9

Approved for Release: 2017/07/25 C06535944

ALL WEATHER OPERATION

TABLE OF CONTENTS

INTRODUCTION

Except for repetition necessary for emphasis or continuity of thought, this section contains only those procedures which differ from or are in addition to the normal procedures supplied in Section II.

INSTRUMENT FLIGHT PROCEDURES

These aircraft handle well during all phases of instrument flight when operated in accordance with procedures specified in the following paragraphs. As with all high performance jet aircraft, constant attention to flight instruments is required. Normal jet instrument techniques are satisfactory for operation during instrument conditions. Navigational aids include an Inertial Navigation System, TACAN, ILS and ADF. IFF is also installed, as are the directional and ranging features of the ARC/50 radio.

The ships pitot static system is the primary speed and altitude reference during takeoff, penetration, approach and landing. Speeds given here are knots indicated airspeed (KIAS). Equivalent airspeeds (KEAS) and altitude information from the air data computer system (TDI instrument) can be used; however, TDI response may not be as rapid as the ship system indications during transient airspeed situations.

The stall warning indication is referenced to pitot total pressure and to the attitude probe in the Rosemount pitot-static boom. It is independent of pitot-static pressures sensed by the ship and air data computer systems to that extent. Pitot heat should be sufficient to keep both the pitot head and the attitude probe operating during icing conditions.

NOTE

Keep pitot heat on during all subsonic instrument flight operations.

BEFORE INSTRUMENT TAKEOFF

After aligning the aircraft with the centerline of the runway, check synchronization of the FRS compass, check the INS mode selector in FRS position, and set the attitude indicator so that the miniature airplane is level with the horizon line. The BDHI No. 1 needle selector switch is placed in the TACAN position to display TACAN bearing information on the No. 1 needle of the BDHI.

NOTE

The FRS compass will be used for heading reference during all takeoffs and instrument departures.

INSTRUMENT TAKEOFF

Maximum thrust will be used for instrument takeoffs, using procedures identical to those contained in Section II. The following procedures supplement those given in Section II:

a. Rotation - Begin at computed rotation speed. Apply smooth, constant back pressure to establish an indication of + 10 to + 12 degrees on the attitude indicator in about five seconds. The aircraft will fly off the runway at normal airspeeds.

b. Maintain 10 to 12 degree pitch attitude indication while accelerating to desired climb speed. The altimeter and vertical velocity indicator should show a definite climb indication before retracting the landing gear. Care must be exercised to insure that a positive rate of climb is maintained during acceleration to climb speed in order to prevent the aircraft from settling back to the runway surface.

NOTE

Initial indications of the altimeter and vertical speed indicator may be that of a slight descent.

c. Landing gear lever - UP when definitely airborne.

d. Throttles - Minimum afterburning after gear up is indicated. Military thrust may be set as 300 KIAS is approached when a Military power climb is used for instrument departure.

NOTE

Use Indicated Airspeed during takeoff and climb until proper climb speed schedule is reached on the TDI.

INSTRUMENT CLIMB

Instrument climbs using the normal airspeed and afterburner schedules can be made safely. It may be desirable to maintain maximum afterburning after takeoff at heavy weights, but allowances must be made for the more rapid acceleration and steeper than normal climb attitude. It is highly recommended that the normal afterburning schedule be used after takeoff. This minimizes the possibility of exceeding the desired climb speed schedule. It also provides more time for EGT control if this is required. Maximum thrust may be resumed if desired after stabilizing at the proper climb speed.

NOTE

- Reduce climb speed if rough air is encountered as described in Operation in Turbulence, this section.
- The TDI and ship system pitot-static flight instruments should be cross checked periodically during instrument flight to confirm proper operation.

Restrict all turning maneuvers to 30° maximum bank angle during low altitude instrument flight.

MILITARY THRUST CLIMBS

The optimum VFR Military thrust schedule is suitable for instrument climbs to intermediate altitudes. As soon as the climb schedule is intercepted, the TDI becomes the primary pitch control instrument for the remainder of the climb.

INSTRUMENT CRUISING FLIGHT

Establish cruising airspeed at the desired altitude and retrim the aircraft. After Instrument Departure Instructions have been accomplished, the BDHI may be switched to display INS navigation information as required for mission completion. Readjust the horizon bar on the attitude indicator to indicate level flight attitude when the aircraft is in level flight at cruising airspeed. These aircraft have excellent handling characteristics throughout their normal flight speed range if properly trimmed and flown by reference to the flight instruments.

NOTE

Below Flight Level 180, the altimeter must be set to station pressure and used to maintain assigned altitude.

TURNS

A constant 30° angle of bank may be used for all turns except rate turns when required or desired.

STEEP TURNS

Any angle of bank exceeding 30° is considered a steep turn. The aircraft is easily controlled on instruments in banks up to 60°; however, due to structural load restrictions, bank angles in excess of 45° should be avoided.

