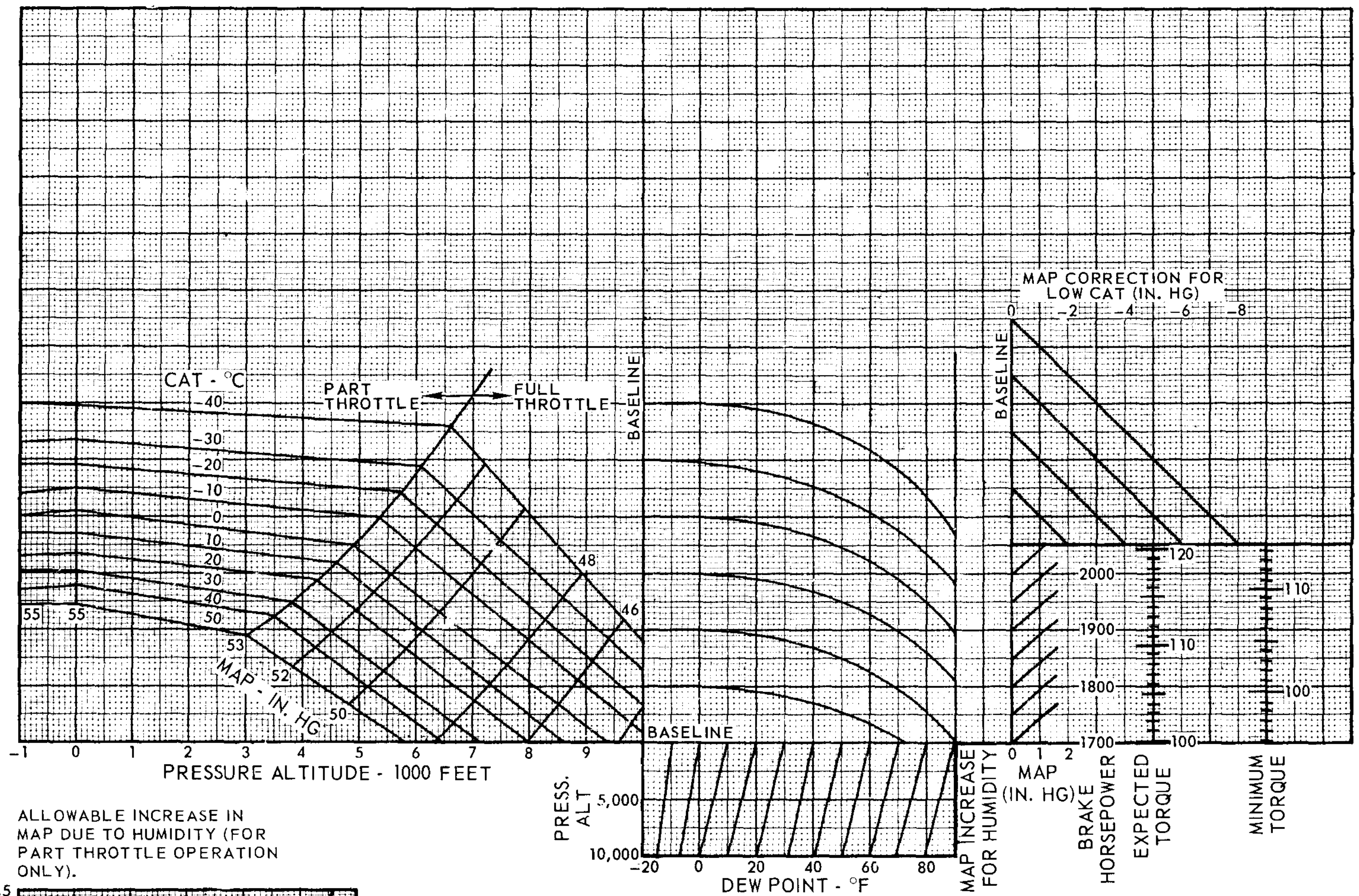
Figure 2A2-4

ALTERNATE MAXIMUM DRY POWER AVAILABLE

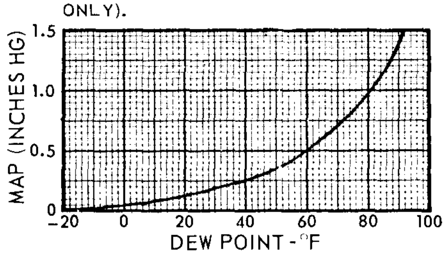
MODEL: **T-29 C/D**
DATE: 5 DECEMBER 1967
DATA BASIS: **ESTIMATED**

LOW BLOWER 2700 RPM AUTO RICH
FUEL GRADE 100/130

ENGINES: **R2800-99W**



ALLOWABLE INCREASE IN MAP DUE TO HUMIDITY (FOR PART THROTTLE OPERATION ONLY).



24,178C

NOTES:

(1) CAT EQUALS OAT + 1°C.

(2) WHEN USING CABIN PRESSURIZATION, TORQUE PRESSURE WILL BE 4.0 PSI LOWER.

(3) CHART BASED ON ZERO AIRSPEED. DO NOT EXCEED MAP LIMITS DURING TAKEOFF.

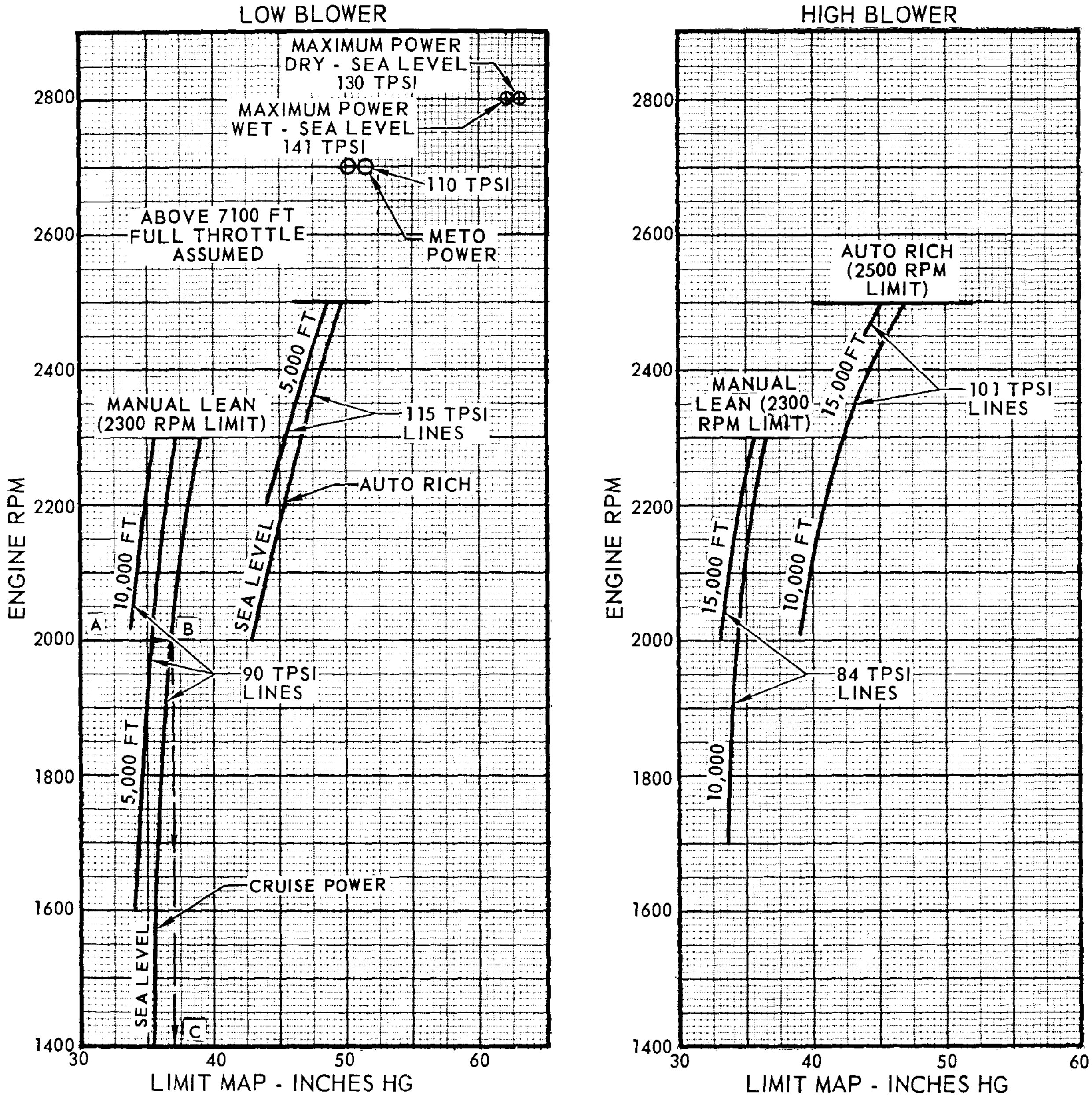
Figure 2A2-5

MANIFOLD PRESSURE LIMITS

MODEL: **T-29 C/D**
DATE: 1 APRIL 1957
DATA BASIS: ENGINE MANUFACTURER'S DATA

FUEL GRADE: 115/145 STANDARD ATMOSPHERE

ENGINES: **R2800-99W**



NOTES:

(1) IN MANUAL LEAN ADD 1/2 INCH MAP FOR EACH 10°C ABOVE STANDARD TEMPERATURE AND SUBTRACT 1/2 INCH MAP FOR EACH 10°C BELOW STANDARD, EXCEPT DO NOT EXCEED MAXIMUM MAP LIMIT.

(2) IN AUTO RICH, ADD 1 INCH MAP FOR EACH 10°C ABOVE STANDARD TEMPERATURE AND SUBTRACT 1 INCH MAP FOR EACH 10°C BELOW STANDARD EXCEPT DO NOT EXCEED MAXIMUM POWER AND METO POWER MAP LIMITS.

(3) ENGINE OPERATION ABOVE INDICATED MAP/RPM COMBINATIONS MAY RESULT IN EXCEEDING TORQUE PRESSURE LIMITS ON A STANDARD DAY.

45,435D

Figure 2A2-6

MODEL: **T-29C/D**
DATE: 14 OCTOBER 1969
DATA BASIS: **ENGINE MANUFACTURER'S DATA**

CLIMB POWER SCHEDULE

1500 BHP/ENGINE

ENGINES: **R2800-99W**

AUTO RICH MIXTURE

PRESSURE ALTITUDE (FEET)	MANIFOLD PRESSURE (IN. HG) CARBURETOR AIR TEMPERATURE							BLOWER	RPM	NOMINAL TORQUE PRESSURE (PSI)	MINIMUM FUEL FLOW (PPH)	DESIRED FUEL FLOW (PPH)
	−30° C	−20° C	−10° C	0° C	+10° C	+20° C	+30° C					
20,000	40.2	40.8										
19,000	40.2	40.9	F.T.									
18,000	39.6	41.0	41.8	F.T.								
17,000	39.6	40.4	41.9	42.6	F.T.	F.T.						
16,000	39.7	40.4	41.2	42.6	43.5	44.5						
15,000	36.2	40.5	41.3	42.0	43.5	44.5		HIGH	2500	95	1110	1145
14,000	36.3	40.5	41.4	42.1	42.8	43.5						
13,000	36.4	37.1	37.8	42.1	42.8	43.5						
12,000	36.5	37.2	37.9	42.2	42.9	43.6		HIGH	2400	99	1040	1045
11,000	36.7	37.3	38.0	38.7	43.0	43.6						
10,000	36.8	37.6	38.4	38.8	39.5	43.7						
9,000	37.0	37.8	38.6	39.2	39.7	40.4						
8,000	37.1	37.9	38.7	39.3	40.0	40.5	41.2					
7,000	37.3	38.0	38.8	39.5	40.2	41.0	41.4	LOW	2400	99	980	1030
6,000	37.5	38.2	39.0	39.7	40.4	41.2	41.8					
5,000	37.6	38.4	39.2	39.9	40.6	41.3	42.0					
4,000	37.8	38.6	39.4	40.1	40.8	41.5	42.2					
3,000	38.0	38.8	39.6	40.3	41.0	41.7	42.4	LOW	2300	103	950	1085
2,000	38.2	39.0	39.8	40.5	41.2	41.9	42.6					
1,000	38.4	39.2	40.0	40.7	41.4	42.1	42.8					
S.L.	38.7	39.5	40.3	41.0	41.7	42.4	43.1					

NOTES:

(1) MINIMUM FUEL FLOW VALUES ARE ENGINE MANUFACTURER'S RECOMMENDED MINIMUMS.

(2) DESIRED FUEL FLOW VALUES ARE OBTAINED BY FLIGHT TEST.

(3) F.T. INDICATES FULL THROTTLE.

(4) NO CABIN PRESSURIZATION LOAD.

(5) NO OPERATION IN HIGH BLOWER ABOVE 15°C C A T
20° C C A T VALUES FOR INTERPOLATION ONLY.

45,970E

Figure 2A2-7

MODEL: **T-29 C/D**
DATE: 2 MARCH 1966
DATA BASIS: **ENGINE MANUFACTURER'S DATA**

CLIMB POWER SCHEDULE

2400 RPM - 1400 BHP

ENGINES: **R2800-99W**

AUTO RICH MIXTURE

PRESSURE ALTITUDE (FEET)	MANIFOLD PRESSURE (IN. HG) CARBURETOR AIR TEMPERATURE							BLOWER	RPM	NOMINAL TORQUE PRESSURE (PSI)	MINIMUM FUEL FLOW (PPH)	DESIRED FUEL FLOW (PPH)
	−30° C	−20° C	−10° C	0° C	+10° C	+20° C	+30° C					
22,000	F.T.											
21,000	36.7	F.T.										
20,000	36.7	37.4	F.T.									
19,000	36.8	37.5	38.2	F.T.	F.T.							
18,000	36.8	37.5	38.2	38.8	39.6							
17,000	36.8	37.5	38.2	38.8	39.6							
16,000	36.8	37.5	38.2	38.8	39.6	SEE NOTE (3)		HIGH	2400	92	960	1110
15,000	33.8	37.5	38.2	38.9	39.7							
14,000	33.9	34.5	38.2	38.9	39.7							
13,000	34.0	34.6	35.3	38.9	39.7							
12,000	34.1	34.7	35.4	36.1	39.7							
11,000	34.2	34.9	35.6	36.2	36.9							
10,000	34.3	35.0	35.7	36.3	37.0	37.6	38.3					
9,000	34.5	35.1	35.8	36.5	37.1	37.8	38.4					
8,000	34.6	35.2	35.9	36.6	37.2	37.9	38.5					
7,000	34.7	35.3	36.0	36.7	37.4	38.1	38.6					
6,000	34.8	35.4	36.1	36.8	37.5	38.2	38.7					
5,000	35.0	35.7	36.4	37.1	37.8	38.5	39.0	LOW	2400	92	920	1065
4,000	35.2	35.9	36.6	37.4	38.0	38.7	39.3					
3,000	35.4	36.1	36.8	37.5	38.2	38.9	39.5					
2,000	35.5	36.2	37.0	37.6	38.3	39.0	39.7					
1,000	35.8	36.5	37.3	37.9	38.6	39.3	40.0					
S.L.	36.1	36.8	37.5	38.2	38.9	39.6	40.2					

NOTES:

(1) F.T. INDICATES FULL THROTTLE.

(2) NO CABIN PRESSURIZATION LOAD.

(3) IF CARBURETOR AIR TEMPERATURE EXCEEDS 15°C, CONTINUE CLIMB IN LOW BLOWER

24,216D

Figure 2A2-8

MODEL: **T-29C/D**
DATE: 1 OCTOBER 1962
DATA BASIS: ESTIMATED

CLIMB POWER SCHEDULE

METO POWER

MIXTURE AUTO RICH

ENGINES: **R2800-99W**

PRESSURE ALTITUDE (FEET)	MANIFOLD PRESSURE (IN. HG.) CARBURETOR AIR TEMPERATURE °C							BLOWER	RPM	NOMINAL TORQUE PRESSURE (PSI)	MINIMUM FUEL FLOW (PPH)	DESIRED FUEL FLOW (PPH)	BHP
	−30	−20	−10	0	+15	+30	+40						
20,000	40.2	F.T.											
19,000	40.3	41.0	F.T.										
18,000	40.4	41.1	41.8	F.T.									
17,000	42.8	41.2	41.9	42.7	F.T.			HIGH	2500	95	1110	1145	1500
16,000	42.9	43.7	44.6	42.8	43.8								
15,000	41.1	43.8	44.7	42.9	43.9								
14,000	41.3	42.3	44.8	45.5	46.2								
13,000	41.5	42.7	42.9	45.6	46.3	47.0							
12,000	47.5	43.0	43.2	43.6	46.4	47.1		HIGH	2500	101	1210	1230	1600
11,000	48.0	48.5	43.5	43.9	44.8	47.2							
10,000	48.2	48.7	49.0	44.3	44.9	45.3							
9,000	48.5	49.0	49.2	49.4	45.0	45.5	45.7						
8,000	48.5	49.0	49.2	49.7	50.2	45.7	45.9						
7,000	48.6	49.1	49.3	49.8	50.4		46.1	LOW	2700	100	1240	1300	1700
6,000	48.7	49.2	49.5	50.0	50.6		46.3						
5,000	49.0	49.4	49.7	50.2	50.8								
4,000	49.2	49.7	50.0	50.5	51.2								
3,000	49.2	49.7	50.2	50.7	51.3								
2,000	49.5	50.0	50.5	51.0	51.5			LOW	2700	110	1470	1500	1900
1,000	49.7	50.2	50.7	51.2	51.5								
S.L.	49.7	50.2	50.7	51.2	51.5								

NOTES:

(1) F.T. INDICATES FULL THROTTLE.

(2) NO CABIN PRESSURIZATION LOAD

45,972A

Figure 2A2-9

MODEL: **T-29C/D**
DATE: 1 APRIL 1957
DATA BASIS: ENGINE MANUFACTURER'S DATA

POWER SCHEDULE

500 BHP/ENG

ENGINES: **R2800-99W**

MANUAL LEAN FROM BEST POWER

PRESSURE ALTITUDE (FEET)	MANIFOLD PRESSURE (IN. HG) CARBURETOR AIR TEMPERATURE								BLOWER	RPM	NOMINAL TORQUE PRESSURE (PSI)	NOMINAL FUEL FLOW (PPH)
	-30°C	-20°C	-10°C	0°C	+10°C	+20°C	+30°C	+38°C				
20,000	18.9	19.3	19.0	19.3	19.7	19.4	19.7	20.1	LOW	1900	41	265
19,000	19.7	19.4	19.8	20.2	19.8	20.2	20.5	20.3				
18,000	19.8	20.2	20.0	20.4	20.7	20.4	20.7	21.1	LOW	1800	44	255
17,000	20.6	20.4	20.8	21.2	20.9	21.3	21.6	21.3				
16,000	20.8	21.3	21.0	21.4	21.8	21.5	21.8	22.2	LOW	1700	46	250
15,000	21.0	21.5	21.9	22.4	22.0	22.4	22.8	22.4				
14,000	22.2	21.7	22.1	22.6	23.0	22.6	23.0	23.4	LOW	1600	49	240
13,000	22.4	22.9	23.4	22.8	23.2	23.6	24.0	23.6				
12,000	22.7	23.1	23.6	24.1	23.4	23.8	24.2	24.7	LOW	1500	53	235
11,000	22.9	23.4	23.8	24.3	24.7	25.1	24.4	24.9				
10,000	23.1	23.6	24.1	24.5	25.0	25.4	25.9	25.1				
9,000	23.4	23.9	24.4	24.8	25.3	25.7	26.2	26.6	LOW	1400	56	230
8,000	23.7	24.2	24.6	25.1	25.6	26.0	26.4	26.9				
7,000	24.0	24.5	24.9	25.4	25.9	26.3	26.7	27.2				
6,000	24.2	24.7	25.2	25.7	26.2	26.6	27.0	27.5				
5,000	24.5	25.0	25.5	26.0	26.5	27.0	27.4	27.9				
4,000	24.8	25.3	25.8	26.3	26.8	27.3	27.7	28.2				
3,000	25.2	25.7	26.2	26.7	27.2	27.7	28.2	28.7				
2,000	25.5	26.0	26.5	27.0	27.5	28.0	28.5	28.9				
1,000	25.9	26.4	26.9	27.4	27.9	28.4	28.9	29.3				
S.L.	26.2	26.7	27.2	27.7	28.2	28.7	29.2	29.7				

NOTES:

(1) MANUAL LEAN MIXTURE SETTING ESTABLISHED BY 7 PSI TORQUE PRESSURE DROP FROM BEST POWER.

(2) NO CABIN PRESSURIZATION LOAD.

24,203C

Figure 2A2-10

MODEL: **T-29C/D**
DATE: 1 APRIL 1957
DATA BASIS: ENGINE MANUFACTURER'S DATA

POWER SCHEDULE

600 BHP/ENG

ENGINES: **R2800-99W**

MANUAL LEAN FROM BEST POWER

PRESSURE ALTITUDE (FEET)	MANIFOLD PRESSURE (IN. HG) CARBURETOR AIR TEMPERATURE								BLOWER	RPM	NOMINAL TORQUE PRESSURE (PSI)	NOMINAL FUEL FLOW (PPH)
	−30°C	−20°C	−10°C	0°C	+10°C	+20°C	+30°C	+38°C				
15,000	22.6	23.1	22.9	23.4	23.8	24.2			LOW	1700	56	280
14,000	22.9	23.3	23.7	24.2	24.1	24.5	24.9					
13,000	23.8	23.6	24.1	24.5	25.0	25.4	25.1	25.4				
12,000	24.0	24.5	25.0	24.8	25.3	25.7	26.1	25.6				
11,000	24.8	24.7	25.2	25.7	26.1	25.9	26.3	26.8	LOW	1600	59	270
10,000	25.1	25.7	25.4	25.8	26.3	26.7	26.5	27.0				
9,000	25.4	25.9	26.5	26.9	26.5	27.0	27.5	27.3				
8,000	25.7	26.3	26.8	27.2	27.7	27.2	27.7	28.1	LOW	1500	63	265
7,000	26.0	26.5	27.0	27.5	28.0	28.6	27.9	28.3				
6,000	26.4	26.9	27.4	27.9	28.5	29.0	29.4	28.5				
5,000	26.7	27.2	27.7	28.2	28.7	29.3	29.8	30.2	LOW	1400	68	260
4,000	27.0	27.5	28.1	28.7	29.1	29.7	30.2	30.6				
3,000	27.3	27.8	28.4	29.0	29.5	30.0	30.5	31.0				
2,000	27.6	28.1	28.7	29.2	29.7	30.3	30.8	31.3				
1,000	27.9	28.4	29.0	29.5	30.1	30.6	31.1	31.6				
S.L.	28.3	28.9	29.4	30.0	30.5	31.1	31.6	32.0				

NOTES:

(1) MANUAL LEAN MIXTURE SETTING ESTABLISHED BY 7 PSI TORQUE PRESSURE DROP FROM BEST POWER.
(2) NO CABIN PRESSURIZATION LOAD.

24,204C

Figure 2A2-11

MODEL: **T-29C/D**
DATE: 1 APRIL 1957
DATA BASIS: ENGINE MANUFACTURER'S DATA

POWER SCHEDULE

700 BHP/ENG

ENGINES: **R2800-99W**

MANUAL LEAN FROM BEST POWER

PRESSURE ALTITUDE (FEET)	MANIFOLD PRESSURE (IN. HG) CARBURETOR AIR TEMPERATURE -30°C	-20°C	-10°C	0°C	+10°C	+20°C	+30°C	+38°C	BLOWER	RPM	NOMINAL TORQUE PRESSURE (PSI)	NOMINAL FUEL FLOW (PPH)
25,000	21.9	22.4	22.8	23.3	23.1	23.5	23.9		HIGH	2200	50	370
24,000	22.9	23.3	22.8	23.2	23.7	23.6	24.0					
23,000	22.9	23.3	23.8	23.3	23.7	24.1	24.0					
22,000	23.0	23.4	23.9	24.3	24.8	24.2	24.6		HIGH	2100	53	360
21,000	23.8	24.3	24.7	24.4	24.8	25.3	24.6					
20,000	23.9	24.4	24.8	24.5	24.9	25.4	25.8		HIGH	2000	55	350
19,000	24.8	25.3	24.9	25.4	25.9	26.3	25.8					
18,000	24.9	25.4	26.0	25.5	26.0	26.4	25.9					
17,000	23.2	25.5	26.1	26.5	27.0	26.5	27.0		HIGH	1900	58	340
16,000	23.5	23.9	26.2	26.7	27.1	27.6	27.1					
15,000	23.7	24.1	24.5	25.0	27.3	27.7	28.2		HIGH	1800	62	330
14,000	24.6	25.0	24.7	25.1	25.6	26.0	28.3					
13,000	24.8	25.3	25.8	26.3	25.9	26.3	26.8					
12,000	25.6	26.1	26.5	26.5	27.0	26.7	27.2	27.5	LOW	1800	62	320
11,000	25.8	26.3	26.9	27.4	27.2	27.7	28.2	27.8				
10,000	26.8	26.6	27.1	27.6	28.2	28.0	28.5	28.9	LOW	1700	66	315
9,000	27.1	27.6	27.3	27.8	28.4	28.8	28.7	29.1				
8,000	27.3	27.9	28.4	28.9	28.6	29.0	29.5	29.4				
7,000	28.4	28.9	28.7	29.3	29.8	30.3	29.7	30.1	LOW	1600	69	310
6,000	28.6	29.2	29.8	30.3	30.0	30.5	31.0	30.3				
5,000	29.0	29.6	30.2	30.7	31.3	30.8	31.3	31.7	LOW	1500	74	305
4,000	29.3	29.9	30.5	31.1	31.7	32.2	31.7	32.1				
3,000	29.7	30.3	30.9	31.5	32.1	32.7	33.3	33.7	LOW	1400	79	295
2,000	30.0	30.7	31.3	31.9	32.4	33.0	33.6	34.0				
1,000	30.4	31.0	31.7	32.3	32.8	33.4	34.0	34.4				

NOTES:

(1) MANUAL LEAN MIXTURE SETTING ESTABLISHED BY 7 PSI TORQUE PRESSURE DROP FROM BEST POWER.

(2) NO CABIN PRESSURIZATION LOAD

24,205C

Figure 2A2-12

MODEL: **T-29C/D**
DATE: 1 APRIL 1957
DATA BASIS: ENGINE MANUFACTURER'S DATA

POWER SCHEDULE

800 BHP/ENG

ENGINES: **R2800-99W**

MANUAL LEAN FROM BEST POWER

PRESSURE ALTITUDE (FEET)	MANIFOLD PRESSURE (IN.HG) CARBURETOR AIR TEMPERATURE								BLOWER	RPM	NOMINAL TORQUE PRESSURE (PSI)	NOMINAL FUEL FLOW (PPH)
	−30°C	−20°C	−10°C	0°C	+10°C	+20°C	+30°C	+38°C				
25,000	23.9	24.4	24.9	25.2	25.6	26.1	F.T.					
24,000	23.9	24.5	24.9	25.5	25.8	26.2	26.7		HIGH	2300	55	405
23,000	24.6	25.1	25.6	25.5	25.8	26.3	26.7					
22,000	22.6	23.1	25.7	26.2	25.9	26.3	26.8		HIGH	2200	58	392
21,000	23.2	23.3	23.7	26.4	26.8	27.3	26.8					
20,000	23.3	23.6	23.8	24.3	24.7	27.4	27.9					
19,000	23.9	23.7	24.1	24.6	24.9	25.3	27.9		HIGH	2100	61	384
18,000	24.0	24.4	24.3	24.8	25.2	25.5	26.0					
17,000	24.7	24.5	25.0	25.5	25.3	25.8	26.2	26.5	LOW	2200	58	392
16,000	24.8	25.3	25.2	25.6	26.1	26.0	26.5	26.9	LOW	2100	61	382
15,000	25.0	25.5	26.0	26.5	26.3	26.7	26.7	27.1				
14,000	26.1	25.6	26.1	26.7	27.1	26.9	27.4	27.8	LOW	2000	64	373
13,000	26.3	26.8	27.3	26.9	27.4	27.8	27.5	27.9				
12,000	27.2	27.0	27.5	28.0	28.6	28.0	28.5	28.9	LOW	1900	67	366
11,000	27.4	28.0	28.5	28.2	28.8	29.2	28.7	29.1				
10,000	28.1	28.2	28.7	29.2	29.0	29.5	30.0	30.4				
9,000	28.3	28.8	29.4	29.4	30.0	30.5	30.2	30.6	LOW	1800	72	357
8,000	28.7	29.2	29.8	30.3	30.2	30.7	31.2	30.8				
7,000	29.6	30.2	30.1	30.6	31.2	30.9	31.5	31.9	LOW	1700	74	350
6,000	29.9	30.5	31.1	31.0	31.5	32.0	32.6	32.1				
5,000	30.1	30.7	31.3	31.9	31.7	32.2	32.8	33.2	LOW	1600	79	345
4,000	30.4	31.0	32.6	32.2	32.8	33.4	32.9	33.3				
3,000	30.7	31.2	31.9	32.5	33.1	33.7	34.3	34.7				
2,000	31.0	31.6	32.3	32.9	33.5	34.0	34.6	35.0	LOW	1500	85	340
1,000	31.4	32.0	32.7	33.3	33.9	34.4	35.0	35.4				

NOTES:

(1) MANUAL LEAN MIXTURE SETTING ESTABLISHED BY 7 PSI TORQUE PRESSURE DROP FROM BEST POWER.

(2) F.T. INDICATES FULL THROTTLE.

(3) NO CABIN PRESSURIZATION LOAD.

24,206C

Figure 2A2-13

MODEL: **T-29C/D**
DATE: 1 APRIL 1957
DATA BASIS: ENGINE MANUFACTURER'S DATA

POWER SCHEDULE

900 BHP/ENG

ENGINES: **R2800-99W**

MANUAL LEAN FROM BEST POWER

PRESSURE ALTITUDE (FEET)	MANIFOLD PRESSURE (IN. HG) CARBURETOR AIR TEMPERATURE								BLOWER	RPM	NOMINAL TORQUE PRESSURE (PSI)	NOMINAL FUEL FLOW (PPH)
	−30°C	−20°C	−10°C	0°C	+10°C	+20°C	+30°C	+38°C				
25,000	26.7	27.2	F.T.	F.T.					HIGH	2300	62	452
24,000	26.6	27.2	27.7	28.2	F.T.	F.T.						
23,000	26.7	27.3	27.8	28.2	28.8	29.3	F.T.					
22,000	26.7	27.3	27.8	28.3	28.8	29.2	29.7					
21,000	27.2	27.8	27.9	28.4	28.9	29.3	29.7					
20,000	25.0	27.8	28.3	28.9	28.9	29.4	29.9					
19,000	25.0	25.5	26.1	28.8	29.4	29.9	29.9		HIGH	2200	65	440
18,000	25.5	26.0	26.2	26.7	27.1	30.0	30.5					
17,000	25.6	26.1	26.7	27.2	27.2	27.7	30.6		HIGH	2100	68	430
16,000	26.3	26.8	26.8	27.3	27.7	27.8	28.3					
15,000	26.4	26.9	27.5	27.4	27.9	28.3	28.5	28.9	LOW	2200	65	426
14,000	27.3	27.8	27.6	28.2	28.7	28.5	29.0	29.0				
13,000	27.4	28.0	28.5	28.3	28.8	29.3	29.2	29.6	LOW	2100	68	418
12,000	28.5	28.2	28.7	29.3	28.9	29.5	30.0	29.7				
11,000	28.7	29.3	29.8	29.6	30.1	29.7	30.2	30.6	LOW	2000	72	409
10,000	28.9	29.5	30.0	30.6	30.2	30.7	30.3	30.7				
9,000	29.9	30.5	31.1	30.7	31.3	30.9	31.5	31.9	LOW	1900	75	403
8,000	30.4	31.1	31.3	31.8	31.5	32.0	31.6	32.0				
7,000	30.6	31.2	31.9	32.1	32.7	32.3	32.9	33.3	LOW	1800	80	396
6,000	31.0	31.6	32.2	32.9	32.9	33.5	34.1	33.5				
5,000	31.1	31.8	32.4	33.0	33.6	34.2	34.3	34.7	LOW	1700	84	389
4,000	31.3	31.9	32.5	33.2	33.8	34.4	35.0	35.4	LOW	1650	86	385
3,000	31.5	32.1	32.7	33.4	34.0	34.6	35.2	35.6				
2,000	31.7	32.4	33.0	33.7	34.2	34.8	35.4	35.8				
1,000	32.0	32.6	33.3	33.9	34.5	35.1	35.7	36.1				

NOTES:

(1) MANUAL LEAN MIXTURE SETTING ESTABLISHED BY 7 PSI TORQUE PRESSURE DROP FROM BEST POWER.

(2) F.T. INDICATES FULL THROTTLE.

(3) NO CABIN PRESSURIZATION LOAD.

24,207D

Figure 2A2-14

MODEL: **T-29C/D**
DATE: 1 APRIL 1957
DATA BASIS: ENGINE MANUFACTURER'S DATA

POWER SCHEDULE

950 BHP/ENG

ENGINES: **R2800-99W**

PRESSURE ALTITUDE (FEET)	MANIFOLD PRESSURE (IN. HG) CARBURETOR AIR TEMPERATURE								BLOWER	RPM	NOMINAL TORQUE PRESSURE (PSI)	NOMINAL FUEL FLOW (PPH)
	−30°C	−20°C	−10°C	0°C	+10°C	+20°C	+30°C	+38°C				
25,000	28.0	28.5	F.T.									
24,000	28.0	28.5	29.0	F.T.								
23,000	28.1	28.6	29.1	29.4	F.T.	F.T.			HIGH	2300	66	470
22,000	28.0	28.6	29.1	29.7	30.2	30.7						
21,000	28.3	28.9	29.2	29.8	30.2	30.7						
20,000	26.0	29.0	29.5	30.1	30.3	30.8			HIGH	2200	70	460
19,000	26.1	26.6	27.2	30.2	30.6	30.8						
18,000	26.5	27.0	27.3	27.8	30.6	31.1			HIGH	2100	72	450
17,000	26.6	27.1	27.7	27.9	28.3	31.2						
16,000	27.3	27.8	27.9	28.4	28.5	29.0						
15,000	27.5	28.0	28.6	28.5	29.0	29.1	29.3	29.8	LOW	2200	70	445
14,000	28.0	28.6	28.7	29.3	29.3	29.7	29.7	30.0				
13,000	28.2	28.8	29.3	29.5	30.1	29.8	30.3	30.8	LOW	2100	72	436
12,000	29.1	29.7	29.5	30.1	30.2	30.8	30.5	31.0				
11,000	29.3	29.9	30.4	30.2	30.2	31.0	31.5	32.0	LOW	2000	76	430
10,000	30.2	30.0	30.6	31.2	31.0	31.6	31.7	32.2				
9,000	30.4	31.0	30.8	31.3	32.0	31.8	32.3	32.8	LOW	1950	78	425
8,000	30.7	31.3	32.0	31.5	32.1	32.7	32.5	33.0				
7,000	30.9	31.5	32.2	32.7	33.3	32.9	33.4	33.9	LOW	1850	81	420
6,000	31.2	31.8	32.4	33.0	33.6	34.2	33.6	34.1				
5,000	31.3	31.9	32.6	33.2	33.8	34.4	35.0	35.5				
4,000	31.4	32.0	32.7	33.3	33.9	34.5	35.1	35.6				
3,000	31.6	32.2	32.9	33.5	34.1	34.7	35.3	35.8	LOW	1750	86	410
2,000	31.8	32.5	33.1	33.7	34.3	34.9	35.5	35.9				
1,000	32.0	32.6	33.3	33.9	34.5	35.1	35.7	36.1				

NOTES:

(1) MANUAL LEAN MIXTURE SETTING ESTABLISHED BY 7 PSI TORQUE PRESSURE DROP FROM BEST POWER.

(2) F.T. INDICATES FULL THROTTLE.

(3) NO CABIN PRESSURIZATION LOAD.

24,150A

Figure 2A2-15

MODEL: **T-29C/D**
DATE: 1 APRIL 1957
DATA BASIS: ENGINE MANUFACTURER'S DATA

POWER SCHEDULE

1000 BHP/ENG

ENGINES: **R2800-99W**

MANUAL LEAN FROM BEST POWER

PRESSURE ALTITUDE (FEET)	MANIFOLD PRESSURE (IN. HG) CARBURETOR AIR TEMPERATURE								BLOWER	RPM	NOMINAL TORQUE PRESSURE (PSI)	NOMINAL FUEL FLOW (PPH)
	−30°C	−20°C	−10°C	0°C	+10°C	+20°C	+30°C	+38°C				
23,000	29.1	29.7	F.T.	F.T.					HIGH	2300	69	491
22,000	29.1	29.7	30.3	30.9	F.T.							
21,000	29.2	29.7	30.3	30.9	31.4	F.T.						
20,000	29.5	29.8	30.3	30.9	31.4	32.0	F.T.					
19,000	29.6	30.2	30.7	30.9	31.4	32.0	32.6					
18,000	27.0	27.5	30.8	31.3	31.5	32.0	32.6					
17,000	27.2	27.7	28.3	31.4	31.8	32.0	32.6		HIGH	2200	72	480
16,000	27.8	28.3	28.4	28.9	31.9	32.4	32.6					
15,000	27.9	28.5	29.1	29.0	29.6	32.5	33.0		HIGH	2100	76	468
14,000	28.8	29.4	29.2	29.7	29.7	30.1	33.0					
13,000	28.9	29.5	30.1	29.8	30.4	30.2	30.8	31.2	LOW	2200	72	463
12,000	29.8	30.3	30.2	30.7	30.5	31.1	31.7	31.4				
11,000	30.4	30.6	31.2	30.9	31.4	31.3	31.9	32.3	LOW	2100	76	455
10,000	30.5	31.1	31.3	31.9	31.5	32.1	32.7	32.4				
9,000	30.7	31.3	32.0	32.1	32.6	32.2	32.8	33.2	LOW	2000	79	450
8,000	30.9	31.5	32.1	32.6	32.8	33.4	34.0	33.4				
7,000	31.1	31.7	32.3	32.9	33.5	34.2	34.2	34.6	LOW	1900	83	445
6,000	31.3	31.9	32.5	33.1	33.7	34.3	34.9	35.3	LOW	1850	86	440
5,000	31.4	32.1	32.7	33.3	33.9	34.5	35.1	35.5				
4,000	31.6	32.3	32.9	33.6	34.2	34.8	35.4	35.8				
3,000	31.9	32.5	33.1	33.8	34.3	35.0	35.6	36.0				
2,000	32.0	32.7	33.3	33.9	34.5	35.1	35.7	36.1				
1,000	32.3	32.9	33.6	34.2	34.8	35.4	36.0	36.4				

NOTES:

(1) MANUAL LEAN MIXTURE SETTING ESTABLISHED BY 7 PSI TORQUE PRESSURE DROP FROM BEST POWER.

(2) F.T. INDICATES FULL THROTTLE

(3) NO CABIN PRESSURIZATION LOAD.

24,208D

Figure 2A2-16

MODEL: **T-29C/D**
DATE: 1 APRIL 1957
DATA BASIS: ENGINE MANUFACTURER'S DATA

POWER SCHEDULE

1050 BHP/ENG

ENGINES: **R2800-99W**

PRESSURE ALTITUDE (FEET)	MANIFOLD PRESSURE (IN. HG) CARBURETOR AIR TEMPERATURE								BLOWER	RPM	NOMINAL TORQUE PRESSURE (PSI)	NOMINAL FUEL FLOW (PPH)
	−30°C	−20°C	−10°C	0°C	+10°C	+20°C	+30°C	+38°C				
23,000	30.6	F.T.	F.T.						HIGH	2300	72	515
22,000	30.4	31.0	31.6	F.T.								
21,000	30.3	30.9	31.7	32.2	F.T.	F.T.						
20,000	30.4	31.0	31.5	32.2	32.8	33.3						
19,000	30.7	31.3	31.6	32.2	32.9	33.4						
18,000	28.2	31.5	31.9	32.3	32.7	33.3			HIGH	2200	76	500
17,000	28.3	28.9	32.1	32.6	32.8	33.4						
16,000	28.8	29.0	29.6	32.7	33.2	33.9			HIGH	2100	80	490
15,000	28.9	29.5	29.7	30.2	33.3	34.0						
14,000	29.8	29.7	30.3	30.3	30.9	31.4			LOW	2200	76	485
13,000	29.9	30.5	30.5	31.0	31.0	31.5						
12,000	30.4	30.7	31.2	31.1	31.7	32.3	32.3	32.7				
11,000	30.6	31.2	31.3	32.0	32.0	32.5	32.5	32.9				
10,000	30.7	31.3	31.9	32.1	32.8	33.2	33.1	33.6	LOW	2100	80	475
9,000	30.8	31.5	32.1	32.7	33.3	33.8	33.8	33.8				
8,000	31.0	31.6	32.3	32.8	33.5	34.0	34.0	34.5	LOW	2000	83	470
7,000	31.2	31.8	32.4	33.0	33.7	34.2	34.8	34.6				
6,000	31.3	32.0	32.6	33.2	33.8	34.4	35.0	35.4	LOW	1950	86	465
5,000	31.5	32.1	32.8	33.4	34.0	34.6	35.2	35.6				
4,000	31.7	32.3	32.9	33.6	34.2	34.8	35.4	35.8				
3,000	31.9	32.5	33.2	33.8	34.4	35.0	35.6	36.0				
2,000	32.1	32.7	33.4	34.0	34.6	35.2	35.8	36.2				
1,000	32.3	32.9	33.6	34.2	34.8	35.4	36.0	36.4				

NOTES:

(1) MANUAL LEAN MIXTURE SETTING ESTABLISHED BY 7 PSI TORQUE PRESSURE DROP FROM BEST POWER.

(2) F.T. INDICATES FULL THROTTLE.

(3) NO CABIN PRESSURIZATION LOAD.

24,151A

Figure 2A2-17

MODEL: **T-29 C/D**
DATE: 1 APRIL 1957
DATA BASIS: ENGINE MANUFACTURER'S DATA

POWER SCHEDULE

1100 BHP/ENG

ENGINES: **R2800-99W**

MANUAL LEAN FROM BEST POWER

PRESSURE ALTITUDE (FEET)	MANIFOLD PRESSURE (IN. HG) CARBURETOR AIR TEMPERATURE								BLOWER	RPM	NOMINAL TORQUE PRESSURE (PSI)	NOMINAL FUEL FLOW (PPH)
	−30°C	−20°C	−10°C	0°C	+10°C	+20°C	+30°C	+38°C				
21,000	31.6	32.1	F.T.	F.T.								
20,000	31.6	32.1	32.8	33.4	F.T.							
19,000	31.7	32.1	32.8	33.5	34.0	F.T.						
18,000	31.9	32.2	32.9	33.4	34.1	34.6	F.T.		HIGH	2300	76	535
17,000	32.0	32.4	33.1	33.5	34.0	34.6	35.1					
16,000	29.3	29.9	33.2	33.7	34.1	34.6	35.1					
15,000	30.1	30.1	30.6	33.8	34.3	34.6	35.1		HIGH	2200	79	520
14,000	30.2	30.7	30.7	31.3	34.4	35.1	35.1					
13,000	31.0	30.9	31.5	31.4	32.0	35.2	35.7		HIGH	2100	83	510
12,000	31.1	31.7	31.7	32.2	32.2	32.8	35.7					
11,000	31.2	31.9	32.5	32.3	32.9	33.0	33.6	34.0	LOW	2200	79	505
10,000	31.3	32.0	32.6	33.2	33.0	33.6	34.2	34.1				
9,000	31.5	32.1	3[illegible].8	33.4	34.0	33.7	34.3	34.7	LOW	2100	83	495
8,000	31.7	32.3	33.0	33.5	34.2	34.8	35.4	34.9				
7,000	31.9	32.5	33.1	33.7	34.3	35.0	35.6	36.0				
6,000	32.1	32.7	33.4	34.0	34.6	35.2	35.8	36.2				
5,000	32.2	32.8	33.5	34.1	34.7	35.3	35.9	36.3				
4,000	32.3	33.0	33.7	34.3	34.9	35.5	36.1	36.5	LOW	2000	87	490
3,000	32.6	33.3	34.0	34.6	35.2	35.8	36.4	36.8				
2,000	32.7	33.4	34.1	34.7	35.3	35.9	36.5	37.0				
1,000	32.8	33.5	34.2	34.8	35.4	36.0	36.7	37.2				

NOTES:

(1) MANUAL LEAN MIXTURE SETTING ESTABLISHED BY 7 PSI TORQUE PRESSURE DROP FROM BEST POWER.

(2) F.T. INDICATES FULL THROTTLE.

(3) NO CABIN PRESSURIZATION LOAD.

24,209D

Figure 2A2-18

MODEL: **T-29C/D**
DATE: 1 APRIL 1957
DATA BASIS: ENGINE MANUFACTURER'S DATA

POWER SCHEDULE

1150 BHP/ENG

ENGINES: **R2800-99W**

PRESSURE ALTITUDE (FT)	MANIFOLD PRESSURE (IN. HG) CARBURETOR AIR TEMPERATURE								BLOWER	RPM	NOMINAL TORQUE PRESSURE (PSI)	NOMINAL FUEL FLOW (PPH)
	−30° C	−20° C	−10° C	0° C	+10° C	+20° C	+30° C	+38° C				
20,000	33.2	F.T.							HIGH	2300	80	533
19,000	33.2	33.8	F.T.									
18,000	33.0	33.6	34.4	F.T.								
17,000	33.0	33.6	34.3	35.1	F.T.							
16,000	33.0	33.6	34.3	34.9	35.6	F.T.						
15,000	32.9	33.6	34.2	34.8	35.5	36.2	F.T.					
14,000	30.7	31.4	32.0	34.8	35.5	36.2	36.7					
13,000	30.8	31.4	32.1	32.7	35.4	36.0	36.7		HIGH	2200	83	539
12,000	31.3	31.9	32.6	32.8	33.3	36.0	36.7					
11,000	31.6	32.2	32.8	33.4	33.5	34.1	34.6	35.0	LOW	2200	83	522
10,000	31.7	32.3	33.0	33.6	34.2	34.2	34.8	35.2				
9,000	31.8	32.4	33.1	33.7	34.3	34.9	35.5	35.3				
8,000	31.9	32.6	33.2	33.8	34.5	35.1	35.7	35.9	LOW	2100	87	513
7,000	32.0	32.7	33.3	33.9	34.6	35.2	35.8	36.0				
6,000	32.2	32.8	33.5	34.1	34.8	35.4	35.9	36.2				
5,000	32.4	33.0	33.7	34.3	34.9	35.5	36.2	36.5				
4,000	32.6	33.2	33.9	34.6	35.2	35.8	36.4	36.8				
3,000	32.8	33.4	34.1	34.8	35.4	36.0	36.6	37.0				
2,000	32.9	33.6	34.3	34.9	35.5	36.1	36.8	37.2				
1,000	33.2	33.9	34.6	35.2	35.8	36.4	37.1	37.5				

NOTES:

(1) MANUAL LEAN MIXTURE SETTING ESTABLISHED BY 7 PSI TORQUE PRESSURE DROP FROM BEST POWER.
(2) F.T. INDICATES FULL THROTTLE.
(3) NO CABIN PRESSURIZATION LOAD.

24,152

Figure 2A2-19

MODEL: **T-29C/D**
DATE: 1 APRIL 1957
DATA BASIS: ENGINE MANUFACTURER'S DATA

POWER SCHEDULE

1200 BHP/ENG

ENGINES: **R2800-99W**

PRESSURE ALTITUDE (FEET)	MANIFOLD PRESSURE (IN. HG) CARBURETOR AIR TEMPERATURE -30°C	-20°C	-10°C	0°C	+10°C	+20°C	+30°C	+38°C	BLOWER	RPM	NOMINAL TORQUE PRESSURE (PSI)	MINIMUM FUEL FLOW (PPH)	DESIRED FUEL FLOW (PPH)
19,000	34.1	F.T.							HIGH	2300	82.5	575	700
18,000	33.9	34.6	F.T.	F.T.									
17,000	33.9	34.6	35.3	36.0	F.T.								
16,000	31.3	34.5	35.2	35.8	36.5	F.T.	F.T.						
15,000	31.3	31.9	35.2	35.8	36.4	37.1	37.7						
14,000	31.7	32.1	32.7	33.3	36.4	37.0	37.6						
13,000	31.8	32.4	32.8	33.4	34.0	37.0	37.6						
12,000	31.9	32.5	33.1	33.7	34.0	34.6	37.6						
11,000	32.0	32.7	33.3	34.0	34.6	34.8	35.4	35.8	LOW	2300	82	555	
10,000	32.2	32.8	33.5	34.1	34.7	35.3	35.4	35.8					
9,000	32.3	33.0	33.7	34.3	34.9	35.5	36.1	36.5	LOW	2200	87	542	
8,000	32.6	33.2	33.8	34.4	35.1	35.7	36.3	36.7					
7,000	32.7	33.3	34.0	34.6	35.2	35.9	36.5	37.0					
6,000	32.8	33.5	34.2	34.8	35.5	36.1	36.6	37.1					
5,000	33.0	33.7	34.4	35.0	35.6	36.3	36.9	37.3					
4,000	33.2	33.9	34.6	35.3	35.9	36.5	37.1	37.6					
3,000	33.4	34.0	34.7	35.4	36.0	36.6	37.2	37.7					
2,000	33.6	34.3	35.0	35.6	36.2	36.8	37.5	38.0					
1,000	33.8	34.5	35.2	35.8	36.4	37.0	37.7	38.2					

NOTES:

(1) MANUAL LEAN MIXTURE SETTING IN LOW BLOWER ESTABLISHED BY 7 PSI TORQUE PRESSURE DROP FROM BEST POWER.