HOLDING

Holding patterns and descents between holding levels should be flown at 275 <u>KIAS</u> at altitudes from 35,000 ft to 20,000 feet. (KEAS ranges between 260 and 270 knots at these altitudes.) Approximately 6200 rpm will be required. At normal weights, average fuel flow while turning varies from approximately 5500 pph per engine at the higher altitudes to approximately 6500 pph

JET PENETRATION AND TACAN APPROACH (Typical)

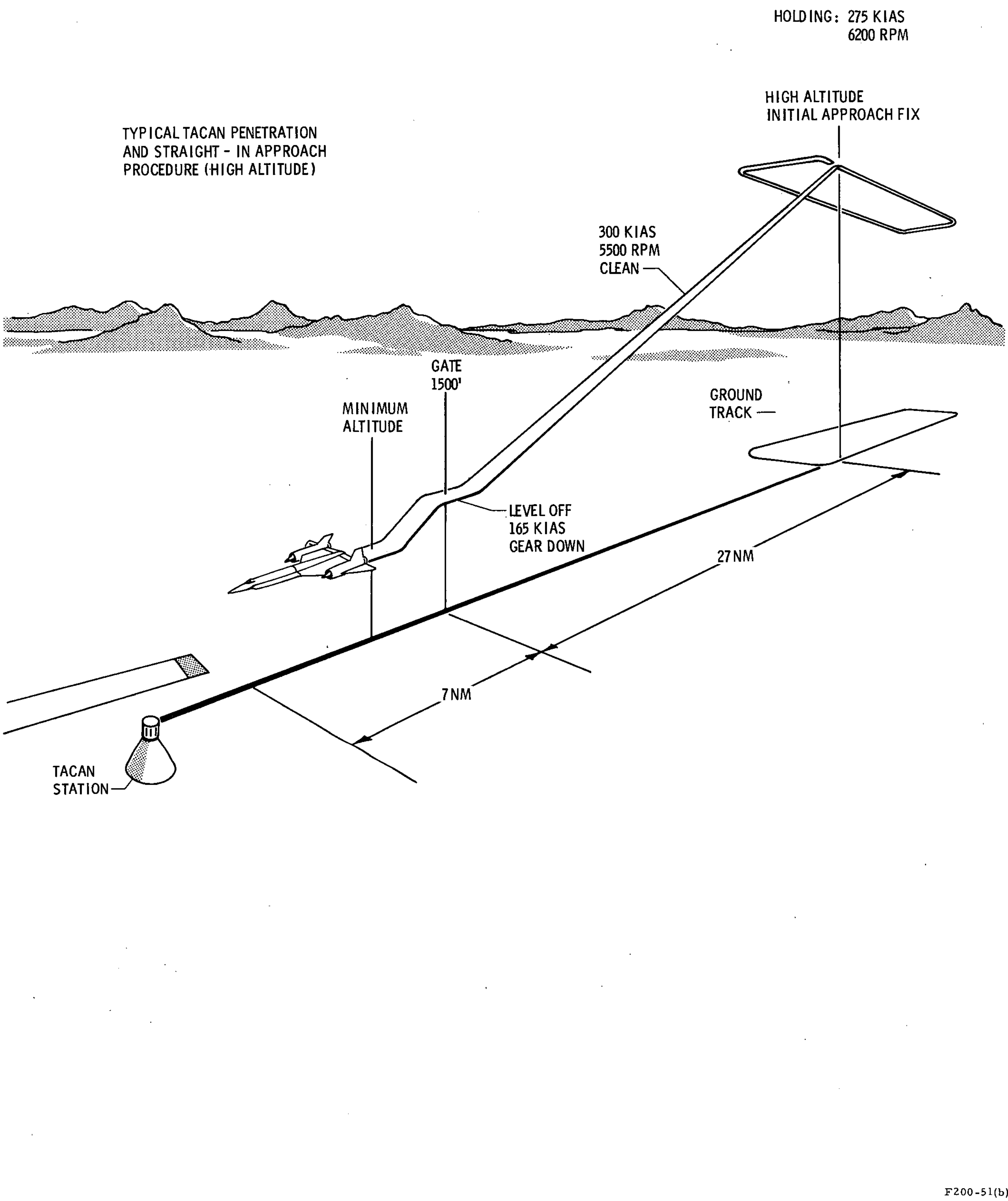


Figure 9-1

at 20,000 feet. The rate decreases about 500 pph per engine during straight legs. Somewhat lower airspeeds can be used, if desired, if there is little or no turbulence. To descend between holding levels, reduce power until 500 to 1000 feet above the desired altitude. Refer to Appendix for loiter performance.

NOTE

- The INS mode selector must be placed in the FRS position prior to initial station passage and entry into the holding pattern.
- Check the FRS compass for synchronization and that the BDHI No. 1 needle selector switch is in the desired TACAN or ADF position.
- When the BDHI No. 1 needle selector switch is placed in the TACAN or ADF position and the INS mode selector switch is placed in the FRS position, the No. 1 needle of the BDHI will display magnetic bearing to the selected ADF or TACAN station provided the AN/ARC-50 function switch is not in the ADF position. For the same conditions except with INS mode selected, true heading will be displayed.

JET PENETRATION

The ships pitot-static instruments are the primary flight instruments during a penetration procedure descent. These penetrations are flown at 300 KIAS with power set at 5500 rpm. Initial rate of descent will be 3000 to 4000 fpm. Approximately 4000 pph per engine fuel flow can be expected for normal weights when starting from 20,000 feet. The initial rpm should be maintained and fuel flow allowed to increase as altitude is lost.

NOTE

Engine speeds below 5000 rpm should be avoided to prevent cycling of the engine start bleed valves. TACAN will be inoperative if left engine rpm is below approximately 4500.

The landing gear may be used for additional drag during the penetration if desired, but should be extended no earlier than middle station passage and no later than the turn to final approach when making a procedure turn to final approach heading. In a normal teardrop penetration or straight in approach the landing gear should be extended prior to the final approach gate. At normal approach gross weights, maintain 230 to 250 KIAS after level off through the turn to final approach. Total fuel flow increases to approximately 13,000 lb/hr with the gear down. Final approach speeds are identical to those for normal traffic patterns and landings and will be adjusted for existing gross weight. For a single engine approach the gear should not be extended until final approach is initiated. Minimum approach speed is 200 KIAS for a single engine approach.

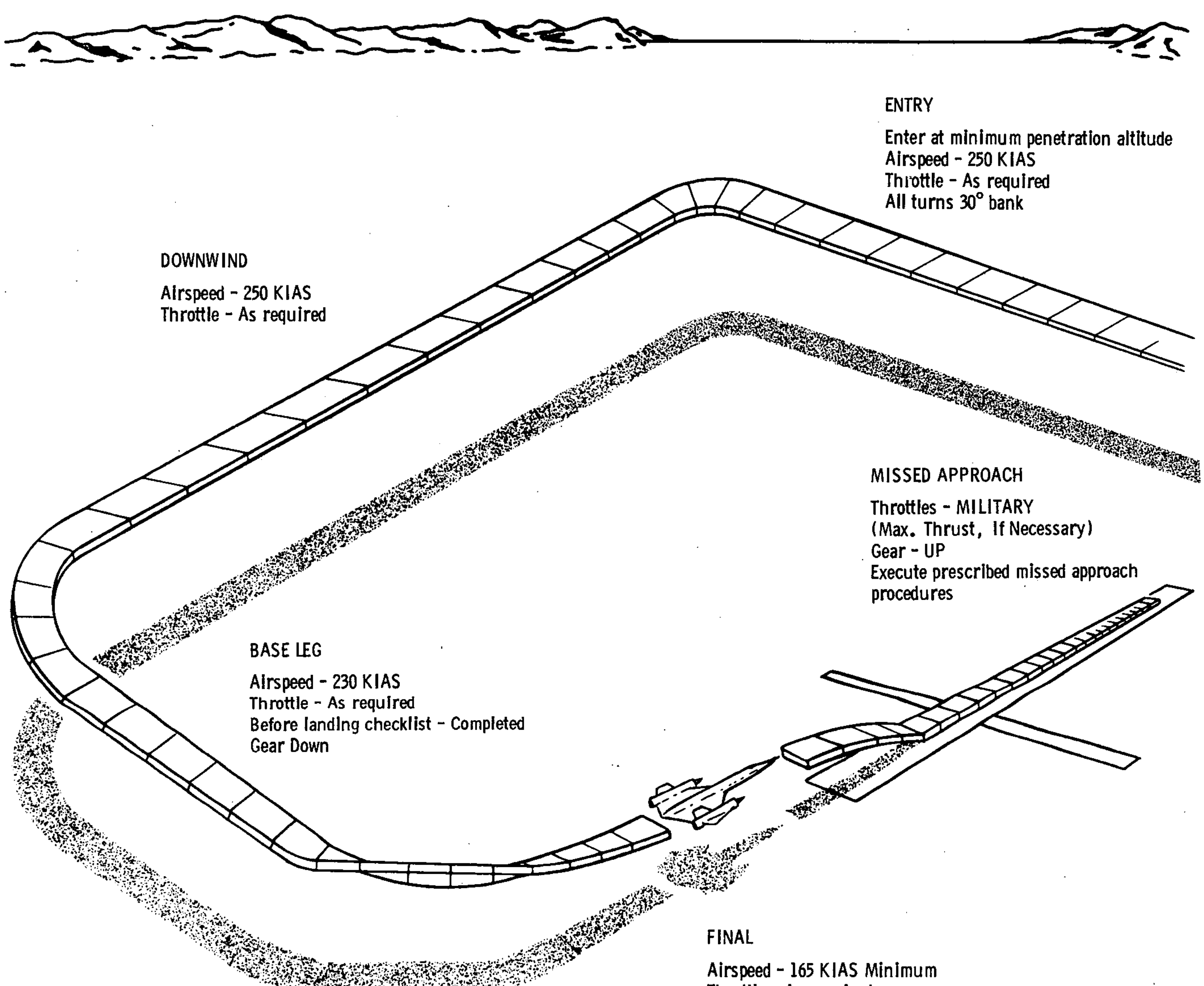
NOTE

Fuel required for a typical teardrop penetration is from 1000 to 1700 pounds.

INSTRUMENT APPROACHES

These aircraft are equipped to make either TACAN, ILS or ADF approaches. Precision Approach Radar (PAR) approaches may also be made. When flown as recommended, aircraft control response is good at all times. The downwind or outbound portions of all approaches are flown at 250 KIAS with the landing gear down. The base

RADAR APPROACH PAR/ASR



NOTE
Increase final approach speed 1 knot for each 1000 lbs. over 5000 lbs. of fuel remaining

9-7-65
F200-53(b)

Figure 9-2

leg or procedure turn portions are flown 230 KIAS. The minimum final approach speed is 165 KIAS and should be increased by one knot for each 1000 pounds of fuel remaining over 5000 pounds under normal operating conditions. With one engine inoperative, hold gear extension until the final turn is completed and maintain a minimum final approach speed of 200 KIAS.