(2) MANUAL ADJUST TO DESIRED FUEL FLOW IN HIGH BLOWER.

(3) F.T. INDICATES FULL THROTTLE.

(4) NO CABIN PRESSURIZATION LOAD.

24,210D

Figure 2A2-20

MODEL: T-29C/D
DATE: 5 DECEMBER 1967
DATA BASIS: ENGINE MANUFACTURER'S DATA

POWER SCHEDULE

1300 BHP/ENG

ENGINES: R2800-99W

PRESSURE ALTITUDE (FEET)	MANIFOLD PRESSURE (IN. HG) CARBURETOR AIR TEMPERATURE -30°C	-20°C	-10°C	0°C	+10°C	+20°C	+30°C	+38°C	BLOWER	RPM	NOMINAL TORQUE PRESSURE (PSI)	MINIMUM FUEL FLOW (PPH)	DESIRED FUEL FLOW (PPH)
22,000	33.6	F.T.											
21,000	33.7	34.4	F.T.	F.T.	F.T.	F.T.			HIGH	2400	85.6	810	860
20,000	33.8	34.5	35.4	36.2	36.7	F.T.							
19,000	32.7	34.1	35.2	36.0	36.5	36.8							
18,000	32.8	34.2	34.7	35.5	36.2	36.5							
17,000	33.0	34.4	34.8	35.7	36.4	36.9			HIGH	2300	89.5	770	825
16,000	34.0	35.0	35.8	35.9	36.6	37.1							
15,000	34.1	35.1	35.9	36.9	37.4	37.9			HIGH	2200	93.4	745	800
14,000	34.3	35.3	36.2	37.2	37.6	38.2							
13,000	33.3	33.9	34.6	37.3	37.9	38.3							
12,000	33.4	34.1	34.7	35.4	38.0	38.5							
11,000	33.5	34.2	34.9	35.5	36.2	38.8							
10,000	33.6	34.3	35.0	35.6	36.3	36.9			LOW	2300	89.5	690	776
9,000	33.8	34.4	35.1	35.7	36.4	37.1							
8,000	33.9	34.5	35.2	35.8	36.5	37.2							
7,000	34.0	34.7	35.4	36.0	36.7	37.4							
6,000	34.2	34.8	35.5	36.2	36.9	37.5							
5,000	34.3	35.0	35.7	36.4	37.1	37.7							
4,000	34.4	35.2	35.9	36.6	37.3	37.9							
3,000	34.7	35.4	36.1	36.9	37.5	38.2							
2,000	34.9	35.7	36.4	37.1	37.7	38.4							
1,000	35.2	35.9	36.6	37.3	38.0	38.6							

NOTES:

(1) MINIMUM FUEL FLOWS ARE ENGINE MANUFACTURER'S DATA.
(2) DESIRED FUEL FLOWS ARE BASED ON FLIGHT TEST USING MANUAL ADJUST PROCEDURE.
(3) F.T. INDICATES FULL THROTTLE.
(4) NO CABIN PRESSURIZATION LOAD.
(5) MAXIMUM C A T 15°C IN HIGH BLOWER.

24,211E

Figure 2A2-21

MODEL: **T-29 C/D**
DATE: 1 APRIL 1957
DATA BASIS: ENGINE MANUFACTURER'S DATA

POWER SCHEDULE
1400 BHP/ENG

ENGINES: **R2800-99W**

PRESSURE ALTITUDE (FEET)	MANIFOLD PRESSURE (IN. HG) CARBURETOR AIR TEMPERATURE								BLOWER	RPM	NOMINAL TORQUE PRESSURE (PSI)	MINIMUM FUEL FLOW (PPH)	DESIRED FUEL FLOW (PPH)
	−30°C	−20°C	−10°C	0°C	+10°C	+20°C	+30°C	+38°C					
22,000	F.T.	F.T.							HIGH	2500	89	1000	1050
20,000	37.3	37.7	F.T.	F.T.	F.T.	F.T.							
18,000	36.7	37.5	38.2	39.4	40.2	40.8							
16,000	36.8	37.5	38.3	38.9	39.6	40.3							
14,000	34.2	37.6	38.3	39.0	39.8	40.3			HIGH	2400	92	920	970
12,000	34.5	35.2	35.9	39.1	39.9	40.6			HIGH	2300	96	870	925
10,000	34.7	35.4	36.1	36.7	37.4	40.8							
8,000	35.0	35.7	36.4	37.1	37.8	38.4	39.0		LOW	2300	96	850	870
6,000	35.3	36.0	36.7	37.4	38.1	38.7	39.3						
4,000	35.6	36.3	37.0	37.8	38.4	39.1	39.7						
2,000	36.0	36.7	37.4	38.1	38.8	39.5	40.2						
SEA LEVEL	36.3	37.0	37.7	38.4	39.2	39.8	40.5						

NOTES:

(1) MINIMUM FUEL FLOWS ARE ENGINE MANUFACTURER'S DATA.

(2) DESIRED FUEL FLOW VALUES ARE BASED ON FLIGHT TEST USING MANUAL ADJUST PROCEDURE.

(3) F.T. INDICATES FULL THROTTLE.

(4) NO CABIN PRESSURIZATION LOAD.

(5) MAXIMUM C A T 15°C IN HIGH BLOWER

24,212D

Figure 2A2-22

MODEL: T-29C/D
DATE: 1 APRIL 1957
DATA BASIS: ENGINE MANUFACTURER'S DATA

POWER SCHEDULE

1500 BHP/ENG

ENGINES: R2800-99W

PRESSURE ALTITUDE (FEET)	MANIFOLD PRESSURE (IN. HG) CARBURETOR AIR TEMPERATURE								BLOWER	RPM	NOMINAL TORQUE PRESSURE (PSI)	MINIMUM FUEL FLOW (PPH)	DESIRED FUEL FLOW (PPH)
	−30°C	−20°C	−10°C	0°C	+10°C	+20°C	+30°C	+38°C					
22,000	F.T.								HIGH	2500	95	1110	1145
20,000	40.2	F.T.	F.T.										
18,000	39.6	41.0	41.8	F.T.	F.T.								
16,000	39.7	40.4	41.2	42.8	43.5	F.T.							
14,000	36.3	40.5	41.4	42.1	42.8	43.5							
12,000	36.5	37.2	37.9	42.2	42.9	43.5			HIGH	2400	99	1040	1045
10,000	36.7	37.4	38.1	38.8	39.5	43.7							
8,000	36.9	37.7	38.4	39.0	39.8	40.5	41.2		LOW	2400	99	980	1030
6,000	37.3	38.0	38.7	39.5	40.2	40.9	41.6						
4,000	37.5	38.3	39.1	39.8	40.5	41.3	41.9						
2,000	37.9	38.7	39.5	40.2	40.9	41.6	42.7						
SEA LEVEL	38.4	39.2	39.9	40.6	41.4	42.1	42.7						

NOTES:

(1) MINIMUM FUEL FLOWS ARE ENGINE MANUFACTURER'S DATA.

(2) DESIRED FUEL FLOW VALUES ARE BASED ON FLIGHT TEST USING MANUAL ADJUST PROCEDURE.

(3) F.T. INDICATES FULL THROTTLE.

(4) NO CABIN PRESSURIZATION LOAD.

(5) MAXIMUM C A T 15°C IN HIGH BLOWER

24,213D

Figure 2A2-23

POWER SCHEDULE

MODEL: **T-29C/D**
DATE: 1 APRIL 1957
DATA BASIS: ENGINE MANUFACTURER'S DATA

1600 BHP/ENG

ENGINES: **R2800-99W**

PRESSURE ALTITUDE (FEET)	MANIFOLD PRESSURE (IN. HG) CARBURETOR AIR TEMPERATURE								BLOWER	RPM	NOMINAL TORQUE PRESSURE (PSI)	MINIMUM FUEL FLOW (PPH)	DESIRED FUEL FLOW (PPH)
	−30°C	−20°C	−10°C	0°C	+10°C	+20°C	+30°C	+38°C					
20,000	F.T.	F.T.	F.T										
18,000	42.8	43.6	44.5	F.T.	F.T.								
16,000	42.9	43.7	44.7	45.4	46.2				HIGH	2500	101	1210	1230
14,000	42.9	43.8	44.7	45.5	46.3								
12,000	38.7	39.5	40.3	45.6	46.4								
10,000	38.9	39.7	40.5	41.2	42.0								
8,000	39.2	40.0	40.8	41.5	42.3	43.0							
6,000	39.4	40.2	41.0	41.8	42.6	43.3							
4,000	39.7	40.5	41.4	42.2	42.9	43.7			LOW	2500	101	1110	1170
2,000	40.3	41.1	41.9	42.7	43.4	44.2							
SEA LEVEL	40.8	41.6	42.4	43.2	44.0	44.7							

NOTES:

(1) AUTO RICH MIXTURE

(2) FUEL FLOW MAY BE MANUALLY ADJUSTED TO MINIMUM FUEL FLOW VALUE IF REQUIRED BY EMERGENCY RANGE CONDITIONS.

(3) F.T. INDICATES FULL THROTTLE.

(4) NO CABIN PRESSURIZATION LOAD.

24,214F

Figure 2A2-24

MODEL: T-29 C/D
DATE: 1 APRIL 1957
DATA BASIS: ENGINE MANUFACTURER'S DATA

POWER SCHEDULE

1700 BHP/ENG

ENGINES: R2800-99W

PRESSURE ALTITUDE (FEET)	MANIFOLD PRESSURE (IN. HG) CARBURETOR AIR TEMPERATURE								BLOWER	RPM	NOMINAL TORQUE PRESSURE (PSI)	MINIMUM FUEL FLOW (PPH)	DESIRED FUEL FLOW (PPH)
	−30°C	−20°C	−10°C	0°C	+10°C	+20°C	+30°C	+38°C					
20,000													
18,000													
16,000	F.T.	F.T.											
14,000	41.2	42.3	F.T.	F.T.									
12,000	41.3	42.3	43.2	43.6	F.T.	F.T.			LOW	2700	100	1250	1295
10,000	41.4	42.3	43.3	43.8	44.7	45.3							
8,000	41.7	42.5	43.4	44.2	44.9	45.7							
6,000	41.9	42.7	43.6	44.5	45.2	46.0							
4,000	42.1	42.9	43.8	44.7	45.4	46.2			LOW	2500	108	1220	1270
2,000	42.3	43.2	44.1	44.9	45.8	46.5							
SEA LEVEL	42.8	43.6	44.5	45.3	46.2	46.9							

NOTES:

(1) AUTO RICH MIXTURE

(2) FUEL FLOW MAY BE MANUALLY ADJUSTED TO MINIMUM FUEL FLOW VALUE IF REQUIRED BY EMERGENCY RANGE CONDITIONS.

(3) F.T. INDICATES FULL THROTTLE.

(4) NO CABIN PRESSURIZATION LOAD.

24,215F

Figure 2A2-25

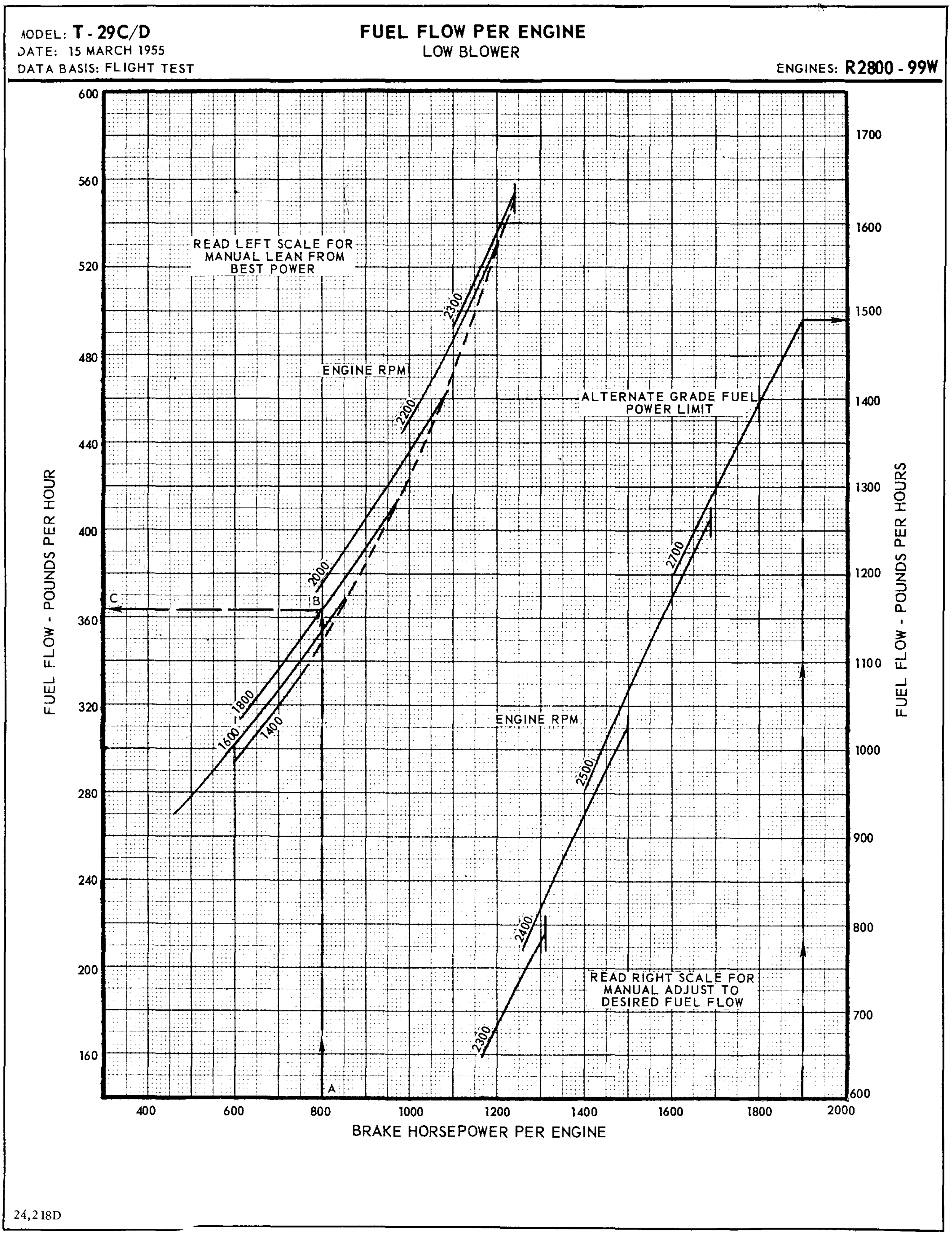


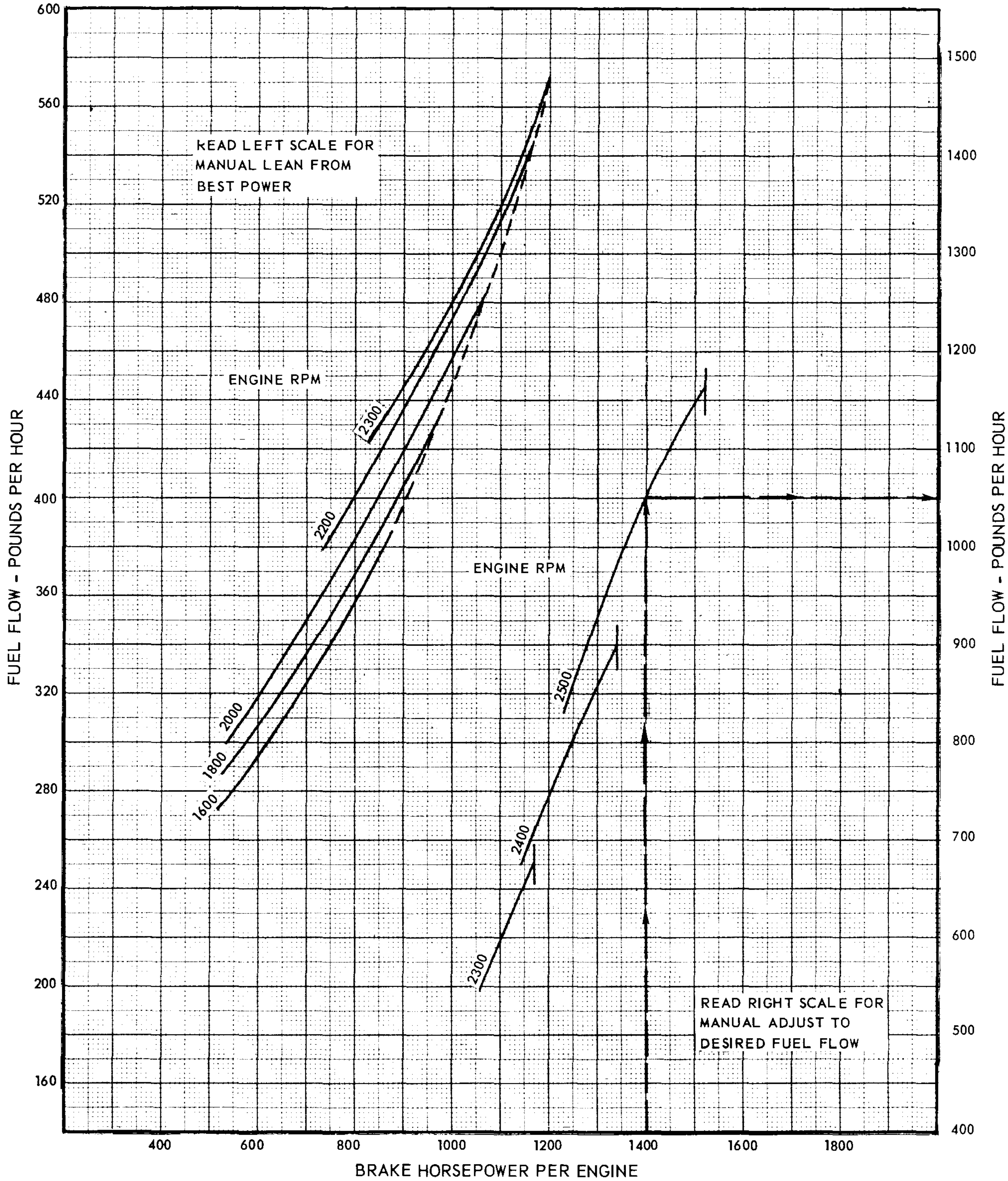
Figure 2A2-26

MODEL: **T-29 C/D**
DATE: 15 MARCH 1955
DATA BASIS: FLIGHT TEST

FUEL FLOW PER ENGINE

HIGH BLOWER

ENGINES: **R2800-99W**



24,179B

Figure 2A2-27

PART 3 — TAKEOFF

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The symbol * indicates an illustration

TAKEOFF

DISCUSSION OF TAKEOFF TERMS

The relationship of takeoff terms (figure 2A3-1) illustrates the relationship of the terms used in the takeoff charts. The upper chart represents the sum of the distance required to accelerate on two engines to critical engine failure speed, experience an engine failure and either continue to accelerate on one engine to takeoff speed or stop, using brakes only, in the same distance. On the lower chart Curve A shows the two engine acceleration to takeoff speed and the distance traversed is the round run. Curves B and D show that from the critical engine failure speed point the distance to accelerate on one engine to takeoff speed and the distance to stop are the same. This distance added to the distance required to reach critical engine failure speed is called the critical field length. Curve C shows that the refusal speed is the highest speed from which the takeoff may be aborted and the aircraft brought to a stop within the remaining runway length. The acceleration check point is a predetermined point, based on time or distance, at which the acceleration check speed must be attained. If runway length and critical field length were equal, Curves C and D would coincide and the refusal speed would be the same as the critical engine failure speed. In this case, the acceleration check speed will be lower than the critical engine failure speed.

Ground Effect

Ground effect, in general, refers to a reduction in the overall drag of an airplane when operated near the ground. The degree of drag reduction will vary with distance of the wing or supporting surface from the ground, being greatest when the wing is at ground level, and will have disappeared, for all practical purposes, when the wing is one-half its span above the ground. The reduction in drag is also greatest at low velocities and becomes less as velocity increases. All of the takeoff charts pertaining to the ground run consider the reduction in drag due to ground effect.

MAXIMUM TAKEOFF GROSS WEIGHT

Safe operation of the aircraft requires that takeoffs not be attempted at gross weights for which acceleration, rate of climb, or obstacle clearance capability are marginal. There are four primary factors which must be considered when determining a safe limit for the takeoff gross weight.

1. The ability of the structure to withstand taxiing loads and inflight maneuvering loads is shown as design takeoff gross weights on the Gross Weight Limitation Chart in Section V.

2. The ability to takeoff or stop within the available runway is shown on the Critical Field Length Charts (figures 2A3-8, 2A3-11, 2A3-14, and 2A3-17).

3. The ability to have adequate rate of climb when airborne is shown on the Gross Weight Limited by One-Engine Climb Performance Chart (figure 2A3-3).

4. The ability to clear obstacles within the takeoff corridor is determined by the Climbout Factor Charts and the Climbout Flight Path Charts (figures 2A3-21 thru 2A3-32).

For a given set of takeoff conditions, each of these four considerations will permit a different gross weight. Any one of the four weights may be the lowest, depending on the conditions. For this reason, all four factors must be considered for each takeoff, even though in many cases one or more of them may be eliminated after cursory examination. The lowest weight determined by these factors will be the maximum takeoff gross weight.

TAKEOFF PLANNING

An engine failure, while admittedly rare, remains a possibility, especially under takeoff (high power) conditions. If an engine should fail during the early part of a takeoff run, there is no problem - cut the remaining engine and stop. However, under certain conditions of weight, speed, and runway length, it is desirable to continue the takeoff. One of the purposes of the normal takeoff charts is to provide the necessary information to determine a desirable loading and wing flap setting and then to determine the amount of runway required and the rate of climb expected if an engine should fail during a late phase of the takeoff. In flight planning, the larger wing flap setting should be considered first. This is because the greater wing flap extensions result in reduced takeoff speed and required field length. The flap setting will be considered acceptable if (1) the rate of climb on the gross weight limited by climb chart is acceptable, and (2) if the critical field length found is equal to or less than the runway field length under consideration. If the rate of climb is too low, a lesser wing flap setting will then require a re-evaluation of the takeoff field length. If, after choosing the smallest recommended wing flap setting to obtain an acceptable initial rate of climb, it is found that the actual available runway field length is less than that shown on the chart, a reduction in gross weight is desirable. It is recommended that the airplane not be loaded so that the critical field length exceeds the available runway length. From the definition it can be seen that critical engine failure speed is required only when critical field length is equal to the available runway length, and since critical engine failure speed and refusal speed are equal in this case, then refusal speed in the only speed that need be monitored to determine whether or not to abort when encountering engine failure during takeoff. When the available field length is so much greater than the critical field length that the refusal speed is higher than takeoff speed, then the only speed that need be monitored during takeoff run is takeoff speed, and the decision to abort or continue the takeoff is determined by whether or not the airplane is airborne. The wind correction nomograms on the charts are calculated on the basis of 100% wind accountability. It is realized that wind differential ordinarily exists between the runway and the top of the control tower or building where the wind velocity reading is taken, the wind usually being a greater velocity at the higher altitude. Therefore headwinds reported by the tower should be used at one-half their value and tailwinds at one and one-half times their value for takeoff, and at full value for conditions after takeoff. Exception: always apply 100% of wind component to acceleration check speed and ground run distance.

TAKEOFF WITH ALLOWANCE FOR ENGINE FAILURE

Normal takeoff planning procedure allows for the possibility of an engine failure during takeoff. There are two methods for which data is provided herein.

Critical Field Length Method

When critical field length equals runway available, utilize data from the critical field length charts. When using this method, if an engine fails before the critical engine failure speed is reached, the aircraft must be stopped. If an engine fails after the critical engine failure speed is reached, the takeoff is continued. Takeoff speeds are the same as those shown in figure 2A3-7. Climbout flight path data is determined from the one engine climbout flight path charts, figures 2A3-26 thru 2A3-30.

Refusal Speed Method

The refusal speed method will be used when the available runway is longer than the critical field length. This method utilizes data from the ground run charts, refusal speed charts and the velocity during takeoff ground run chart. When using this method, an acceleration check speed, time and/or distance will be determined to validate proper

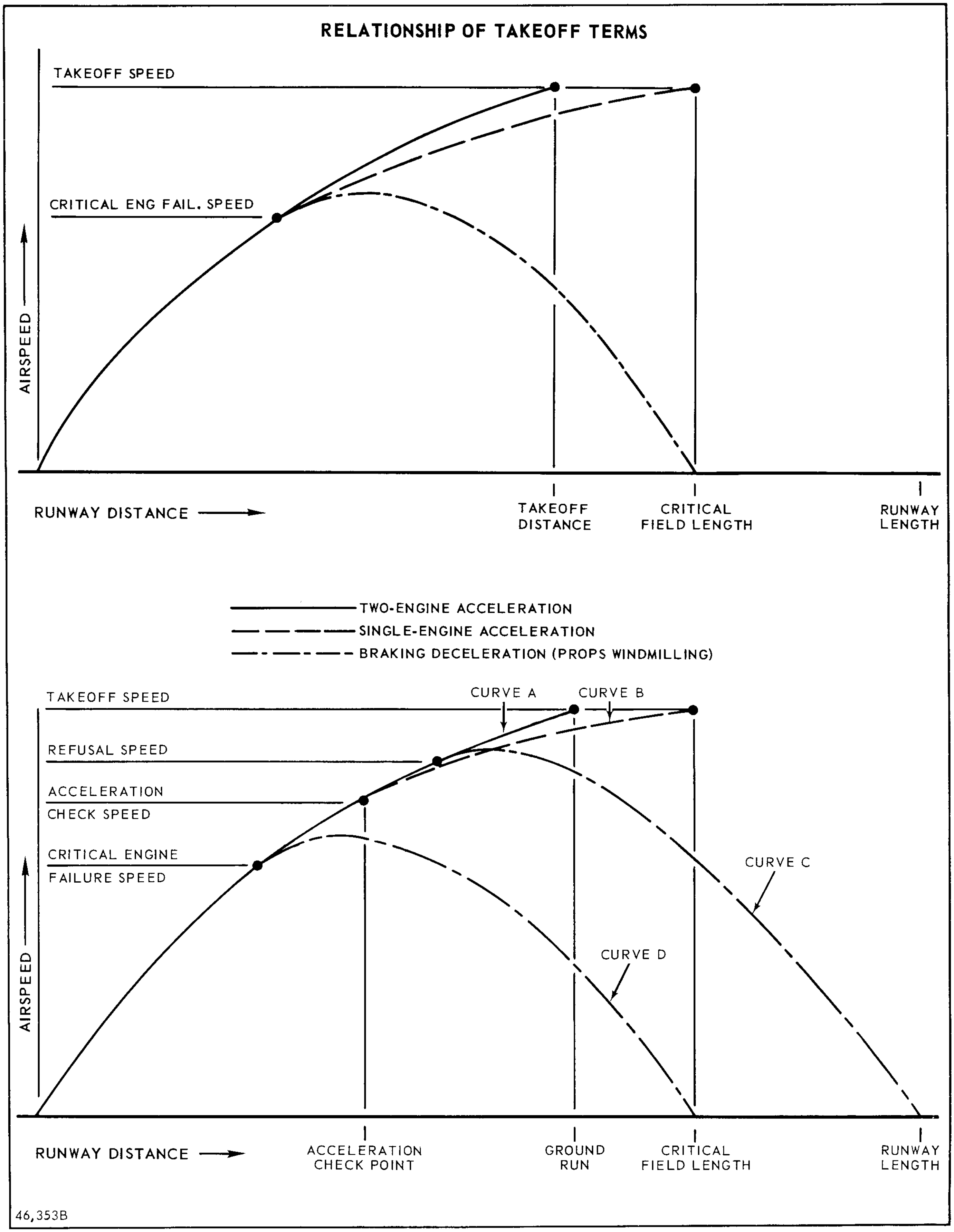

RELATIONSHIP OF TAKEOFF TERMS
TAKEOFF SPEED
CRITICAL ENG FAIL. SPEED
AIRSPEED
RUNWAY DISTANCE
TAKEOFF DISTANCE
CRITICAL FIELD LENGTH
RUNWAY LENGTH
TWO-ENGINE ACCELERATION
SINGLE-ENGINE ACCELERATION
BRAKING DECELERATION (PROPS WINDMILLING)
TAKEOFF SPEED
CURVE A
CURVE B
REFUSAL SPEED
ACCELERATION CHECK SPEED
CRITICAL ENGINE FAILURE SPEED
CURVE C
CURVE D
AIRSPEED
RUNWAY DISTANCE
ACCELERATION CHECK POINT
GROUND RUN
CRITICAL FIELD LENGTH
RUNWAY LENGTH
46,353B

Figure 2A3-1

acceleration prior to reaching refusal speed. If an engine fails, or the acceleration check speed is low at the designated acceleration check point, the aircraft is stopped. If an engine fails between the acceleration check speed and refusal speed, the aircraft is also stopped. If an engine fails after reaching refusal speed, the takeoff should be continued. The following steps summarize what action should be taken when using the refusal speed method.

1. Stop (abort takeoff)

    a. If an acceleration check speed is not attained by the time the acceleration check speed time and/or distance is reached.

    b. If engine failure occurs before acceleration check speed is attained.

    c. If an engine failure occurs between the acceleration check speed and refusal speed.

2. Go. (continue takeoff) If an engine failure occurs after reaching refusal speed.

DISCUSSION OF CHARTS

TAKEOFF AND LANDING CROSSWIND CHART

A Takeoff and Landing Crosswind Chart (figure 2A3-2) is provided to determine the runway headwind component from a given combination of wind direction and velocity.

TAKEOFF GROSS WEIGHT LIMITED BY CLIMB

These charts (figures 2A3-3 and 2A3-5) present initial climb performance with one engine inoperative and its propeller feathered, and with continuous two-engine operation. Data are shown for approach flap settings as well as the basic takeoff flap settings. Single-engine rate of climb and two-engine rate of climb with landing gear retracted can be determined with any variable of wing flap setting, gross weight, TPSI, altitude, and temperature. The single-engine chart should be used for preflight planning to assure adequate rate of climb if an engine should fail during takeoff.

EXAMPLE

Given:

Density altitude = 1800 feet

Desired rate of climb = 300 fpm

TPSI = 128 psi

Gross weight = 44, 000 pounds

To find the takeoff flap setting, enter the chart (figure 2A3-3) at density altitude of 1800 feet (A). Read across to 300 fpm rate of climb (B). Parallel guide lines to the sea level base line and then read up to TPSI 128 psi (C). Parallel the guide lines to the base line and read up to the takeoff gross weight (D). Read across to find takeoff flap setting of 0° (E).

Note

- For practical operation, limit the takeoff flap settings to either 12°, 6°, or 0°. Intermediate positions should be used only when one of these flap positions will not provide the required rate of climb and runway length combination.
- If the takeoff flap setting should come out as less than 0° under existing conditions, off-load as necessary to reduce the takeoff weight to that which allows the desired rate of climb. If the takeoff weight cannot be reduced, work backwards from the weight and minimum flap setting to determine the rate of climb.

INITIAL RATE OF CLIMB CORRECTION

This chart (figure 2A3-4) may be used to determine the initial takeoff rate of climb before the landing gear is retracted. The decrease in rate of climb obtained is due to the landing gear drag at takeoff. When takeoff conditions are critical, the rate of climb correction is applied to the takeoff gross weight limited by climb (figures 2A3-3 and 2A3-5) to re-evaluate the allowable gross weight and/or desired rate of climb.

WARNING

This correction applies only during the initial takeoff until the landing gear is retracted. Landing gear retraction after takeoff is a normal requirement and is imperative with one engine inoperative, high temperatures, or high ground elevation. Refer to ENGINE FAILURE, Section III.

EXAMPLE

Given:

Gross weight = 44, 000 pounds

Takeoff flap setting = 0°

Density altitude = 1800 feet

Desired rate of climb (landing gear up) = 300 fpm

Enter the chart at gross weight of 44, 000 pounds (A). Proceed vertically to 0° flap line (B), then across to the base line of density altitude. Parallel the guide lines to density altitude 1800 feet (C), then across to read decrease in rate of climb, -335 feet (D). This value, when subtracted from 300 fpm rate of climb used in determining gross weight limited by climb, results in a -35 feet rate of climb with the landing gear down. To assure a safe takeoff with one engine inoperative, it will be necessary to recompute the allowable gross weight. Re-enter the takeoff gross weight limited by climb chart (figure 2A3-3) at desired rate of climb of 335 feet (300 + 35) and with the same conditions of density altitude, torque pressure, and flap setting find the adjusted gross weight of 43,000 pounds.

VELOCITY DURING TAKEOFF GROUND RUN

Figure 2A3-6 shows the relationship between distance, time, and speed during the takeoff acceleration. It is based on acceleration from brake release on a dry, hard surface runway with two engines operating. Airspeeds used to enter the chart are indicated airspeeds corrected for 100% of reported headwinds and tailwinds. If actual winds during the takeoff run exceed these values, the time to accelerate to a given checkpoint, and the speed at the checkpoint will be correspondingly higher for headwinds and lower for tailwinds than those computed from the chart. The refusal speed distance, acceleration check speed and checkpoint may be determined from this chart. To do this, it is necessary first to obtain the ground run for the flap setting used (figures 2A3-10, -13, -16, or -19) and indicated takeoff speed (figure 2A3-7). The ground run should be corrected for wind and runway slope. By entering the chart with takeoff speed and takeoff ground run corrected for wind, a contour line is established which is then used to determine the acceleration check speed, time, and distance. From the applicable refusal speed chart (figures 2A3-9, -12, -15, or -18), determine the indicated refusal speed corrected for wind for the available runway and again correct for wind before entering the chart. Following the corrected refusal speed to the contour line previously established will determine the refusal distance. Acceleration speed/time is then determined at the intersection of the contour line and the acceleration checkpoint time/distance. This speed is then corrected for wind velocity. Distance, speed, and time relationships for other speeds can also be determined.

The acceleration time check is the most accurate means of checking acceleration. With this method, an even 10 knot increment, not less than 5 and not more than 15 knots below refusal speed, will normally be used as an acceleration check speed. As a secondary procedure, on marked runways the acceleration check may be made at a distance marker. For this method, the acceleration checkpoint will normally be the first 1000 foot marker at least 500 feet but not more than 1500 feet prior to the refusal distance.

EXAMPLE

Given:

Wind (100% of reported headwind) = 10 knots

Ground run (corrected for headwind and slope) = 3600 feet

Takeoff speed = 119 knots IAS

Refusal speed (corrected for headwind) = 115 knots IAS

Density altitude = 5600 feet

Subtract headwind from takeoff speed to obtain corrected takeoff speed (119 - 10 = 109 knots IAS). Enter chart (figure 2A3-6) with corrected takeoff speed of 109 knots IAS (A) and read up to ground run of 3600 feet (B) and establish a contour line by following the guide lines.

Subtract headwind from the refusal speed to obtain the corrected refusal speed (115 - 10 = 105 knots IAS). Enter the chart with corrected refusal speed of 105 knots IAS (C) and read up to the intersection of contour line (D) to find the refusal distance of 3250 feet.

Enter the chart at the nearest 1000 foot marker at least 500 feet below the refusal distance to determine acceleration check distance of 2000 feet (E). Read across to the intersection of the contour line to find time to accelerate of 29 seconds (F), and read down to find uncorrected acceleration check speed of 88 knots IAS (G).

Correct acceleration check speed by adding headwind velocity (88 + 10 = 98 knots IAS).

Determine $1/\sqrt{\sigma}$ of 1.087 from the Density Altitude vs $1/\sqrt{\sigma}$ chart (figure 2A1-2) for 5600 feet density altitude. Correct time to accelerate by dividing by this figure. Actual time at the marker will be $29 \div 1.087 = 27$ seconds.

Note

> Since the contour (acceleration) line has been established for the given conditions, time to any speed or distance can be readily determined.

TAKEOFF AND MINIMUM CONTROL SPEEDS

The Takeoff and Minimum Control Speed Chart (figure 2A3-7) is provided to show takeoff speeds and 1.1 minimum control speeds. Takeoff speed is based on 120 percent of power-off stall speed or 110 percent of minimum control speed, whichever is greater. At low gross weights and larger flap settings, the minimum control speed becomes greater than the takeoff speed.

EXAMPLE

Given:

Gross weight = 42,000 pounds

Flap setting = 12°

Find takeoff speed by entering chart at gross weight of 42,000 pounds (A), and read up to flap deflection of 12° (B). Read across to find speed of 114 knots (C).

CRITICAL FIELD LENGTH

The critical field length is defined as the distance required to accelerate with two engines from brake release to the critical engine failure speed, experience an engine failure, and then either continue accelerating with one engine to takeoff speed or decelerate to a stop in the same distance. Critical engine failure speed is determined by entering the refusal speed chart using critical field length for the runway length and computing speed in the same manner as for refusal speed.

The stopping distance portion of the critical field length has been determined by the use of brakes only. This data also includes a three second reaction time/distance after reaching critical engine failure speed before the remaining engine is cut and brakes are applied. To determine critical field length, refer to figures A3-8, -11, -14, -17.

EXAMPLE

Given:

Density altitude = 1800 feet

TPSI = 126 psi

Gross weight = 44, 000 pounds

Runway slope = 1 per cent up

1/2 reported headwind = 10 knots

Flap setting = 12°

Select chart for 12° flap (figure 2A3-11). Enter chart at density altitude 1800 feet (A). Read up guide line to the 126 TPSI line(B). Read across to 44, 000 pounds gross weight (C), and then down into the runway slope chart and follow the uphill curve to one percent (D). Read down and into the wind velocity chart. Follow the headwind curve to 10 knots (E), and read down to find the critical field length of 4300 feet (F). For the conditions given above, critical field length, uncorrected for wind, would be 4800 feet. Applying correction for headwind, corrected critical field length would be 4300 feet (F).

REFUSAL SPEED

The Refusal Speed Charts (figures 2A3-9, 2A3-12, 2A3-15, and 2A3-18) provide a means of determining the refusal speed for various conditions of gross weight, density altitude, TPSI, and wind. Refusal speed is the maximum speed at which takeoff may be aborted and the airplane brought to a complete stop within the remaining runway length, using brakes only. If the critical field length and runway available 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 the critical engine failure speed. For this reason, the refusal speed is of primary importance during takeoff operation. It must be remembered that the validity of the refusal speed is dependent on a normal two 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 speed, time and/or distance is necessary to insure safe takeoff. When corrected refusal speed exceeds takeoff speed, use takeoff speed as refusal speed.

EXAMPLE

Given:

Density altitude = 1800 feet

TPSI = 126 psi

Gross weight = 44, 000 pounds

Runway length = 5000 feet

Reported headwind = 10 knots

Flap setting = 12°

Select chart for 12° flap (figure 2A3-12). Enter chart at runway length 5000 feet (A) and read across to reported headwind 10 knots (B). Follow guide line to base line and read across to 126 TPSI (C). Follow guide line to base line and read across to 1800 feet density altitude (D). Follow guide line to base line and read across to intersection of gross weight line from 44, 000 pounds (E). Read refusal speed 109 knots IAS (F).

TAKEOFF GROUND RUN

Charts (figures 2A3-10, 2A3-13, 2A3-16, and 2A3-19) are provided to determine the ground run distance required from brake release to the point of takeoff for various conditions of gross weight, density altitude, wind, and TPSI for each takeoff flap setting. Under certain conditions where runway length is not critical but obstacle clearance is, takeoff with zero degrees flap may be utilized.

EXAMPLE

Given:

Density altitude = 1800 feet

TPSI = 126 psi

Gross weight = 44, 000 pounds

Runway slope = 1 per cent up

Reported headwind = 10 knots

Flap setting = 12°

Select chart for 12° flap (figure 2A3-13). Enter chart at density altitude 1800 feet (A). Read up guide line to the 126 TPSI line (B). Read across to 44, 000 pounds gross weight (C), and then down into the runway slope chart and follow the uphill curve to 1 per cent (D). Read down and into the wind velocity chart. Follow the headwind curve to 10 knots (E), and read down to find corrected ground run of 2900 feet (F).

RUNWAY CONDITION READING (RCR)

Stopping distance depends upon tire-to-runway coefficient of friction, which varies with condition of the runway surface. Runway surface condition will be reported as a Runway Condition Reading (RCR). The RCR is a measure of the coefficient of friction between the tire and the runway surface, as determined by an inspection decelerometer. All charts involving stopping distance are based on dry concrete or asphalt friction coefficients corresponding to an RCR of 23. Slippery runway surfaces will increase stopping distances; increased distances are accounted for by correction charts as a function of RCR. RCR is reported as a whole number varying from 02 to 23. Many airfields will continue to report braking action in accordance with ICAO documents. This is the GOOD, MEDIUM, and POOR classification of braking action on unusual runway surface condition. In order to relate ther classifications to an RCR, or when RCR values are not available, the following relationship will be used:

RUNWAY CONDITION	ICAO REPORT	RCR
Dry	Good	23
Wet	Medium	12
Icy	Poor	05

EXAMPLE

Given:

Gross weight = 40, 000 pounds

Critical field length = 4300 feet

Refusal speed = 109 KIAS

Runway condition = Icy

Enter chart (figure 2A3-20) with a Runway Condition Reading (RCR) of 5 (obtained from base weather) for an icy runway (A). Read across to gross weight in refusal speed portion of chart (B) and read down to find refusal speed correction factor K_{RS} 0.81 (C). Multiply refusal speed by K_{RS} factor to obtain refusal speed for runway condition. Follow same procedure to correct critical field length using the K_{CFL} factor.

RUNWAY SURFACE COVERING (RSC)

Also reported will be Runway Surface Covering (RSC), which will be the average runway surface covering given in depth and type, such as slush, water, or snow. The depth of this covering can cause a significant reduction in takeoff performance due to the retarding effect of the tires displacing the covering, plus the additional drag effect of this material being sprayed and consequently striking the aircraft surfaces. The retarding effect of slush and water puddles increases as the speed increases. However, the retarding effect will vary considerably with varying slush and water depths encountered on the runway due to surface contour. The retarding effect of slush and water puddles will decrease when the aircraft reaches hydroplaning speed. Hydroplaning occurs because the pressure between the fluid on the runway and the tires increases until the tires are entirely supported on top of the fluid. The speed at which this occurs is called hydroplaning speed and is usually lower than end acceleration check speed. Due to the number of unpredictable conditions which affect acceleration with various types of runway covering, the acceleration check will not be an accurate indication of performance when takeoff is attempted in a measurable depth of slush, snow, or water.

CAUTION

As there are no corrections given for RSC, the pilot should exercise extreme caution during takeoff planning and ground run on water, slush, or snow covered runways.

CLIMBOUT FACTOR FOR CLIMBOUT FLIGHT PATH

Figures 2A3-21 and 2A3-31 will provide climbout factors for use with the climbout flight path charts. Figure 2A3-21 should be used to determine the climbout factor for use with the takeoff power (2800 rpm) climbout flight path charts, and figure 2A3-31 should be used to determine the climbout factor for use with the METO power climbout flight path chart. The climbout factor chart for takeoff power has engine power correction lines in terms of torque pressure. However, power corrections in the climbout factor chart for METO power is in terms of bhp, thus making it possible to use the chart for a range of engine rpm.

WARNING

The METO power climbout factor chart was constructed for use with engine rpm's from 2500 to 2700. The charts become excessively inaccurate at rpm's outside this range.

EXAMPLE (for takeoff power settings)

Given:

Gross weight = 44, 000 pounds

Density altitude = 1800 feet

TPSI = 126 psi

Enter the climbout factor chart (figure 2A3-21) at gross weight of 44, 000 pounds (A) and read up to density altitude of 1800 feet (B). Read across to 126 psi in the torque pressure curves (C) and then down to find the climbout factor of 6 (D). This factor can be used in any of the takeoff power (2800 rpm) climbout flight path charts, figures 2A3-22 thru 2A3-30.

A climbout factor for use in the METO power climbout flight path chart can be determined in the same manner by using figure 2A3-31. In this case, the bhp for the corresponding pressure altitude must first be obtained from the METO power climb schedule and then applied at the appropriate spot in the climbout factor chart.

WARNING

The climbout factors obtained for takeoff power and the factors for METO power are not interchangeable. Do not use a takeoff power climbout factor on the METO power flight path chart or vice versa.

CLIMBOUT FLIGHT PATH

Climbout flight path charts, figures 2A3-22 thru 2A3-30, and 2A3-32 are provided to determine the distance required to clear a given obstacle. Figures 2A3-22 thru 2A3-26 and 2A3-28 thru 2A3-30 provide all the information needed to determine obstacle clearance capability within the first 11,000 feet horizontal distance or 600 feet altitude after takeoff. Figures 2A3-27 and 2A3-32 are needed to determine extended flight path information beyond 11,000 feet horizontal distance or 600 feet vertical altitude. In this case, the vertical and horizontal distances must be added together to complete the climbout flight path analysis.

Individual charts provide data for two-engine or one-engine operation and for takeoff flap settings of 0, 6, 12, or 24 degrees. All climbout flight path charts are based on a speed of 1.2 stall speed for the particular flap setting.

WARNING

The climbout factor to be applied must be obtained from the appropriate climbout factor chart depending on the flight path chart to be used.

EXAMPLE

Given:

Obstacle height = 5300 feet

Obstacle distance = 63,500 feet (from brake release)

Takeoff gross weight = 44,000 pounds

Engines operating = 2

Torque pressure = 126 psi (2800 rpm)

Takeoff flap setting = 6°

Takeoff ground run = 3675 feet

Flap retraction altitude = 500 feet

Takeoff density altitude = 1800 feet

OAT = 15°C

1/2 reported headwind = 10 knots

Determine initial climbout factor of 6 from figure 2A3-21 for takeoff weight, density altitude, and torque pressure. Enter climbout flight path chart for two-engine, 6° flap operation (figure 2A3-23).

Follow factor line 6 to 500 feet altitude, apply correction for 1/2 the reported headwind and record distance of 4700 feet.

At this point, 500 feet, we will assume that IAS is increased to 1.2 stall speed for 0° flaps, flaps are retracted to 0°, and power is reduced to METO.

Note

The flap retraction, power reduction point is not dictated by any specific requirement. It may be a function of operating policy, immediate obstacle clearance requirement, or simply pilot preference.

Convert density altitude (1800 + 500 = 2300) to pressure altitude (approximately 1900 feet) and determine bhp (1900) from the METO power climb schedule (figure 2A2-9). Note that 1900 bhp can be held for 8100 feet of climb (from 1900 feet pressure altitude) and then METO power drops to 1700 bhp.

Enter METO power climbout factor chart (figure 2A3-31) with 44,000 pounds (ignore fuel usage), 2300 feet density altitude, and 1900 bhp to obtain climbout factor of 6.2.

At this point, compute remaining distance to obstacle. 63,500 feet (total distance) - 3675 feet (takeoff run) - 4700 feet (initial climb segment) = 55,125 feet remaining.

Enter METO power climbout flight path chart (figure 2A3-32) with remaining distance (55,125 feet), remove correction for 1/2 the reported headwind (giving a distance of 59,000 feet) and move vertically to intersect the 6.2 factor line. Read altitude of 6000 feet.

Note

If winds aloft are available, use 1/2 their reported value rather than using field elevation winds for making distance corrections.

Add this altitude segment to previous altitude segment (500 + 6000 = 6500 feet). Since this altitude is greater than the obstacle height, the obstacle can be cleared.

Note

It may be necessary in some cases to compute an additional segment of the extended climbout flight path. If the climbout extends through a power reduction point as determined from the METO power climb schedule, compute a new climbout factor for the higher altitude and lower power and re-enter the climbout flight path chart to obtain additional distance and altitude figures.

MAXIMUM EFFORT

For maximum effort planning, the two-engine takeoff gross weight limited by climb, takeoff ground run, and METO power climb charts are used. These data represent maximum possible airplane performance regardless of the risks involved. The takeoff ground run and respective operational gross weights are predicated on the continued operation of both engines. When planning a takeoff using this information, consider the use of the lowest of the flap settings first.