NOTE

- When the left engine has failed, the landing gear must be extended using the Emergency Landing Gear Extension procedure. The pilot should be aware of the time required and of the other aircraft systems which are affected by loss of the left engine.
- Altimeter position error corrections are small at instrument approach speeds and may be neglected.
- Use the rain remover and windshield defog and deice systems as needed.

MISSED APPROACH AND GO-AROUND

Apply Military thrust as soon as it is determined that a go-around is necessary. Use afterburning or Maximum thrust if necessary. Raise the landing gear only after a climb has been established, and climb to the missed approach altitude at 250 KIAS. When positive rate of climb has been established adjust power as necessary to maintain 250 KIAS and approximately 1000 to 2000 foot per minute climb. In the event a single engine missed approach is necessary, follow the single engine go-around procedures in Section III and observe the single engine minimum control speed.

NOTE

Fuel required for a missed approach and GCA is approximately 3000 pounds. A VFR closed pattern go-around requires approximately 1000 pounds.

ICE AND RAIN

Detailed information on flight through icing conditions is not conclusive at this time. Flight to and from terminal areas where heavy icing conditions and/or heavy rain are present is undesirable. Extended flight in any known icing conditions is prohibited. If icing conditions or heavy rain at near freezing conditions is encountered in flight, the engines must be examined for damage during post flight inspection.

WINDSHIELD ICING

Without hot air deicing, forward visibility through the windshield is unsatisfactory under all icing conditions at penetration and approach speeds. Ice buildup occurs very rapidly and dissipates very slowly, particularly with heavy build-up, even after descent to lower, warmer altitudes. Ice will build up on the spikes at penetration and approach speeds and enter the engine as it breaks off upon descent to warmer altitudes. Engine damage due to ice ingestion is not normally severe enough to cause engine shutdown and can be minimized by reducing

STRUCTURAL CAPABILITY IN GUSTS

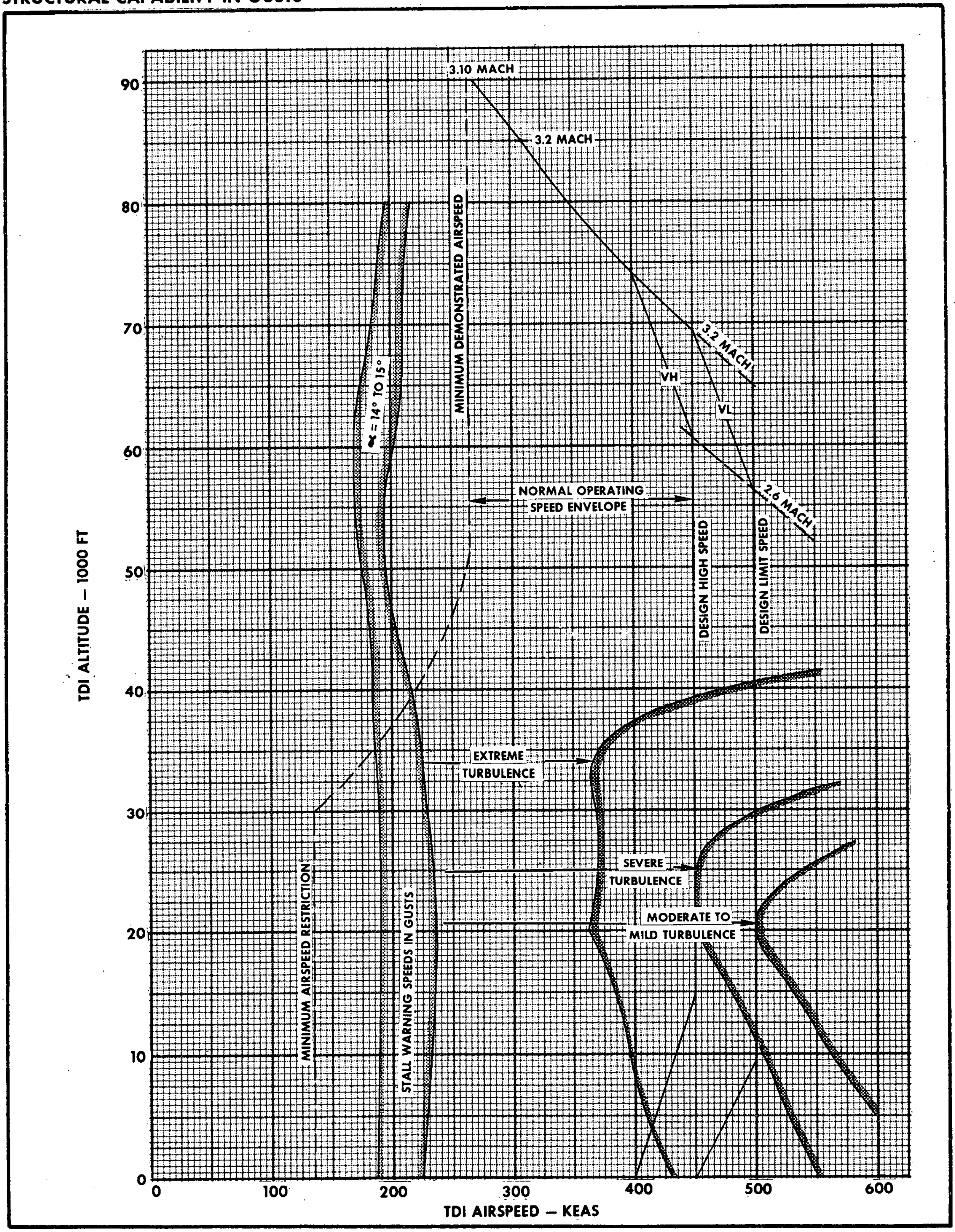


Figure 9-3

rpm. Hot air flow on the windshield is satisfactory for de-icing and inhibiting ice build-up if used prior to the time that icing conditions are encountered. If windshield icing is anticipated or encountered:

1. Windshield deicer switch - R, or L & R, as required.

FLIGHT IN RAIN

In rain, forward visibility is obscured by a water film which extends over almost all of the windshield area. Use of the rain remover liquid during light and moderate rain conditions improves visibility to a usable condition at approach speeds. Visibility is momentarily obscured as the liquid is applied, then the windshield clears and beads of water form which stream across the glass. Rain remover application is needed at ten to fifteen second intervals for best effectiveness. The hot air deicer should not be used in light to moderate rain, as the hot air by itself does not clear the windshield, and the rain remover liquid is apparently blown away before it can become effective. The rain remover system is not effective with very heavy rain conditions, and, although hot air deicing provides very slight improvement, visibility remains obscured.

NOTE

Reduce speed below 250 KIAS before applying rain remover fluid.

CAUTION

Do not apply rain repellent on a dry windshield. Prolonged obscuration may result.

1. Rain removal button - PUSH.

NOTE

Momentary cloudiness will occur.

2. Repeat as required when visibility deteriorates.

HIGH HUMIDITY CONDITIONS

If fog emanates from cockpit overhead distribution ducts:

1. Q-Bay temp control - INCREASE as required.

If condensation forms on inner or outer glass:

2. Windshield defog switch - INCREASE as required.
3. Windshield deicer switch - ON R, or L & R, as required.

TURBULENCE AND THUNDERSTORMS

Flight should not be scheduled through areas where extreme or severe turbulence is forecast. In the event that such conditions are encountered however, airspeed should be maintained between 250 and 350 KEAS as a general rule. Refer to the Structural Capability In Gusts chart, figure 9-3.

OPERATION IN TURBULENCE

Gust conditions are defined in terms of "extreme", "severe", and "moderate to mild" conditions. (Refer USAF AWSM 55-8, 15 June 1965). Aircraft structural capabilities in turbulence air do not penalize normal operating procedures except when below 40,000 feet. In the event of extreme turbulence below 40,000 feet, airspeed should be maintained between 250 and 350 KEAS. Figure 9-3 shows that the aircraft can be operated safely in severe turbulence at the design speed unless in the altitude range between 20,000 and 25,000 feet. A speed reduction to 400 KEAS should be accomplished by reducing power if severe turbulence is encountered while operating at high speed in this area. (The normal Mach 0.9 climb speed in this area is below 400 KEAS.) Normal descent speed, 300 KEAS, approaches the optimum path for rough air penetration.

Transonic Acceleration in Turbulence

The probability of encountering unforecasted severe or extreme turbulence in clear air is relatively small. However, if there is a reasonable possibility that this may occur during the transonic acceleration phase, modify the normal climb procedure. After reaching supersonic conditions, climb at 375 to 400 KEAS instead of 450 KEAS while below 30,000 feet. Increase the climb speed above this altitude so as to reach normal climb speed between 35,000 and 40,000 feet. Be prepared to reduce airspeed to 375 KEAS if severe turbulence is encountered below 40,000 feet.

Jet Penetration and Landing Approach

Normal penetration and approach speeds are compatible with rough air penetration schedules. However, the normal turn to final approach speed may be increased from 230 KIAS to 250 KIAS in order to avoid the possibility of maneuvering difficulty during this phase. Standard rough air penetration techniques apply to this aircraft.

COLD AND HOT WEATHER PROCEDURES

Detailed cold or hot weather procedures are not available. The pilot should always be aware of the effects of non-standard temperatures on takeoff and landing distances and minimum single engine control speeds. The pilot should also be aware of the effects of wet, icy, and slush covered runways on takeoff and landing distances and on ground handling characteristics. Refer to Section V for cold weather Oil Temperature operating limits.

NIGHT FLYING

Detailed specific night flying procedures are not required; however, the normal precaution of memorizing the positions of switches located in dim or unlighted locations should be accomplished. Lower fire warning light covers to reduce glare in event of illumination.

A-12

APPENDIX

PERFORMANCE DATA

TABLE OF CONTENTS

PART I

INTRODUCTION

List of Illustrations

DATA BASIS

Engines

The performance charts are based on test data with YJ and/or YJ-1 engines.

Fuel and Fuel Density

These data are applicable to aircraft fueled with PWA 523E with PS 67A additive. Deviations from the nominal fuel density of 6.45 pounds per gallon have negligible effect on performance as long as actual aircraft gross weight and fuel load are known. However, with all tanks filled to capacity, the maximum fuel load changes 1060 pounds for each 0.1 pound per gallon change in fuel density. This effect on operational capabilities must be considered.