Note

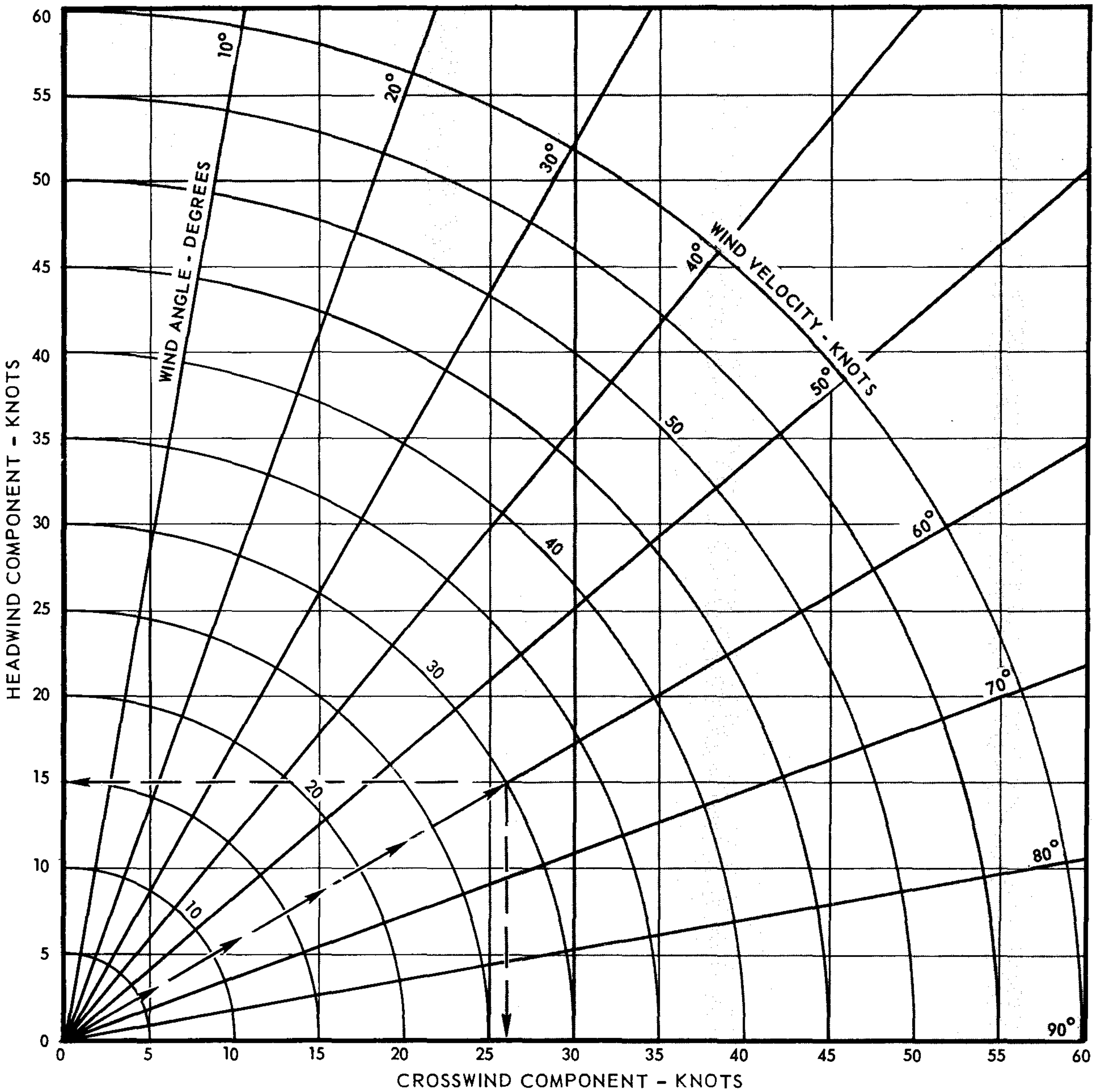
This procedure is the reverse of normal flight planning in which the highest flap setting is considered first. In maximum effort planning it is desirable to obtain the best performance (even though it is substandard) within the runway length available.

This setting will be acceptable if the takeoff ground run distance found on the chart is equal to or less than the length of the runway under consideration. If the required runway length is greater than the distance available, a greater wing flap setting will have to be considered. If, after checking all takeoff flap settings, the available takeoff runway is still too short, the gross weight will have to be reduced in order to operate from the field. A takeoff distance obtained from these charts is the distance from release of brakes to takeoff. In addition, each of the takeoff ground run charts has a correction factor that can be used to determine the distance required to clear a 50-foot obstacle

MODEL: T-29C/D
DATE: 15 MARCH 1955
DATA BASIS: FLIGHT TEST

TAKEOFF AND LANDING CROSSWIND CHART

ENGINES: R2800-99W



EXAMPLE:

GIVEN: TAKEOFF RUNWAY - 01
WIND - 070°/30 KNOTS

FIND: HEADWIND AND CROSSWIND COMPONENTS.

SOLUTION:

1. RUNWAY WIND ANGLE 070° – 010° = 060°
2. WITH RUNWAY ANGLE OF 060° AND A WIND VELOCITY OF 30 KNOTS FIND CROSSWIND COMPONENT OF 26 KNOTS AND HEADWIND COMPONENT OF 15 KNOTS.

NOTE:

ENTER CHART WITH MAXIMUM GUST VELOCITY TO DETERMINE CROSSWIND OR TAILWIND COMPONENT.

ENTER CHART WITH MAXIMUM STEADY WIND VELOCITY TO DETERMINE HEADWIND COMPONENT.

RECOMMENDED

NOT RECOMMENDED

24188B

Figure 2A3-2

MODEL: **T-29C/D**
DATE: 15 MARCH 1955
DATA BASIS: FLIGHT TEST

TAKEOFF GROSS WEIGHT LIMITED BY CLIMB

IF ONE ENGINE FAILS DURING TAKEOFF
LANDING GEAR UP 2800 RPM

ENGINES: **R2800-99W**

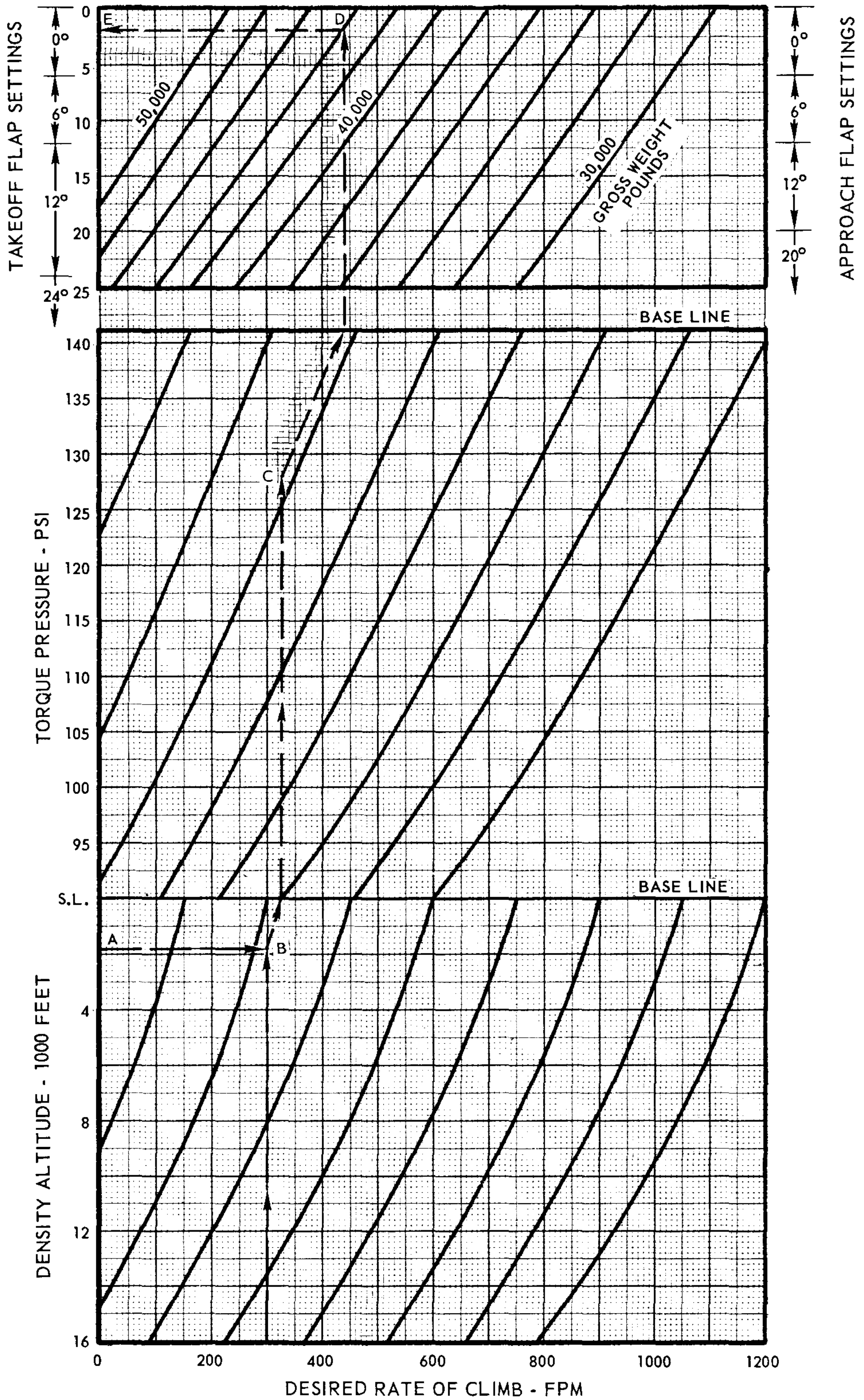
REMARKS:

(1) INOPERATIVE PROPELLER FEATHERED

(2) LANDING GEAR RETRACTED

(3) NACELLE FLAPS OPEN TO MID-POSITION

(4) CLIMB SPEED • TAKEOFF SPEED (REFER TO TAKEOFF CURVES)



45,971E

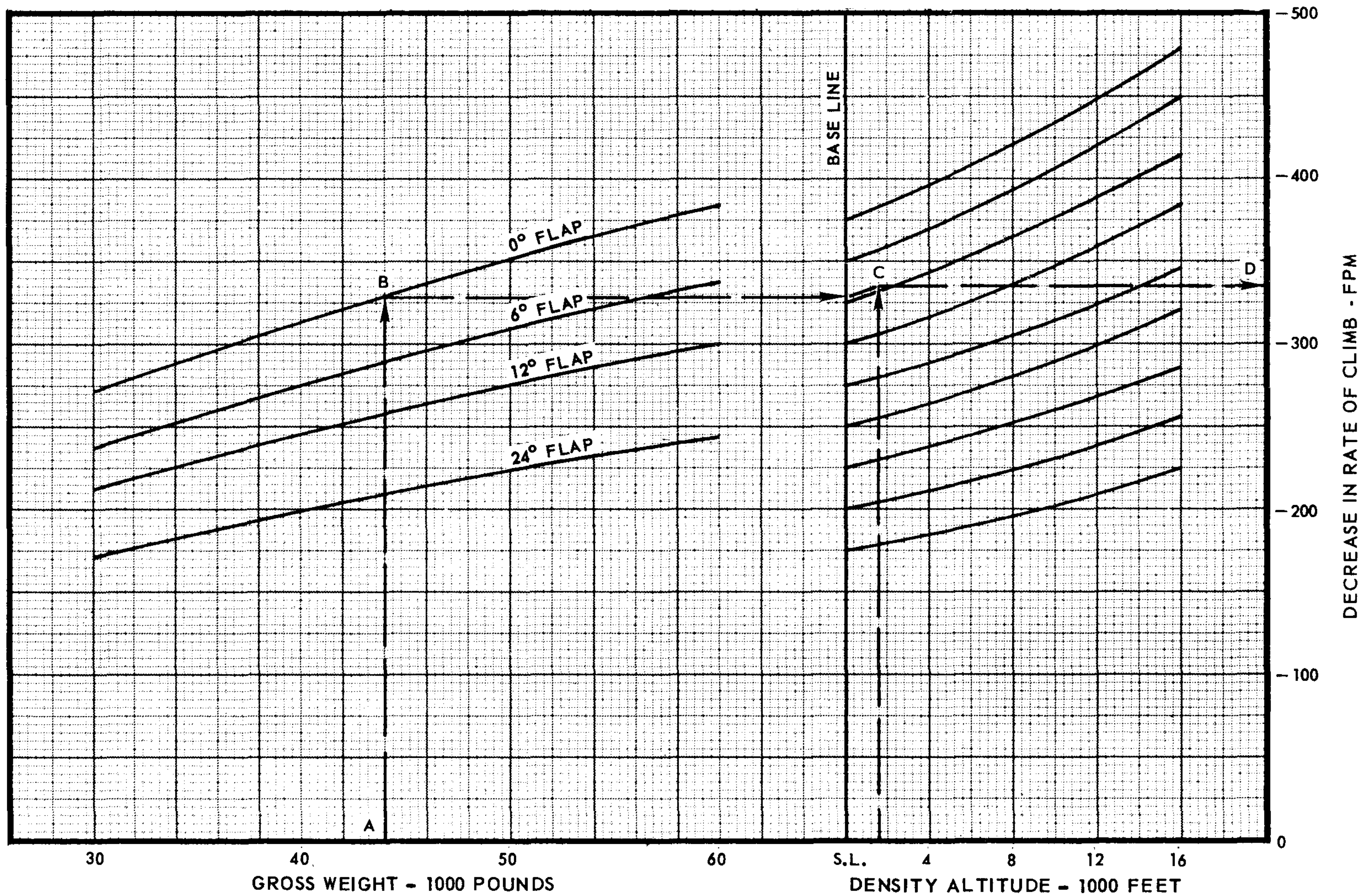
Figure 2A3-3

INITIAL RATE OF CLIMB CORRECTION

MODEL: **T-29C/D**
DATE: 15 MARCH 1955
DATA BASIS: FLIGHT TEST

LANDING GEAR DOWN 2800 RPM

ENGINES: **R2800-99W**



NOTE:

THE DECREASE IN RATE OF CLIMB IS DUE TO LANDING GEAR DRAG AT TAKEOFF. THE CORRECTION IS APPLICABLE TO THE RATE OF CLIMB FROM THE GROSS WEIGHT LIMITED BY CLIMB CHARTS, SINGLE ENGINE AND TWO ENGINE.

45,454

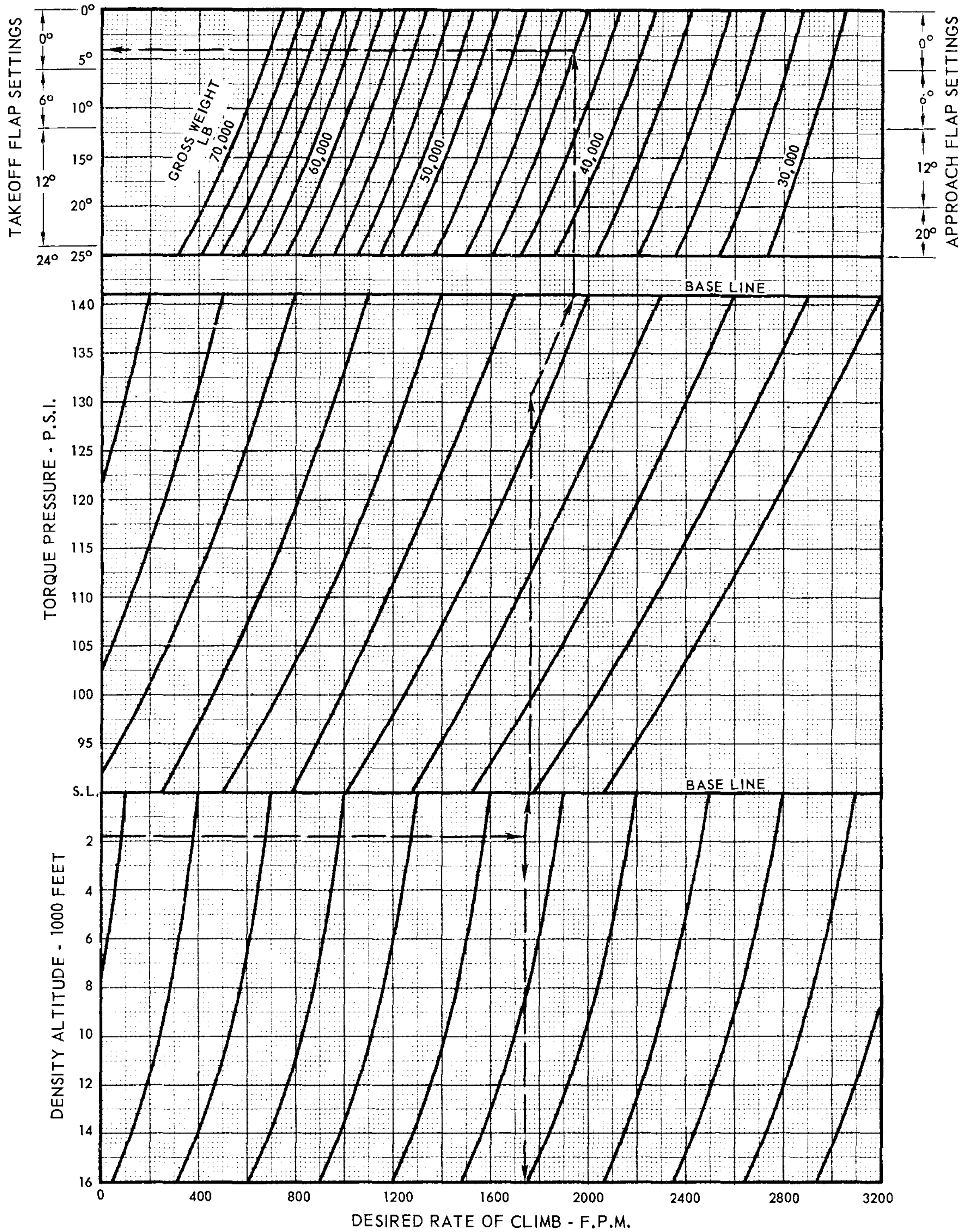
Figure 2A3-4

MODEL: **T-29C/D**
DATE: 15 MARCH 1955
DATA BASIS: FLIGHT TEST

TAKEOFF GROSS WEIGHT LIMITED BY CLIMB

CONTINUOUS TWO ENGINE OPERATION 2800 RPM
LANDING GEAR UP

ENGINES: **R2800-99W**



CONDITIONS:

(1) LANDING GEAR RETRACTED
(2) NACELLE FLAPS OPEN TO MIDPOSITION
(3) CLIMB SPEED = TAKEOFF SPEED (REFER TO TAKEOFF CURVES)

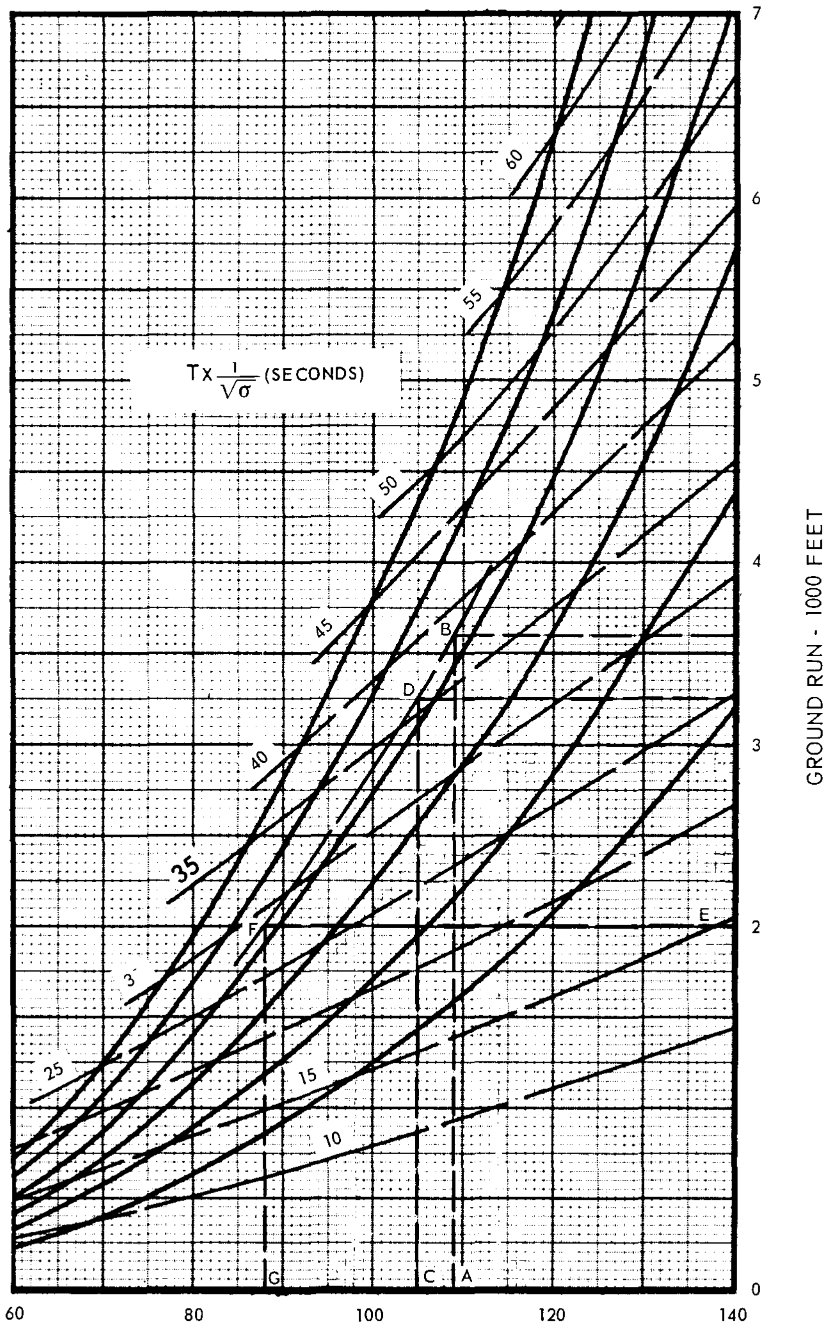
45,437B

Figure 2A3-5

MODEL: T-29 C/D
DATE: 15 MARCH 1955
DATA BASIS: FLIGHT TEST

VELOCITY DURING TAKEOFF GROUND RUN
(FOR ALL WEIGHTS AND FLAP SETTINGS)
2800 RPM

ENGINES: R-2800-99W



NOTES:

1. 100% WIND ACCOUNTABILITY.
2. TIME LINES ARE FOR SEA LEVEL. STANDARD CONDITIONS. TO OBTAIN TRUE TIME AT DENSITY ALTITUDE, DIVIDE T x $\frac{1}{\sqrt{\sigma}}$ BY $\frac{1}{\sqrt{\sigma}}$.

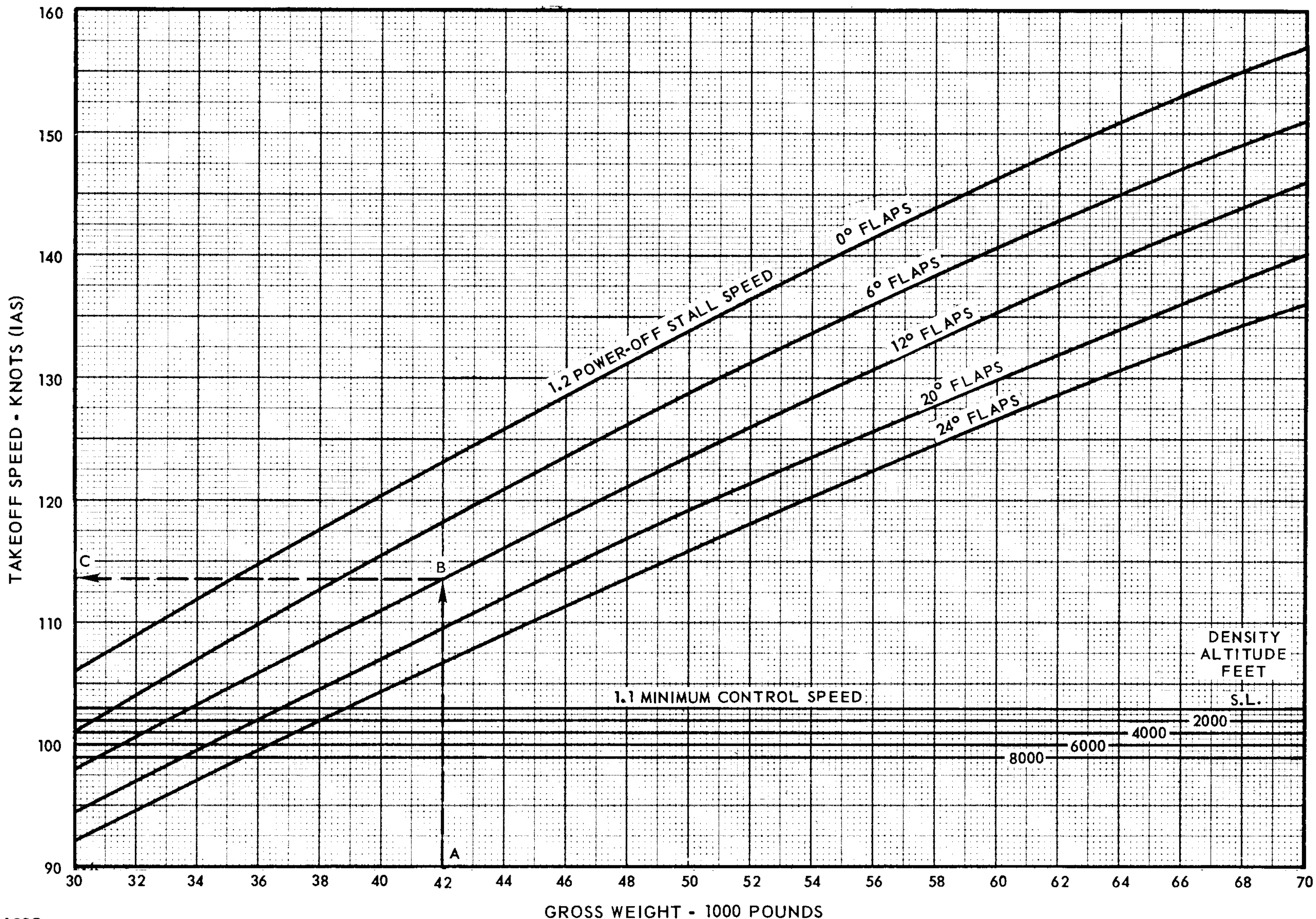
45,456 A

Figure 2A3-6

MODEL T-29C/D
DATE: 15 MARCH 1955
DATA BASIS: FLIGHT TEST

TAKEOFF AND MINIMUM CONTROL SPEEDS
LANDING GEAR RETRACTED

ENGINES: R2800-99W



24,155C

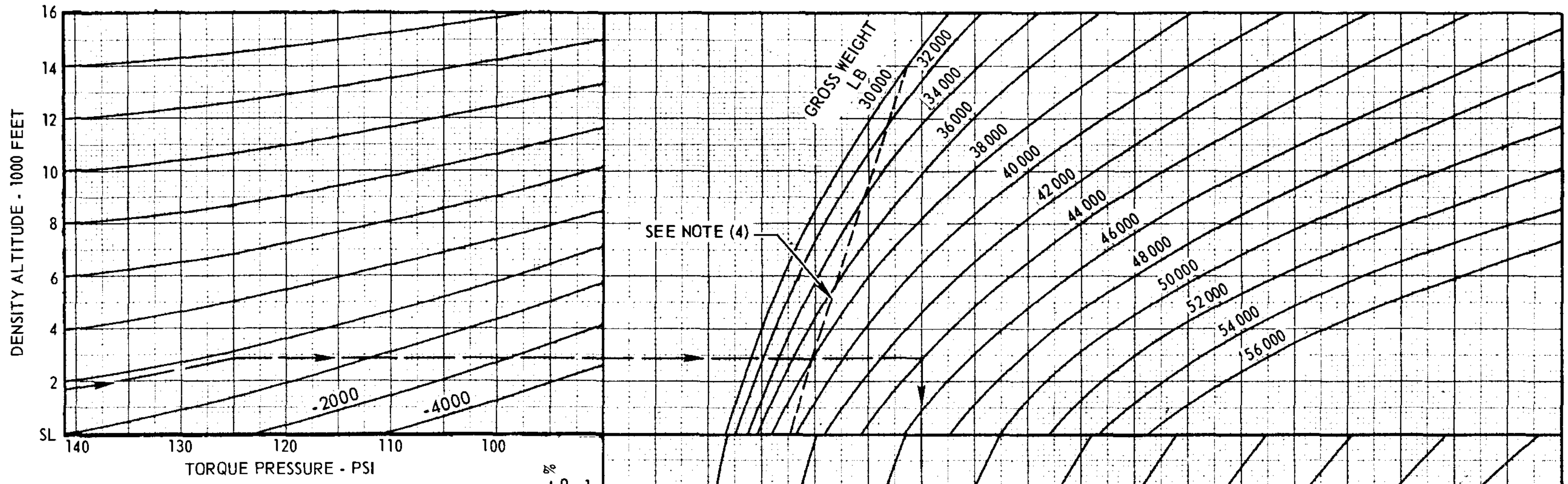
Figure 2A3-7

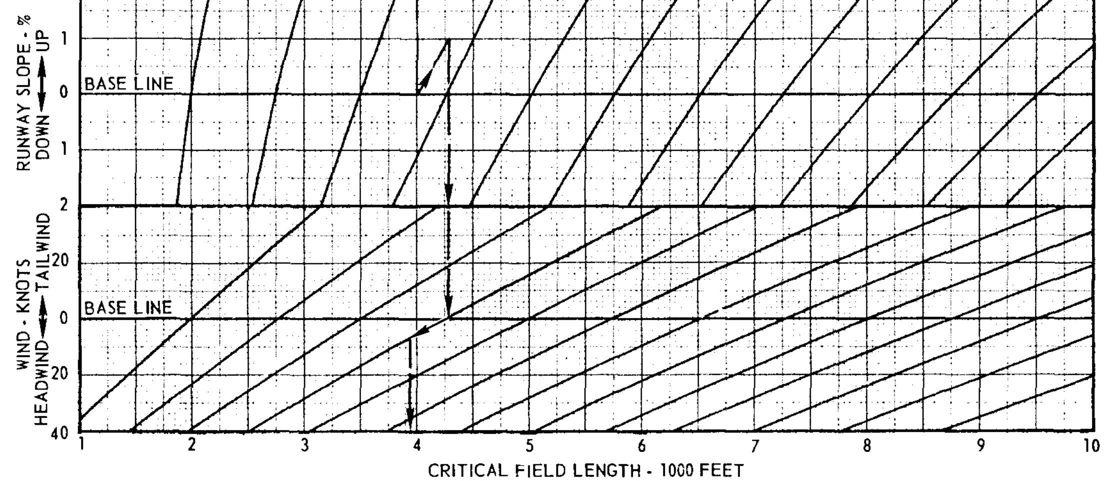
CRITICAL FIELD LENGTH (24° FLAP)

2800 RPM

MODEL: **T-29C/D**
DATE: 15 MARCH 1955
DATA BASIS: FLIGHT TEST

ENGINES: **R2800-99W**





CONDITIONS:

(1) WING FLAPS - 24°
(2) DRY HARD SURFACE RUNWAY
(3) NACELLE FLAPS - MIDPOSITION
(4) CABIN COMPRESSOR - ON

NOTES:

(1) DISTANCES ARE BASED ON AUTOFEATHERING AT CRITICAL ENGINE FAILURE SPEED.
(2) TORQUE PRESSURE IS FOR LEFT ENGINE. RIGHT ENGINE TORQUE WILL BE 4.0 PSI LOWER.
(3) 100% WIND ACCOUNTABILITY.
(4) TO THE LEFT OF THE DASHED LINE, TAKEOFF SPEED IS 1.1 MINIMUM CONTROL SPEED (SEE TAKEOFF AND MINIMUM CONTROL SPEEDS CHART, FIGURE A 3 - 8).

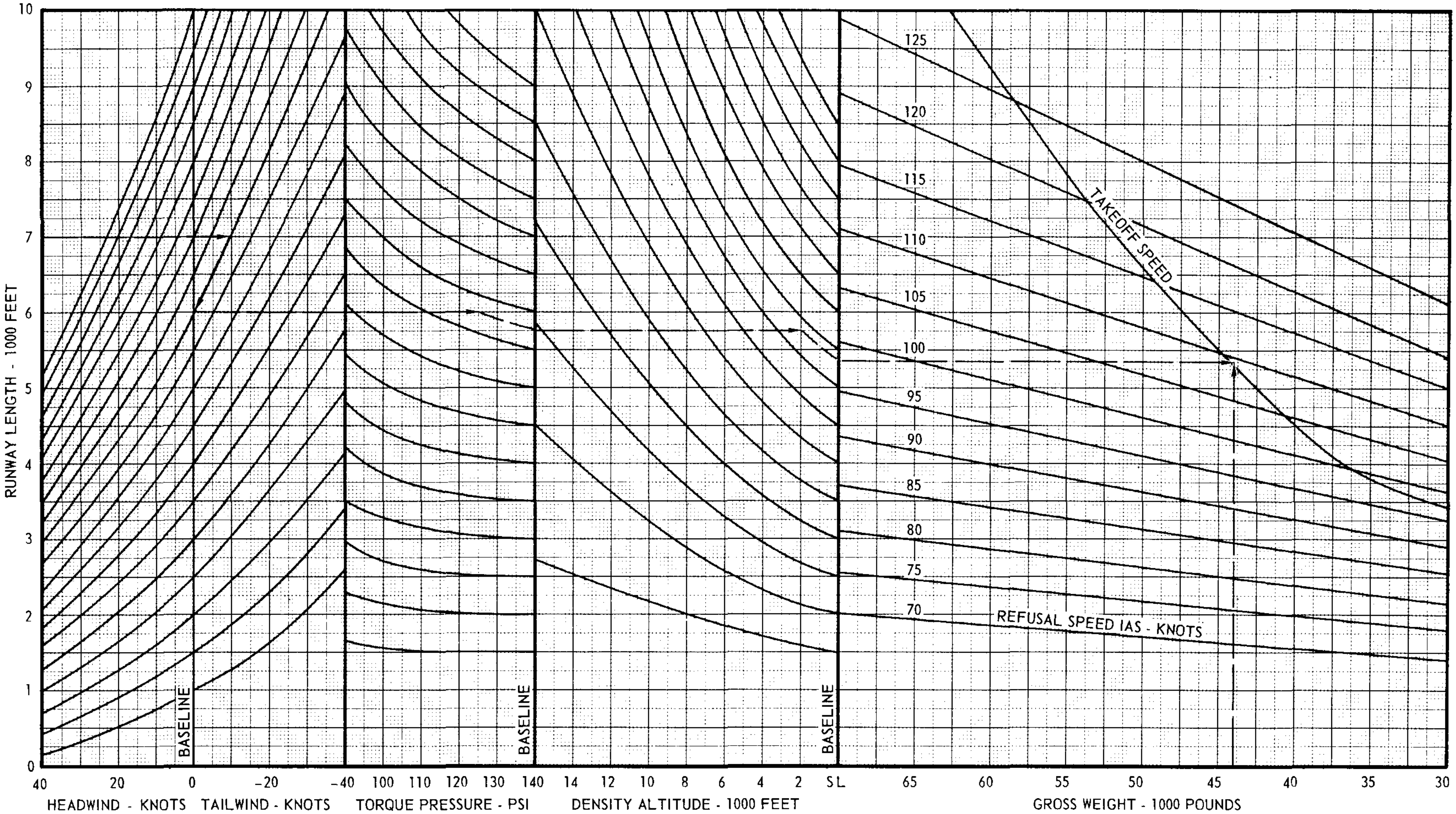
45,439C

Figure 2A3-8

MODEL: **T-29C/D**
DATE: 15 MARCH 1955
DATA BASIS: FLIGHT TEST

REFUSAL SPEED (24° FLAP)

ENGINES: **R2800-99W**



CONDITIONS:

(1) WING FLAPS AT 24°
(2) DRY HARD SURFACE RUNWAY
(3) NACELLE FLAPS MIDPOSITION
(4) CABIN COMPRESSOR ON

NOTES:

(1) TORQUE PRESSURE IS FOR LEFT ENGINE. RIGHT ENGINE TORQUE PRESSURE WILL BE 4.0 PSI LOWER.
(2) 100% WIND ACCOUNTABILITY
(3) BASED ON PILOT REACTION TIME 6 SECONDS.

45,438D

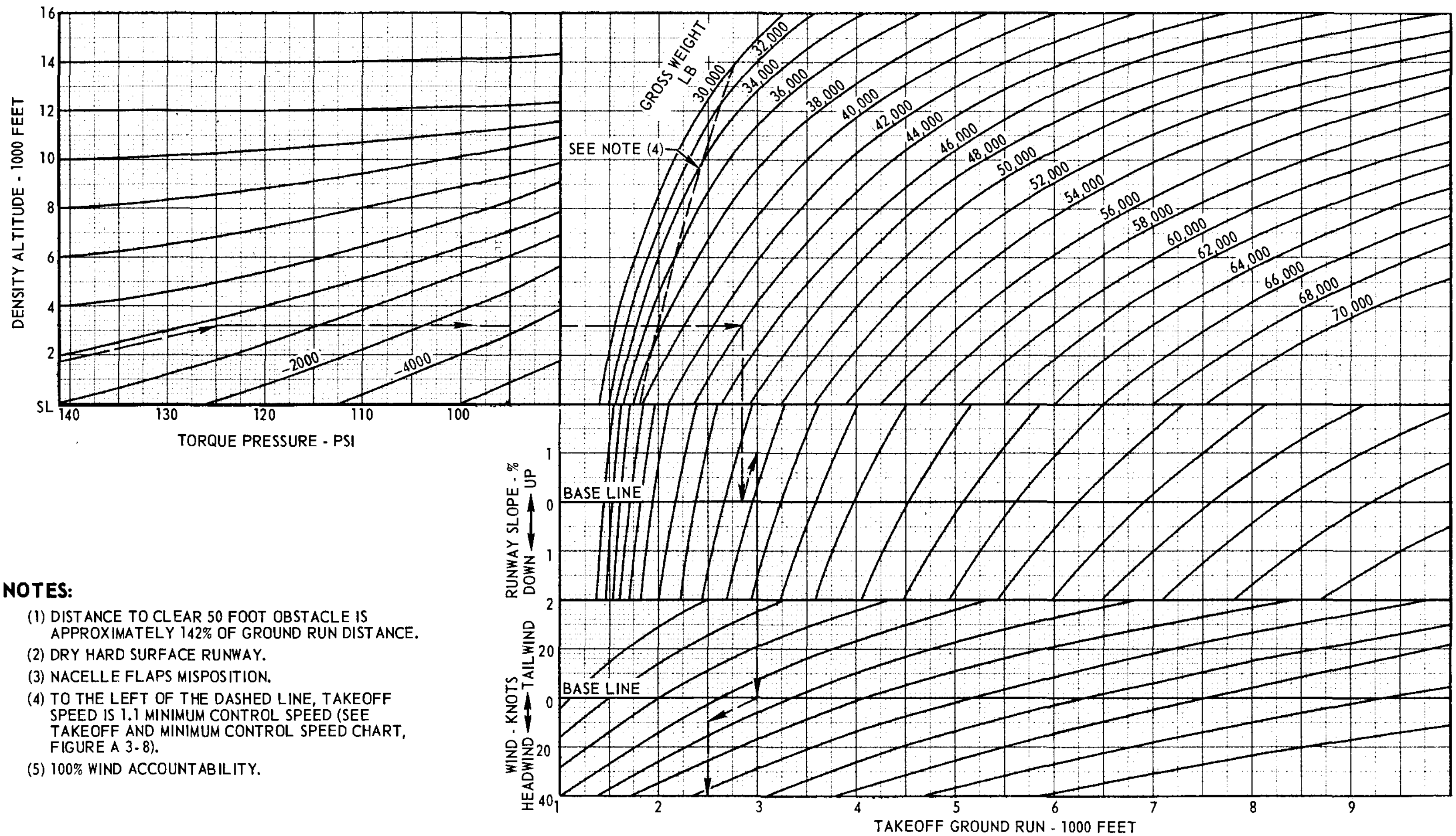
Figure 2A3-9

TAKEOFF GROUND RUN (24° FLAP)

CONTINUOUS TWO ENGINE OPERATION
2800 RPM

MODEL: T-29C/D
DATE: 15 MARCH 1955
DATA BASIS: FLIGHT TEST

ENGINES: R2800-99W



NOTES:

(1) DISTANCE TO CLEAR 50 FOOT OBSTACLE IS APPROXIMATELY 142% OF GROUND RUN DISTANCE.
(2) DRY HARD SURFACE RUNWAY.
(3) NACELLE FLAPS MISPOSITION.
(4) TO THE LEFT OF THE DASHED LINE, TAKEOFF SPEED IS 1.1 MINIMUM CONTROL SPEED (SEE TAKEOFF AND MINIMUM CONTROL SPEED CHART, FIGURE A 3-8).
(5) 100% WIND ACCOUNTABILITY.

45,440C

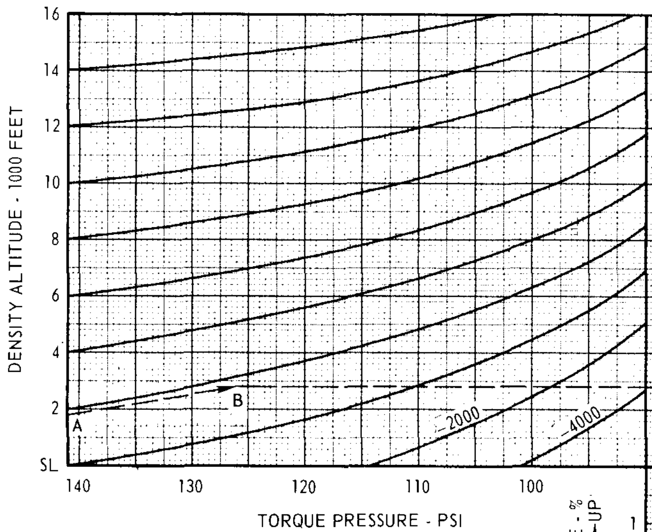
Figure 2A3-10

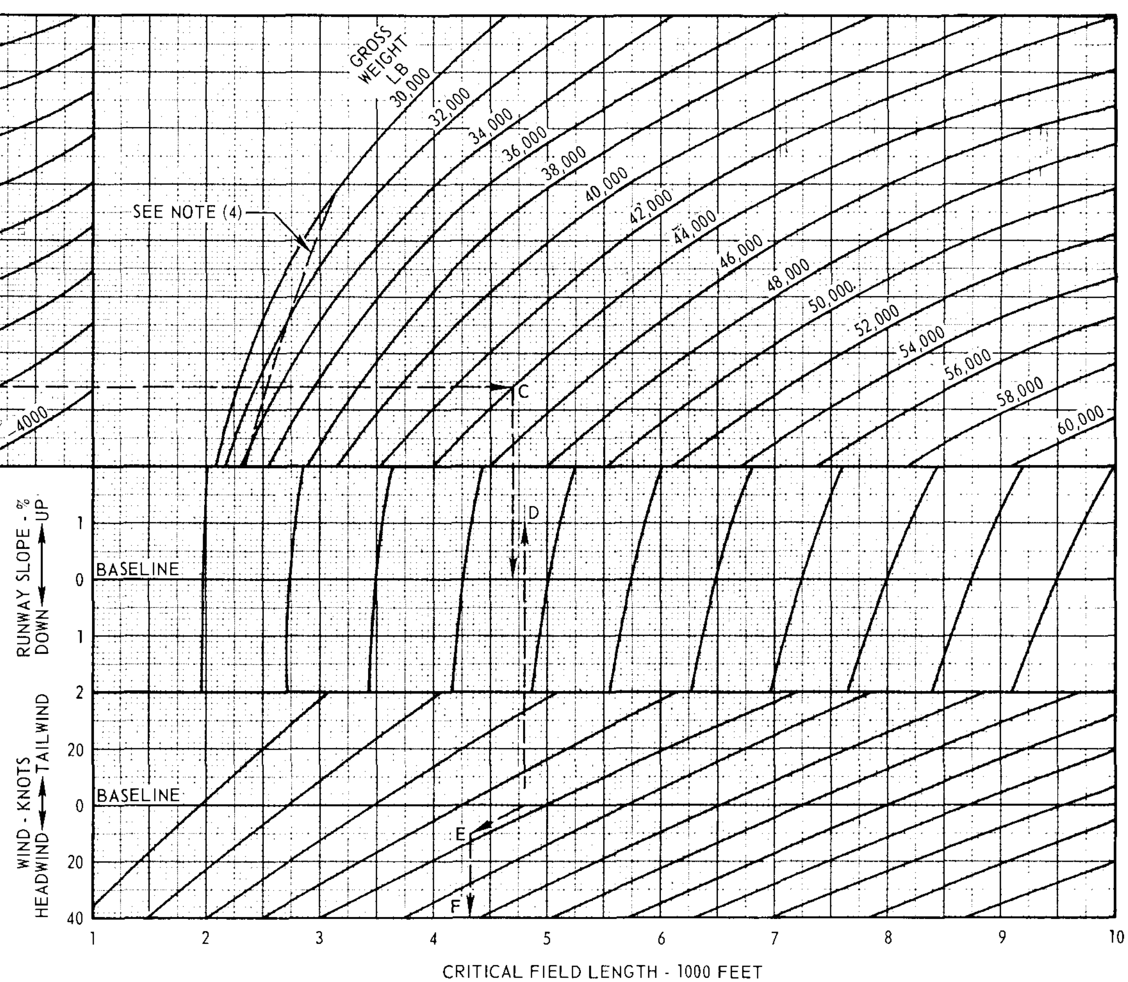
CRITICAL FIELD LENGTH (12° FLAP)

2800 RPM

MODEL: **T-29C/D**
DATE: 15 MARCH 1955
DATA BASIS: FLIGHT TEST

ENGINES: **R2800-99W**





CONDITIONS:

(1) WING FLAPS - 12°
(2) DRY HARD SURFACE RUNWAY
(3) NACELLE FLAPS - MIDPOSITION
(4) CABIN COMPRESSOR - ON

NOTES:

(1) DISTANCES ARE BASED ON AUTOFEATHERING AT CRITICAL ENGINE FAILURE SPEED.
(2) TORQUE PRESSURE IS FOR LEFT ENGINE. RIGHT ENGINE TORQUE WILL BE 4.0 PSI LOWER.
(3) 100% WIND ACCOUNTABILITY.
(4) TO THE LEFT OF THE DASHED LINE, TAKEOFF SPEED IS 1.1 MINIMUM CONTROL SPEED (SEE TAKEOFF AND MINIMUM CONTROL SPEED CHART, FIGURE A 3-8).

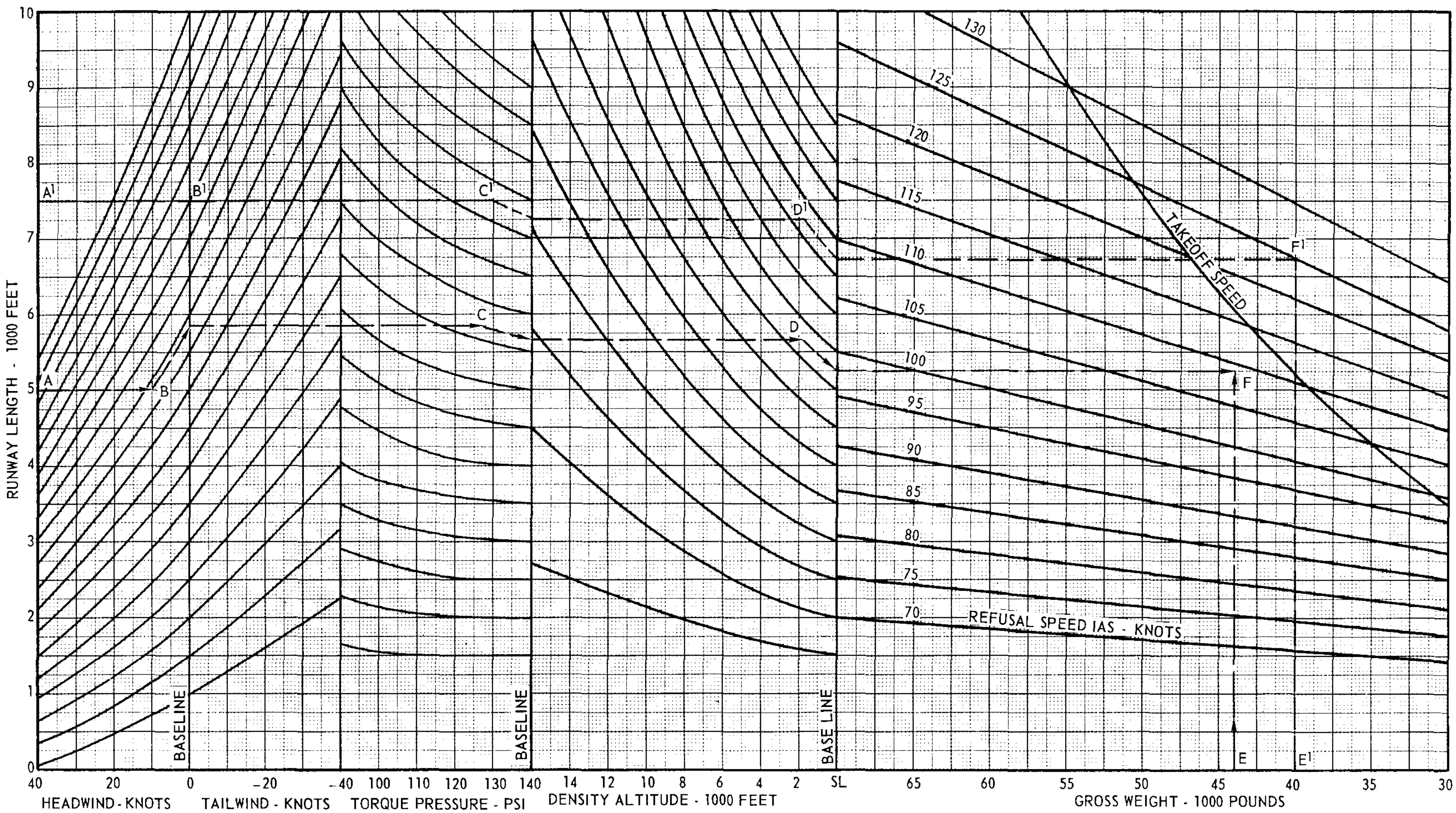
45,442D

Figure 2A3-11

MODEL: **T29C /D**
DATE: 15 MARCH 1955
DATA BASIS: FLIGHT TEST

REFUSAL SPEED (12° FLAP)

ENGINES: **R2800 - 99W**



CONDITIONS:
(1) WING FLAPS AT 12°
(2) DRY HARD SURFACE RUNWAY
(3) NACELLE FLAPS MIDPOSITION
(4) CABIN COMPRESSOR ON

NOTES:
(1) TORQUE PRESSURE IS FOR LEFT ENGINE. RIGHT ENGINE TORQUE PRESSURE WILL BE 4.0 PSI LOWER.
(2) 100% WIND ACCOUNTABILITY
(3) BASED ON PILOT REACTION TIME 6 SECONDS.