AIRSPEED SYSTEMS

Airspeed, altitude, and Mach number are available from the ship system instruments and from the triple display indicator (TDI). The ship normal and alternate systems supply conventional altimeter and airspeed Mach number indicators. The TDI provides digital values for equivalent airspeed (KEAS), corrected pressure altitude, and true Mach number. The differences between indicated airspeed (KIAS) and KEAS are a function of speed, altitude, and ship system position error. A comparison of KEAS from the triple display indicator and KIAS from the ship's normal system instruments is shown by Figure A1-3. For example: at 400 KEAS, the normal ship system will indicate 420 KIAS at 20,000 feet indicated pressure altitude and 475 KIAS at 50,000 feet indicated altitude. Other combinations of indicated altitude and KIAS can be determined from Figure A1-3 for use in the event of TDI failure.

POSITION ERROR CORRECTIONS

Triple Display Indicator

The Triple Display Indicator of the Air Data computer system is the primary instrument for climb and for all operations above FL 180. Its digital indications are almost completely compensated for position error and compressibility effects; however, the TDI airspeed lags during takeoff. IAS from the normal ship system should be used until climb speed is attained. The ship system should also be used for pattern operation and landing, although the TDI follows these speed and altitude changes without excessive lag.

Normal Ship System

Figures A1-1 and A1-2 show position error corrections for the altimeter and airspeed-Mach number indicators when the normal (Rosemount pitot static) system is selected. Corrections for operation at subsonic speeds were obtained by calibrations in flight and during ground runs. Corrections provided for supersonic speeds were obtained from wind tunnel results. Standard corrections for compressibility effects must be applied (subtracted) after the position error corrections are made in order to obtain equivalent airspeeds. The compressibility correction is supplied on Figure A1-5. The position error and compressiblity corrections have been combined on Figure A1-3 in order to allow a direct comparison between KIAS and KEAS instruments.

Alternate Ship System

The alternate system senses pitot static pressure by means of a flush static port and total head tube located under the right hand chine. When the alternate system is selected, these pressures operate the ship system altimeter and airspeed-Mach number indicator. The position error corrections are provided by Figure A1-4.

COMPRESSIBILITY CORRECTIONS

Standard corrections for compressibility effects on KIAS are provided by Figure A1-5. These correction should be subtracted from KIAS after the airspeed position error corrections are made in order to obtain KEAS.

TRUE MACH NUMBER VS EQUIVALENT AIRSPEED

Figure A1-6 shows the relationship between true Mach number, pressure altitude, and equivalent airspeed, based on a γ of 1.4, the standard atmospheric parameter.

MACH-AIRSPEED-TEMPERATURE CHART

Ambient air temperature and true airspeed can be obtained from the TDI Mach and CIT gage as shown on the Mach-Airspeed-Temperature Chart, figure A1-7. For example, at a TDI Mach of 3.05 and CIT of 300°C, the ambient air temperature is 72°C and the true airspeed is 1680 knots (28 nmi/minute). The affect of adiabatic compression and temperature rise on atmospheric characteristics has been included by using a variable γ parameter.

STANDARD ATMOSPHERE TABLE

The 1956 ARDC standard atmospheric table, Figure A1-8, provides reference temperature, pressure, air density, and sonic speed information which may be of assistance in over-all flight planning.

STANDARD UNITS CONVERSION

The standard units conversion chart, Figure A1-9, provides a means for direct conversion of temperature, distance, and speed between English and metric units.