45,441D

Figure 2A3-12

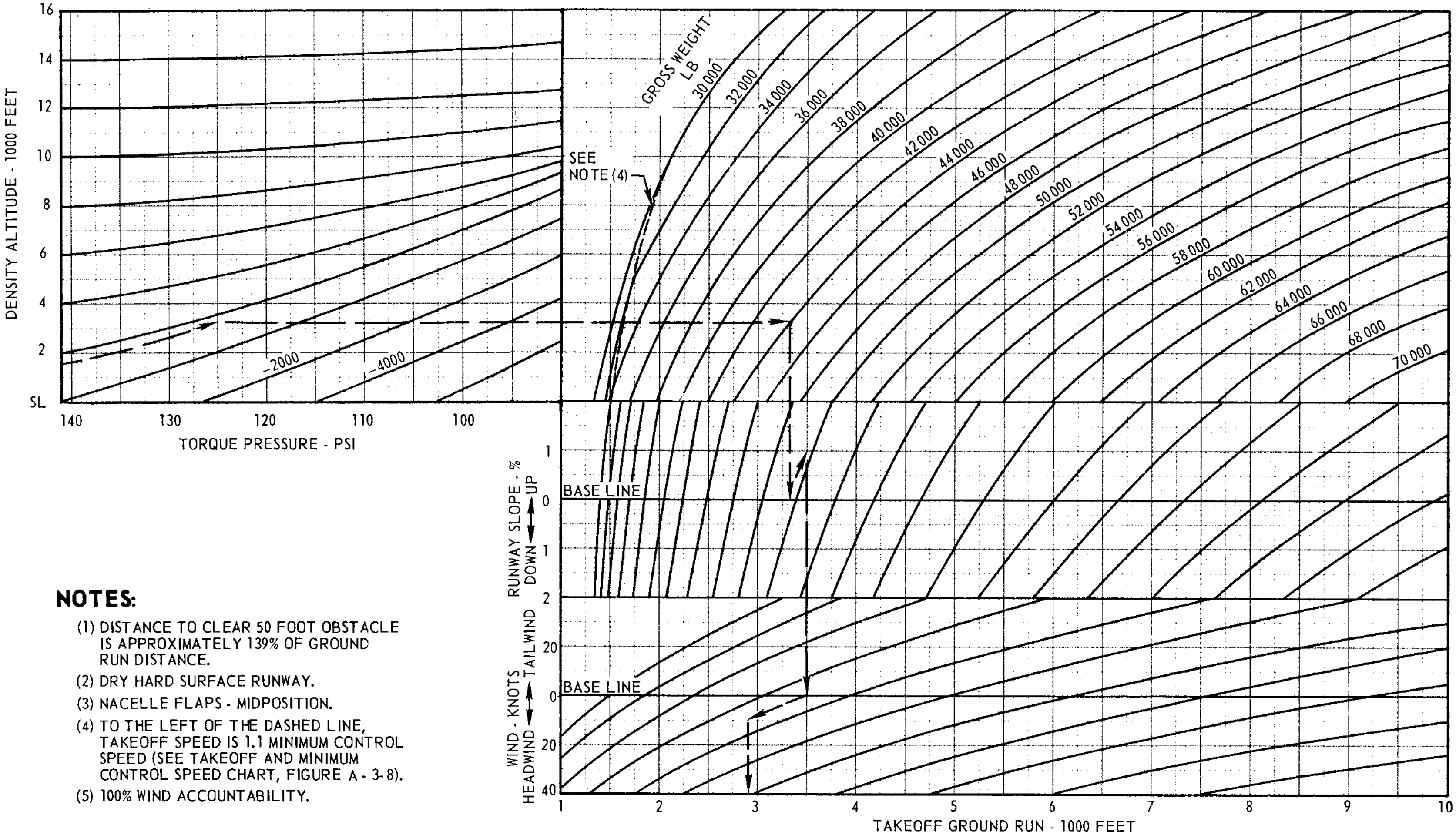
MODEL: T-29C/D
DATE: 15 MARCH 1955
DATA BASIS: FLIGHT TEST

TAKEOFF GROUND RUN (12° FLAP)

CONTINUOUS TWO ENGINE OPERATION

2800 RPM

ENGINES: R2800-99W



NOTES:

(1) DISTANCE TO CLEAR 50 FOOT OBSTACLE IS APPROXIMATELY 139% OF GROUND RUN DISTANCE.
(2) DRY HARD SURFACE RUNWAY.
(3) NACELLE FLAPS - MIDPOSITION.
(4) TO THE LEFT OF THE DASHED LINE, TAKEOFF SPEED IS 1.1 MINIMUM CONTROL SPEED (SEE TAKEOFF AND MINIMUM CONTROL SPEED CHART, FIGURE A-3-8).
(5) 100% WIND ACCOUNTABILITY.

45,443C

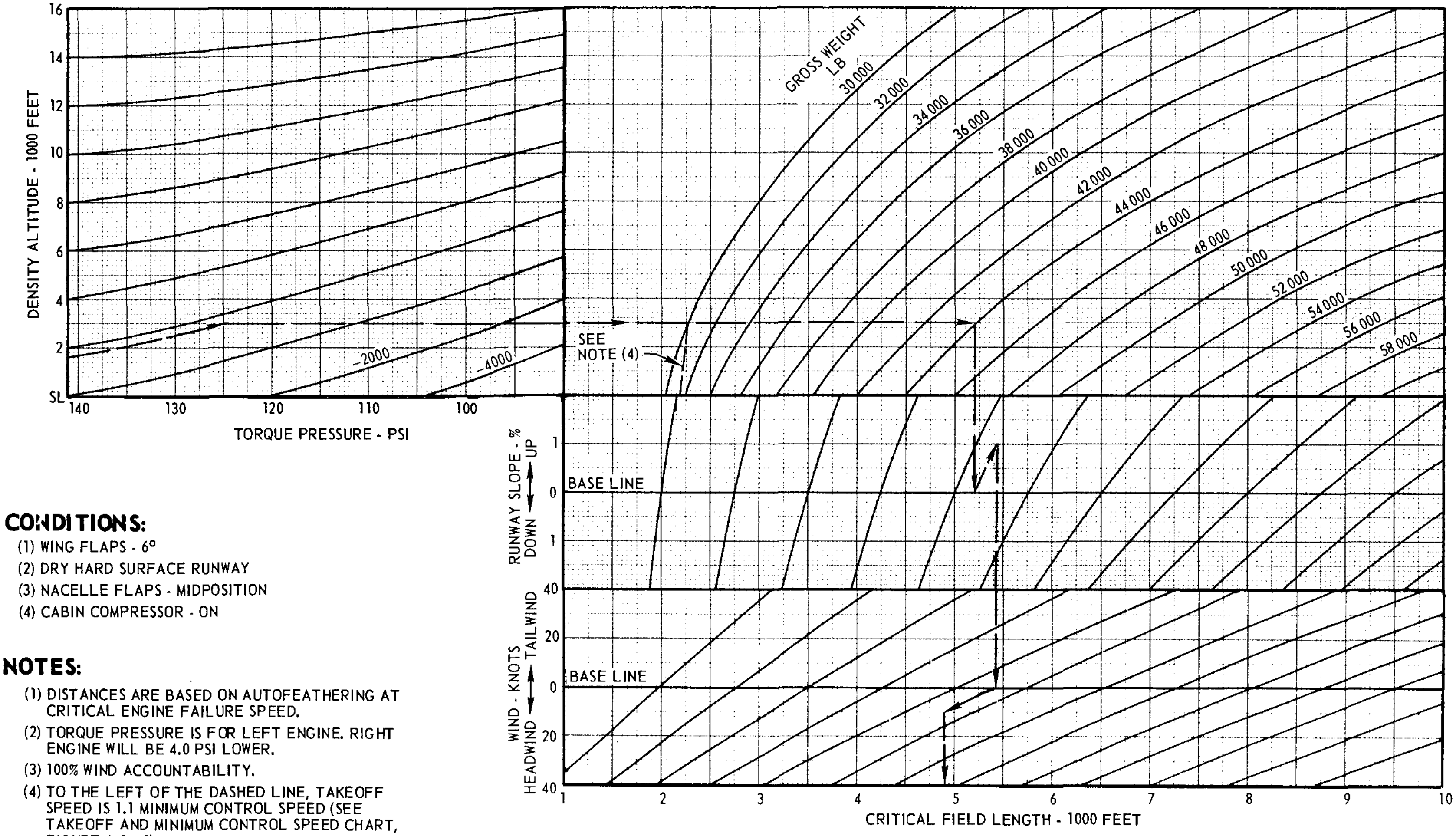
Figure 2A3-13

MODEL: T-29C/D
DATE: 15 MARCH 1955
DATA BASIS: FLIGHT TEST

CRITICAL FIELD LENGTH (6° FLAP)

2800 RPM

ENGINES: R2800-99W



CONDITIONS:

(1) WING FLAPS - 6°
(2) DRY HARD SURFACE RUNWAY
(3) NACELLE FLAPS - MIDPOSITION
(4) CABIN COMPRESSOR - ON

NOTES:

(1) DISTANCES ARE BASED ON AUTOFEATHERING AT CRITICAL ENGINE FAILURE SPEED.
(2) TORQUE PRESSURE IS FOR LEFT ENGINE. RIGHT ENGINE WILL BE 4.0 PSI LOWER.
(3) 100% WIND ACCOUNTABILITY.
(4) TO THE LEFT OF THE DASHED LINE, TAKEOFF SPEED IS 1.1 MINIMUM CONTROL SPEED (SEE TAKEOFF AND MINIMUM CONTROL SPEED CHART, FIGURE A 3 - 8).

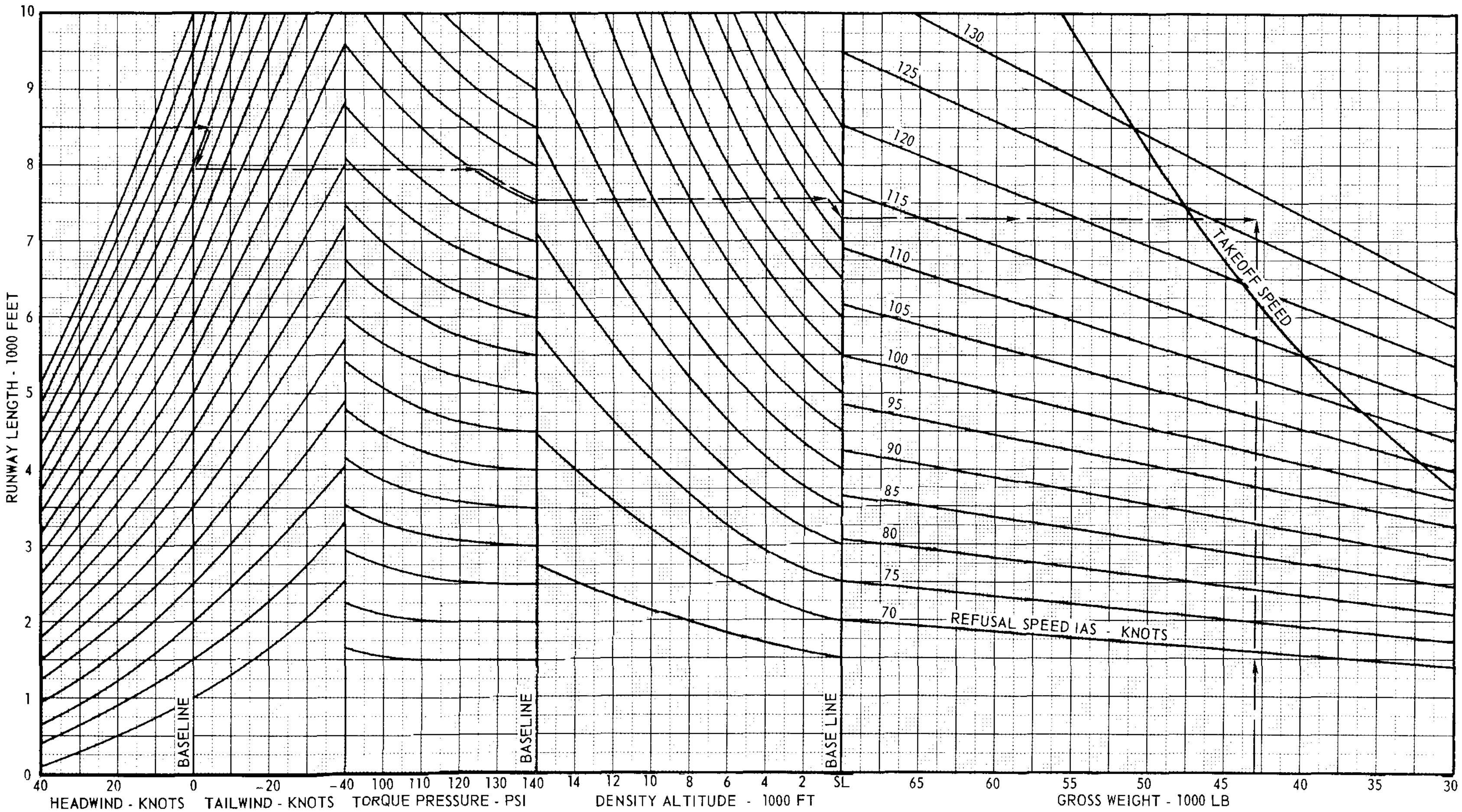
45,445C

Figure 2A3-14

MODEL: T29C/D
DATE: 15 MARCH 1955
DATA BASIS: FLIGHT TEST

REFUSAL SPEED (6° FLAP)

ENGINES: R2800 - 99W



CONDITIONS:
(1) WING FLAPS AT 6°
(2) DRY HARD SURFACE RUNWAY
(3) NACELLE FLAPS MIDPOSITION
(4) CABIN COMPRESSOR ON

NOTES:
(1) TORQUE PRESSURE IS FOR LEFT ENGINE. RIGHT ENGINE TORQUE PRESSURE WILL BE 4.0 PSI LOWER.
(2) 100% WIND ACCOUNTABILITY
(3) BASED ON PILOT REACTION TIME 6 SECONDS.

15,114D

Figure 2A3-15

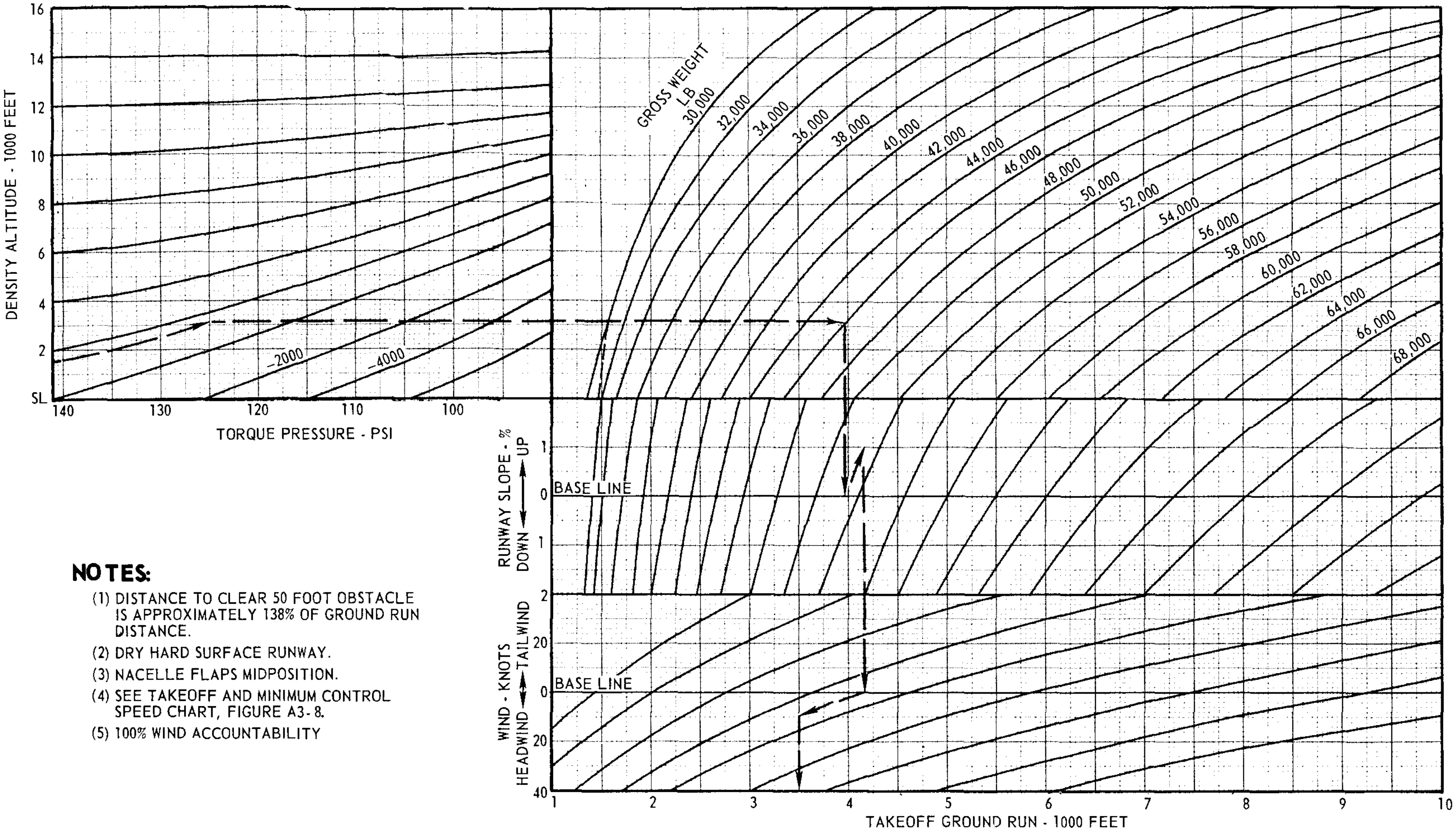
TAKEOFF GROUND RUN (6° FLAP)

CONTINUOUS TWO ENGINE OPERATION

2800 RPM

MODEL: T-29C/D
DATE: 15 MARCH 1955
DATA BASIS: FLIGHT TEST

ENGINES: R2800-99W



NOTES:

(1) DISTANCE TO CLEAR 50 FOOT OBSTACLE IS APPROXIMATELY 138% OF GROUND RUN DISTANCE.

(2) DRY HARD SURFACE RUNWAY.

(3) NACELLE FLAPS MIDPOSITION.

(4) SEE TAKEOFF AND MINIMUM CONTROL SPEED CHART, FIGURE A3-8.

(5) 100% WIND ACCOUNTABILITY

45,446C

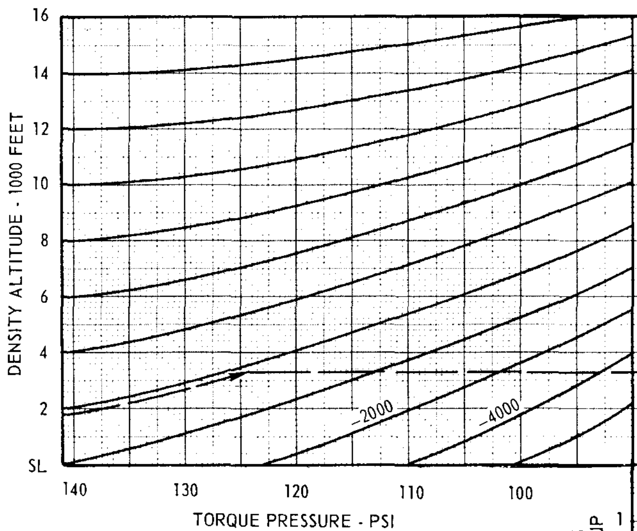
Figure 2A3-16

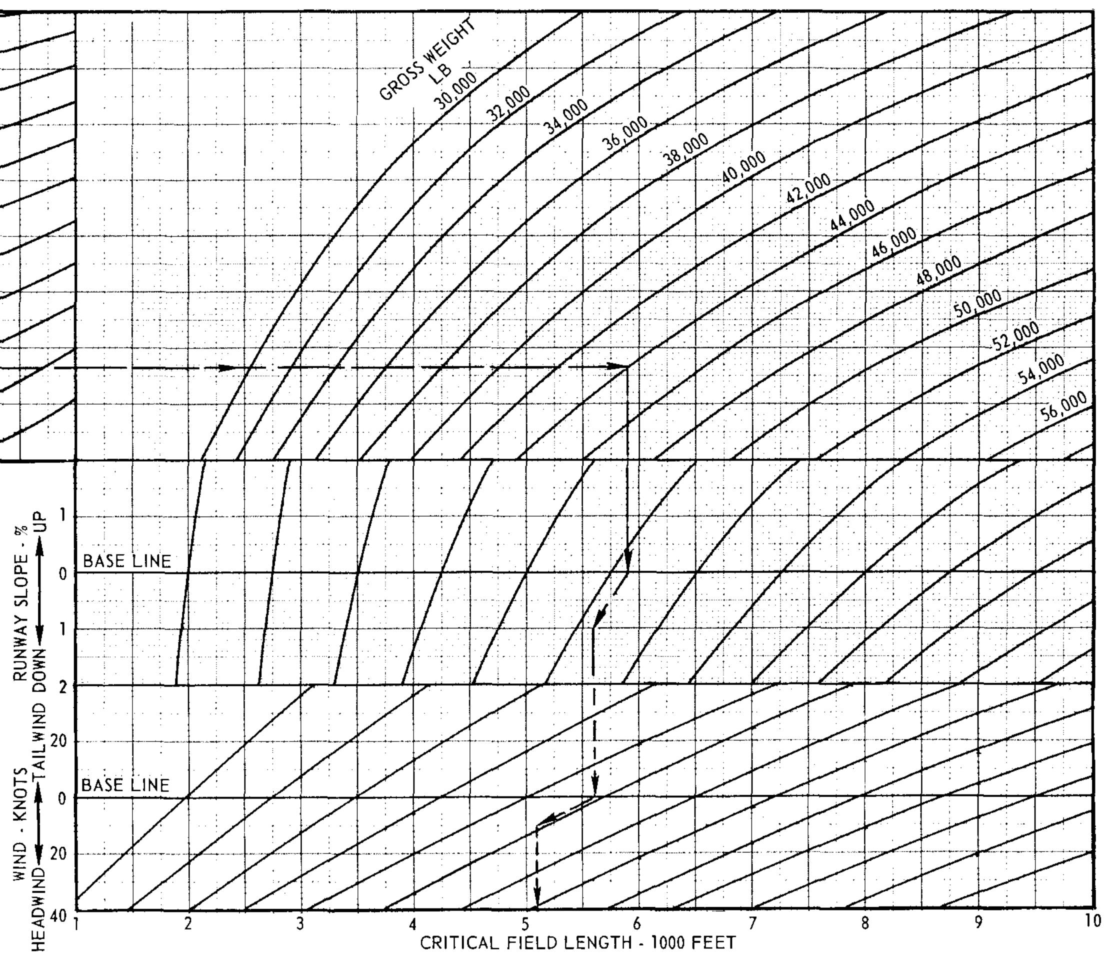
MODEL: T-29C/D
DATE: 15 MARCH 1955
DATA BASIS: FLIGHT TEST

CRITICAL FIELD LENGTH (0° FLAP)

2800 RPM

ENGINES: R2800-99W





CONDITIONS:

(1) WING FLAPS - 0°
(2) DRY HARD SURFACE RUNWAY
(3) NACELLE FLAPS - MIDPOSITION
(4) CABIN COMPRESSOR - ON

NOTES:

(1) DISTANCES ARE BASED ON AUTOFEATHERING AT CRITICAL ENGINE FAILURE SPEED.
(2) TORQUE PRESSURE IS FOR LEFT ENGINE. RIGHT ENGINE TORQUE WILL BE 4.0 PSI LOWER.
(3) 100% WIND ACCOUNTABILITY.
(4) SEE TAKEOFF AND MINIMUM CONTROL SPEED CHART, FIGURE A 3 - 8.

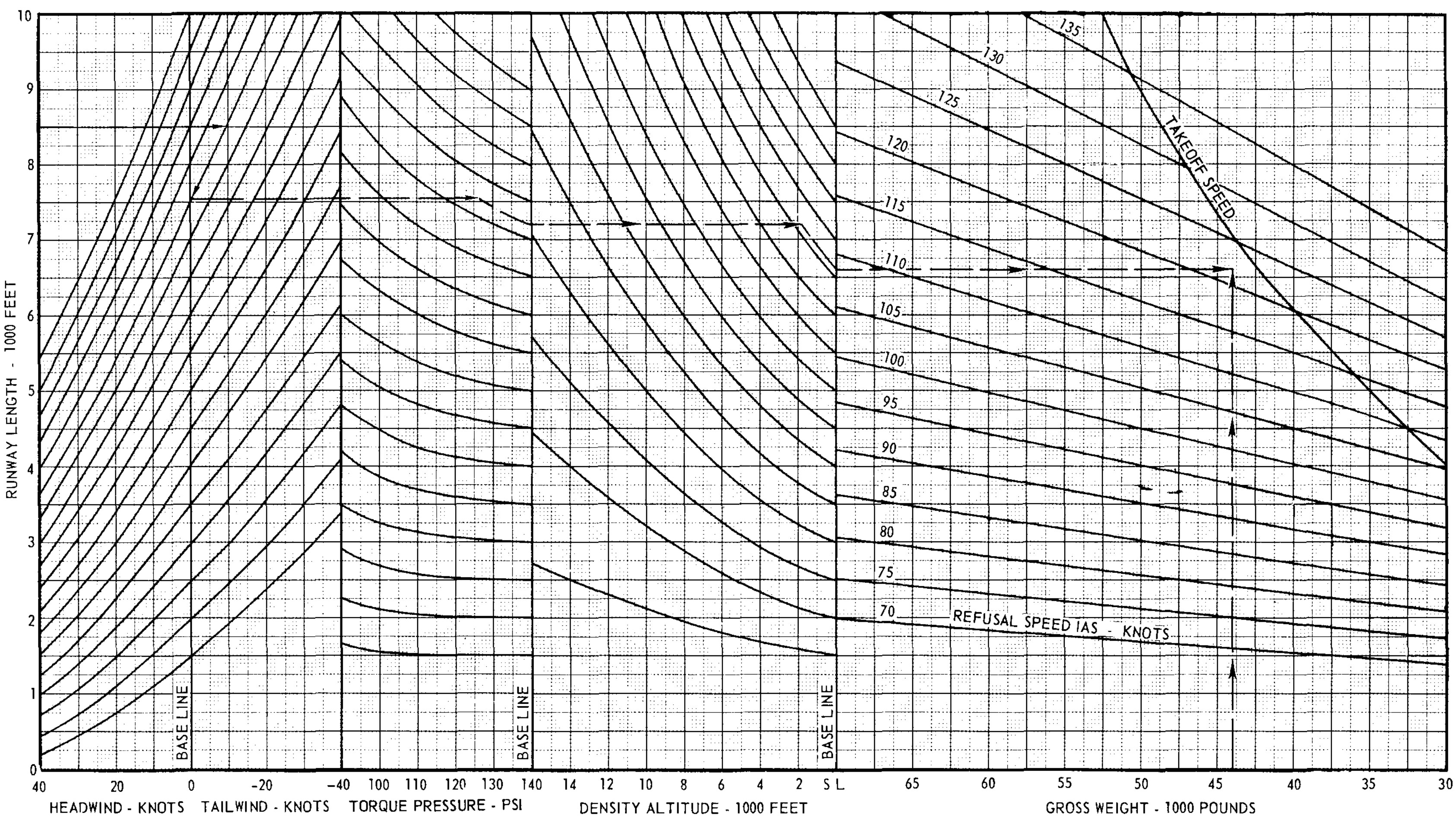
45,448C

Figure 2A3-17

REFUSAL SPEED (0° FLAP)

MODEL: **T29C/D**
DATE: 15 MARCH 1955
DATA BASIS: FLIGHT TEST

ENGINES: **R2800 - 99W**



CONDITIONS:
(1) WING FLAPS AT 0°
(2) DRY HARD SURFACE RUNWAY
(3) NACELLE FLAPS MIDPOSITION
(4) CABIN COMPRESSOR ON

NOTES:
(1) TORQUE PRESSURE IS FOR LEFT ENGINE. RIGHT ENGINE TORQUE PRESSURE WILL BE 4.0 PSI LOWER.
(2) 100% WIND ACCOUNTABILITY
(3) BASED ON PILOT REACTION TIME 6 SECONDS.

45,447D

Figure 2A3-18

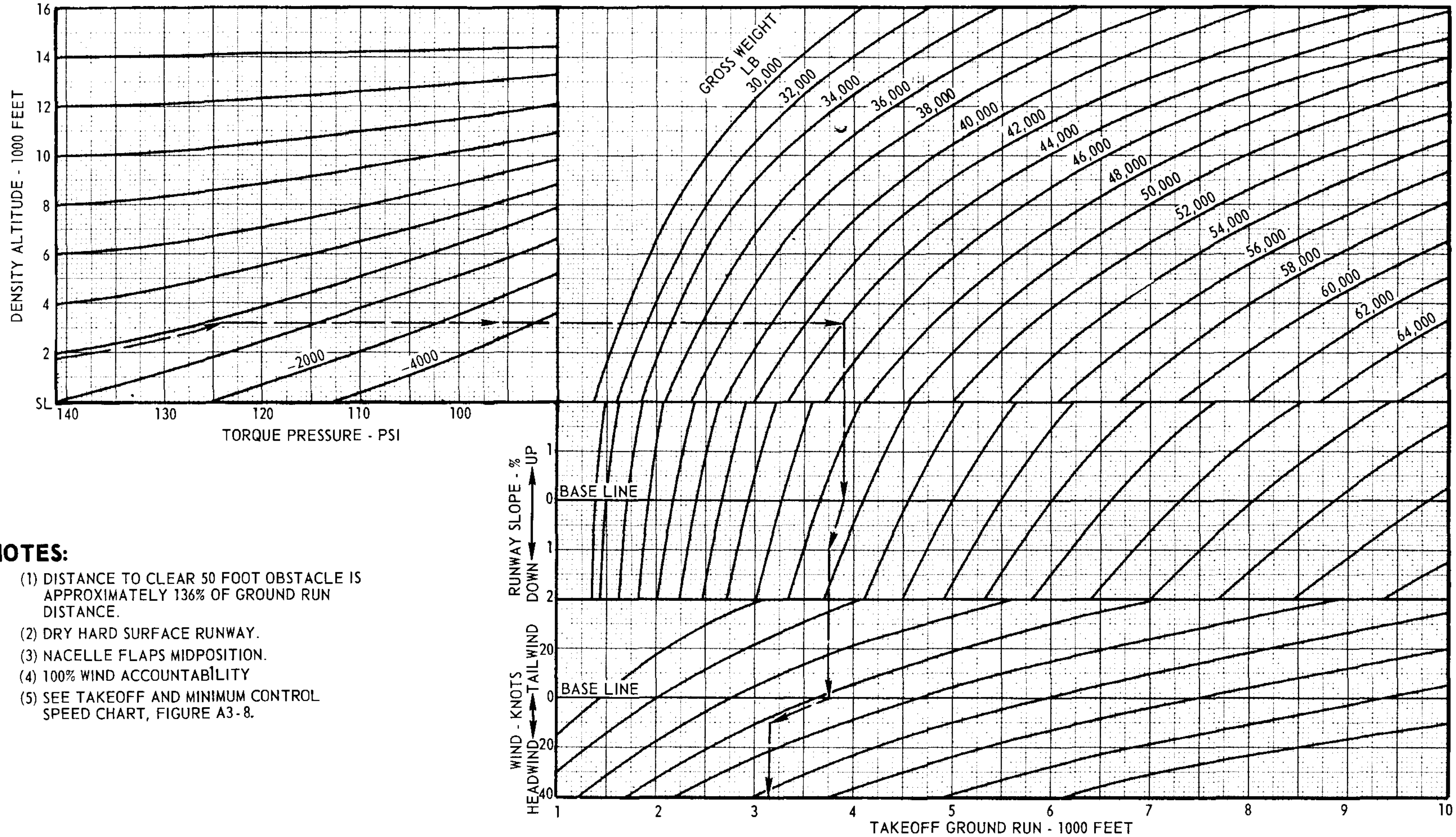
TAKEOFF GROUND RUN (0° FLAP)

CONTINUOUS TWO ENGINE OPERATION

2800 RPM

MODEL: T-29C/D
DATE: 15 MARCH 1955
DATA BASIS: FLIGHT TEST

ENGINES: R2800-99W



NOTES:

(1) DISTANCE TO CLEAR 50 FOOT OBSTACLE IS APPROXIMATELY 136% OF GROUND RUN DISTANCE.

(2) DRY HARD SURFACE RUNWAY.

(3) NACELLE FLAPS MIDPOSITION.

(4) 100% WIND ACCOUNTABILITY

(5) SEE TAKEOFF AND MINIMUM CONTROL SPEED CHART, FIGURE A3-8.

45,449C

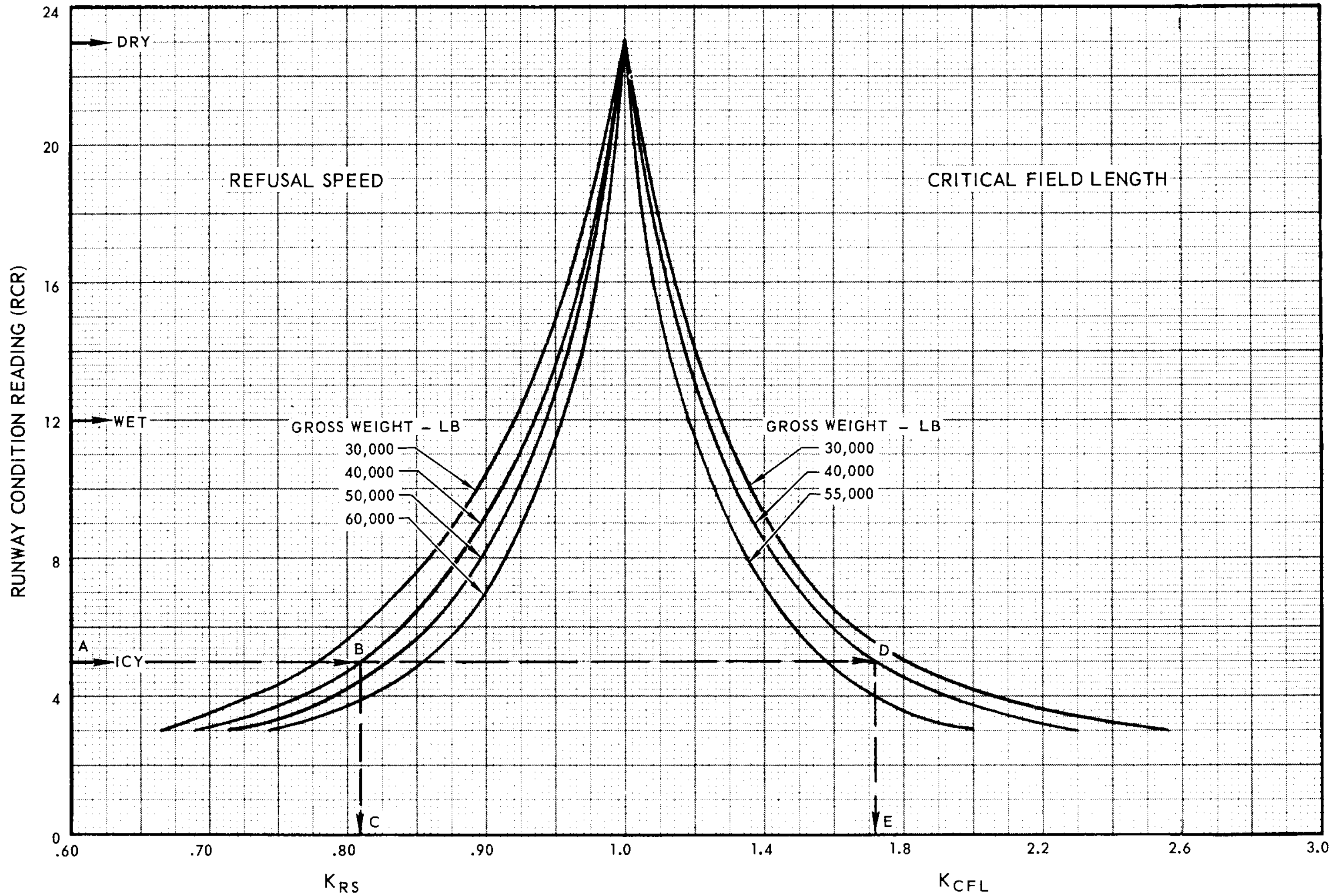
Figure 2A3-19

MODEL: **T-29C/D**
DATE: 13 JULY 1964
DATA BASIS: ESTIMATED

EFFECT OF RUNWAY SURFACE CONDITIONS

REFUSAL SPEED AND CRITICAL FIELD LENGTH CORRECTIONS
ALL FLAP SETTINGS

ENGINES: **R2800-99W**



CORRECTED REFUSAL SPEED = K_{RS} × REFUSAL SPEED FROM CHARTS
CORRECTED CRITICAL FIELD LENGTH = K_{CFL} × CRITICAL FIELD LENGTH FROM CHARTS

NOTE: IF NO RCR IS AVAILABLE, USE 12 FOR WET RUNWAYS AND 5 FOR ICY RUNWAYS.

45,977B

Figure 2A3-20

CLIMBOUT FACTOR FOR CLIMBOUT FLIGHT PATH

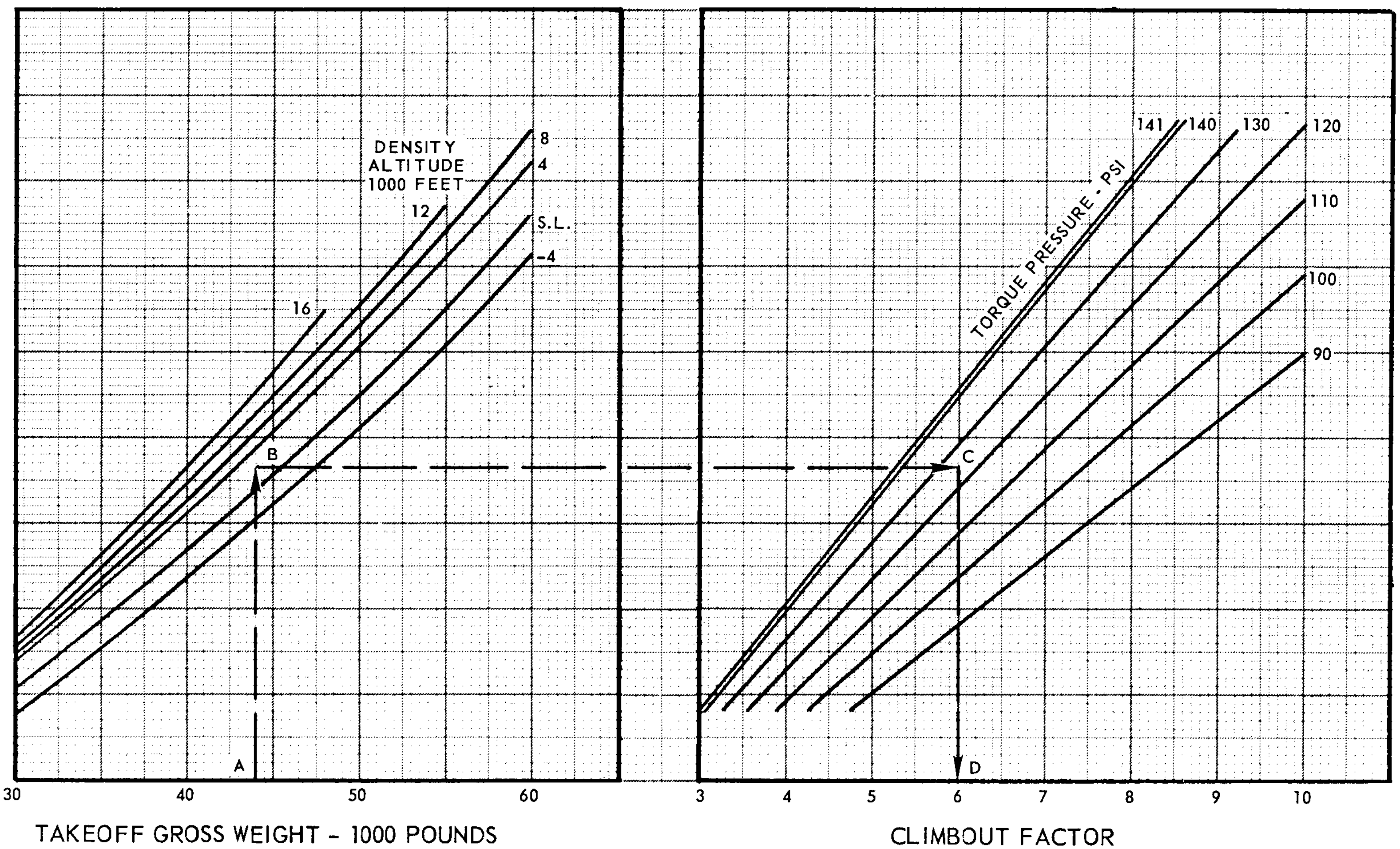
MODEL: **T-29 C/D**
DATE: 15 MARCH 1955
DATA BASIS: FLIGHT TEST

FOR ALL FLAP SETTINGS

TWO AND ONE ENGINE OPERATION

2800 RPM

ENGINES: **R2800-99W**



45,462

Figure 2A3-21

CLIMBOUT FLIGHT PATH - TWO ENGINE - 0° FLAP

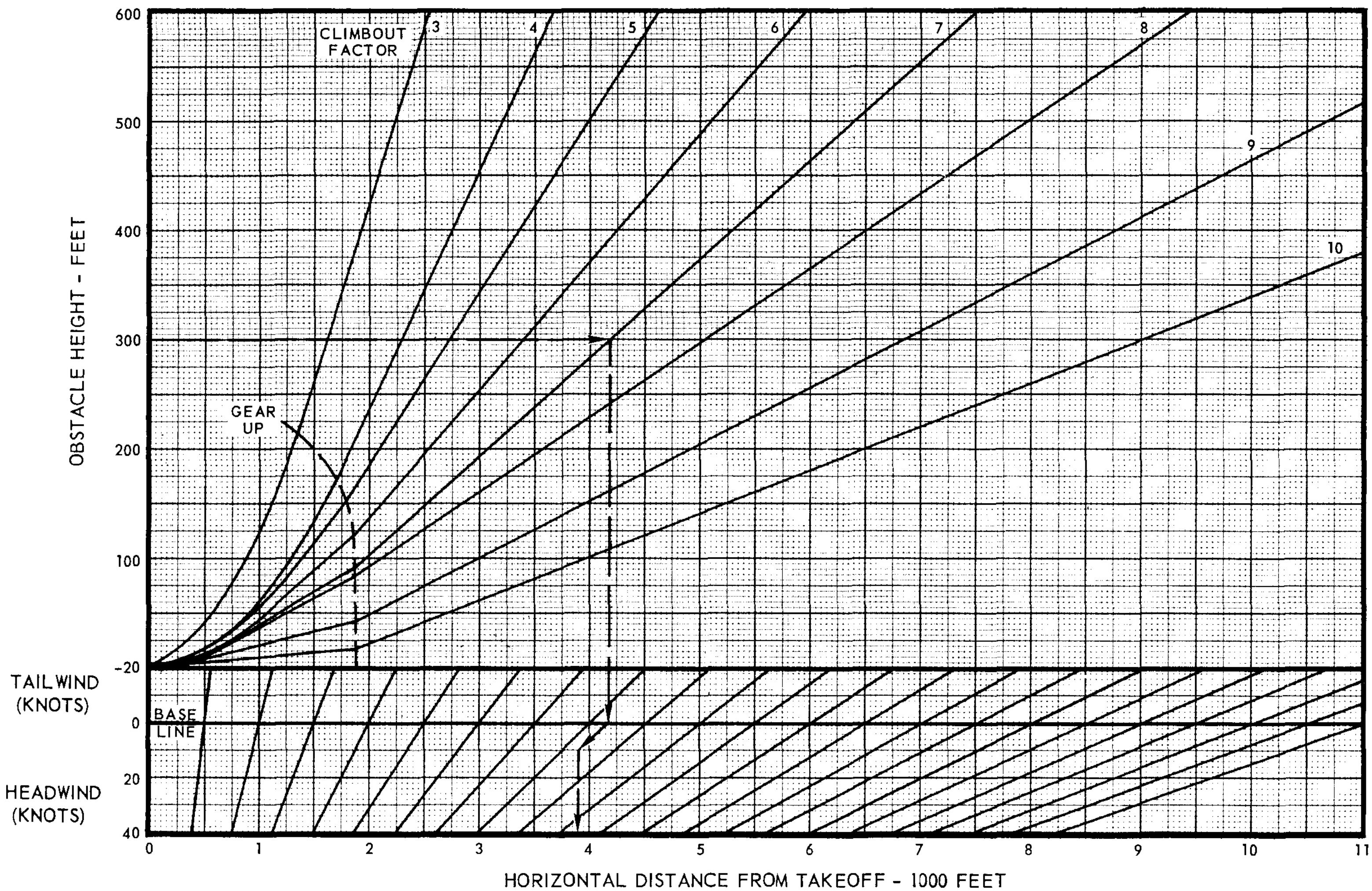
MODEL: **T-29C/D**
DATE: 15 MARCH 1955
DATA BASIS: FLIGHT TEST

INCLUDING FLARE DISTANCE

OBSTACLE HEIGHT 0 - 600 FEET

2800 RPM

ENGINES: **R2800-99W**



NOTES:

(1) LANDING GEAR UP IN 6 SECONDS
(2) CLIMB SPEED = TAKEOFF SPEED
(3) 100% WIND ACCOUNTABILITY

45,463

Figure 2A3-22

CLIMBOUT FLIGHT PATH - TWO ENGINE - 6° FLAP

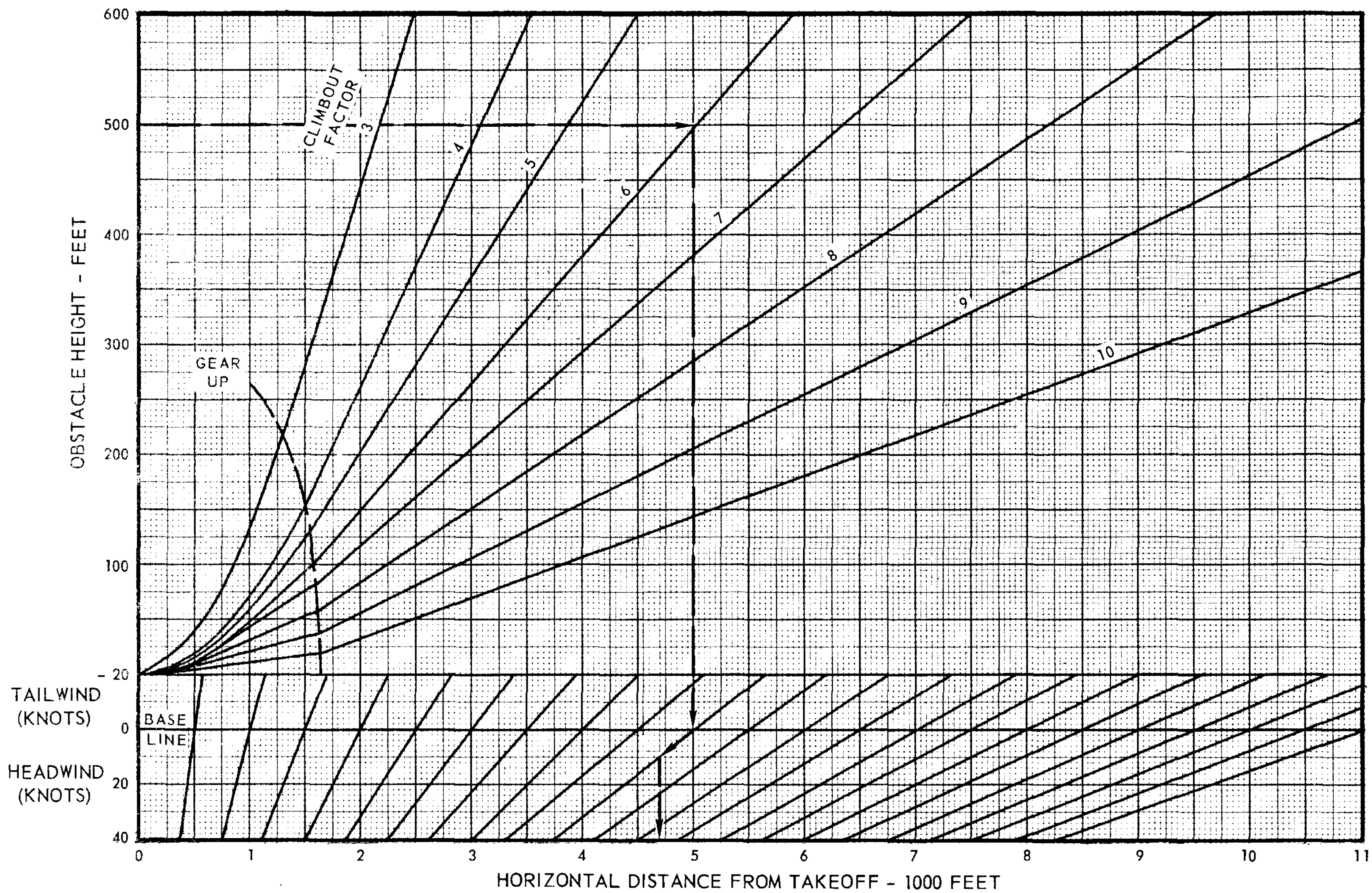
MODEL: **T-29 C/D**
DATE: 15 MARCH 1955
DATA BASIS: FLIGHT TEST

INCLUDING FLARE DISTANCE

OBSTACLE HEIGHT 0 - 600 FEET

2800 RPM

ENGINES: **R2800-99W**



NOTES:

(1) LANDING GEAR UP IN 6 SECONDS

(2) CLIMB SPEED = TAKEOFF SPEED

(3) 100% WIND ACCOUNTABILITY

45,464A

Figure 2A3-23

CLIMBOUT FLIGHT PATH - TWO ENGINE - 12° FLAP

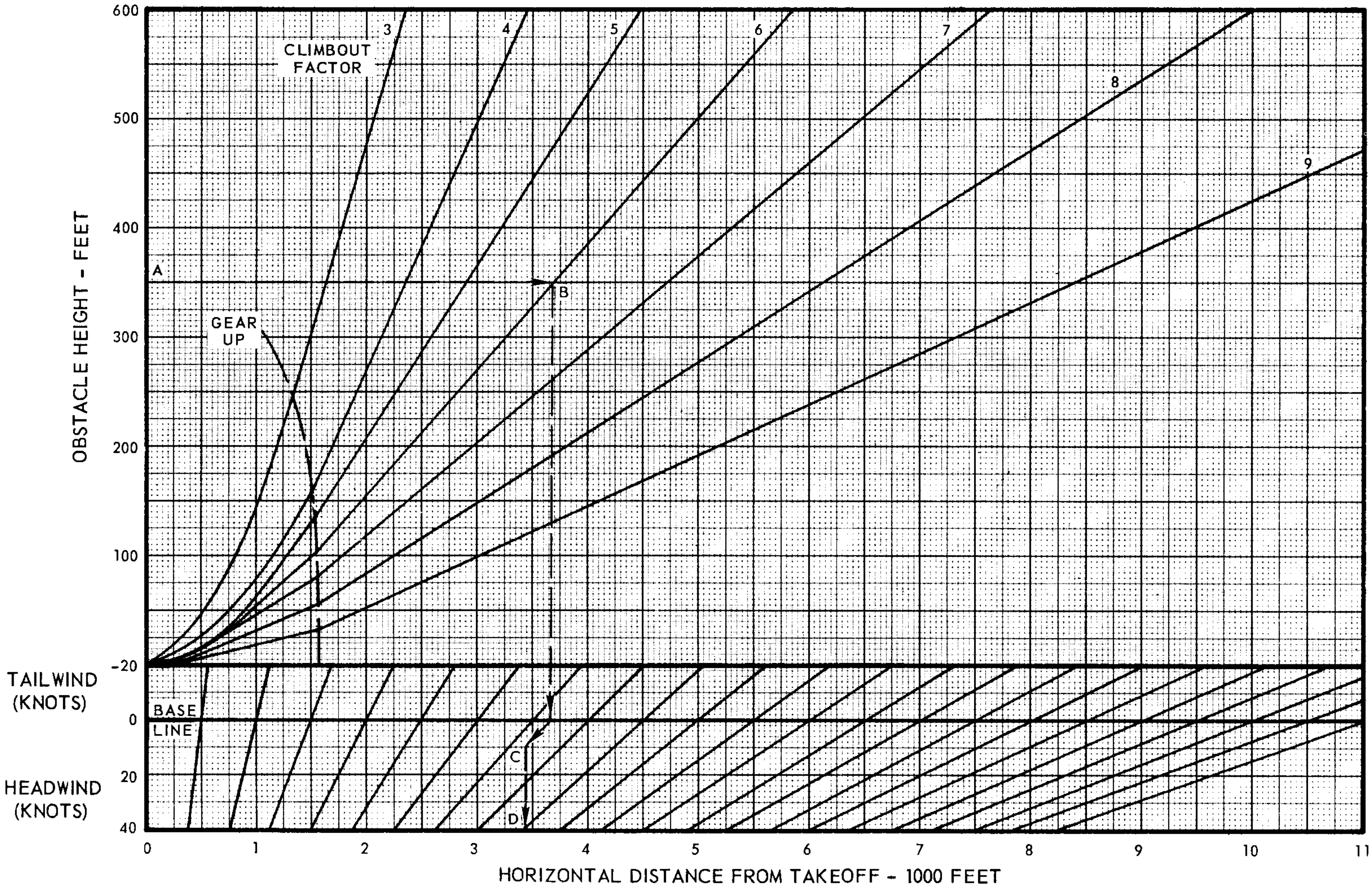
INCLUDING FLARE DISTANCE

OBSTACLE HEIGHT 0 - 600 FEET

2800 RPM

MODEL: **T-29C/D**
DATE: 15 MARCH 1955
DATA BASIS: FLIGHT TEST

ENGINES: **R2800-99W**



NOTES:

(1) LANDING GEAR UP IN 6 SECONDS

(2) CLIMB SPEED = TAKEOFF SPEED

(3) 100% WIND ACCOUNTABILITY

45,465

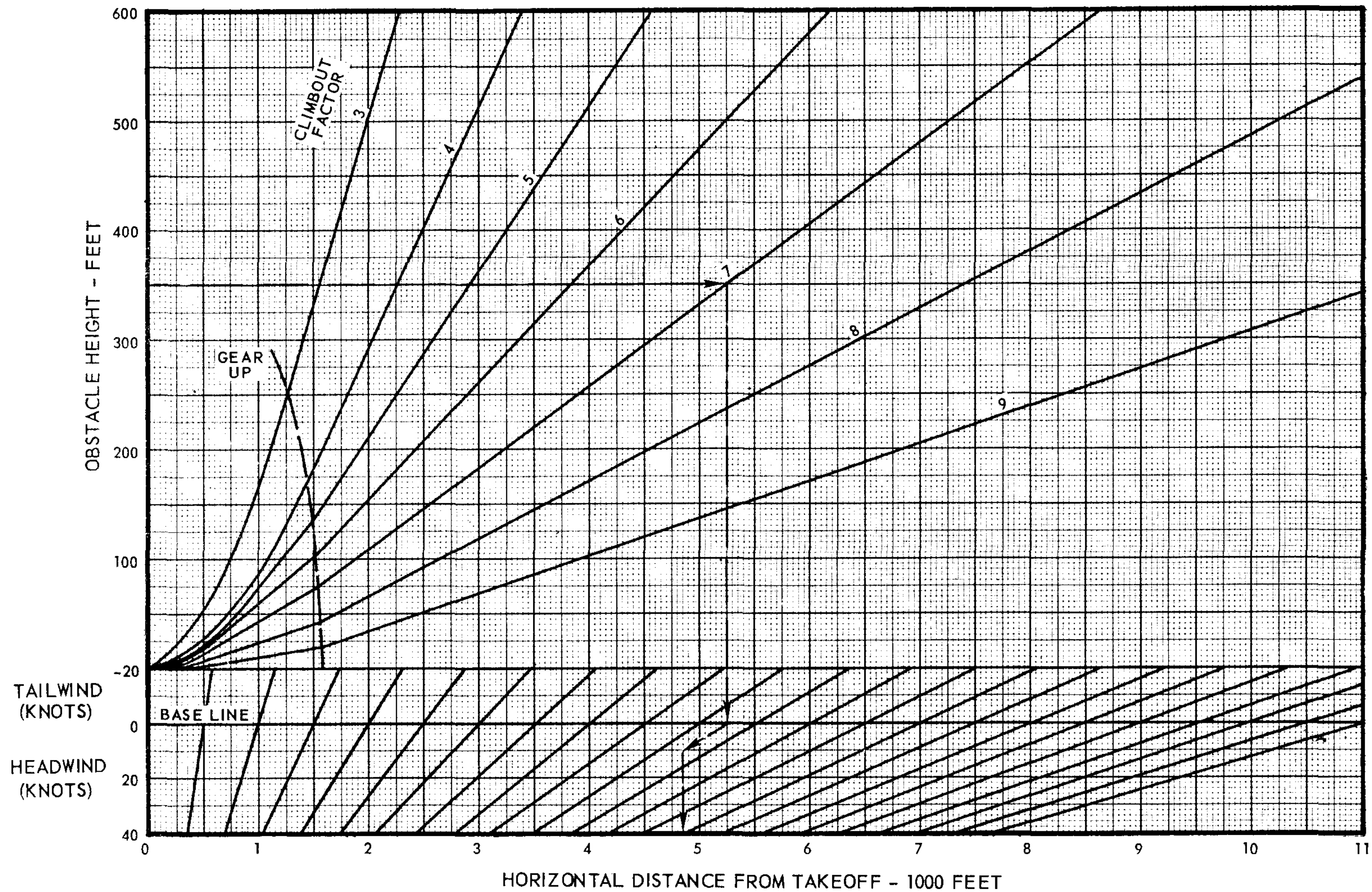
Figure 2A3-24

CLIMBOUT FLIGHT PATH - TWO ENGINE - 24° FLAP

MODEL: **T-29C/D**
DATE: 15 MARCH 1955
DATA BASIS: FLIGHT TEST

INCLUDING FLARE DISTANCE   OBSTACLE HEIGHT 0 - 600 FEET
2800 RPM

ENGINES: **R2800-99W**



NOTES:

(1) LANDING GEAR UP IN 6 SECONDS

(2) CLIMB SPEED = TAKEOFF SPEED

(3) 100% WIND ACCOUNTABILITY

45,466

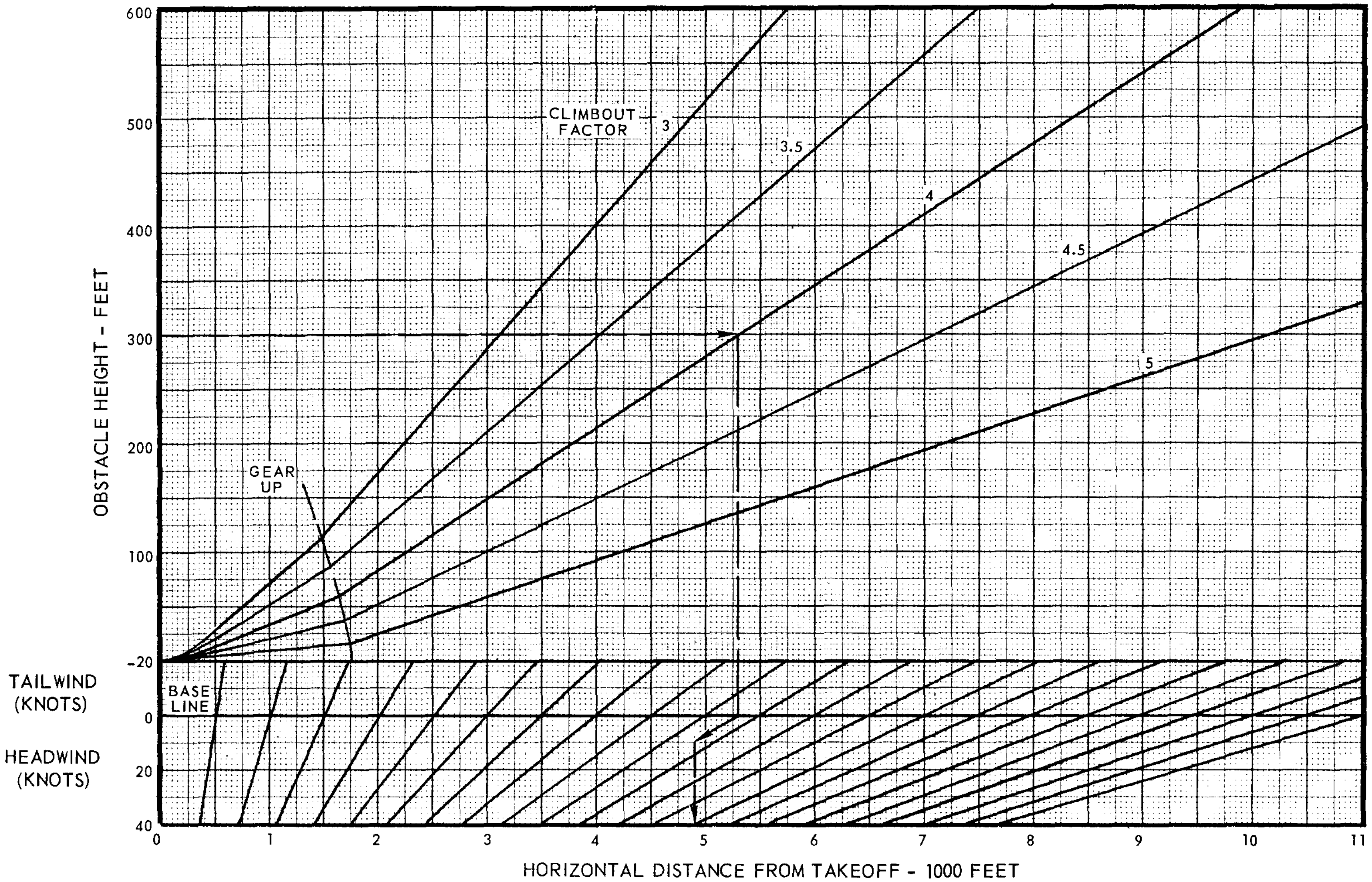
Figure 2A3-25

CLIMBOUT FLIGHT PATH - SINGLE ENGINE - 0° FLAP

INCLUDING FLARE DISTANCE OBSTACLE HEIGHT 0 - 600 FEET
2800 RPM

MODEL: **T-29 C/D**
DATE: 15 MARCH 1955
DATA BASIS: FLIGHT TEST

ENGINES: **R2800-99W**



NOTES:

(1) INOPERATIVE PROPELLER FEATHERED
(2) LANDING GEAR UP IN 6 SECONDS
(3) CLIMB SPEED = TAKEOFF SPEED
(4) 100% WIND ACCOUNTABILITY

45467A

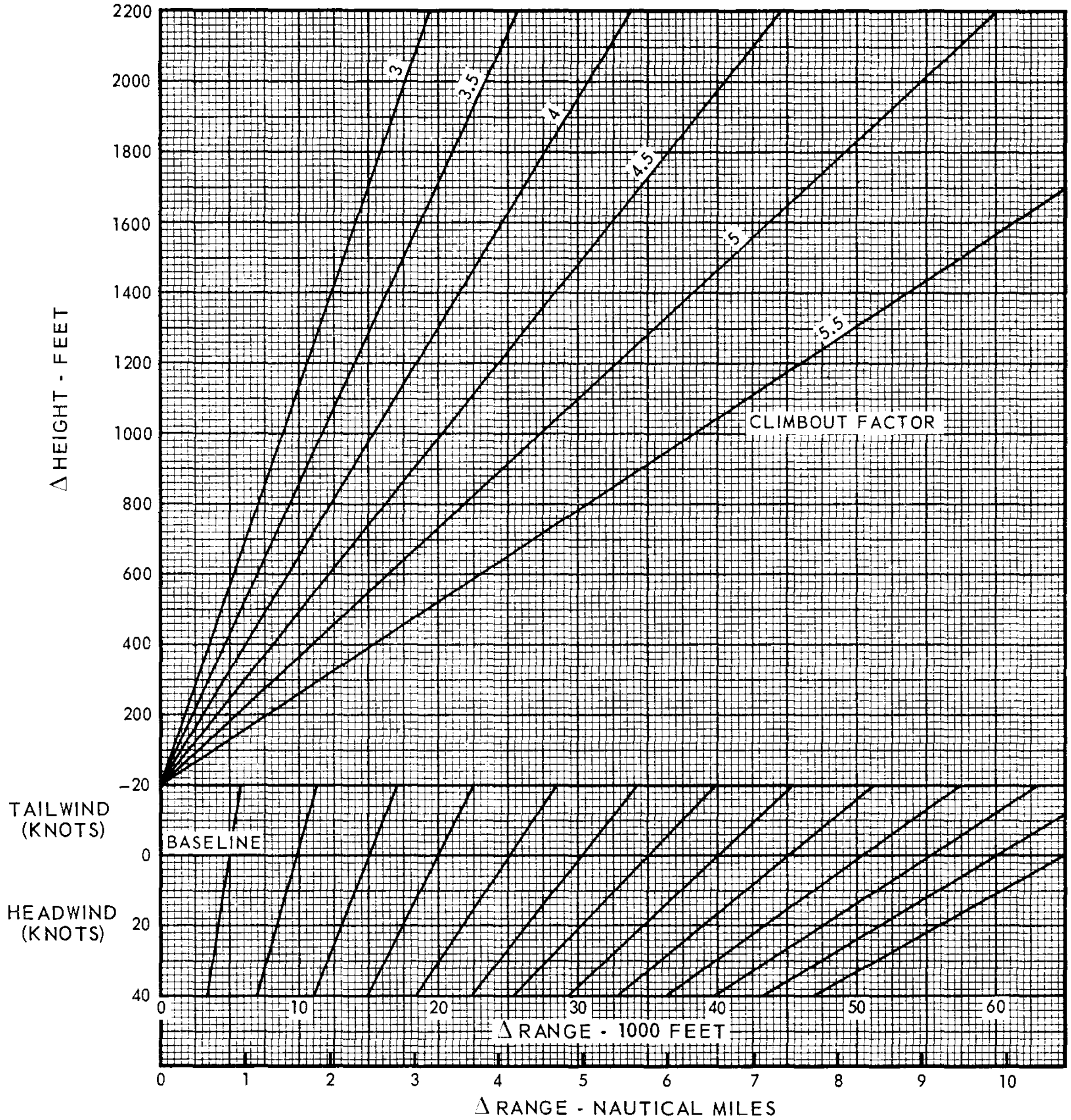
Figure 2A3-26

MODEL: **T-29A/B/C/D**
DATE: 5 DECEMBER 1967
DATA BASIS: **FLIGHT TEST**

CLIMBOUT FLIGHT PATH (EXTENDED) - SINGLE ENGINE - 0° FLAPS

2800 RPM

ENGINES: **R2800-97/99W**



NOTES:

(1) CLIMB SPEED EQUALS 1.2 STALL SPEED (0° FLAPS).
(2) 100% WIND ACCOUNTABILITY.
(3) CHART ASSUMES THAT CLIMB PATH AND AIRSPEED HAVE BEEN ESTABLISHED BEFORE CHART IS ENTERED. USE CHART AS EXTENSION OF BASIC CLIMBOUT FLIGHT PATH CHARTS WHICH INCLUDE TAKEOFF ACCELERATION DATA.
(4) USE CHART WITH CLIMBOUT FACTOR FROM 2800 RPM CLIMBOUT FACTOR CHART ONLY.

45,601

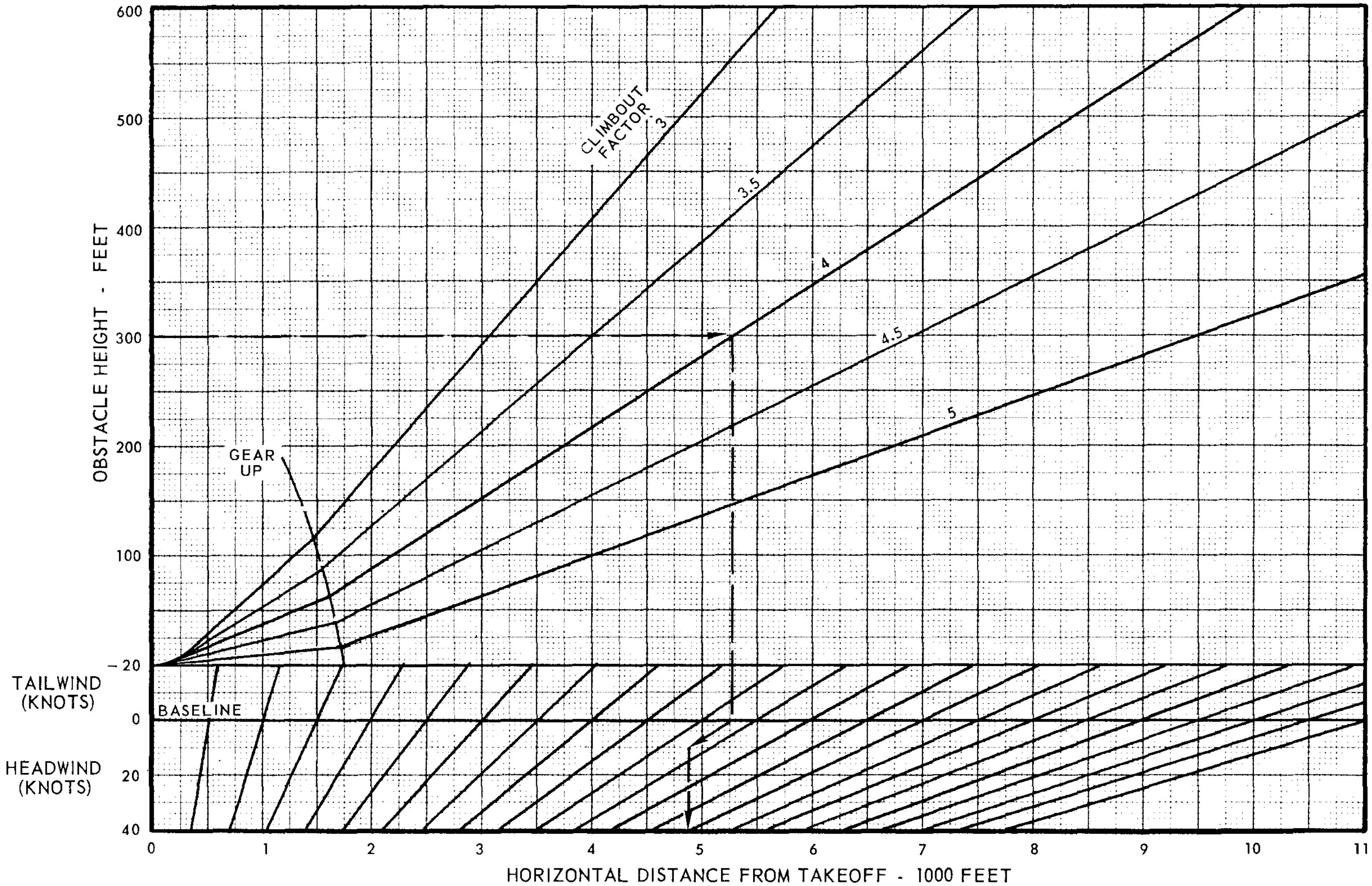
Figure 2A3-27

MODEL: T-29C/D
DATE: 15 MARCH 1955
DATA BASIS: FLIGHT TEST

CLIMBOUT FLIGHT PATH - SINGLE ENGINE - 6° FLAP

INCLUDING FLARE DISTANCE OBSTACLE HEIGHT 0 - 600 FEET
2800 RPM

ENGINES: R2800-99W



NOTES:

(1) INOPERATIVE PROPELLER FEATHERED
(2) LANDING GEAR UP IN 6 SECONDS
(3) CLIMB SPEED = TAKEOFF SPEED
(4) 100% WIND ACCOUNTABILITY

45468A

Figure 2A3-28

CLIMBOUT FLIGHT PATH - SINGLE ENGINE - 12° FLAP

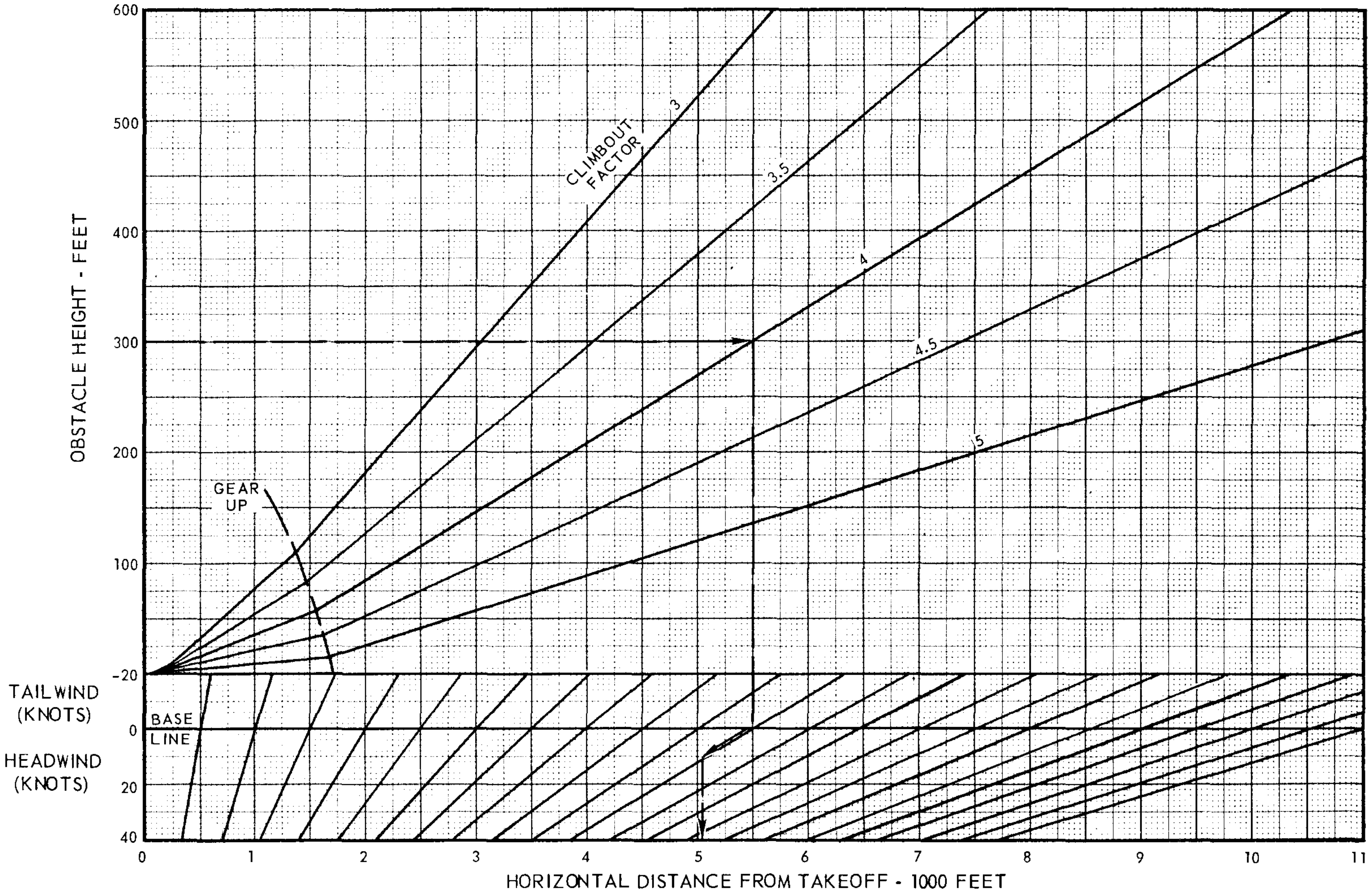
MODEL: **T-29C/D**
DATE: 15 MARCH 1955
DATA BASIS: FLIGHT TEST

INCLUDING FLARE DISTANCE

OBSTACLE HEIGHT 0-600 FEET

2800 RPM

ENGINES: **R2800-99W**



NOTES:

(1) INOPERATIVE PROPELLER FEATHERED
(2) LANDING GEAR UP IN 6 SECONDS
(3) CLIMB SPEED = TAKEOFF SPEED
(4) 100% WIND ACCOUNTABILITY

45469A

Figure 2A3-29

CLIMBOUT FLIGHT PATH - SINGLE ENGINE - 24° FLAP

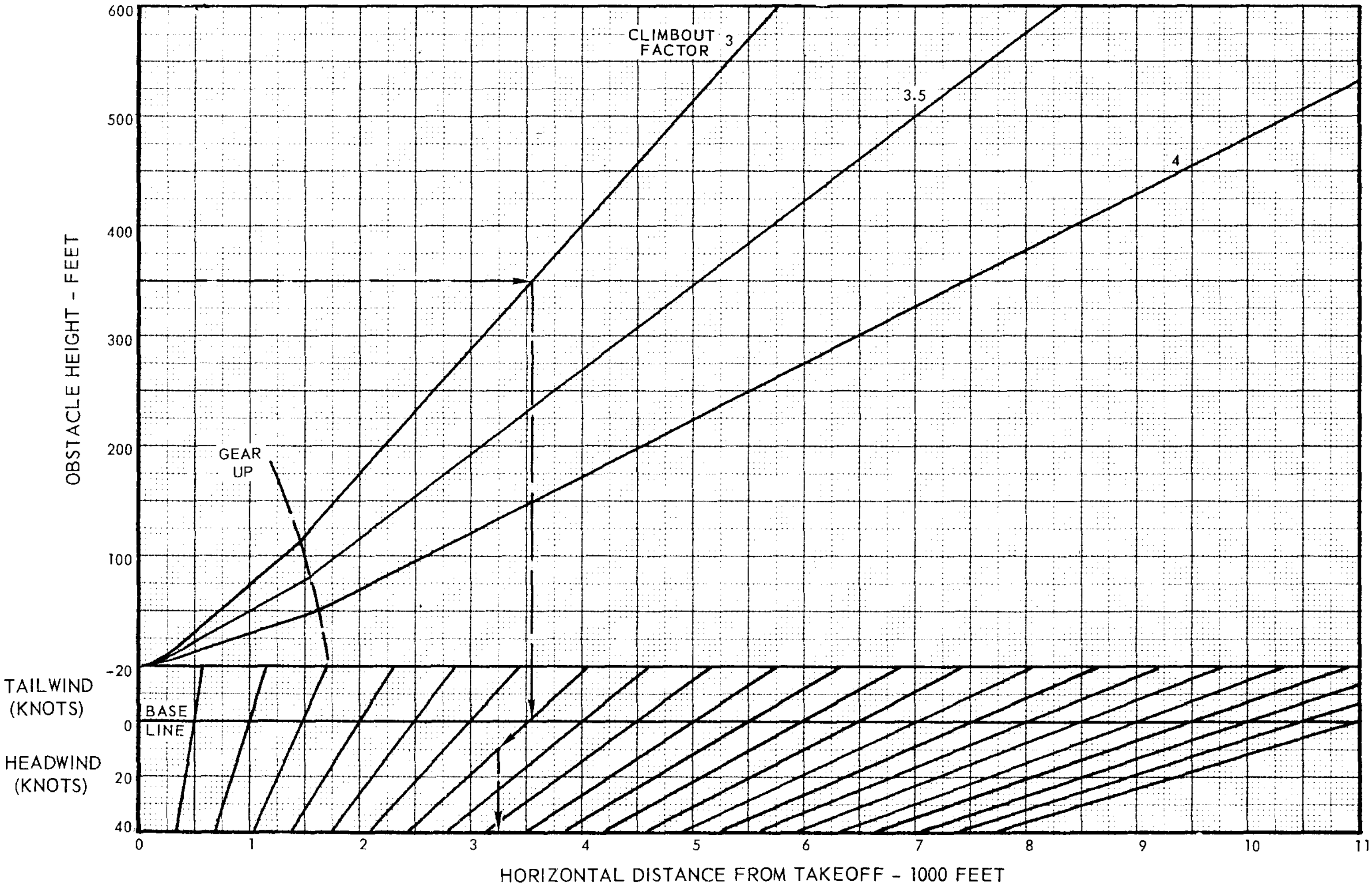
MODEL: **T-29C/D**
DATE: 15 MARCH 1955
DATA BASIS: FLIGHT TEST

INCLUDING FLARE DISTANCE

OBSTACLE HEIGHT 0-600 FEET

2800 RPM

ENGINES: **R2800-99W**



NOTES:

(1) INOPERATIVE PROPELLER FEATHERED
(2) LANDING GEAR UP IN 6 SECONDS
(3) CLIMB SPEED = TAKEOFF SPEED
(4) 100% WIND ACCOUNTABILITY

45470A

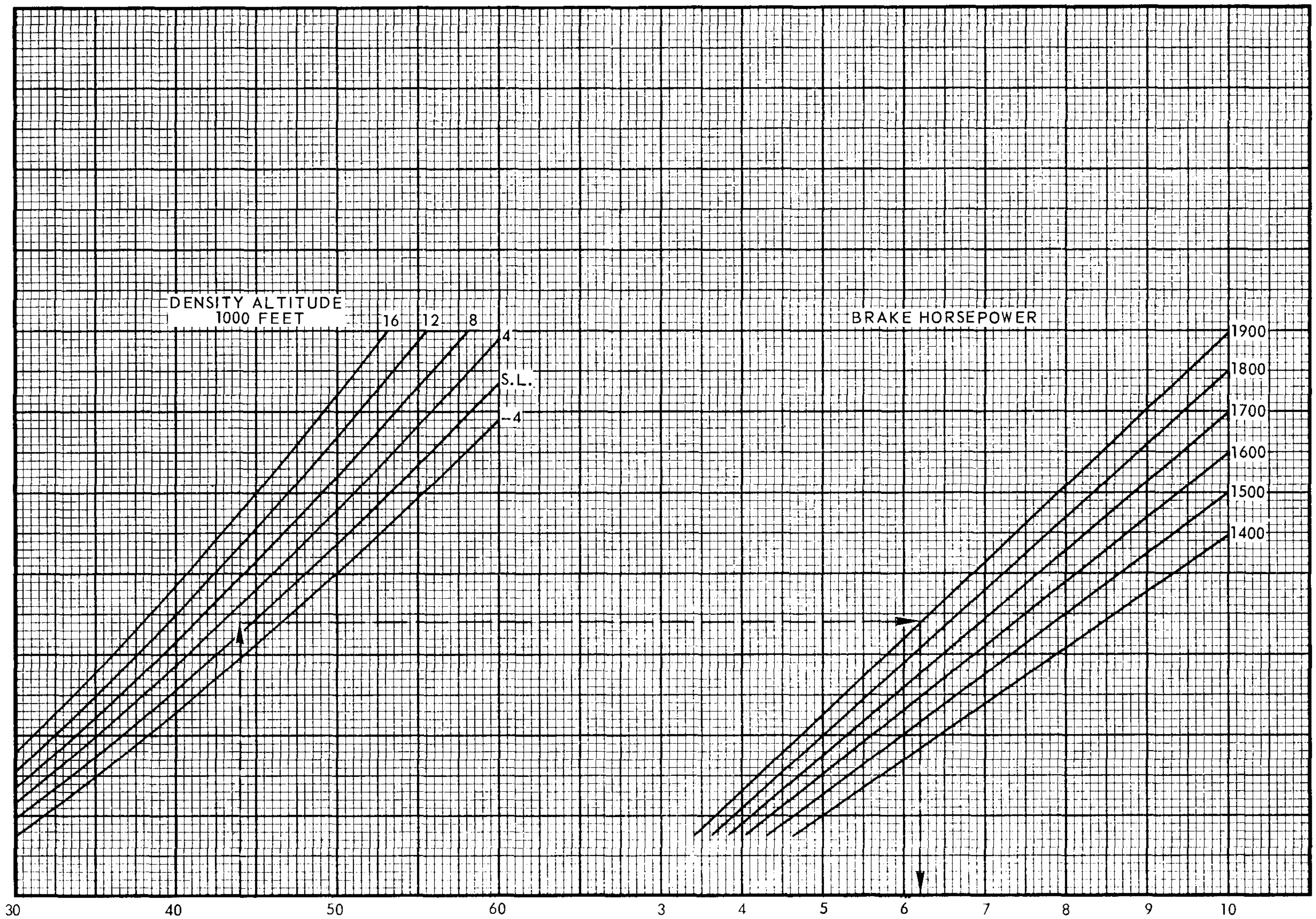
Figure 2A3-30

MODEL: **T-29 C/D**
DATE: 5 DECEMBER 1967
DATA BASIS: **FLIGHT TEST**

CLIMBOUT FACTOR FOR CLIMBOUT FLIGHT PATH

FLAPS RETRACTED — TWO ENGINE OPERATION
METO POWER
(2500 RPM TO 2700 RPM)

ENGINES: **R2800-99W**



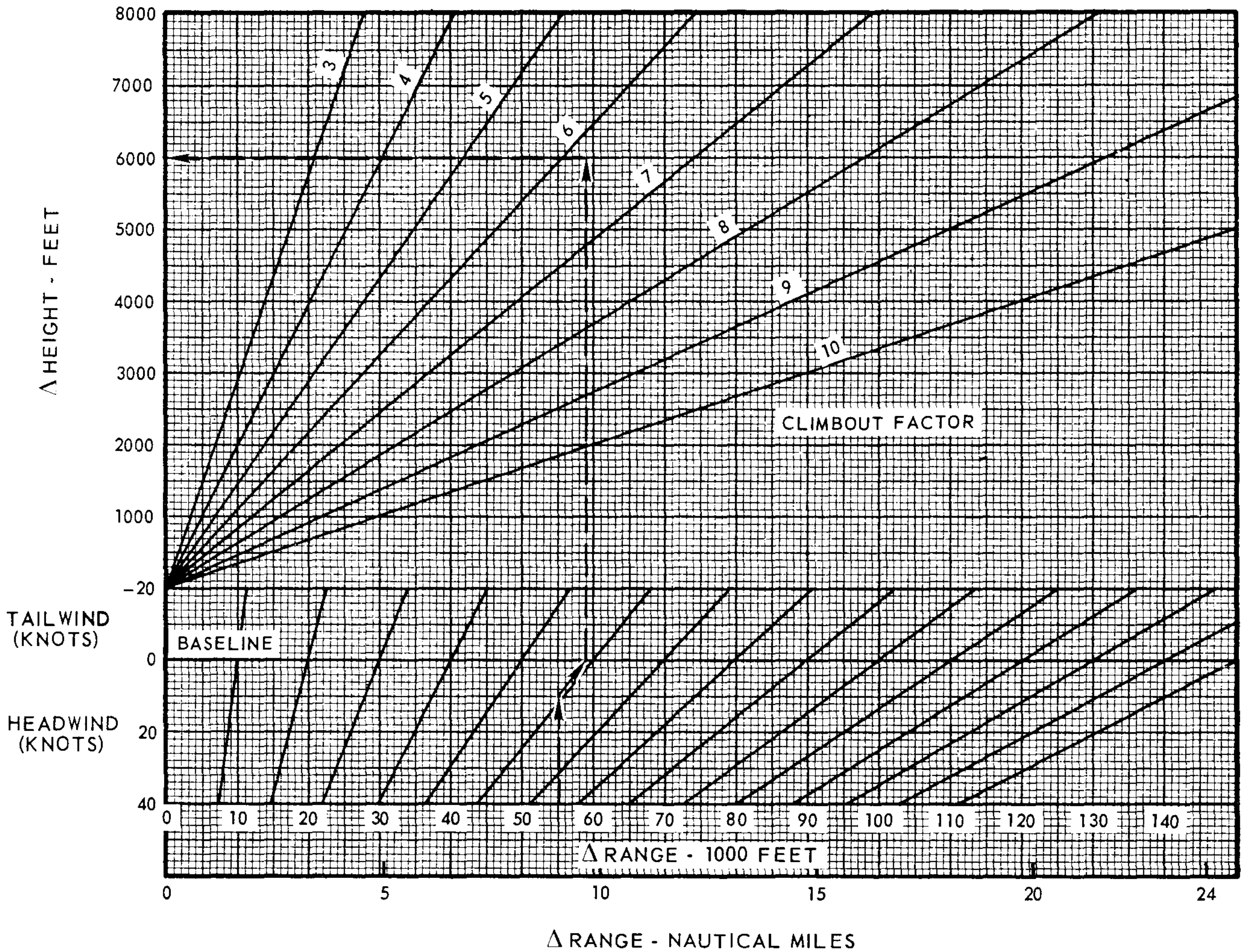
45,607

Figure 2A3-31

MODEL: **T-29C/D**
DATE: 5 DECEMBER 1967
DATA BASIS: **FLIGHT TEST**

CLIMBOUT FLIGHT PATH (EXTENDED)
TWO ENGINE - 0° FLAPS
METO POWER

ENGINES: **R2800-99W**



NOTES:
(1) CLIMB SPEED EQUALS 1.2 STALL SPEED (0° FLAPS).
(2) 100% WIND ACCOUNTABILITY.
(3) CHART ASSUMES THAT CLIMB PATH AND AIRSPEED HAVE BEEN ESTABLISHED BEFORE CHART IS ENTERED. USE CHART AS EXTENSION OF BASIC CLIMBOUT FLIGHT PATH CHARTS WHICH INCLUDE TAKEOFF ACCELERATION DATA.
(4) USE CHART WITH CLIMBOUT FACTOR FROM METO POWER CLIMBOUT FACTOR CHART ONLY.

45,606

Figure 2A3-32

PART 4 — CLIMB

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OPERATIONAL CLIMB

Operational climb performance is presented in two climb curves for normal two-engine operation (figures 2A4-1 and 2A4-2). One presents time and speed. The other presents distance and fuel consumed. The data are plotted in a convenient form against weight with guide lines representing the weight variation during a steady climb. The data are based upon recommended climb at 1500 BHP/ENG, in standard atmosphere with flaps and gear up at a constant airspeed. The climb power schedules show power settings to be used. These include manifold pressure, TPSI and blower speed. Fuel flow is based upon operation in the AUTO RICH mixture position. Climb performance in nonstandard atmospheric conditions is the same as that in standard atmospheric conditions if standard powers are obtainable. It is only necessary to determine the comparable density altitude and obtain the standard power for that altitude.

Note

> The airplane's lift and drag depend primarily upon the density of the air, while the engine power depends upon the pressure of the air, until full throttle is reached. To determine the climb performance under nonstandard conditions, one must determine the fuel, distance and time to climb using density altitudes and obtain the standard power for pressure altitude by adjusting the manifold pressures as required.

If standard powers are not obtainable, a substantial decrease in climb performances can be expected. Speeds shown are those for best rate of climb consistent with engine cooling. Increasing speeds above those shown will decrease the rate of climb and increase time, distance, and fuel consumed in climb. Data are included to show the service (100 fpm rate of climb) and cruise (300 fpm rate of climb) ceilings.

EXAMPLE

For time to climb (figure 2A4-1) enter chart with gross weight and density altitude at start of climb (A). Parallel guide line to density altitude at end of climb (B). Read across to find time to climb in minutes (C). Gross weight at end of climb may be found by reading across from density altitude at end of climb (B) parallel to fuel lines to fuel used in climb (D) and subtracting this weight from the gross weight at start of climb. For distance and fuel (figure 2A4-2) follow same procedure as for time to climb and read distance in climb (nautical miles) to the left. Follow guide lines to the right from density altitude at end of climb and read total fuel used in climb.

METO POWER CLIMB

METO power climb performance is presented in two climb curves (figures 2A4-3 and 2A4-4). One presents time and speed. The other presents distance and fuel consumed. Airspeeds shown (IAS vs density altitude) are the same for both charts. The data are plotted in a convenient form against weight and guide lines representing the weight variations during a steady climb. The data are based upon climb at METO power, standard atmosphere with flaps and gear up. The METO power schedule shows power settings to be used. The charts are used in the same manner as the operational climb charts.

CEILING — ONE ENGINE INOPERATIVE

Absolute and service ceilings of the airplane at various weights with METO power under standard conditions are presented in two charts (figures 2A4-5 and 2A4-6). One chart is for normal fuel grade 115/145 and the other for alternate grade fuel 100/130. These charts can be used to find terrain clearance if an engine should fail enroute. Single-engine drift-down altitude can also be determined by these charts. The gross weight refers to the gross weight of the airplane at the time of engine failure.

DRIFT-DOWN

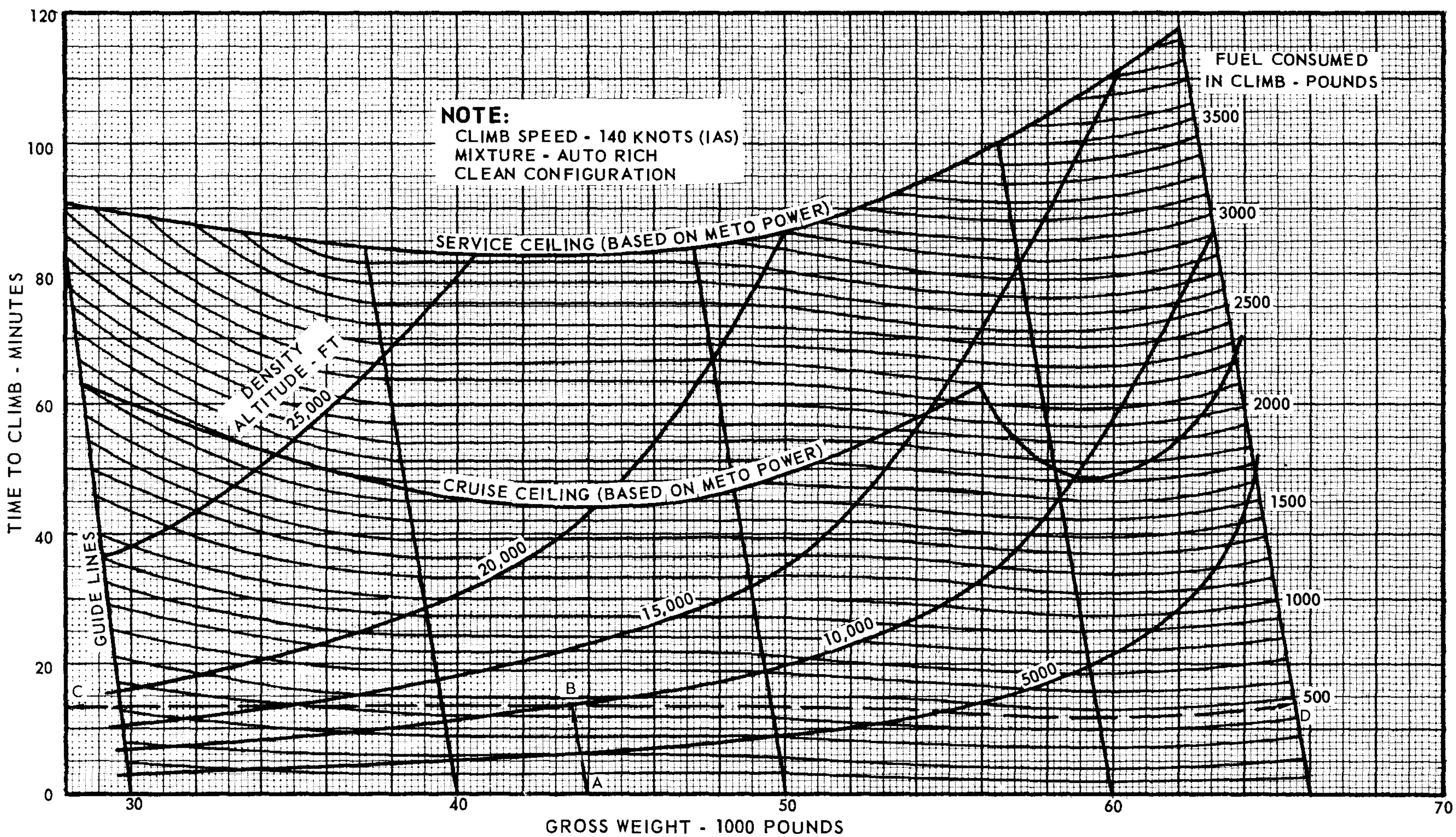
If an engine fails during flight at altitudes above single-engine ceiling, the airplane will drift down; i.e., lose altitude at a decreasing rate until stabilized flight is attained at the absolute ceiling for the power and instantaneous weight conditions. Drift-down performance is presented in figure 2A4-7. For best results operate the remaining engine at METO power and fly the airplane at recommended speed for weight shown on the chart. In cases of emergency at lower altitudes, the use of military power (2800 rpm) for a limited time will reduce the altitude loss. To use the chart, enter with the airplane gross weight at the time of engine failure (A). Proceed vertically to the initial altitude (B). Read the distance traveled during drift-down on the right-hand scale (C). From the initial altitude, parallel the guide lines down to the gross weight scale (D) and read the airplane gross weight at the end of drift-down (final gross weight). With this weight, enter the final gross weight scale in the upper left corner (E). Proceed vertically down to the drift-down curve, then horizontally to the final altitude scale (F).