POSITION ERROR CORRECTIONS VS MACH NO. — NORMAL (SHIP) SYSTEM

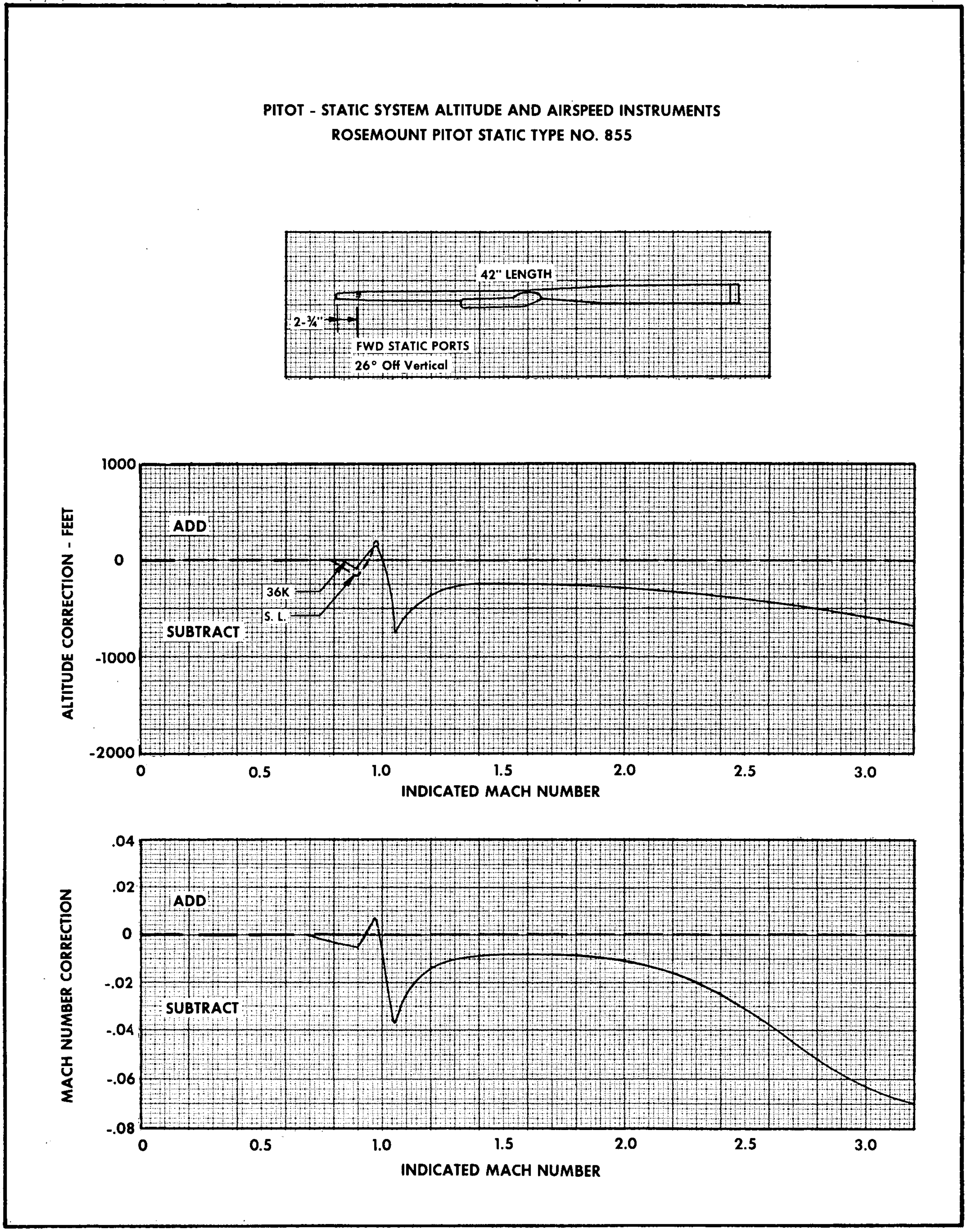


Figure A1-1

POSITION ERROR CORRECTIONS VS IAS — NORMAL (SHIP) SYSTEM

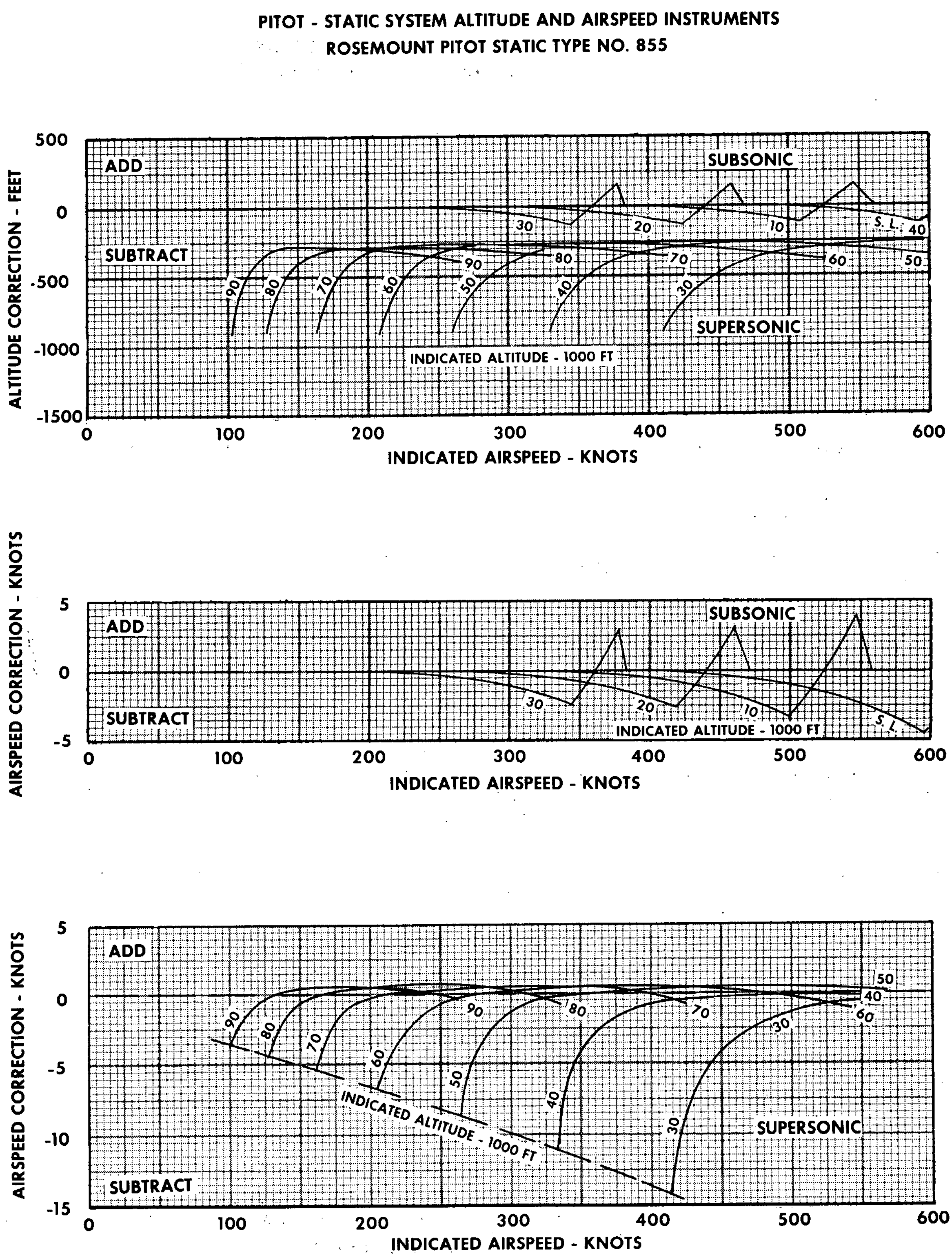


Figure A1-2

APPROXIMATE DIFFERENCES BETWEEN IAS AND EAS INDICATIONS