MODEL: **T-29C/D**
DATE: 15 MARCH 1955
DATA BASIS: FLIGHT TEST

OPERATIONAL CLIMB - TIME & SPEED

1500 BHP/ENG

ENGINES: **R2800-99W**



45,533E

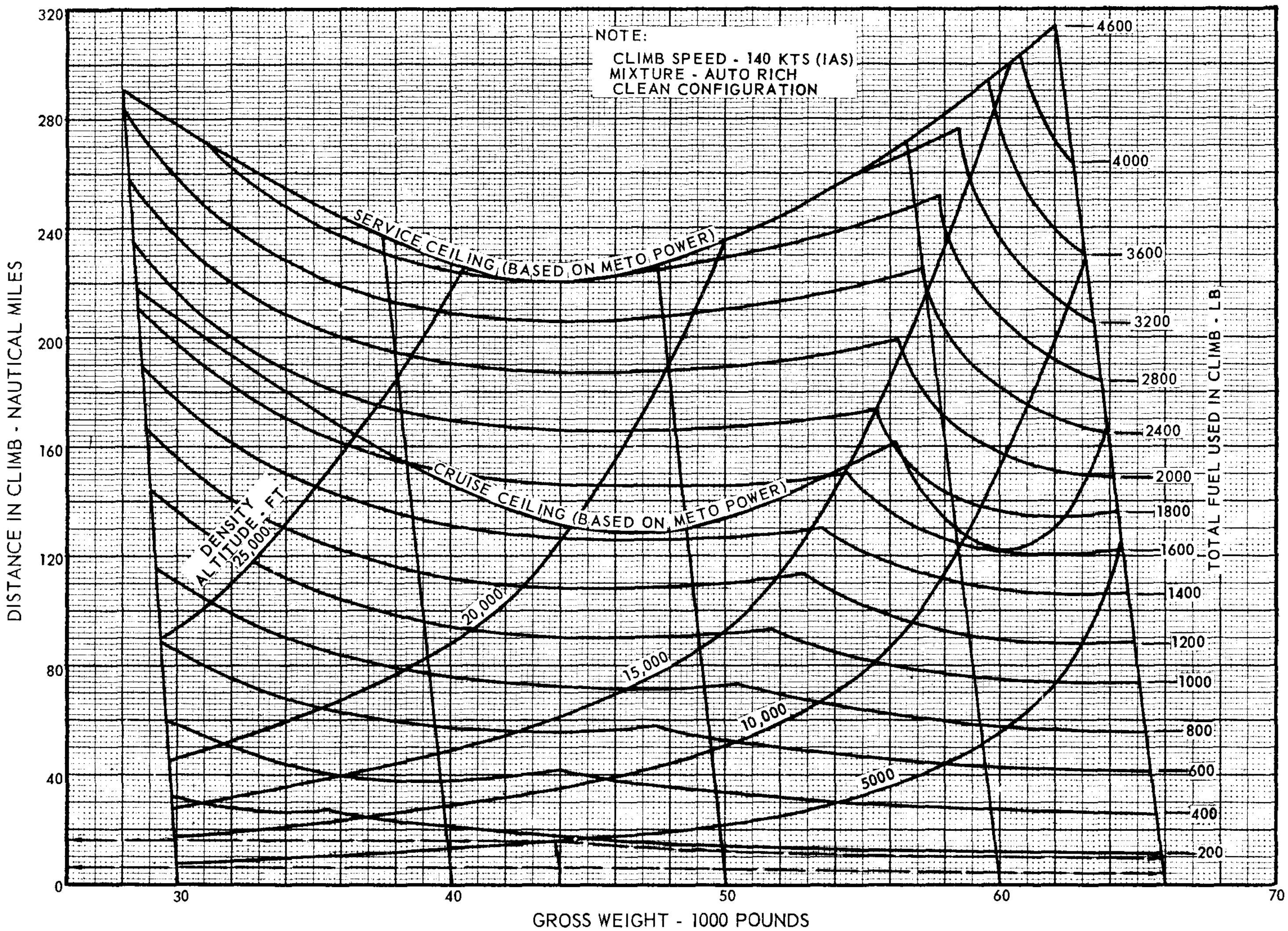
Figure 2A4-1

MODEL: **T-29 C/D**
DATE: 15 MARCH 1955
DATA BASIS: FLIGHT TEST

OPERATIONAL CLIMB - DISTANCE AND FUEL

1500 BHP/ENG

ENGINES: **R2800-99W**



45,534D

Figure 2A4-2

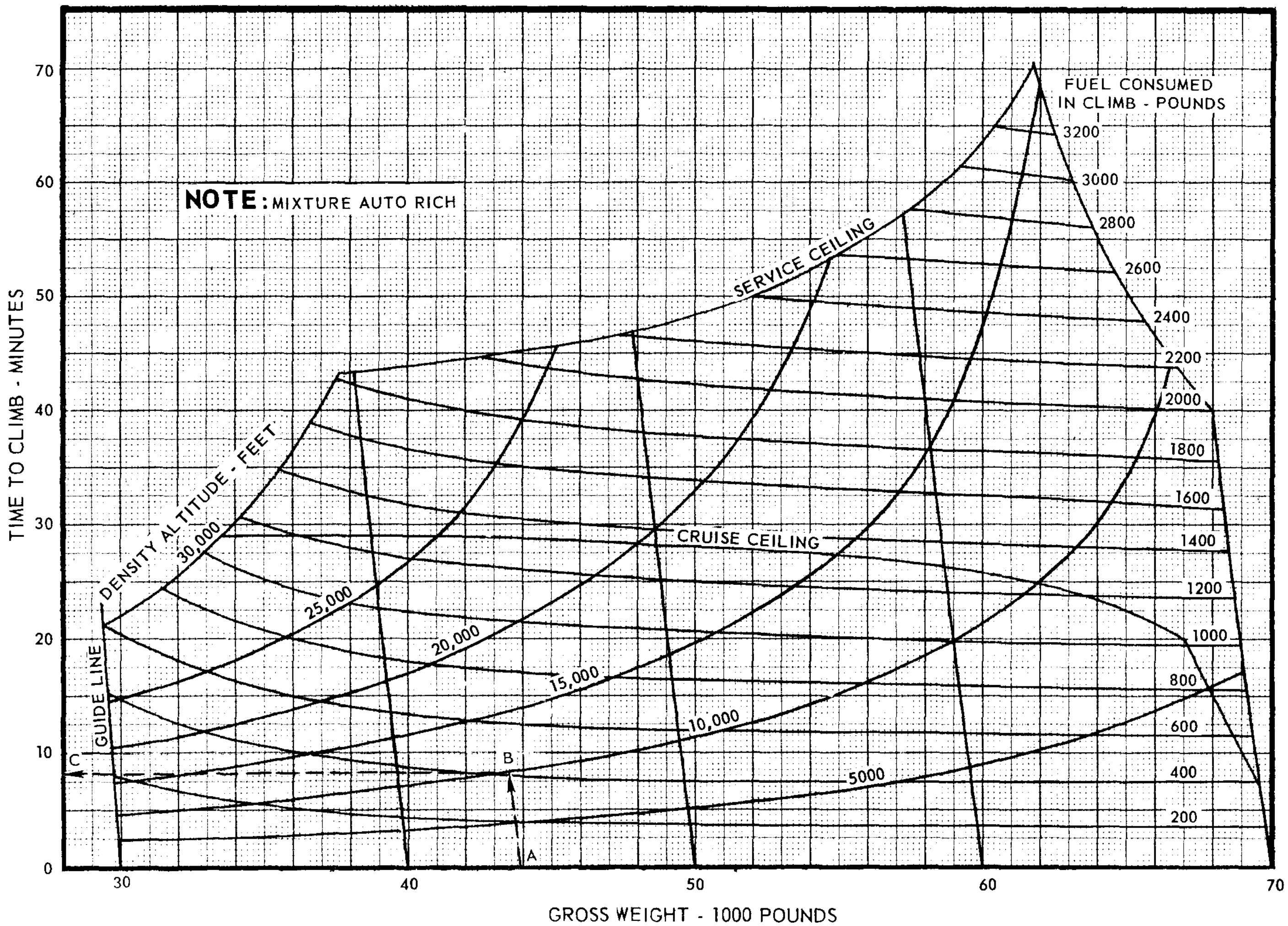
MODEL: T-29C/D
DATE: 15 MARCH 1955
DATA BASIS: FLIGHT TEST

METO POWER CLIMB - TIME AND SPEED

FUEL GRADE 115/145

ENGINES: R2800-99W

APPROXIMATE BEST CLIMB SPEED	
GROSS WEIGHT POUNDS	IAS KNOTS
30,000	120
32,000	121
34,000	122
36,000	123
38,000	124
40,000	125
42,000	127
44,000	129
46,000	131
48,000	133
50,000	135
52,000	137
54,000	139
56,000	141
58,000	143
60,000	145



45,569 C

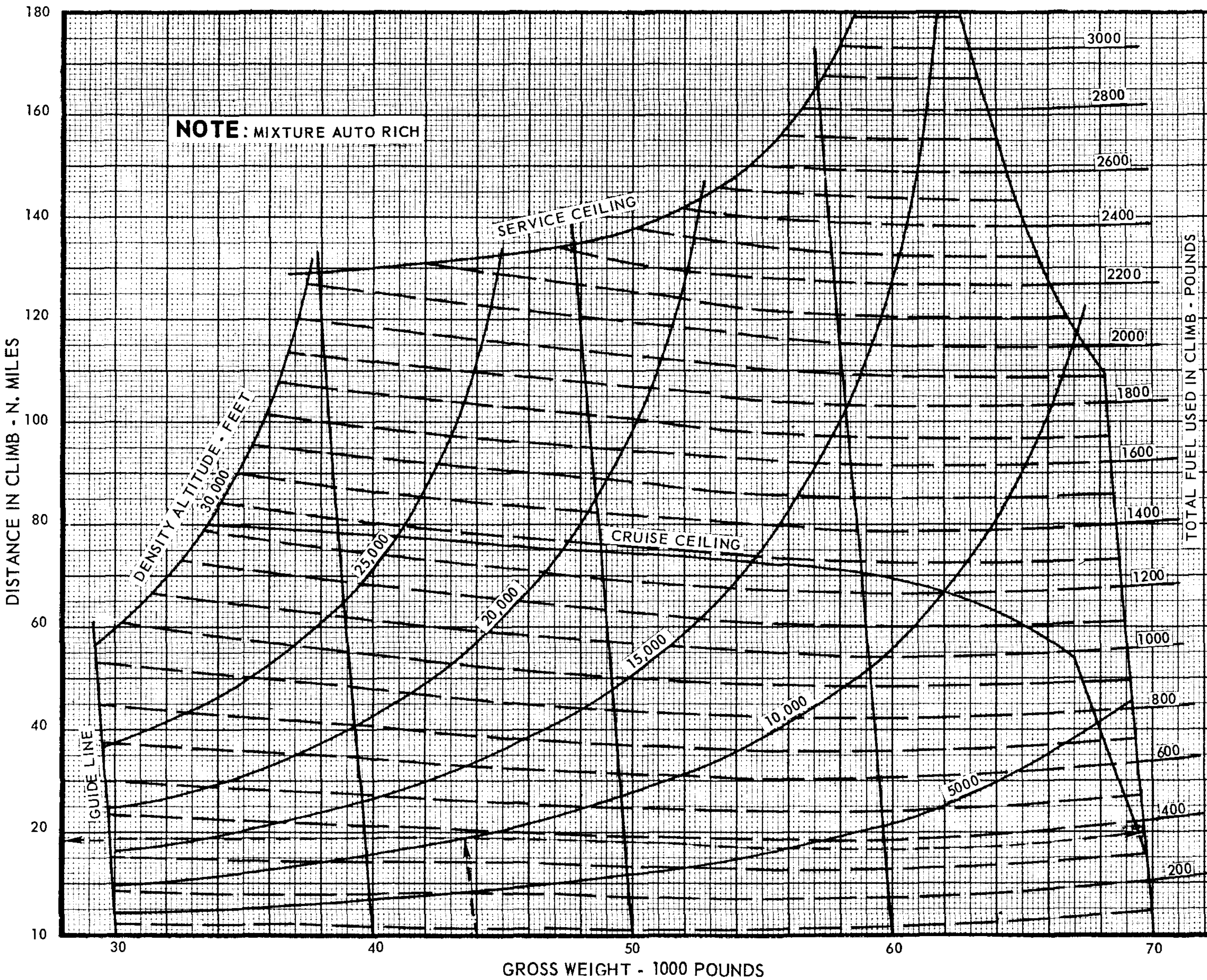
Figure 2A4-3

MODEL: T-29 C/D
DATE: 15 MARCH 1955
DATA BASIS: FLIGHT TEST

METO POWER CLIMB - DISTANCE AND FUEL

115-145 GRADE FUEL

ENGINES: R2800-99W



45,570B

Figure 2A4-4

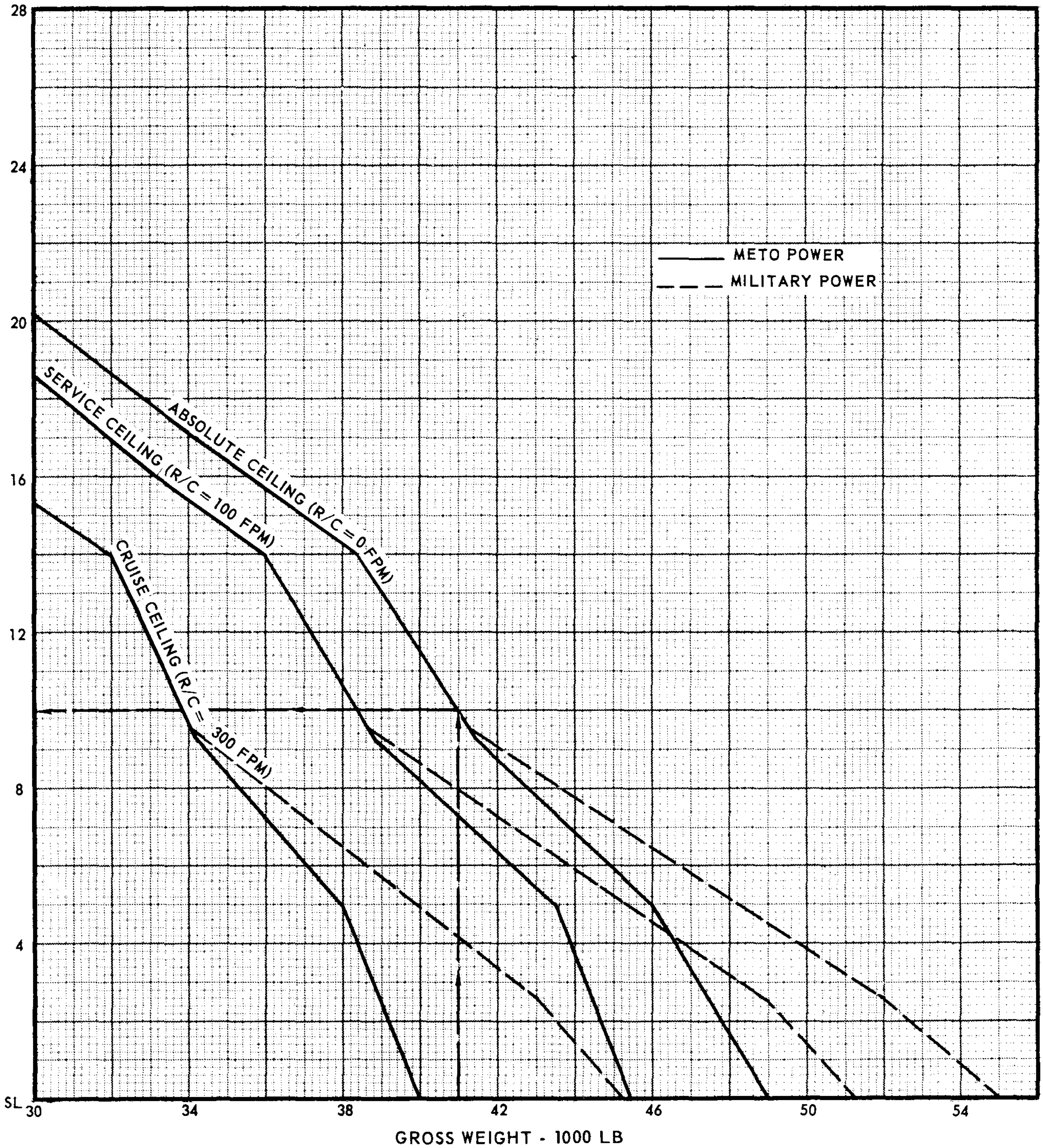
CEILING - ONE ENGINE INOPERATIVE

MODEL: **T-29C/D**
DATE: 15 MARCH 1955
DATA BASIS: FLIGHT TEST

FUEL GRADE 115/145
STANDARD ATMOSPHERE

CLEAN CONFIGURATION
PROPELLER FEATHERED

ENGINES: **R2800-99W**



45,450A

Figure 2A4-5

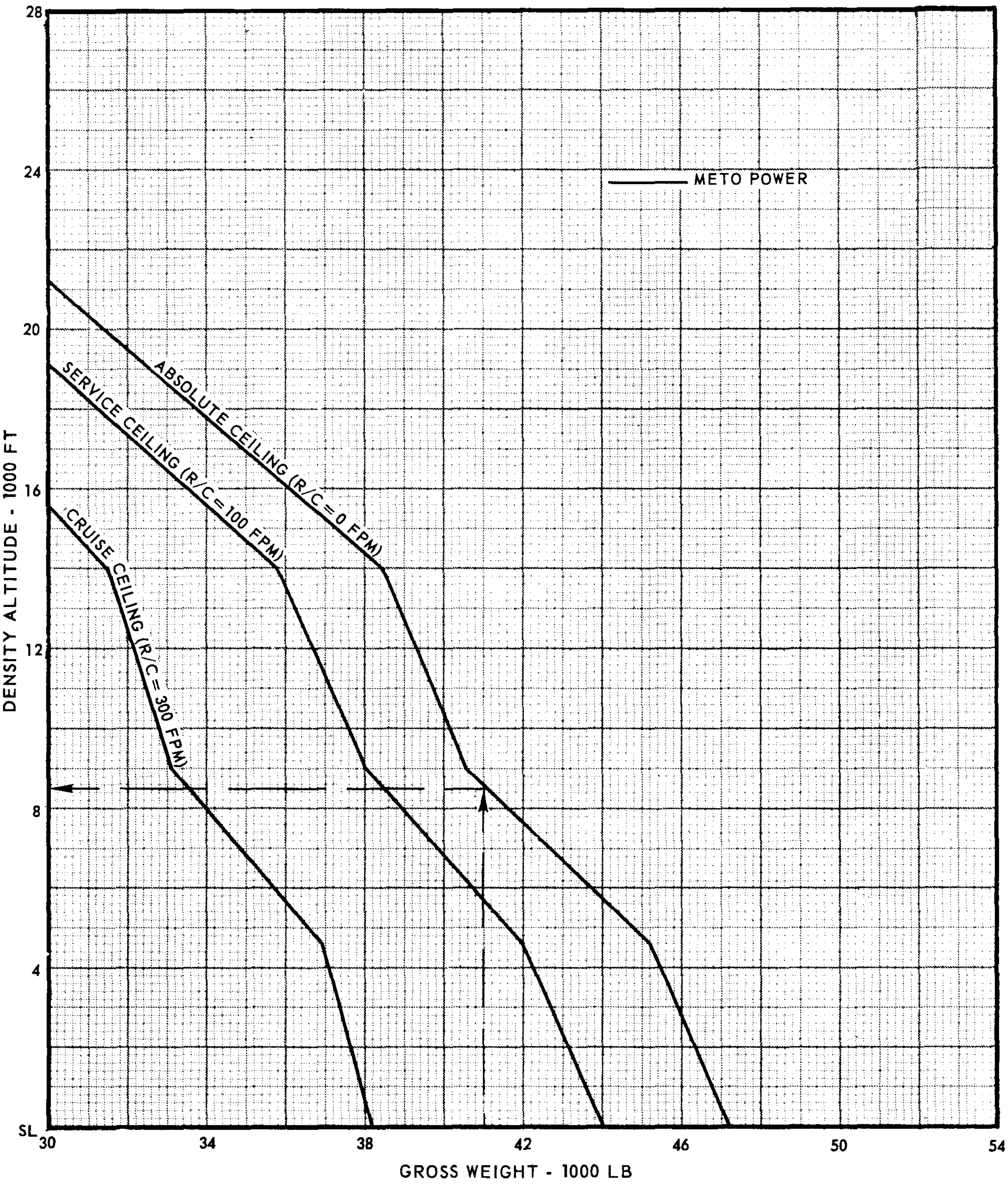
CEILING - ONE ENGINE INOPERATIVE

MODEL: **T-29C/D**
DATE: 15 MARCH 1955
DATA BASIS: FLIGHT TEST

FUEL GRADE 100/130
STANDARD ATMOSPHERE

CLEAN CONFIGURATION
PROPELLER FEATHERED

ENGINES: **R2800-99W**



45,451A

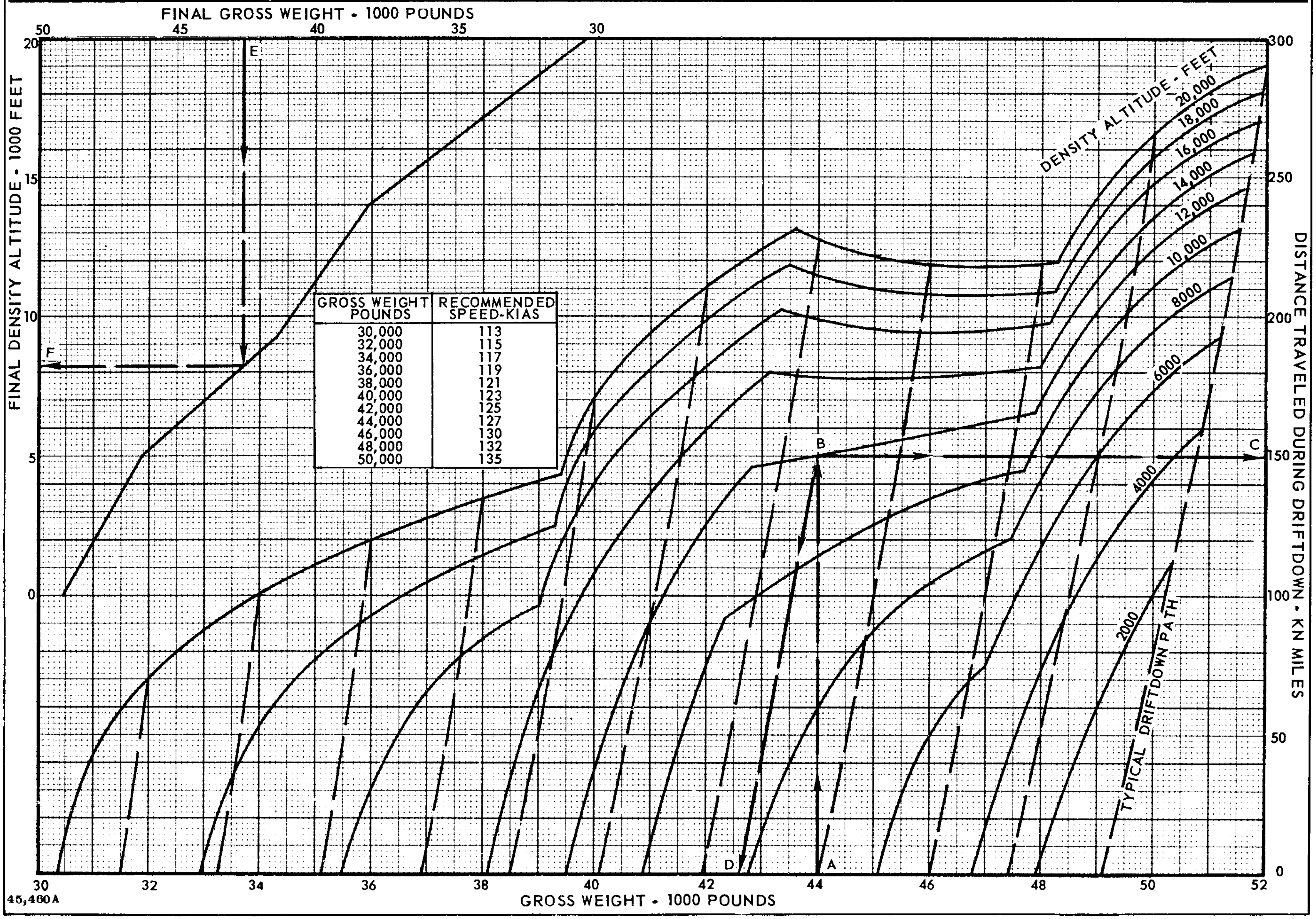
Figure 2A4-6

MODEL: **T-29 C/D**
DATE: 15 MARCH 1955
DATA BASIS: FLIGHT TEST

DRIFTDOWN - ONE ENGINE INOPERATIVE

METO POWER

ENGINES: **R 2800-99W**



GROSS WEIGHT POUNDS	RECOMMENDED SPEED-KIAS
30,000	113
32,000	115
34,000	117
36,000	119
38,000	121
40,000	123
42,000	125
44,000	127
46,000	130
48,000	132
50,000	135

Figure 2A4-7

PART 5 — CRUISE

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The symbol * indicates an illustration

CRUISE CONTROL

Cruise performance as used in this Appendix is defined as being that portion of flight wherein the altitude is held constant, i.e., level flight. The speeds and powers used are selected to maintain this condition. Data are shown to determine this relationship between speed and power throughout the usable range of the airplane. Power is shown as BHP per engine. Reference to the power schedules will show the necessary power settings of MAP, TPSI and rpm to deliver this BHP per engine.

NAUTICAL MILES PER POUND OF FUEL

Nautical miles per pound of fuel curves (figures 2A5-1 through 2A5-5) are presented for several density altitudes from sea level to the maximum usable altitude of the airplane in increments of 5000 feet. The data are based upon fuel flow expected when mixture controls are adjusted manually to desired fuel flow and by use of manual leaning procedures as specified in Section VII. The nautical miles per pound of fuel curves are applicable in any nonstandard conditions where the powers shown may be obtained. To simplify selections of speed and power for long-range cruising, three curves are shown to represent the powers and speeds to be selected for flight in wind conditions: for 50-knot tailwind, zero wind, and 50-knot headwind. Wind conditions between these lines can be interpolated. The following examples show the various methods of using these charts.

EXAMPLE 1. Determine power and speed for long range cruise.

Given:

Density altitude = 10,000 feet

Gross weight at start of cruise = 42,000 pounds

Gross weight at end of cruise = 38,000 pounds

Enter chart (figure 2A5-3) at weight at start of cruise 42,000 pounds. Follow weight line to intersection of long range line (no wind) and find 1035 bhp at start of cruise. Proceed vertically to read calibrated airspeed of 161 knots at start of cruise. Repeat the procedure with gross weight at end of cruise to find 925 bhp and 159 knots CAS at end of cruise.

Note

This cruise procedure requires changes in power and airspeed to maintain long-range conditions. An alternate method would be to use an average gross weight for cruise and fly at a constant power and airspeed for that weight.

EXAMPLE 2. Determine distance, fuel used, and airspeed for two-hour cruise at 1000 bhp.

Note

> Since it is desired to cruise at 1000 bhp for two hours, a sufficiently accurate estimate may be made of the fuel flow by reading nautical miles per pound of fuel value and a true airspeed value at an assumed average weight and dividing the true airspeed by the air nautical miles per pound of fuel (n mi/hr÷n mi/lb = lb/hr).

Using same altitude and weight as Example 1 and assuming a fuel flow of 900 pounds per hour, then average weight for two-hour cruise is 42,000 - 900 = 41,100 pounds. Enter chart (figure 2A5-3) at average cruise weight and follow weight lines to intersection of 1000 bhp. Proceed vertically to find TAS of 185 knots. Proceed horizontally from weight and power intersection to find 0.22 air nautical miles per pound. Then fuel used is 185÷0.22 = 845 pounds per hour.

Note

> The fuel used figure of 845 pounds is close enough to the assumed value of 900 pounds. If it were substantially different, another estimate should be made.

Weight at end of two-hour cruise is 42,000 - 1690 = 40,310 pounds. Distance in two-hour cruise is 185 knots X 2 hours = 370 nautical miles.

EXAMPLE 3. Interpolation for intermediate altitudes.

Given:

Density altitude = 13,000 feet

Gross weight at start of cruise = 42,000 pounds

Power and speed for long range cruise at 13,000 feet can be determined by interpolation between 10,000 feet and 15,000 feet. In Example 1, the power and speed for 42,000 pounds and 10,000 feet were found to be 1035 bhp and 161 knots CAS. Using the same procedure with the chart for 15,000 feet (figure 2A5-4), the power and speed are found to be 1050 bhp and 156 knots CAS. The difference between 1035 bhp and 1050 bhp is 15 bhp for 5000 feet difference in altitude. Find the difference in BHP for 3000 feet by the following ratio:

$$\frac{BHP}{15} = \frac{3}{5}$$

$$BHP = \frac{3 X 15}{5} = 9$$

Then BHP for 13,000 is 1035 + 9 = 1044 bhp. Note that the difference in calibrated airspeed is 5 knots.

The airspeed for 13,000 feet cruise is $161 - \left(\frac{3}{5} X 5\right)$ = 158 knots CAS.

MAXIMUM ENDURANCE

Data from the nautical miles per pound of fuel curves have been replotted in the Maximum Endurance Chart (figure 2A5-6) for convenient determination of recommended minimum power and speed. The data show BHP/ENG, speed, and resulting fuel flow for gross weight and density altitude.

LONG RANGE PREDICTION

The long range prediction curves (figures 2A5-7 and 2A5-8) present the distance and time as fuel is used during cruise.

EXAMPLE

Given:

Weight at start of cruise = 42,900 pounds

Density altitude = 5,000 feet

Cruise distance = 350 nautical miles

Enter chart (figure 2A5-7) at gross weight 42,900 pounds (A) and read up to density altitude 5000 feet (B). Read across to distance and read 2750 nautical miles (C). Add the cruise distance (2750 + 350 = 3100) and re-enter chart at 3100 nautical miles (D). Read across to 5000 feet density altitude (E) and down to find gross weight at end of cruise 41,300 pounds (F). The difference between the weight at start of cruise and the weight at end of cruise (42,900 - 41,300 = 1600) is the weight of fuel used for 350 nautical miles cruise at CAS for long range. CAS is obtained from the applicable nautical miles per pound of fuel chart. Determination of time for cruise is done by the same procedure with the long range prediction time curve (figure 2A5-8).

Note

> These charts can also be used to find the distance traveled and the elapsed time for any given amount of fuel used. Enter the chart at the gross weight at start of cruise and at end of cruise. Extend lines from these two points up to the density altitude line, then across to the distance at altitude scale. The difference between the two points of distance is the distance traveled.

CRUISE CONTROL — ONE ENGINE INOPERATIVE

Nautical miles per pound of fuel data similar to that presented for normal cruise is presented for cruise with one engine inoperative, propeller feathered (figures 2A5-9 through 2A5-12). It is important that the propeller be feathered; if it is allowed to windmill, a serious reduction in range will result.

MODEL: T-29C/D
DATE: 15 MARCH 1955
DATA BASIS: FLIGHT TEST

NAUTICAL MILES PER POUND OF FUEL - SEA LEVEL

TWO ENGINE CRUISE   STANDARD ATMOSPHERE

ENGINES: R2800-99W

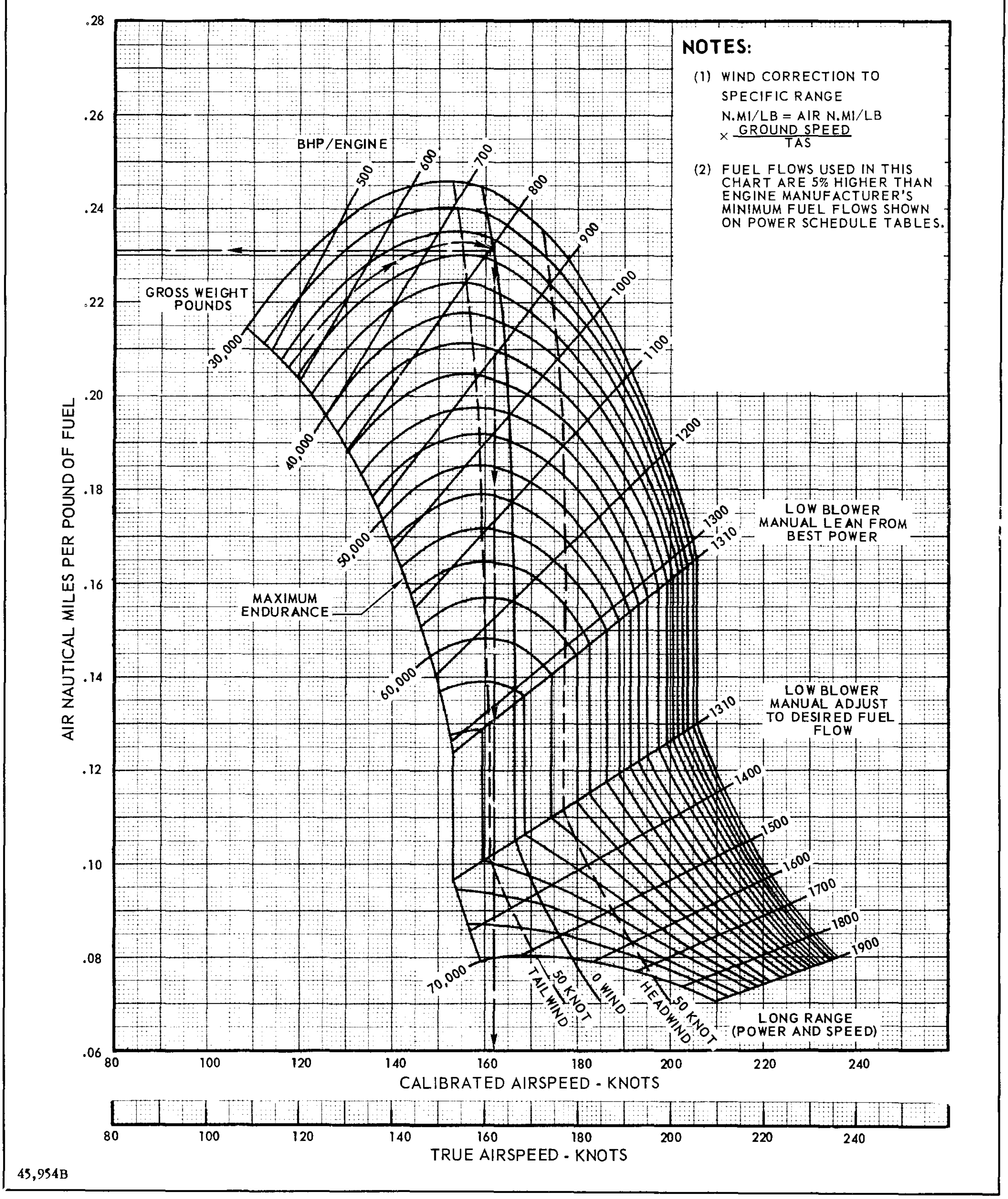


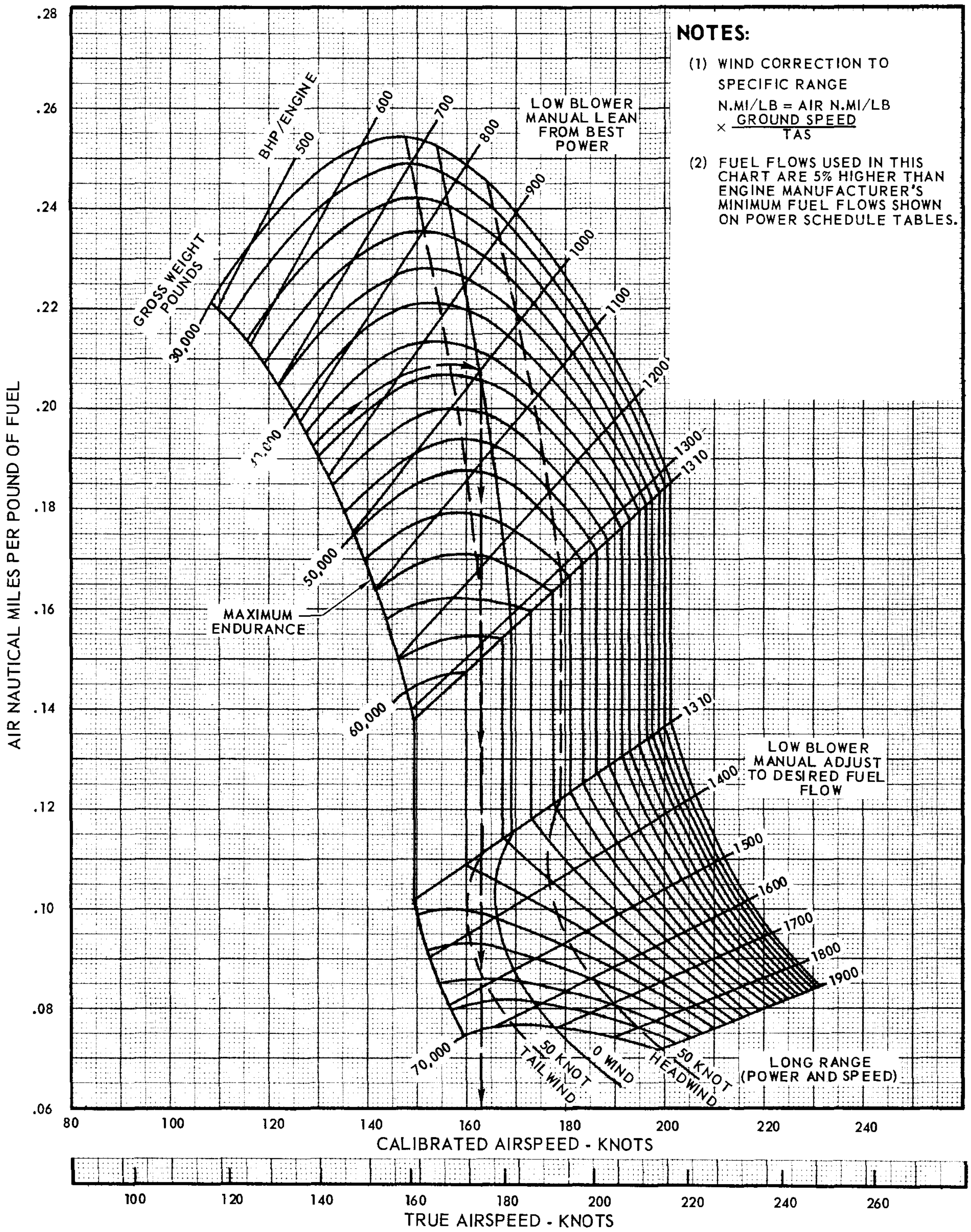
Figure 2A5-1

MODEL: **T-29C/D**
DATE: 15 MARCH 1955
DATA BASIS: FLIGHT TEST

NAUTICAL MILES PER POUND OF FUEL - 5000 FEET

TWO ENGINE CRUISE — STANDARD ATMOSPHERE

ENGINES: **R2800-99W**



45,955B

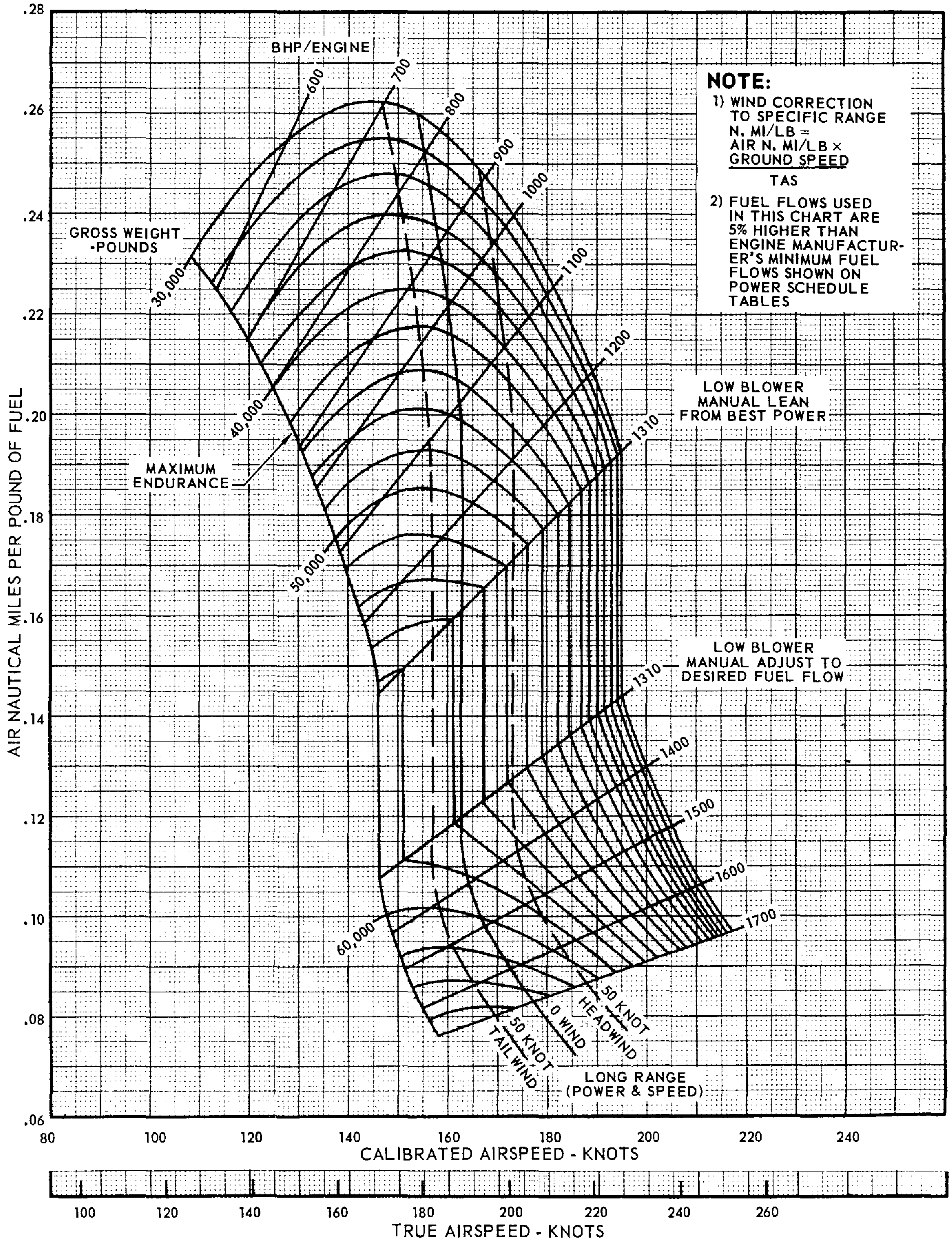
Figure 2A5-2

MODEL: T-29C/D
DATE: 15 MARCH 1955
DATA BASIS: FLIGHT TEST

NAUTICAL MILES PER POUND OF FUEL - 10,000 FEET

TWO ENGINE CRUISE STANDARD ATMOSPHERE

ENGINES: R2800-99W



45,956B

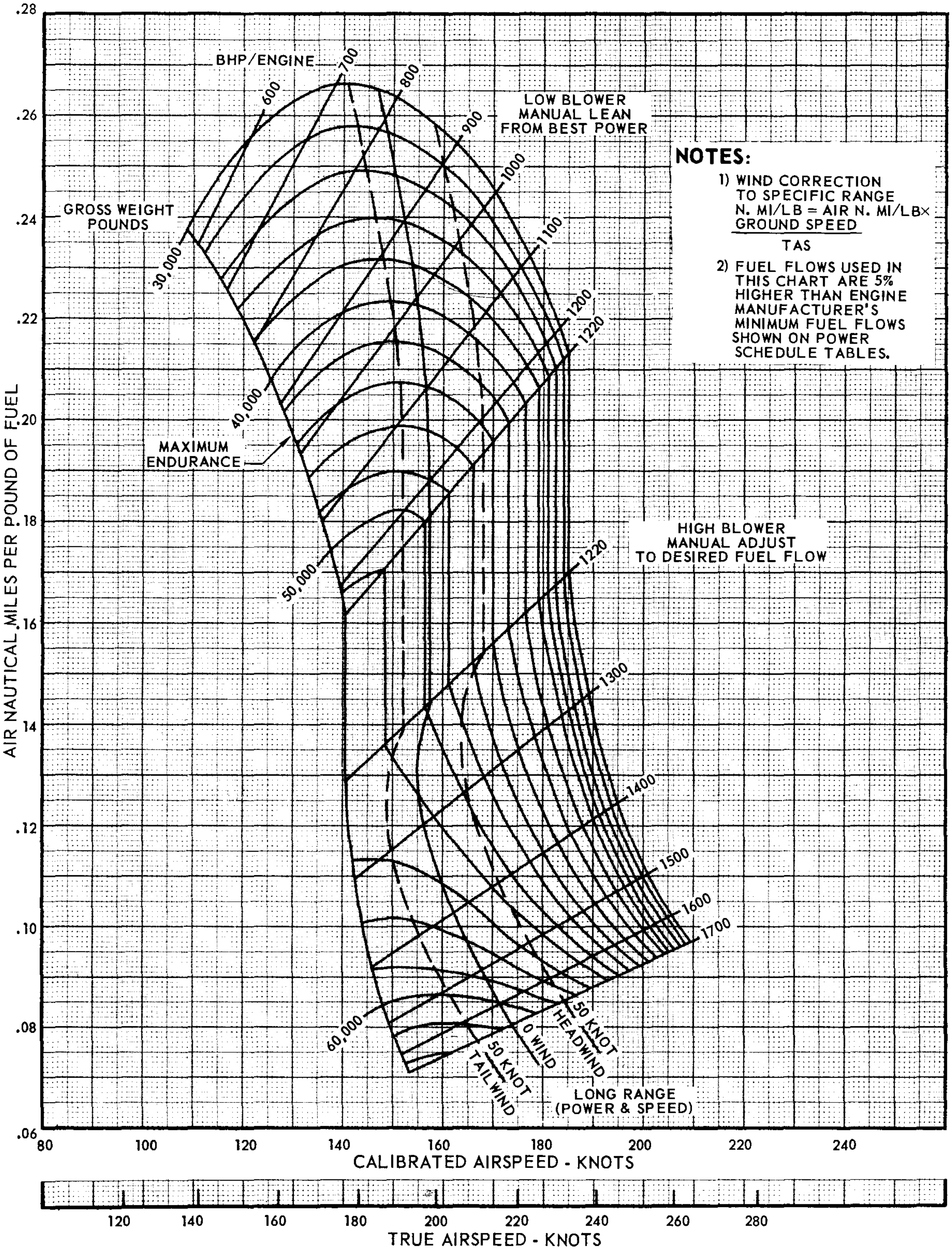
Figure 2A5-3

MODEL: T-29C/D
DATE: 15 MARCH 1955
DATA BASIS: FLIGHT TEST

NAUTICAL MILES PER POUND OF FUEL - 15,000 FEET

TWO ENGINE CRUISE STANDARD ATMOSPHERE

ENGINES: R2800-99W



45,957B

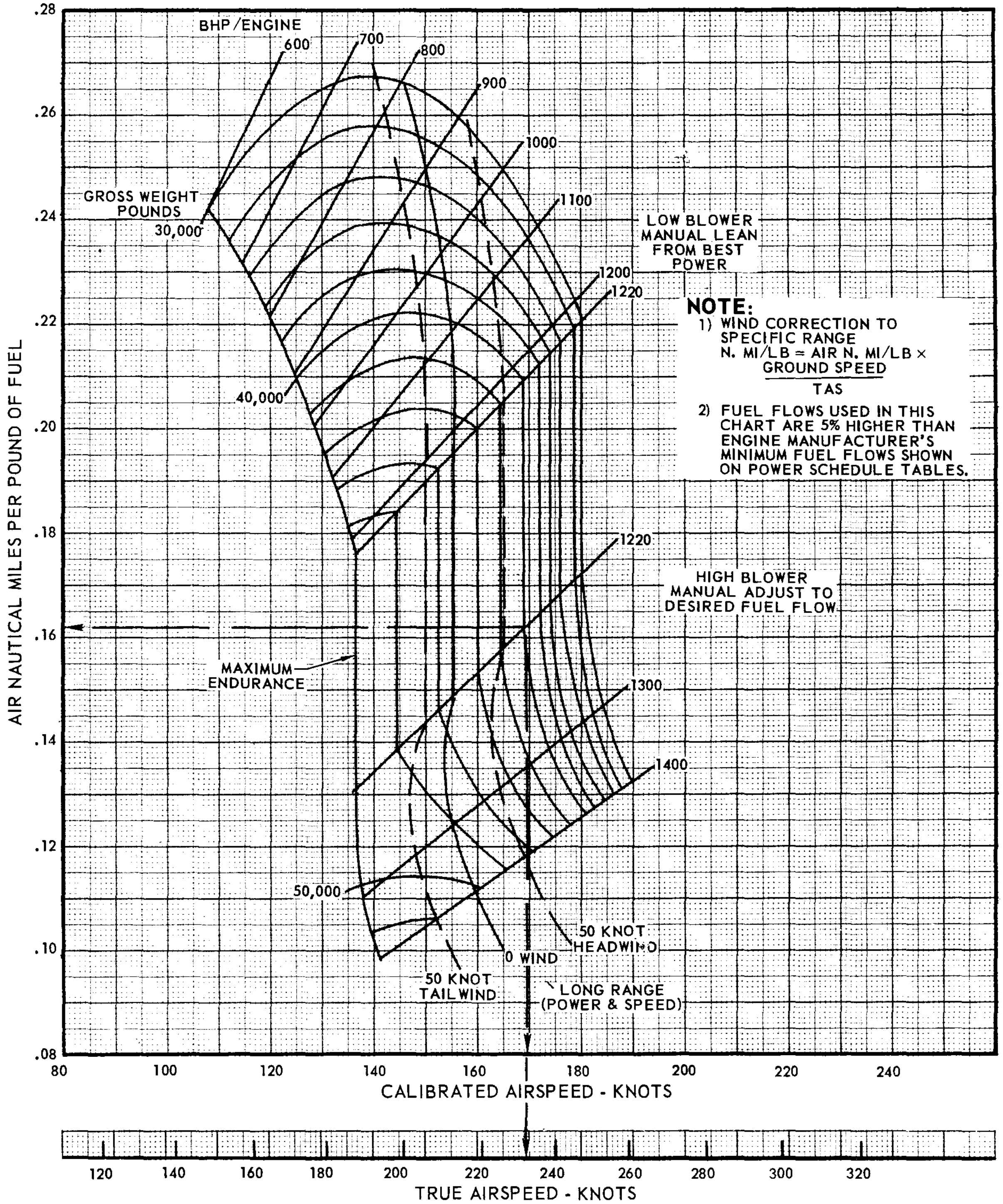
Figure 2A5-4

MODEL: **T-29C/D**
DATE: 15 MARCH 1955
DATA BASIS: FLIGHT TEST

NAUTICAL MILES PER POUND OF FUEL - 20,000 FEET

TWO ENGINE CRUISE STANDARD ATMOSPHERE

ENGINES: **R2800-99W**



45,958B

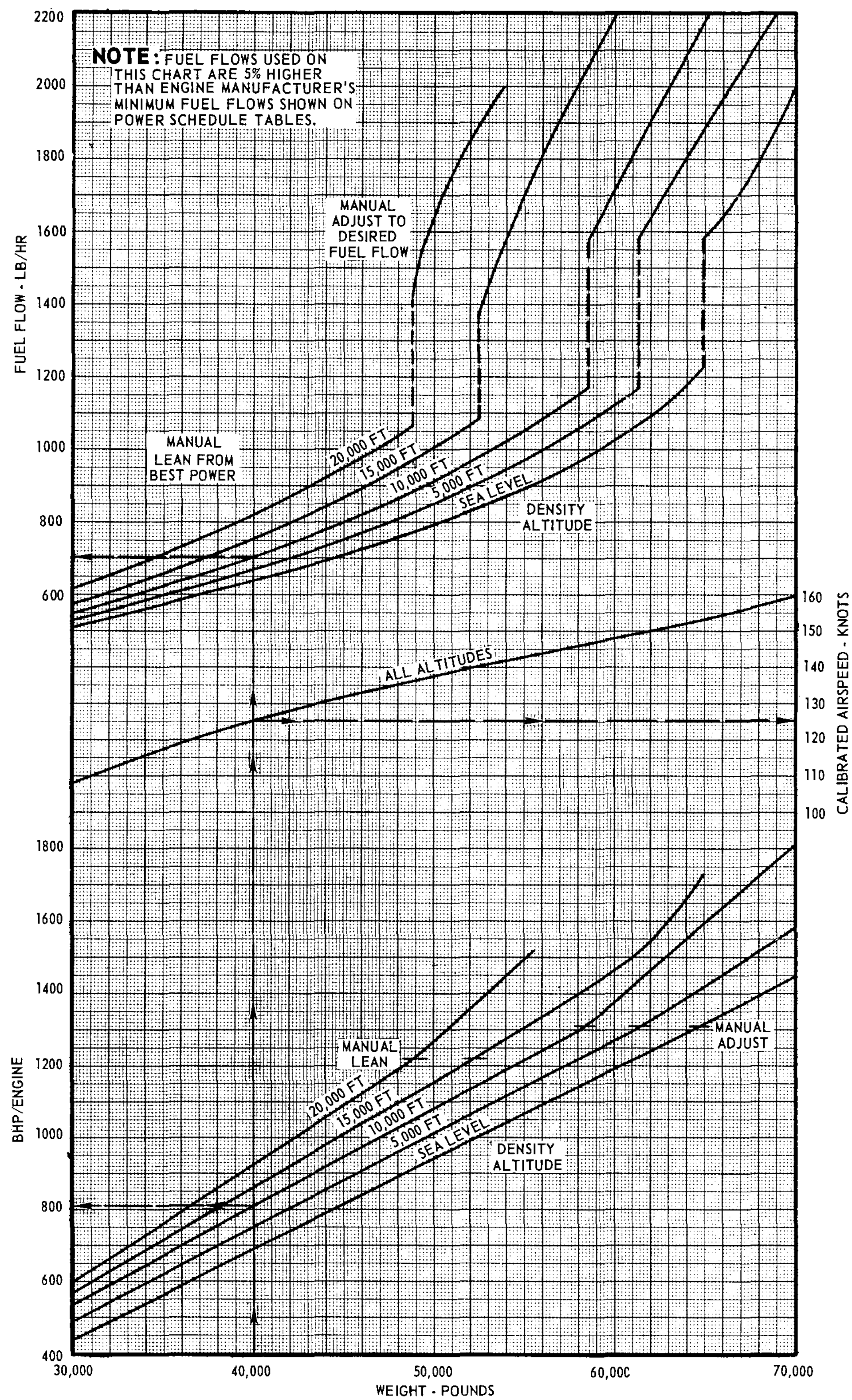
Figure 2A5-5

MODEL: **T-29-C/D**
DATE: 15 MARCH 1955
DATA BASIS: FLIGHT TEST

MAXIMUM ENDURANCE SUMMARY

TWO ENGINE CRUISE STANDARD ATMOSPHERE

ENGINES: **R2800-99W**



45,960B

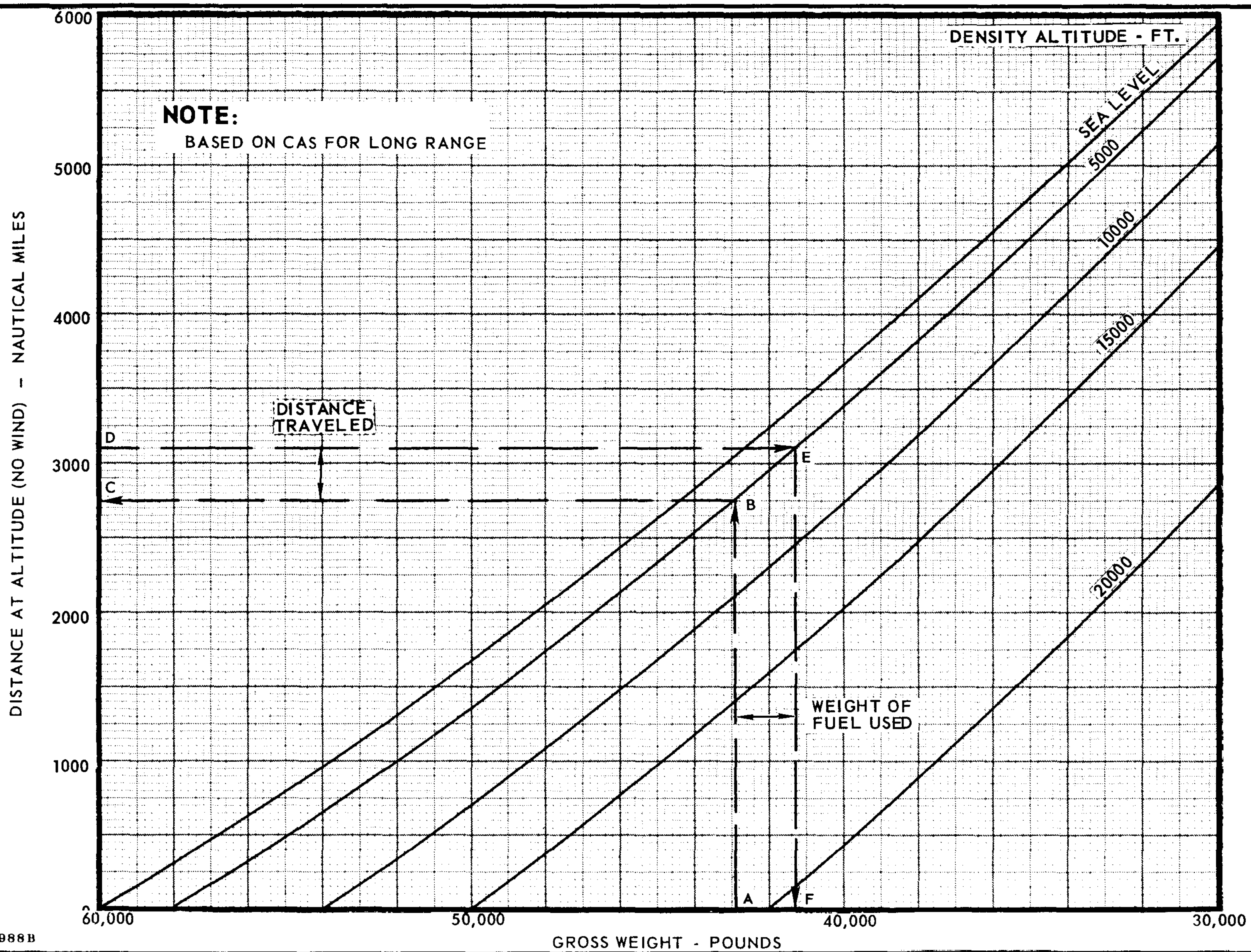
Figure 2A5-6

MODEL: T-29C/D
DATE: 15 MARCH 1955
DATA BASIS: FLIGHT TEST

LONG RANGE PREDICTION – DISTANCE

TWO ENGINE CRUISE   CLEAN CONFIGURATION
STANDARD ATMOSPHERE

ENGINES: R2800-99W



45,988B

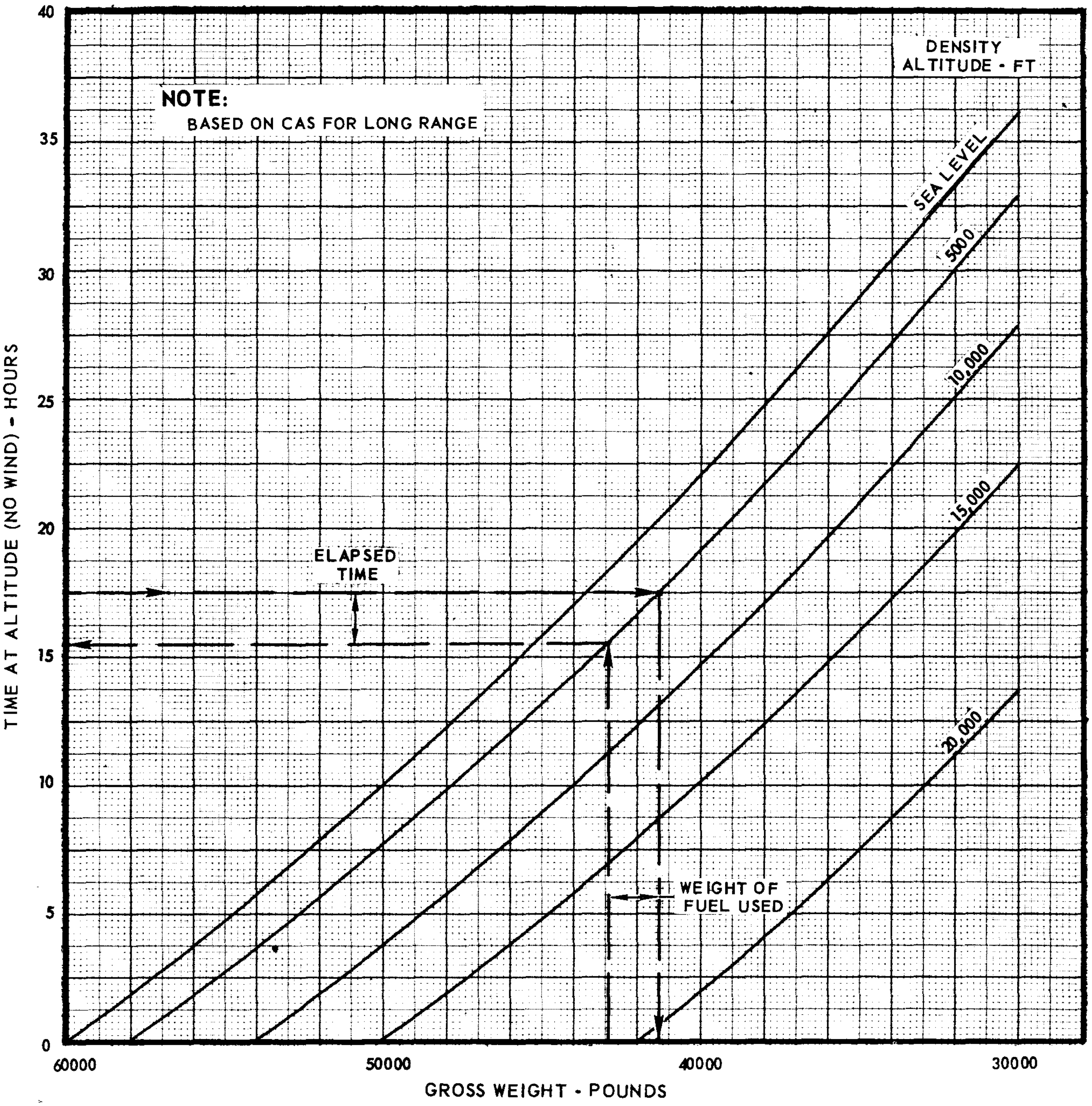
Figure 2A5-7

MODEL: **T-29C/D**
DATE: 15 MARCH 1955
DATA BASIS: FLIGHT TEST

LONG RANGE PREDICTION - TIME

TWO ENGINE CRUISE   CLEAN CONFIGURATION
STANDARD ATMOSPHERE

ENGINES: **R2800-99W**



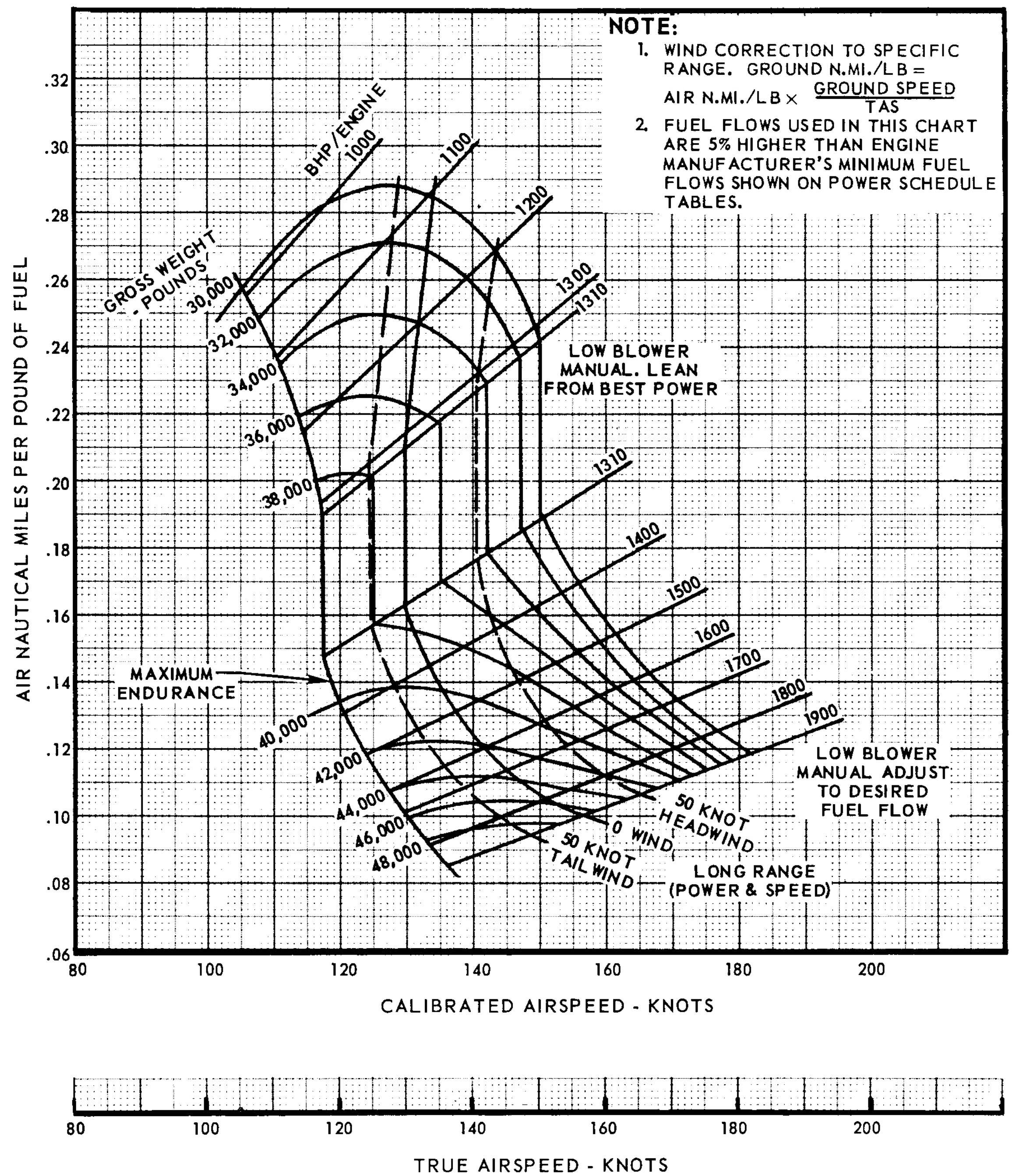
45,969B

Figure 2A5-8

NAUTICAL MILES PER POUND OF FUEL - ONE ENGINE INOPERATIVE
SEA LEVEL

MODEL: T-29C/D
DATE: 15 MARCH 1955
DATA BASIS: FLIGHT TEST

PROPELLER FEATHERED STANDARD ATMOSPHERE ENGINES: R2800-99W



45,963B

Figure 2A5-9

MODEL: T-29C/D

DATE: 15 MARCH 1955

DATA BASIS: FLIGHT TEST

NAUTICAL MILES PER POUND OF FUEL - ONE ENGINE INOPERATIVE
5,000 FEET

PROPELLER FEATHERED   STANDARD ATMOSPHERE   ENGINES: R2800-99W

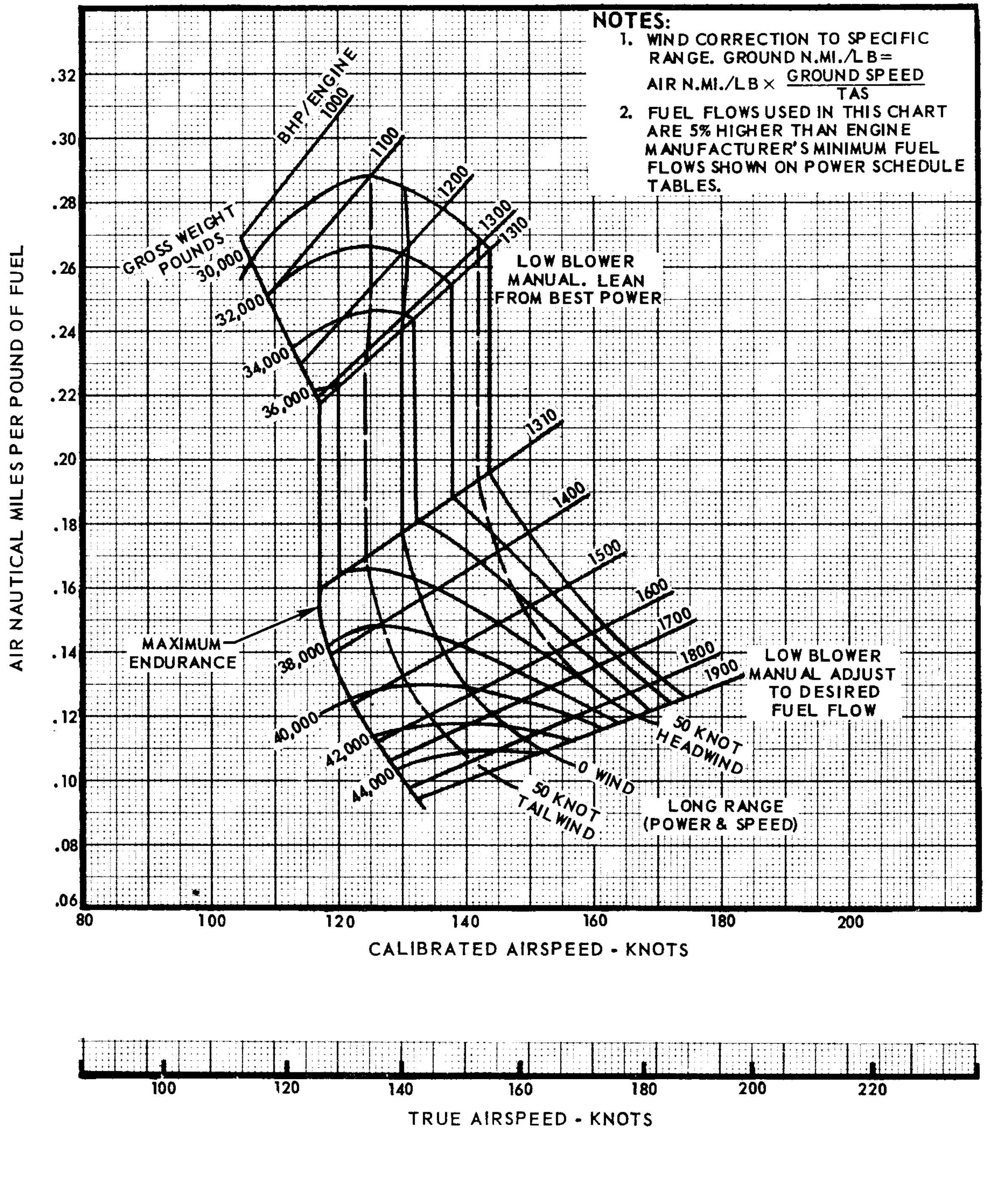


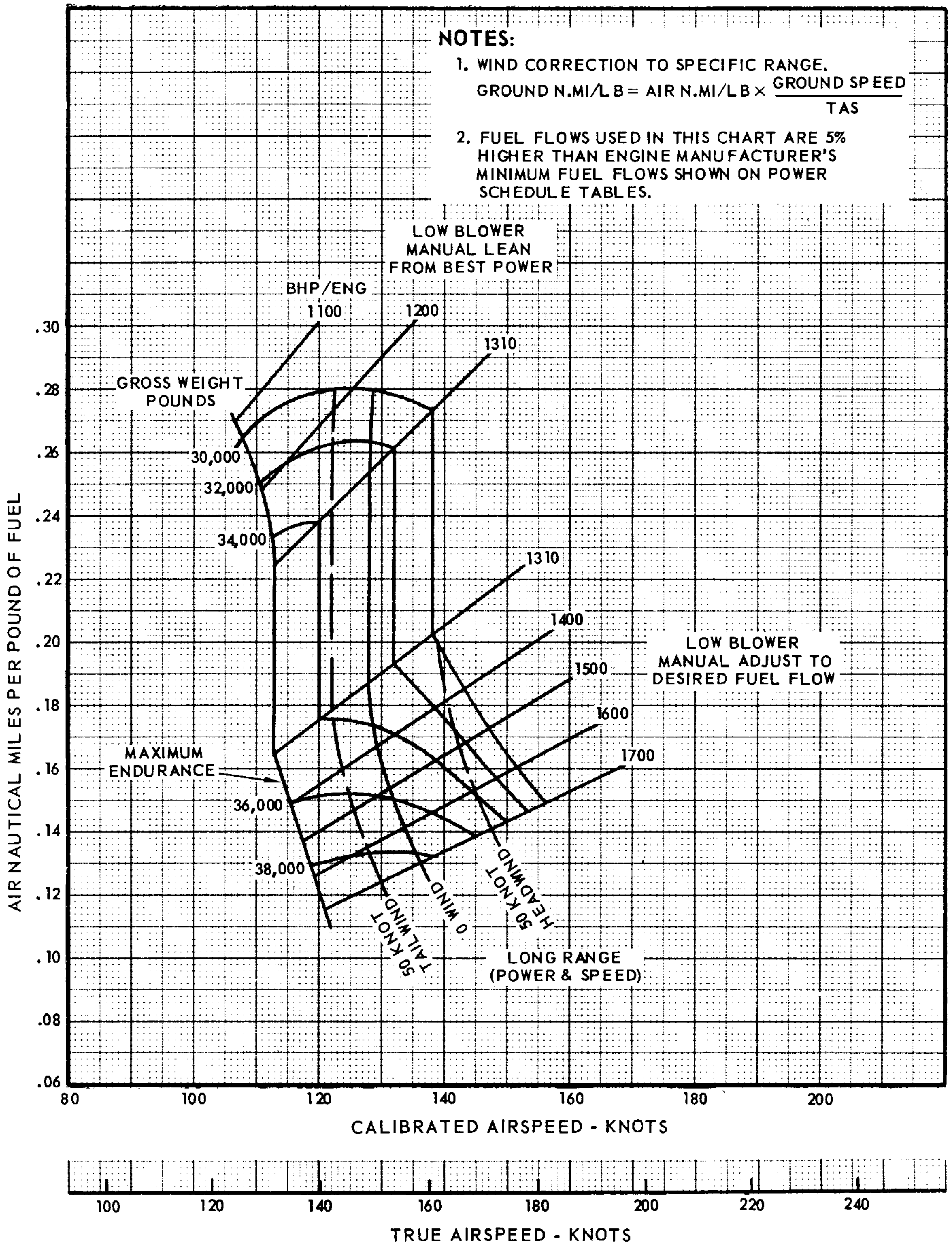
Figure 2A5-10

MODEL: T-29C/D
DATE: 15 MARCH 1955
DATA BASIS: FLIGHT TEST

NAUTICAL MILES PER POUND OF FUEL - ONE ENGINE INOPERATIVE
10,000 FEET

PROPELLER FEATHERED STANDARD ATMOSPHERE

ENGINES: R2800-99W



45,965B

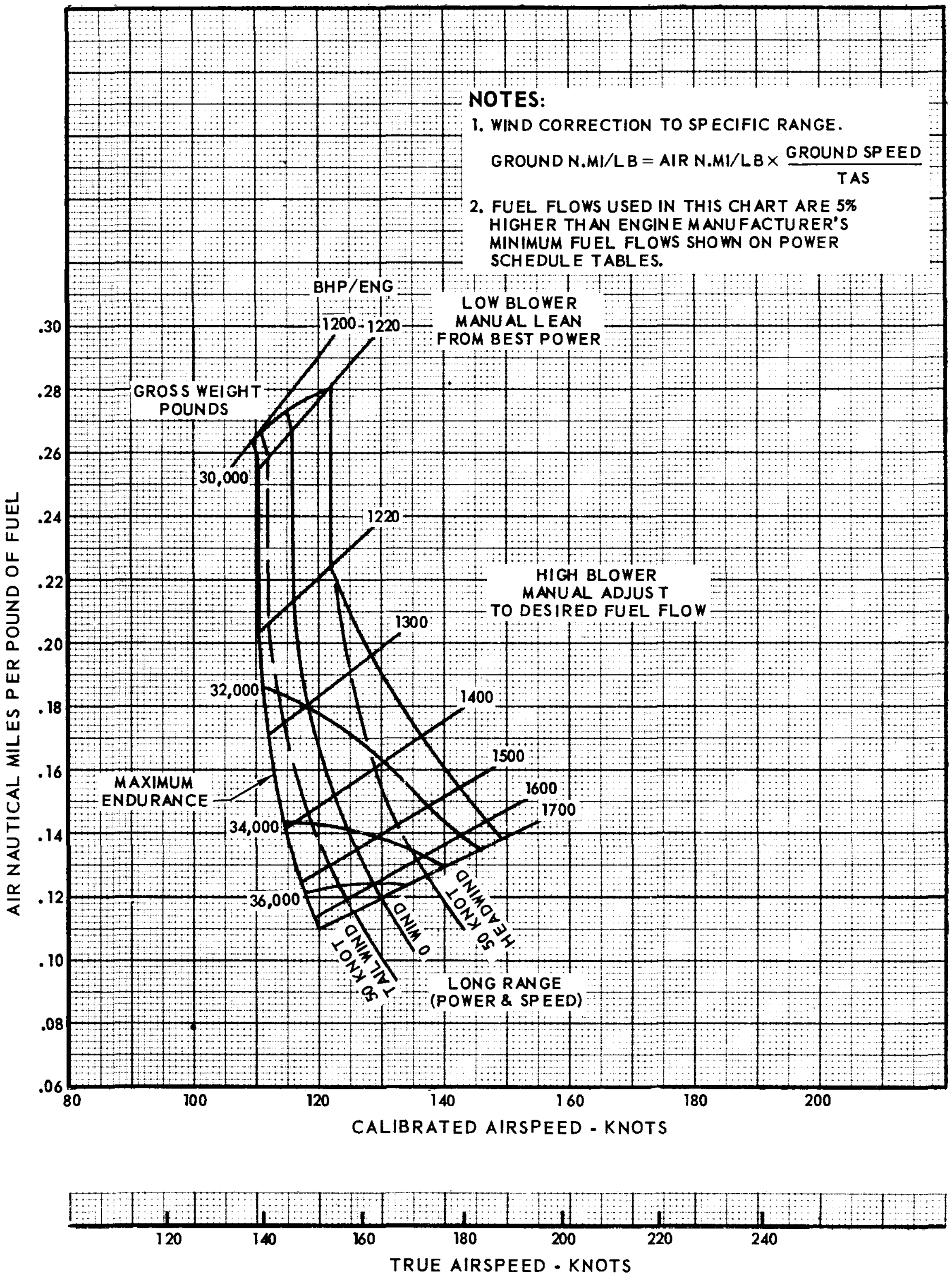
Figure 2A5-11

MODEL: T-29C/D
DATE: 15 MARCH 1955
DATA BASIS: FLIGHT TEST

NAUTICAL MILES PER POUND OF FUEL - ONE ENGINE INOPERATIVE
15,000 FEET

PROPELLER FEATHERED   STANDARD ATMOSPHERE

ENGINES: R2800-99W



45,966B

Figure 2A5-12

PART 6 — APPROACH AND LANDING

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The symbol * indicates an illustration

APPROACH AND LANDING

Extending the flaps decreases the landing speed and decreases the required landing field length. Wing flaps should not be extended to the landing position until the landing is assured. In normal flight planning, the greater of the available landing wing flap settings (39°, 28°, 20°, 15° and 0°) should be considered first. Specifically note that for each of the landing flap settings there is a corresponding approach flap setting. The selection of the landing flap setting should be based on the ability of the corresponding approach flap setting to assure adequate single-engine climb performance in the approach configuration in the event of a go-around or the need to lengthen the approach flight path. The recommended approach speeds are based on 130% of power-off stall speeds; touchdown at 110% of stall speed.

Note

> The approach speeds shown on the charts are indicated airspeeds. Because of position error in the pitot system at the low speeds being used, the indicated approach speeds do not bear a direct relationship to the indicated stall speeds as shown in the Power-Off Stall Speed Chart in Section VI. To correctly calculate the approach and touchdown speeds, it is necessary to convert the indicated stall speed to calibrated airspeed. Using the Airspeed Calibration Chart, multiply by 1.1 or 1.3, and then reconvert the resultant speed to indicated airspeed.

Benefits derived from the brakes are maximum at the lower speeds and minimum at the higher speeds or just after touchdown. Unnecessary use of the brakes greatly reduces their life. Therefore, the landing distance required, as determined from the Appendix data, should be compared to the available runway length. Only in cases where the landing distance required equals the available field length should a minimum roll landing be made. When the available runway length is greater than the calculated minimum landing distance, as determined from the charts, the airplane can be stopped with less than maximum braking.

DISCUSSION OF CHARTS

Note

> See landing pattern diagram, Section II.

APPROACH AND LANDING SPEEDS CHART

The recommended airspeeds for maneuver (1.4 V_{stall}), approach (1.3 V_{stall}), and touchdown (1.1 V_{stall}) with landing gear down may be determined from the Approach and Landing Speeds Chart (figure 2A6-1). The chart is presented for the gross weight and flap setting operating range of the airplane. Power-off stall speeds are included on the chart.

EXAMPLE

Given:

Gross weight = 38,000 pounds

Flap setting - Approach = 12°

Flap setting - Touchdown = 28°

Enter chart at gross weight of 38,000 pounds (A) and read up to flap deflection of 12° (B). Read across to 1.3 stall speed line (approach) (C), and read up to find IAS of 116 knots (D). For 28° flap deflection enter at gross weight of 38,000 pounds (A) and read up to 28° flap deflection (E). Read across to the 1.1 stall speed line (touchdown) (F), and read up for 93 knots IAS (G).

LANDING GROUND ROLL

Landing ground roll is defined as the distance from touchdown to a stop using normal pilot techniques specified in Section II with brakes only (both propellers windmilling). For a minimum roll landing, it is important to initiate wing flap retraction as soon as possible after the airplane is firmly on the ground. Retracting the wing flaps decreases the wing lift and allows more weight to be applied to the main wheels, thus increasing the braking efficiency and shortening the landing roll. Reverse propeller thrust is recommended since it will appreciably shorten the landing roll. The landing ground roll charts (figures 2A6-2 through 2A6-6) present landing distance for density altitude, gross weight, and headwind.

EXAMPLE

Given:

Density altitude = 1800 feet

Gross weight = 36,000 pounds

Headwind = 5 knots

Flap setting = 28°

Select chart for 28° flap (figure 2A6-3). Enter chart at density altitude of 1800 feet (A). Read across to gross weight of 36,000 pounds (B) and read down to wind velocity curve and follow headwind curve to 5 knots (C) and read down to find distance of 3100 feet (D). To compute for landing distance from 50 feet, multiply landing ground roll by 1.22 (3100 X 1.22 = 3775 feet).

Effects of Unusual Runway Conditions on Landing Ground Roll

The landing ground roll charts (figures 2A6-2 through 2A6-6) are based on landing on a dry, hard surface. The landing ground roll can be corrected for other surface conditions by multiplying the ground roll distance by the stopping factor from the Stopping Capability Chart (figure 2A6-7). To use the chart, obtain the latest runway condition reading (RCR) from the base weather station.

Note

If no RCR is available, use 12 for a wet runway and 5 for an icy runway.

EXAMPLE

Given:

RCR = 14

Ground roll distance = 3100 feet

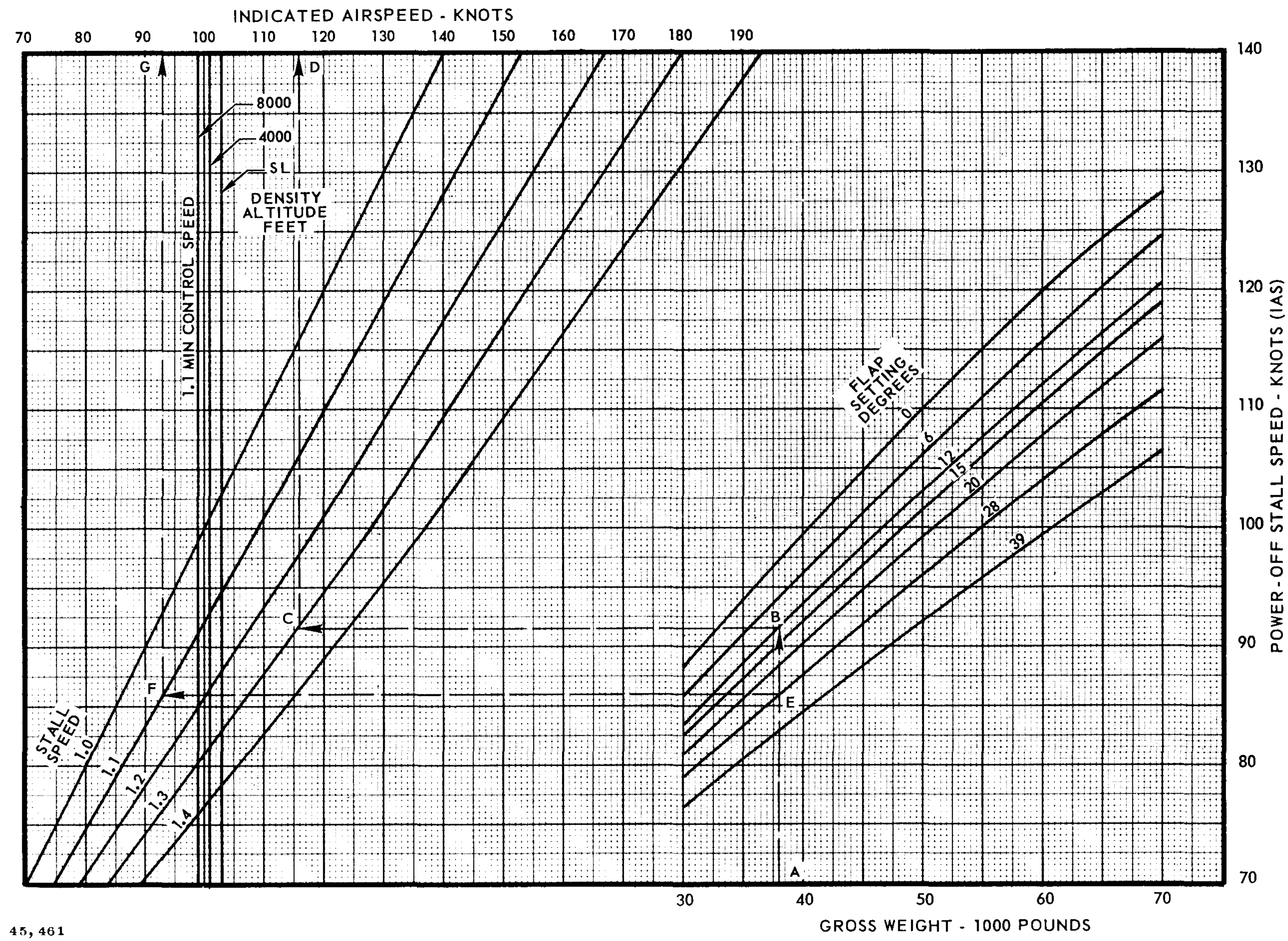
Enter the Stopping Capability Chart (figure 2A6-7) with RCR of 14 (A). Move horizontally to curve (B), then vertically to obtain stopping factor of 1.27 (C). Multiply the dry hard surface runway ground roll (3100) by the stopping distance factor (1.27) to determine the ground roll on a slippery runway (3100 X 1.27 = 3935 feet).

MODEL: **T-29C/D**
DATE: 15 JULY 1955
DATA BASIS: FLIGHT TEST

APPROACH AND LANDING SPEEDS

LANDING GEAR DOWN 0° BANK

ENGINES: **R2800-99W**



45,461

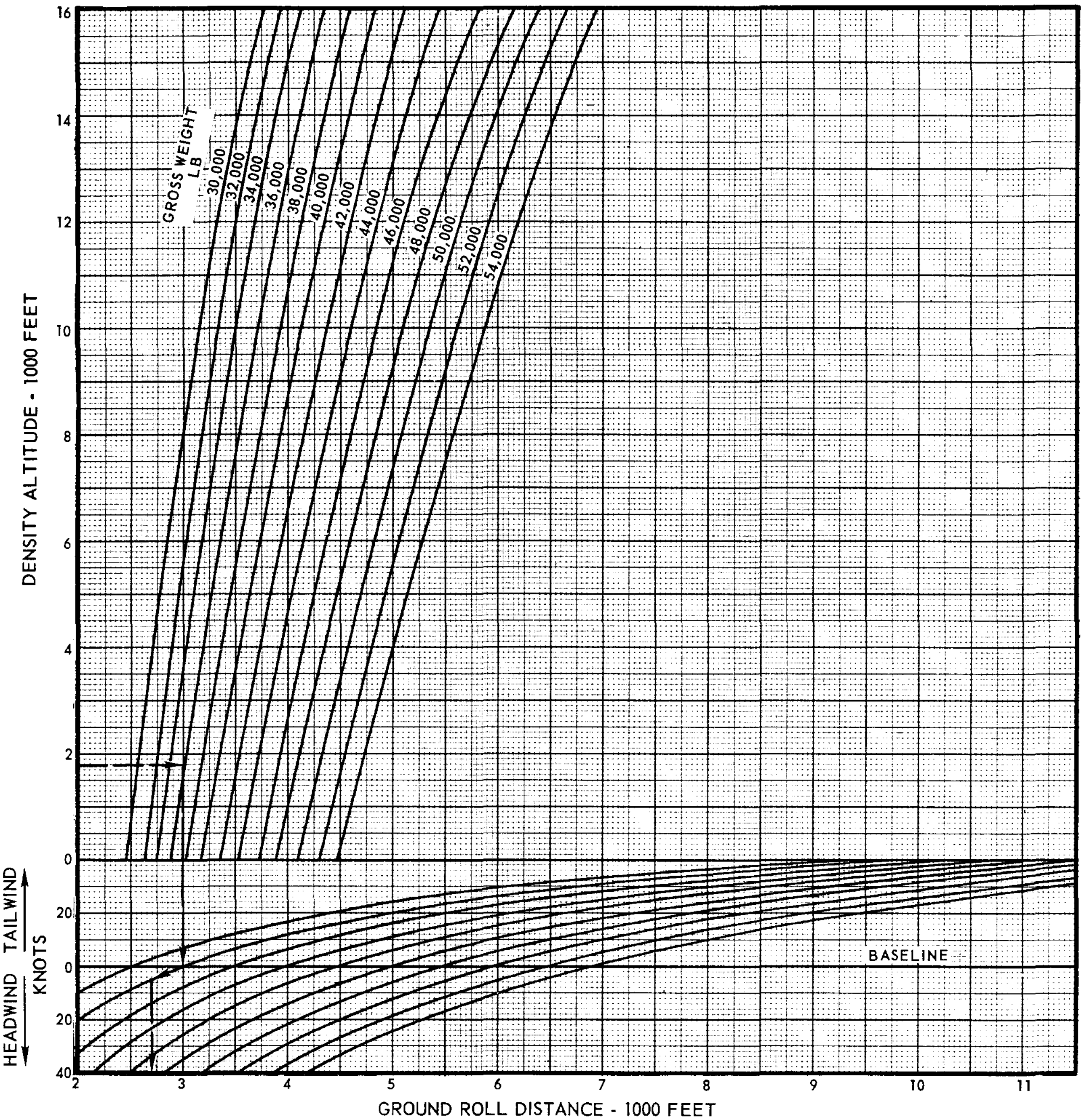
Figure 2A6-1

LANDING GROUND ROLL (39° FLAP)

APPROACH FLAP 20° BRAKES ONLY

MODEL: **T-29C/D**
DATE: 15 MARCH 1955
DATA BASIS: FLIGHT TEST

ENGINES: **R2800-99W**



NOTES:

(1) GROUND ROLL IS FOR BRAKES ONLY, WITH PROPELLERS WINDMILLING. MAXIMUM REVERSE WILL REDUCE GROUND ROLL BY 45%.

(2) DISTANCES ARE BASED ON DRY HARD SURFACED RUNWAY WITH FLAP RETRACTION INITIATED AT 0.9 STALL SPEED.

(3) DO NOT EXTEND FLAPS MORE THAN 20° UNTIL LANDING IS ASSURED.

(4) TOUCHDOWN AT 1.1 POWER OFF STALL SPEED.

(5) LANDING FIELD LENGTH FROM 50 FEET HEIGHT IS 122% OF THE GROUND ROLL SHOWN.

(6) MULTIPLY GROUND ROLL DISTANCE BY STOPPING FACTOR FROM STOPPING CAPABILITY CHART.

(7) 100% WIND ACCOUNTABILITY

45,453C

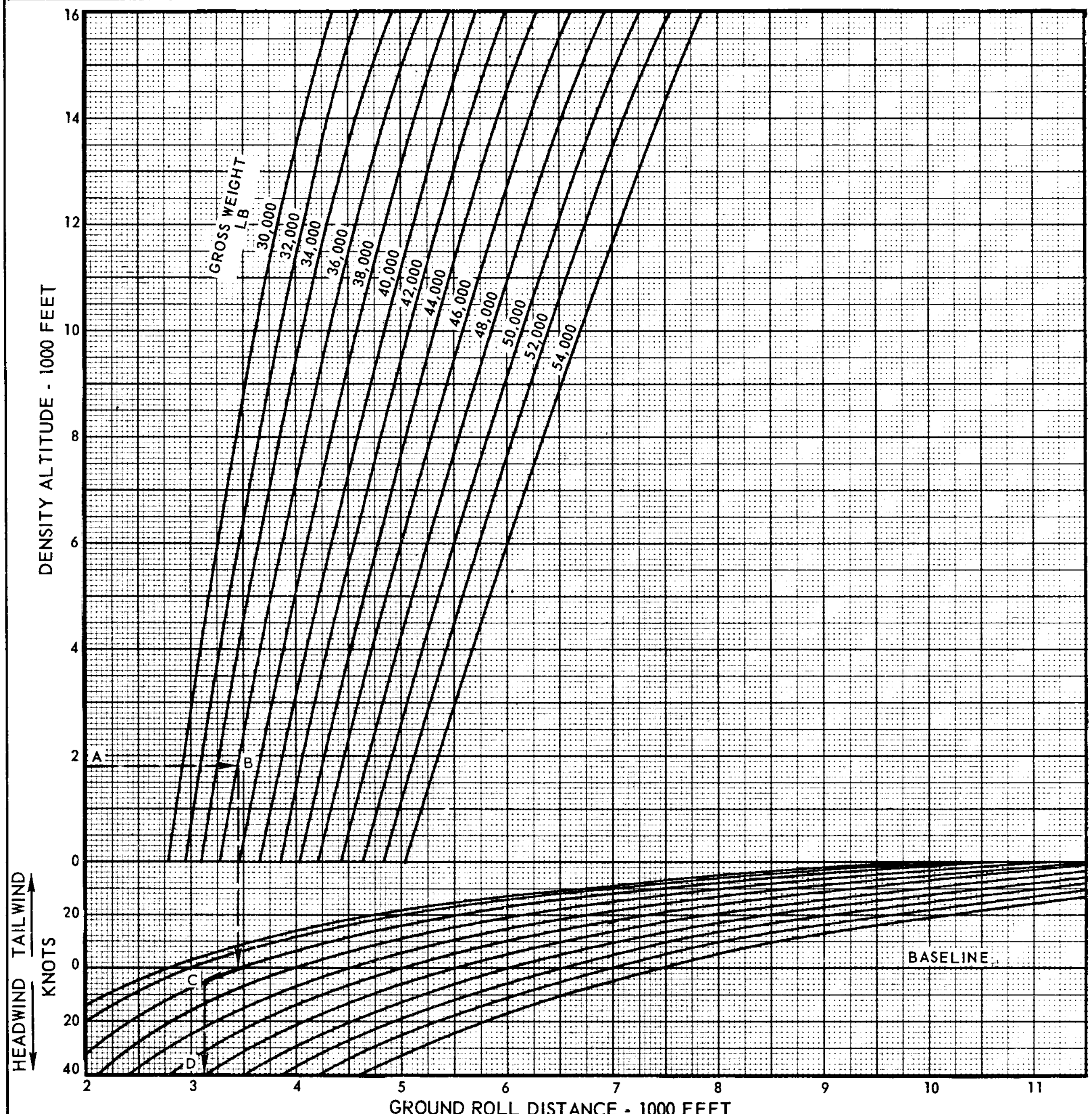
Figure 2A6-2

MODEL: T-29 C/D
DATE: 15 MARCH 1955
DATA BASIS: FLIGHT TEST

LANDING GROUND ROLL (28° FLAP)

APPROACH FLAP - 12° BRAKES ONLY

ENGINES: R2800-99W



NOTES:

(1) GROUND ROLL IS FOR BRAKES ONLY, WITH PROPELLERS WINDMILLING. MAXIMUM REVERSE WILL REDUCE GROUND ROLL BY 45%.

(2) DISTANCES ARE BASED ON DRY HARD SURFACED RUNWAY WITH FLAP RETRACTION INITIATED AT 0.9 STALL SPEED.

(3) DO NOT EXTEND FLAPS MORE THAN 12° UNTIL LANDING IS ASSURED.

(4) TOUCHDOWN AT 1.1 POWER OFF STALL SPEED.

(5) LANDING FIELD LENGTH FROM 50 FT HEIGHT IS 122% OF THE GROUND ROLL SHOWN.

(6) MULTIPLY GROUND ROLL DISTANCE BY STOPPING FACTOR FROM STOPPING CAPABILITY CHART.

(7) 100% WIND ACCOUNTABILITY.

45,455C

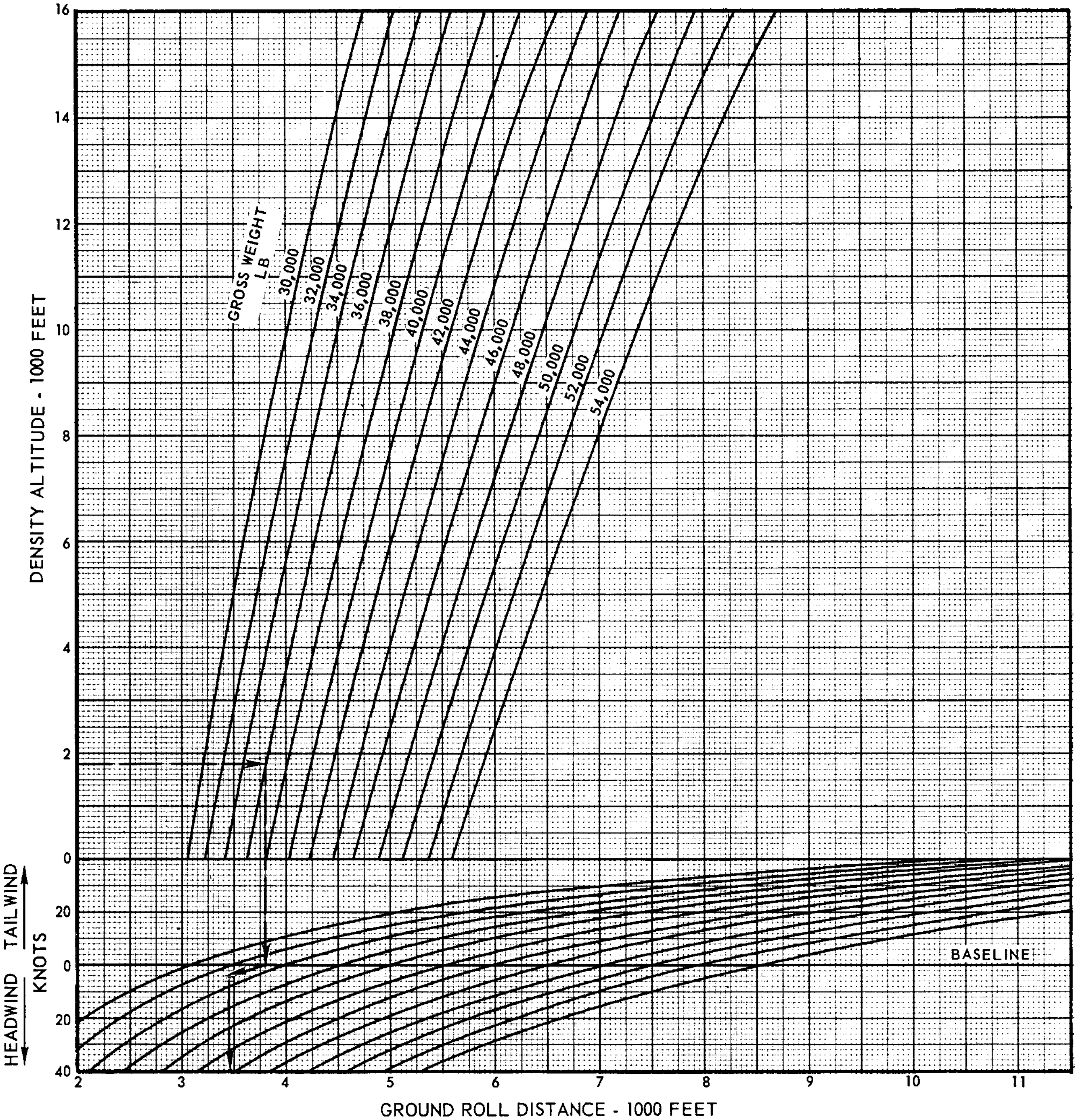
Figure 2A6-3

LANDING GROUND ROLL (20° FLAP)

APPROACH FLAP 6°
BRAKES ONLY

MODEL: **T-29C/D**
DATE: 15 MARCH 1955
DATA BASIS: FLIGHT TEST

ENGINES: **R2800-99W**



NOTES:

(1) GROUND ROLL IS FOR BRAKES ONLY, WITH PROPELLERS WINDMILLING. MAXIMUM REVERSE WILL REDUCE GROUND ROLL BY 45%.

(2) DISTANCES ARE BASED ON DRY HARD SURFACED RUNWAY WITH FLAP RETRACTION INITIATED AT 0.9 STALL SPEED.

(3) DO NOT EXTEND FLAPS MORE THAN 6° UNTIL LANDING IS ASSURED.

(4) TOUCHDOWN AT 1.1 POWER OFF STALL SPEED.

(5) LANDING FIELD LENGTH FROM 50 FT HEIGHT IS 122% OF THE GROUND ROLL SHOWN.

(6) MULTIPLY GROUND ROLL DISTANCE BY STOPPING FACTOR FROM STOPPING CAPABILITY CHART.

(7) 100% WIND ACCOUNTABILITY.

45,976B

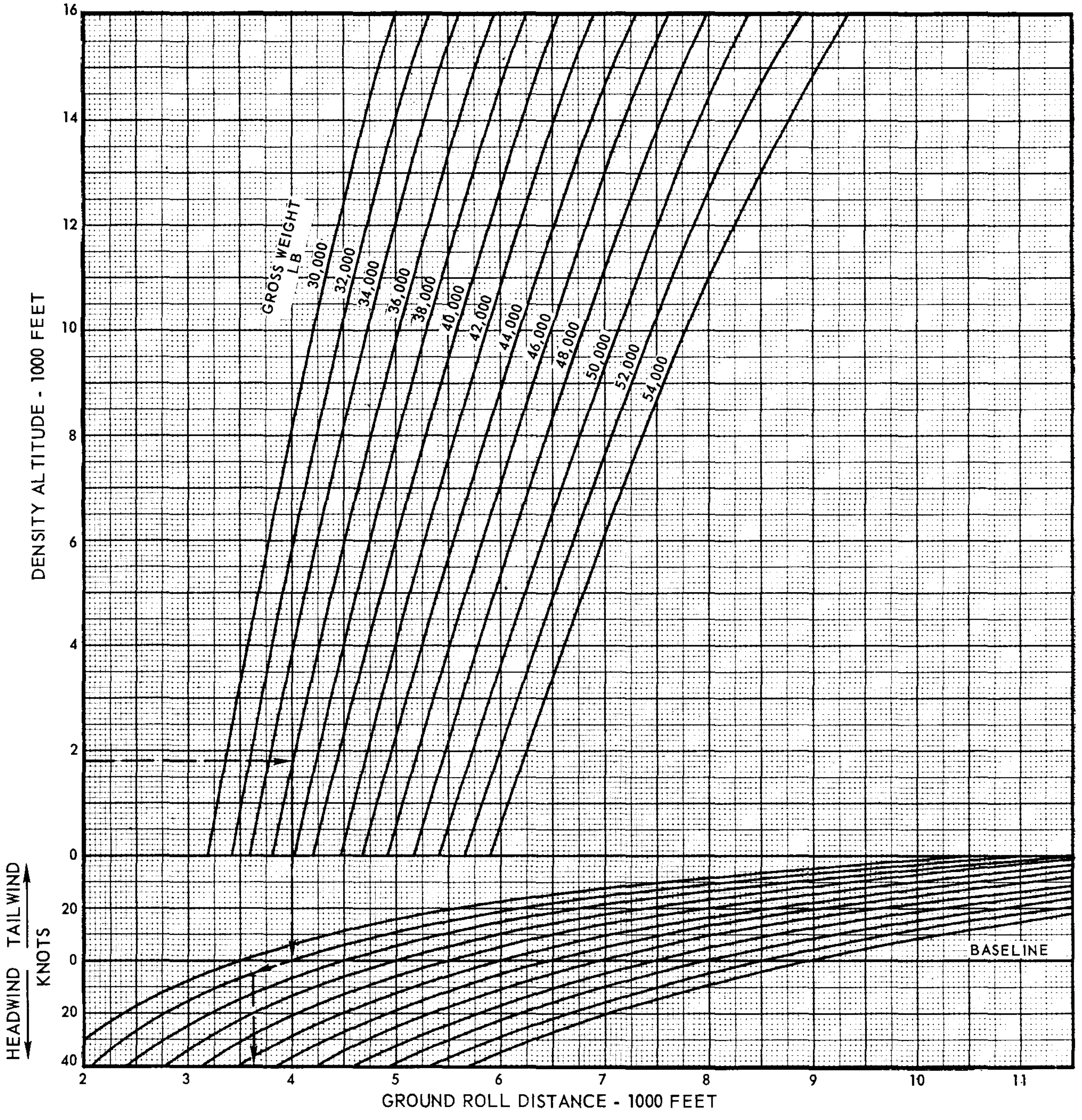
Figure 2A6-4

LANDING GROUND ROLL (15° FLAP)

APPROACH FLAP - 0° BRAKES ONLY

MODEL: **T-29C/D**
DATE: 15 MARCH 1955
DATA BASIS: FLIGHT TEST

ENGINES: **R2800-99W**



NOTES:

(1) GROUND ROLL IS FOR BRAKES ONLY, WITH PROPELLERS WINDMILLING. MAXIMUM REVERSE WILL REDUCE GROUND ROLL BY 45%.

(2) DISTANCES ARE BASED ON DRY HARD SURFACED RUNWAY WITH FLAP RETRACTION INITIATED AT 0.9 STALL SPEED.

(3) DO NOT EXTEND FLAPS MORE THAN 0° UNTIL LANDING IS ASSURED.

(4) TOUCHDOWN AT 1.1 POWER OFF STALL SPEED.

(5) LANDING FIELD LENGTH FROM 50 FT HEIGHT IS 122% OF THE GROUND ROLL SHOWN.

(6) MULTIPLY GROUND ROLL DISTANCE BY STOPPING FACTOR FROM STOPPING CAPABILITY CHART.

(7) 100% WIND ACCOUNTABILITY.

45,457C

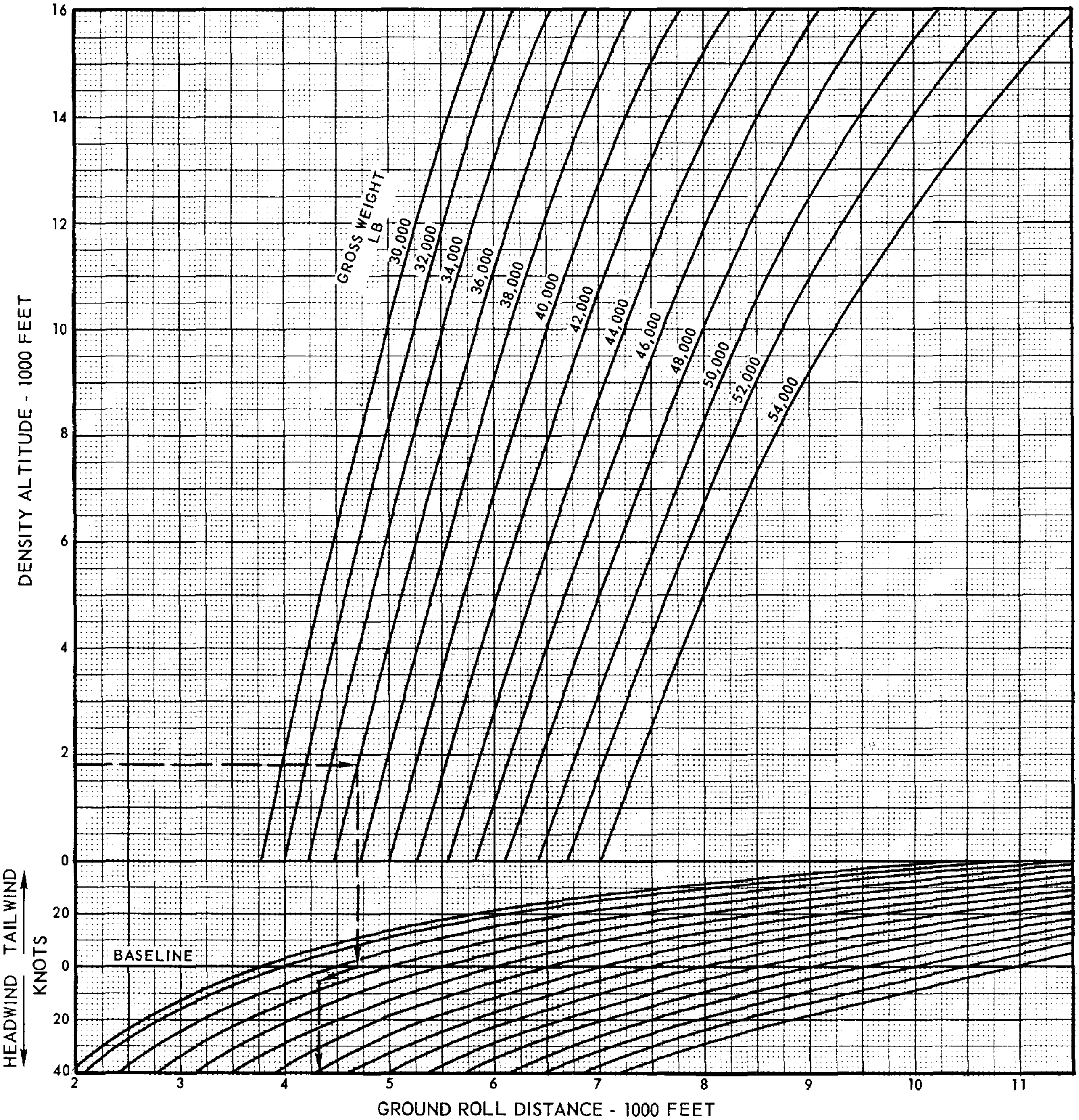
Figure 2A6-5

MODEL: **T-29C/D**
DATE: 15 MARCH 1955
DATA BASIS: FLIGHT TEST

LANDING GROUND ROLL (0° FLAP)

APPROACH FLAP - 0° BRAKES ONLY

ENGINES: **R2800-99W**



NOTES:

(1) GROUND ROLL IS FOR BRAKES ONLY, WITH PROPELLER WINDMILLING. MAXIMUM REVERSE WILL REDUCE THE GROUND ROLL BY 45%.

(2) DISTANCES ARE BASED ON HARD DRY SURFACED RUNWAY WITH FLAP RETRACTION INITIATED AT 0.9 STALL SPEED.

(3) TOUCHDOWN AT 1.1 POWER OFF STALL SPEED.

(4) LANDING FIELD LENGTH FROM 50 FEET HEIGHT IS 122% OF THE GROUND ROLL SHOWN.

(5) MULTIPLY GROUND ROLL DISTANCE BY STOPPING FACTOR FROM STOPPING CAPABILITY CHART.

(6) 100% WIND ACCOUNTABILITY

45,459C

Figure 2A6-6

MODEL: **T-29 C/D**
DATE: 5 DECEMBER 1967
DATA BASIS: **ESTIMATED**

STOPPING CAPABILITY CHART

ENGINES: **R2800-99W**

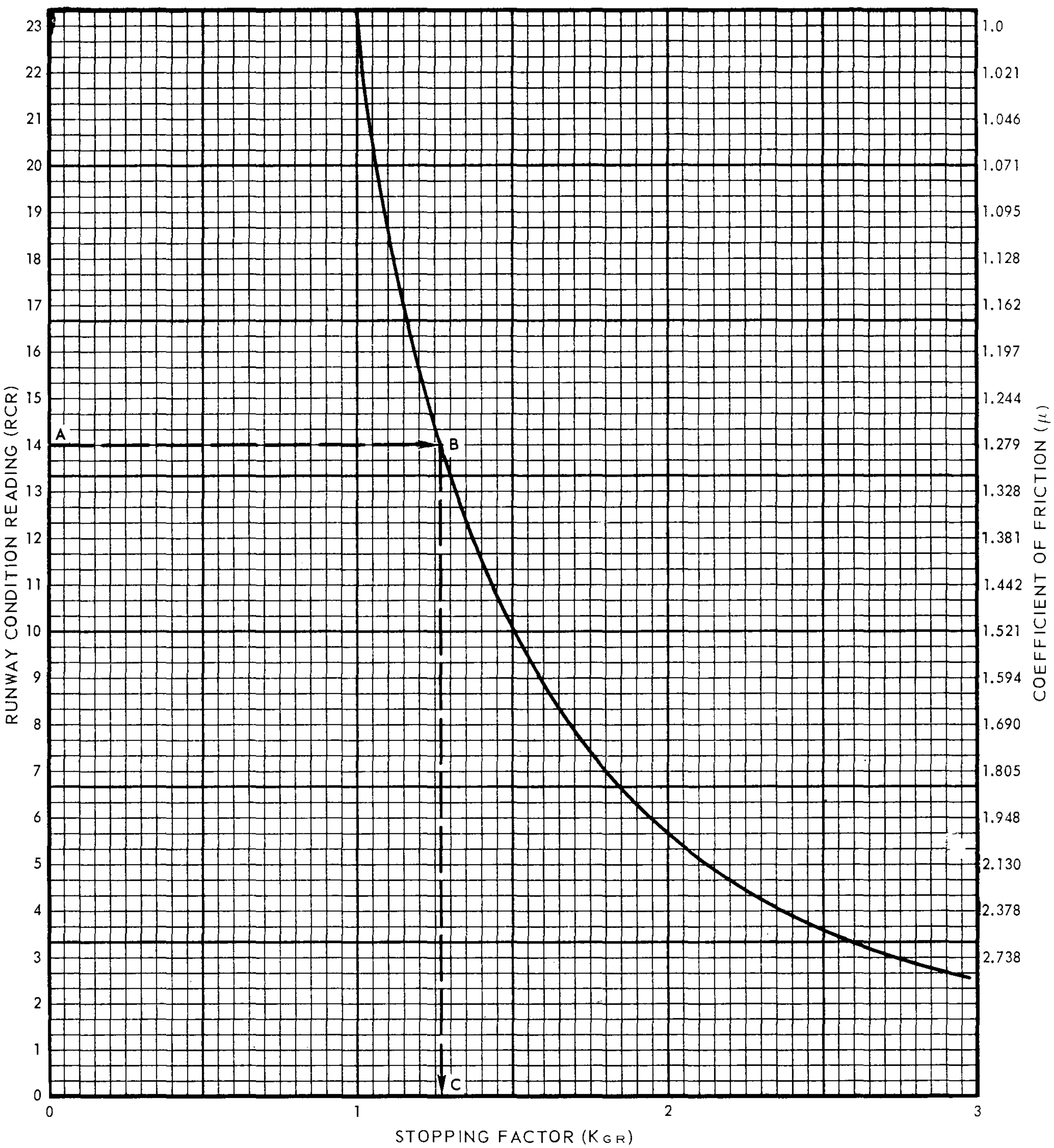


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Figure 2A6-7

PART 7 – MISSION PLANNING

(C) (D)

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MISSION PLANNING

Completion of the Takeoff and Landing Data (TOLD) card (AFTO Form 377) is required for all flights. AFTO Form 377 is available through normal forms distribution channels or may be locally reproduced in emergency situations under provisions of AFM 7-1. Fill out the TOLD card using the operating data in the Appendix or using the precomputed data. To be prepared for an emergency landing immediately after takeoff, complete both the TAKEOFF and LANDING IMMEDIATELY AFTER TAKEOFF portions of the TOLD card using takeoff gross weight. The LANDING portion of the card may be completed at this time or prior to landing at destination.

Note

Acceleration time/distance check data must be computed only when refusal speed is less than takeoff speed.

Adequate planning is an essential part of the successful performance of any mission. The scope of this discussion is limited to considering aircraft performance and associated planning procedures. The procedures suggested by the sample flight problem facilitate safe operation of the aircraft in all phases of the mission. A thorough knowledge of these procedures will provide quicker action in the event of an emergency and will aid in making sound decisions.

CONDITIONS - TAKEOFF - T-29/C-131		
FIELD ELEVATION	GROSS WEIGHT	
RUNWAY LENGTH	WIND COMPONENT	
OAT °C	CAT °C	DEW POINT °F
PRESSURE ALTITUDE	DENSITY ALTITUDE	
RCR	SMOE	
TAKEOFF		
MANIFOLD PRESSURE		
EXPECTED TPSI/BMEP		
MINIMUM TPSI/BMEP		
TAKEOFF FLAP SETTING		
TAKEOFF SPEED *(1.2)*		
CRITICAL FIELD LENGTH		
REFUSAL SPEED		
TAKEOFF GROUND RUN		
SPEED/TIME CHECK	/	
DISTANCE/SPEED CHECK	/	
SINGLE-ENGINE CLIMB SPEED *(1.2 Clean)*		
SINGLE-ENGINE ABSOLUTE CEILING *(METO)*		
LANDING IMMEDIATELY AFTER TAKEOFF		
APPROACH FLAPS °	APPROACH SPEED *(1.3)* KIAS	
GO-AROUND SPEED *(1.2 - Approach Flaps)* KIAS		
LANDING FLAPS °		
LANDING APPROACH SPEED *(1.3)* KIAS		
LANDING GROUND ROLL/DISTANCE /		

AFTO FORM JAN 70 377 **T-29/C-131 TOLD CARD**

CONDITIONS - LANDING		
FIELD ELEVATION	GROSS WEIGHT	
RUNWAY LENGTH	WIND COMPONENT	
OAT °C	RCR	DEW POINT °F
PRESSURE ALTITUDE	DENSITY ALTITUDE	
LANDING		
APPROACH FLAPS °	APPROACH SPEED *(1.3)* KIAS	
GO-AROUND SPEED *(1.2 - Approach Flaps)* KIAS		
GO-AROUND SPEED *(1.2 - Clean)* KIAS		
LANDING FLAPS °		
LANDING APPROACH SPEED *(1.3)* KIAS		
LANDING GROUND ROLL/DISTANCE		

T-29/C-131 Takeoff and Landing Data (TOLD) Card

Complete the TOLD card in accordance with the following instructions.

CONDITIONS—TAKEOFF

FIELD ELEVATION. Enter the field elevation.

GROSS WEIGHT. Enter the gross weight at takeoff.

RUNWAY LENGTH. Enter the length of the runway that is available for takeoff.

HEADWIND COMPONENT. Figure 2A3-2, determine the headwind component.

OAT, CAT, DEW POINT. Obtain the outside air temperature (degrees C) and dew point (degrees F) for takeoff time. Carburetor air temperature will be outside air temperature plus one degree C.

PRESSURE ALTITUDE. Obtain the field pressure altitude for takeoff time.

DENSITY ALTITUDE. Figure 2A1-1, determine the density altitude.

TAKEOFF

MANIFOLD PRESSURE, EXPECTED TPSI, MINIMUM TPSI. Figures 2A2-1 or 2A2-3, determine the manifold pressure to be expected, the expected torque pressure, and the minimum torque pressure. Figures 2A2-2, 2A2-4, or 2A2-5 may be used if dry data is desired.

TAKEOFF FLAP SETTING. Figure 2A3-3, enter at the desired minimum rate of climb and determine the takeoff flap setting. Utilize minimum TPSI (wet) in computations if ADI is available, or use minimum TPSI (dry) if a takeoff without ADI is planned. The approach flap setting may also be determined for landing immediately after takeoff.

TAKEOFF SPEED (1.2). Figure 2A3-7, determine the takeoff speed based on the flap setting to be used. Also determine the single-engine climb speed (clean) and the go-around speed using the 1.2 power-off stall speed line for approach flaps.

CRITICAL FIELD LENGTH. Based on the takeoff flap setting to be used (figures 2A3-8, 2A3-11, 2A3-14, and 2A3-17) determine the critical field length for a dry runway. If necessary, correct the critical field length with RCR correction determined from figure 2A3-20.

REFUSAL SPEED. Based on the takeoff flap setting to be used (figures 2A3-9, 2A3-12, 2A3-15, and 2A3-18) determine the refusal speed for a dry runway. If necessary, correct the refusal speed with the RCR correction determined from figure 2A3-20.

TAKEOFF GROUND RUN. Based on the takeoff flap setting to be used (figures 2A3-10, 2A3-13, 2A3-16, and 2A3-19) determine the takeoff ground roll.

Note

Acceleration time/distance check data is not required when refusal speed is greater than takeoff speed.

ACCELERATION TIME/DISTANCE CHECK. Figure 2A3-6, determine the speed/time data or the distance/speed data for an acceleration check.

SINGLE-ENGINE CLIMB SPEED (1.2 CLEAN). Figure 2A3-7, determine the single-engine climb speed if not previously accomplished.

SINGLE-ENGINE ABSOLUTE CEILING (METO). Figures 2A4-5 or 2A4-6, determine the absolute ceiling with METO power operation.

LANDING IMMEDIATELY AFTER TAKEOFF

Note

The information for this section will be based on takeoff gross weight.

APPROACH FLAPS. Figure 2A3-3, determine the approach flap setting for landing if not previously accomplished. The landing flap setting may be entered in the LANDING FLAPS space at this time.

APPROACH SPEED (1.3). Figure 2A6-1, determine the 1.3 stall speed for the approach flap setting. The 1.3 stall speed for the landing flap setting may also be determined at this time and entered in LANDING APPROACH SPEED (1.3).

GO-AROUND SPEED (1.2 APPROACH). Figure 2A3-7, determine the go-around speed if not previously accomplished.

LANDING FLAPS. Landing flaps are generally based on the amount of approach flaps used. Consult figures 2A6-2 through 2A6-6 for normal flap pairings.

LANDING APPROACH SPEED (1.3). Figure 2A6-1, determine the approach speed for the landing flap setting if not previously accomplished.

LANDING GROUND ROLL/DISTANCE. Based on the landing flap setting to be used (figures 2A6-2 through 2A6-6) determine the landing ground roll. Determine the landing distance (landing over a 50-foot obstacle) by multiplying the landing ground roll by 1.22. If applicable, correct the landing ground roll according to the RCR stopping factor, figure 2A6-7.

CONDITIONS—LANDING AND LANDING

Note

The landing portion of the card may be completed prior to takeoff if weather at destination is available. All items in this section will be completed as previously discussed for like entries.

Sample Flight Problem

To illustrate the use of the charts in this Appendix, a sample flight problem is presented and solved in the following paragraphs.

Note

This example presents a radius navigational training mission. Refer to MISSION PLANNING, Appendix I, for a transport mission sample problem.

Weather, Field and Trip Information

Field elevation pressure altitude	5000 ft
Outside air temperature	10°C
Dew point	35°F
Headwind	10 knots
Runway length	7500 ft
Runway slope	1% up
Takeoff gross weight	43,500 lb
Fuel load	8650 lb

Determine Density Altitude

Using: (Density Altitude Chart, figure 2A1-1)

Enter chart at OAT	10°C
Proceed vertically to pressure altitude line	5000 ft
Proceed horizontally to density altitude scale	
Read density altitude	5600 ft

Determine Ramp Weight

Ramp weight represents a weight greater than maximum takeoff weight. The difference is the fuel that is used for starting, runup, taxiing, and takeoff. Allow 300 pounds of fuel for initial starting, runup, taxiing, and takeoff, and 150 pounds for thru-flight enroute stops. These figures are based on operational experience.

Using:

Initial starting, runup, taxiing, and takeoff fuel	300 lb
Takeoff gross weight	43,500 lb
Ramp weight	43,800 lb

Note

Due to the many and varied operational requirements, these figures may not meet all situations. Therefore, it may be necessary to modify these standard fuel allowances.

TAKEOFF

Determine the Minimum Performance Torque Pressure

Note

If the actual carburetor temperature rise of the airplane is unknown, use OAT; it is sufficiently accurate for preflight planning. A correction should be made when the actual CAT is known.

Using: (Maximum Wet Power Available, figure 2A2-1)

Enter chart with airplane pressure altitude	5000 ft
Proceed vertically to CAT (OAT)	10°C
Read MAP	55.5 in. Hg
Proceed horizontally to base line dew point chart, then parallel guide line to dew point (corrected for altitude)	35°F
Then, proceed horizontally to read:	
Expected TPSI	125 psi
Minimum performance TPSI	119 psi

Also note:

Brake horsepower	2100 bhp
Engine speed	2800 rpm
Blower speed	LOW
Water injection	ON
Mixture position	AUTO RICH

In preflight planning, do not exceed the minimum performance TPSI limit shown. In operation, do not exceed the TPSI limit of 141 psi with wet power or 130 psi with dry power. In the event that minimum performance TPSI is unobtainable before reaching refusal speed, the takeoff should be aborted.

Determine the Takeoff Flap Setting

For the purpose of this sample problem the desired minimum initial rate of climb is considered to be 200 fpm.

Using: (Takeoff Gross Weight Limited by Climb, figure 2A3-3)

Enter lower left-hand portion of chart with density altitude	5600 ft

Proceed horizontally to desired minimum initial rate of climb	200 fpm
Parallel guide lines to base line at sea level density altitude, then proceed vertically to minimum performance torque pressure	119 psi
Parallel guide lines to base line at 141 psi then proceed vertically to takeoff weight	43,500 lb
Read takeoff flap setting	0°

Note

- For practical operation, limit the final selection of takeoff flap setting to either 12°, 6°, or 0°. Intermediate positions should be used only when one of these flap settings will not provide the required initial rate of climb and runway length combination.
- If the takeoff flap setting should come out as less than zero, with the particular takeoff atmospheric conditions available, off-load as necessary to reduce the takeoff weight to that which allows the desired initial rate of climb. Or, if under similar conditions, the takeoff weight cannot be reduced, work backwards from the weight and minimum flap setting to determine the expected initial rate of climb and thereby judge the desirability of taking off.

Determine Takeoff Speed

Using: (Takeoff and Minimum Control Speeds, figure 2A3-7)

Enter chart at gross weight	43,500 lb
Proceed vertically to 0° flap curve, then proceed horizontally to IAS scale and read	125 knots

Determine Critical Field Length

Using: (Critical Field Length, 0° Flap, figure 2A3-17 and Effect of Runway Conditions, figure 2A3-20

Enter figure 2A3-17 with density altitude	5600 ft
Parallel guide lines to minimum performance torque pressure	119 psi
Proceed horizontally to takeoff weight	43,500 lb
Proceed vertically to zero runway slope parallel guide lines to actual runway slope	1% up
Proceed vertically to base line at zero headwind, parallel guide lines to 1/2 reported headwind	5 knots
Proceed vertically to critical field length (for dry, hard surface runway)	7300 ft

Note

This field length is that required to accelerate to the critical engine failure speed, two engines operating, have an engine fail, propeller autofeather and either (a) proceed to takeoff or (b) stop. Since the critical field length (dry, hard surface runway) is less than that available, a safe takeoff is possible. For unusual runway conditions, proceed as follows:

Enter Effects of Runway Surface Condition Chart (figure 2A3-20 with RCR obtained from base weather	12
Proceed horizontally to takeoff weight on critical field length portion of chart	43,500 lb
Proceed vertically to K_{CFL} factor	1.23
Corrected critical field length = K_{CFL} X critical field length from figure 2A3-17	8979 ft

Note

Since critical field length for a wet runway is greater than that available, a takeoff should not be made.

Determine Refusal Speed

Using: (Refusal Speed, 0° Flap, figure 2A3-18 and Effect of Runway Conditions, figure 2A3-20)

Enter chart with available runway length	7500 ft
Proceed horizontally to reported headwind	10 knots
Parallel guide line to base line, then proceed horizontally to torque pressure	119 psi
Parallel guide line to base line, then proceed horizontally to density altitude	5600 ft
Parallel guide line to base line, then proceed horizontally to intersection of vertical line from gross weight	43,500 lb

Refusal speed (IAS) (dry, hard surface runway)	118 knots

Note

If the refusal speed should be greater than the takeoff speed and since refusal speed is limited to takeoff speed, then only takeoff speed would need to be monitored.

To correct refusal speed for unusual runway conditions, enter Effects of Runway Condition chart (figure 2A3-20) with RCR obtained from base weather	12
Proceed horizontally to takeoff weight on refusal speed portion of chart	43,500 lb
Proceed vertically to K_{RS} factor	.938
Corrected refusal speed = K_{RS} X refusal speed from figure 2A3-18	111 knots

Determine Takeoff Ground Run

Using: (Takeoff Ground Run—0° Flap, figure 2A3-19)

Enter chart with density altitude	5600 ft
Parallel guide lines to minimum performance torque pressure	119 psi
Proceed horizontally to takeoff weight	43,500 lb
Proceed vertically to base line at zero runway slope, then parallel guide lines to actual runway slope	1% up
Proceed vertically to base line at zero headwind, then parallel guide lines to reported headwind	10 knots
Proceed vertically to ground run distance	4100 ft

Determine Acceleration Check Speed/Distance/Time

Using: (Velocity During Takeoff Ground Run, figure 2A3-6)

Enter chart with 100% wind takeoff ground run	4100 ft
And takeoff speed corrected for wind (125 - 10)	115 knots
Draw acceleration curve through the point of intersection and parallel to the guide lines	
Re-enter the chart at refusal speed corrected for wind. (If unusual runway conditions exist enter at RCR corrected refusal speed corrected for wind.) (118-10)	108 knots
Proceed vertically to new acceleration check curve and then horizontally to refusal distance	3450 ft
Re-enter chart at the 1000 ft marker that is 500 to 1500 ft before the refusal distance	2000 ft
Proceed horizontally to new acceleration curve and read sea level acceleration time	28 seconds
Proceed vertically to IAS scale and read uncorrected acceleration speed	88 knots
Correct acceleration speed by adding wind (88 + 10)	98 knots
Find acceleration time for 5600 ft density altitude $(28 \div 1/\sqrt{\sigma})$	26 seconds
Find acceleration check time at the even 10 knot speed increment from 5 to 15 knots below refusal speed	
Determine desired check speed (118 - 8) IAS	110 knots
Correct check speed for wind (110 - 10)	100 knots
Enter chart at 100 on IAS scale and read vertically to new acceleration curve and read acceleration time	33 seconds

Summary of Preflight Takeoff Data

Engine speed	2800
MAP	55.5 in. Hg
Minimum performance TPSI	119 psi
Blower speed	LOW
Mixture position	AUTO RICH
Flap setting	0°
Takeoff speed (IAS)	125 knots
Acceleration check distance/speed	2000 ft/98 knots

Acceleration check speed/time	110 knots/33 seconds
Takeoff ground run	4100 ft

CLIMB TO 10,000 FEET

Determine Climb Distance and Fuel

Using: (Operational Climb—Distance and Fuel, 1500 BHP, figure 2A4-2)

Note airspeed (IAS)	140 knots
Enter chart at weight at start of climb	43,500 lb
Proceed vertically to density altitude at start of climb	5600 ft
Read:	
Distance	16 n mi
Fuel	180 lb
Parallel guide lines to density altitude at end of climb	10,000 ft
Read:	
Distance	34 n mi
Fuel	350 lb
Subtract start-of-climb index from end-of-climb index	
Find:	
Distance from 5000 to 10,000 ft	18 n mi
Fuel consumed from 5000 ft to 10,000 ft	170 lb
Subtract from weight at start of climb and determine:	
Weight at end of climb	43,330 lb

Note

The airplane lift and drag depend primarily upon the density of the air, while the engine power depends upon the pressure of the air, until full throttle is reached. The altimeter reads pressure altitude. To determine the climb performance under non-standard conditions, then one must determine the fuel, distance and time to climb using density altitudes and obtain the standard power for that altitude by adjusting the manifold pressures as required.

Determine Power Settings at Start of Climb

Using: (Climb Power Schedule—1500 bhp, figure 2A2-7)

Enter table at pressure altitude	5000 ft
Proceed horizontally and interpolate for CAT (+5°) to find MAP	40.3 in. Hg
Read:	
Blower	LOW
Engine speed	2300 rpm
Torque pressure	103 psi
Also note:	
Mixture	AUTO RICH

Determine Power Settings at End of Climb

Re-enter table at pressure altitude	10,000 ft
Proceed horizontally to CAT (-5°)	
Read:	
MAP (interpolated)	38.8 in. Hg
Blower	LOW
Engine speed	2300 rpm
Torque pressure	103 psi
Also note:	
Mixture	AUTO RICH

CRUISE AT 10,000 FEET

Determine Distance and Fuel Used in 2-Hour Cruise

Using: (Long Range Prediction—Time, figure 2A5-8)

Enter chart at weight at start of cruise	43,330 lb
Proceed vertically to cruise density altitude	10,000 ft
Read time at start of cruise	10.7 hr
Add required cruise time 2 hours, find time at end of cruise	12.7 hr

Proceed along density altitude line to time at end of cruise 12.7 hours, and read weight at end of cruise	41,600 lb
Subtract weight at end of cruise from weight at start of cruise to find approximate fuel used in 2 hour cruise	1730 lb

Using: (Long Range Prediction—Distance, figure 2A5-7)

Enter chart at weight at end of cruise	41,600 lb
Proceed vertically to density altitude line	10,000 ft
Read distance at end of cruise	2400 n mi
Proceed along density altitude line to weight at start of cruise	43,330 lb
Read distance at start of cruise	2025 n mi
Subtract from distance at end of cruise to determine distance traveled in 2-hour cruise	375 n mi

Determine Airspeed and Power Settings for Cruise

Using: (Nautical Miles per Pound of Fuel—10,000 feet, figure 2A5-3)

Enter at weight at start of cruise	43,330 lb
Follow weight line to intersection of long range line and read bhp at start of cruise	1050 bhp
Proceed vertically to calibrated airspeed	161 knots
Re-enter at weight at end of cruise	41,600 lb
Follow weight line to intersection of long range line and read bhp at end of cruise	1020 bhp
Proceed vertically to calibrated airspeed	160 knots

Using: (Power Schedule—1050 bhp, figure 2A2-17)

Enter table with pressure altitude	10,000 ft
Proceed horizontally to CAT	-5°C
Read:	
MAP (interpolated)	32.2 in. Hg
Blower	LOW
Engine speed	1950 rpm
Torque pressure	86 psi

Using: (Power Schedule—1000 bhp, figure 2A2-16)

Enter table with pressure altitude	10,000 ft
Proceed horizontally to CAT	-5°C
Read MAP	31.6 in. Hg
Blower	LOW
Engine speed	1900 rpm

Determine MAP for 1020 bhp, 1900 rpm at end of cruise by using the following ratio:

$$\frac{31.6 \text{ in. Hg}}{1000 \text{ bhp}} = \frac{\text{MAP}}{1020 \text{ bhp}}$$

$$\text{MAP} = \frac{31.6 \times 1020}{1000} = \quad 32.2 \text{ in. Hg}$$

Determine torque pressure for 1020 bhp by using the formula:

$$\text{BHP} = \text{TPSI} \times .00632 \times \text{RPM}$$

$$\text{Torque pressure} = \frac{1020}{.00632 \times 1900} = 85 \text{ psi}$$

Also note:

Mixture	MANUAL LEAN

Note

For 1000 bhp, the engine speed given by figure 2A2-16 is 1900 rpm. As greater economy results from lower engine speeds, a reduction in rpm during the cruise is recommended.

CLIMB TO 20,000 FEET

Determine Climb Distance and Fuel (From 10,000 ft. to 20,000 ft.)

Using: (Operational Climb Distance and Fuel—1500 bhp, figure 2A4-2)

Note airspeed (IAS)	140 knots
Enter chart at weight at start of climb	41,600 lb
Proceed vertically to altitude at start of climb	10,000 ft
Read:	
Distance	30 n mi
Fuel	300 lb

Parallel guide lines to altitude at end of climb	20, 000 ft
Read:	
Distance	92 n mi
Fuel	990 lb
Subtract start-of-climb index from end-of-climb index	
Find:	
Distance from 10, 000 ft to 20, 000 ft	60 n mi
Fuel consumed from 10, 000 ft to 20, 000 ft	690 lb
Subtract from weight at start of climb to determine:	
Weight at end of climb	40, 910 lb

Determine Power Settings for Climb

Note

Power setting at start of climb will be the same as the power setting at end of first segment climb to 10, 000 feet.

Using: (Climb Power Schedule—1500 bhp, figure 2A2-7)

Enter table at pressure altitude	20, 000 ft
Proceed horizontally to CAT	-25 °C
Read:	
MAP (interpolated)	40. 5 in. Hg
Blower	HIGH
Engine speed	2500 rpm
Torque pressure	95 psi

Also note:

Mixture	AUTO RICH

Using normal climb procedure adjust MAP until low blower critical altitude is reached, then shift to high blower and continue climb procedure.

CRUISE AT 20,000 FEET

Determine Distance, Fuel Used and Airspeed for 1-Hour Cruise

Using: (Nautical Miles per Pound of Fuel—20, 000 feet, figure 2A5-5)

Note

This portion of the mission is flown at maximum cruise power. Since it is desired to cruise for one hour, a sufficiently accurate estimate may be made of the fuel flow by reading nautical miles per pound value and a true airspeed value at an assumed average weight and dividing the true airspeed by the nautical miles per pound (n mi/hr÷n mi/lb = lb/hr).

Weight at start of cruise	40, 910 lb
Assuming a fuel flow of 1070 lb/hr, then average weight for cruise (40, 910 - 535)	40, 375 lb
At average cruise weight and at maximum cruise rpm of 2300 (1150 bhp) read Nautical Miles per Pound of Fuel	.216 n mi/lb
Calibrated airspeed	163 knots
True airspeed	222 knots
Then fuel used (222 ÷ .216 X 1 hr)	1025 lb

Note

The fuel used figure of 1025 pounds is close enough to the assumed value of 1070 pounds. If it were substantially different another estimate should be made.

Weight at end of 1-hour cruise (40, 910 - 1070)	39, 840 lb
Distance in 1-hour cruise (222 knots X 1 hr)	222 n mi

Determine Power Setting for Cruise

Using: (Power Schedule—1150 bhp/eng, figure 2A2-19)

Enter table at pressure altitude	20, 000 ft
Proceed horizontally to CAT	-25 °C
Read:	
MAP (interpolated)	33. 5 in. Hg
Blower	HIGH
Engine speed	2300 rpm
Torque pressure	80 psi

Also note:

Mixture	MANUAL LEAN

RETURN TO BASE

The return to home base is accomplished at airspeeds for long range at 20,000 feet altitude.

Determine Distance and Fuel Used in 3-Hour Cruise

Using: (Long Range Prediction—Time, figure 2A5-8)

Enter chart at weight at start of cruise	39,840 lb
Proceed vertically to cruise density altitude	20,000 ft
Read time at start of cruise	2 hr
Add required cruise time (3 hours), find time at end of cruise	5 hr
Proceed along density altitude line to time at end of cruise and read weight at end of cruise	37,100 lb
Subtract weight at end of cruise from weight at start of cruise to find approximate fuel used in 3-hour cruise	2740 lb

Using: (Long Range Prediction—Distance, figure 2A5-7)

Enter chart at weight at end of cruise	37,100 lb
Proceed vertically to density altitude line	20,000 ft
Read distance at end of cruise	1100 n mi
Proceed along density altitude line to weight at start of cruise	39,840 lb
Read distance at start of cruise	450 n mi
Subtract from distance at end of cruise to determine distance traveled in 3 hours	650 n mi

Determine Airspeed and Power Settings for Cruise

Using: (Nautical Miles per Pound of Fuel—20,000 feet, figure 2A5-5)

Enter at weight at start of cruise	39,840 lb
Follow weight line to intersection of long range line and read bhp at start of cruise	1075 bhp
Proceed vertically to calibrated airspeed	155 knots
Re-enter at weight at end of cruise	37,100 lb
Follow weight line to intersection of long range line and read bhp at end of cruise	1000 bhp
Proceed vertically to calibrated airspeed	153 knots

Using: (Power Schedule—1100 bhp, figure 2A2-18)

Enter table with pressure altitude	20,000 ft
Proceed horizontally to CAT	-25°C
Read:	
MAP (interpolated)	32 in. Hg
Blower	HIGH
Engine speed	2200 rpm

Determine MAP for 1075 bhp at start of cruise by calculation as before:

$$MAP = \frac{32 \times 1075}{1100} = \quad 31.2 \text{ in. Hg}$$

Determine torque pressure as before:

$$\text{Torque pressure} = \frac{1075}{.00632 \times 2200} = 77 \text{ psi}$$

Using: (Power Schedule—1000 bhp, figure 2A2-16)

Enter table with pressure altitude	20,000 ft
Proceed horizontally to CAT	-25°C
Read:	
MAP (interpolated)	29.8 in. Hg
Blower	HIGH
Engine speed	2100 rpm
Torque pressure	76 psi

Also note:

Mixture	MANUAL LEAN

RESERVE FUEL CONSIDERATIONS

The reserve fuel allowance should include fuel for holding at destination and the possibility of being diverted to an alternate base and some additional fuel for other contingencies. For the purpose of this example the reserve fuel allowance has been chosen to be that required for 30 minutes holding at airspeeds for long range at sea level and 5% of initial fuel load for contingencies.

Determine Reserve Fuel Allowance

Subtract total fuel load from the takeoff weight (43,500 - 8650) — 34,850 lb

Calculate 5% of initial fuel load (8650 X .05) — 430 lb

Add zero fuel weight (34,850 + 430) — 35,280 lb

Using: (Nautical Miles per Pound of Fuel—Sea Level, figure 2A5-1)

Enter chart with weight of — 35,280 lb

Follow weight line to intersection of long range line, then proceed horizontally to nautical miles per pound of fuel scale and read — 0.231 n mi/lb

Proceed vertically to true airspeed — 162 knots

Divide airspeed by n mi/lb (162 ÷ 0.231) — 704 lb/hr

Allowance for 30 minutes holding (704 X 0.5) — 352 lb

Note

This method is slightly conservative but sufficiently accurate for estimating purposes. A more accurate procedure would require using values based on an average weight as was done previously in cruise at long range.

The total of all fuel used thus far after takeoff, plus the reserve allowance is 7182 pounds. Thus, the total fuel load of 8650 pounds is ample for the mission with an added 1468 pounds for unaccounted emergencies, deviations from course, and other variations from flight plan.

LANDING

Landing Conditions

Field elevation pressure altitude — 3000 ft

Outside air temperature — 25 °C

Dew point — 55 °F

Headwind — 15 knots

Runway length — 7500 ft

Landing weight (takeoff weight less fuel for mission, except total reserve)(43,500 - 6400) — 37,100 lb

Determine Power Settings for Emergency Go-Around (if Necessary)

Using: (Maximum Wet Power Available, figure 2A2-1)

Enter chart with pressure altitude — 3000 ft

Proceed vertically to CAT — 25 °C

Read MAP — Approx. 59 in. Hg

Proceed horizontally to dew point chart base line then parallel guide line to reported dew point corrected for altitude — 55 °C

Then horizontally to minimum performance TPSI — 120 psi

Also note:

Engine speed — 2800 rpm

Blower speed — LOW

Mixture position — AUTO RICH

Determine Density Altitude at Destination

Using: (Density Altitude Chart, figure 2A1-1)

Density altitude — 4800 ft

Determine the Approach and Landing Flap Positions

Note

Each approach flap setting has a corresponding landing flap setting. The approach flap setting is felt to be the more important of the two based on the possibility of a single-engine go-around.

Using: (Takeoff Gross Weight Limited by Climb, figure 2A3-3)

Use same procedure as that outlined in determining maximum allowable takeoff flap setting with 300 fpm desired rate of climb. Final selection of approach flap setting — 6°

Determine Approach and Go-Around Speeds

Using: (Approach and Landing Speed Chart, figure 2A6-1)

Enter chart with gross weight — 37,100 lb

Proceed vertically to approach flap line — 6°

Proceed horizontally to approach speed line (1.3 stall) then vertically to read approach speed (IAS) — 118 knots

Repeat procedure for 20° flap to find landing approach speed (IAS) — 110 knots

and landing speed (1.1 stall) — 95 knots

Using: (Takeoff and Minimum Control Speeds, figure 2A3-7)

Enter chart with gross weight — 37,100 lb

Proceed vertically to 1.2 stall speed line for 6° approach flap setting and then horizontally to read climb speed for go-around — 111 knots

Determine Landing Ground Roll

Using: (Landing Ground Roll—20° flap, figure 2A6-4 and Stopping Capability, figure 2A6-7)

Enter chart with density altitude — 4800 ft

Proceed horizontally to gross weight curve — 37,100 lb

Proceed vertically to base line at 0 headwind and parallel guide lines to 1/2 of reported headwind — 7.5 knots

Proceed vertically to landing ground roll (dry, hard surface runway) — 3800 ft

Landing distance from 50 ft altitude (3800 X 1.22) — 4636 ft

To correct landing ground roll for unusual runway conditions, enter the Stopping Capability Chart (figure 2A6-7) with RCR (obtained from base weather) — 12

Proceed vertically to curve then horizontally to the left to obtain stopping factor — 1.38

Corrected landing ground roll = stopping factor X landing ground roll from figure 2A6-4 — 5245 ft

Summary of Approach and Landing Data

Engine speed	2800 rpm
Minimum performance TPSI	120 psi
MAP	Approx. 59 in. Hg
Blower speed	LOW
Mixture position	AUTO RICH
Approach flap setting	6°
Approach speed (IAS)	118 knots
Landing flap setting	20°
Approach speed (IAS)	110 knots
Go-around speed with approach flaps (IAS)	111 knots

ALPHABETICAL INDEX

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