NOTE: EAS, PRESSURE ALTITUDE, AND MACH NUMBER FROM TRIPLE DISPLAY INDICATOR ARE COMPENSATED FOR STATIC ERROR AND COMPRESSIBILITY EFFECTS

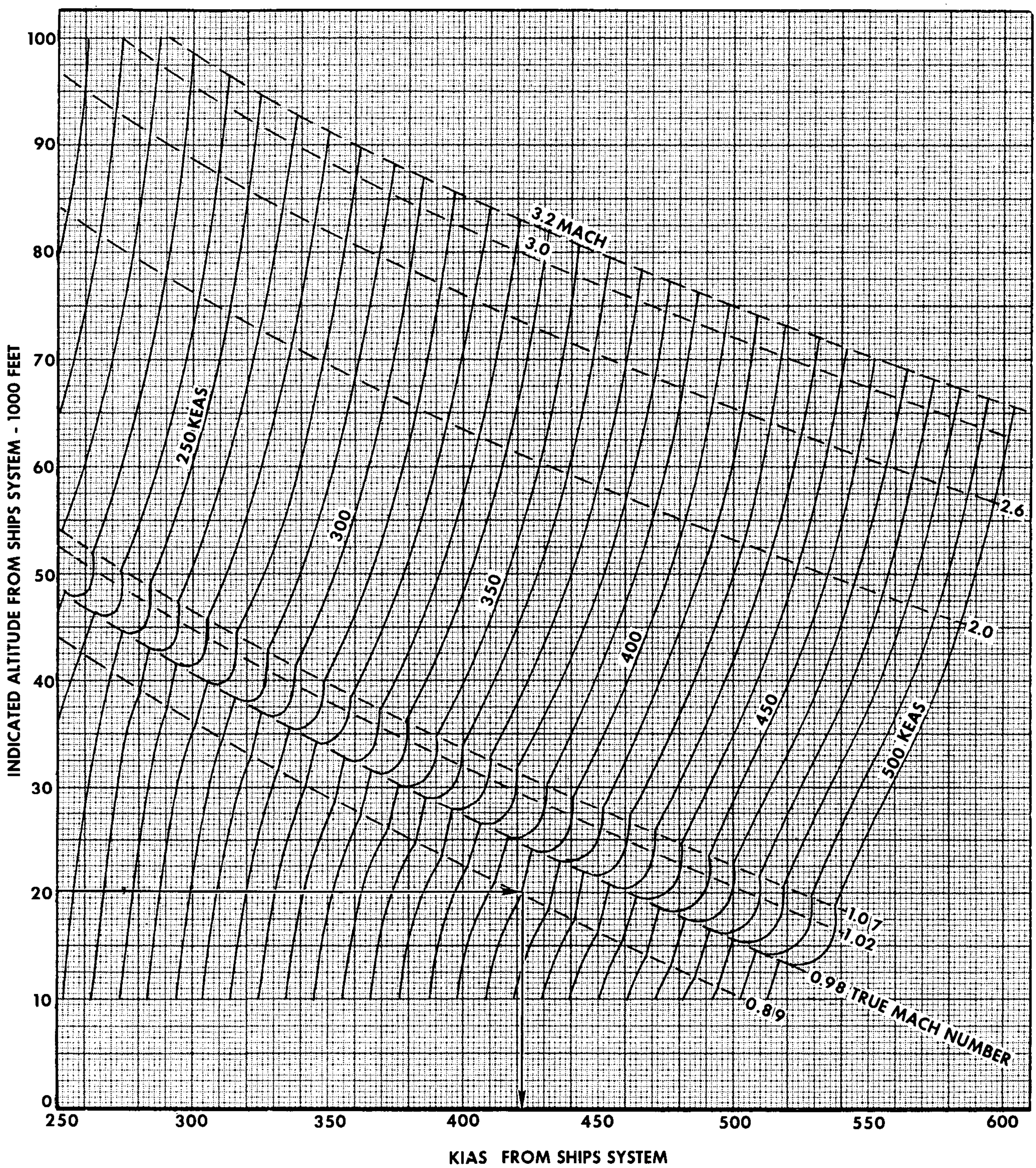


Figure A1-3

POSITION ERROR CORRECTIONS-ALTERNATE PITOT STATIC SYSTEM

ALTERNATE (FLIGHT RECORDER) AIRSPEED SYSTEM
CHINE PITOT AND FLUSH STATIC

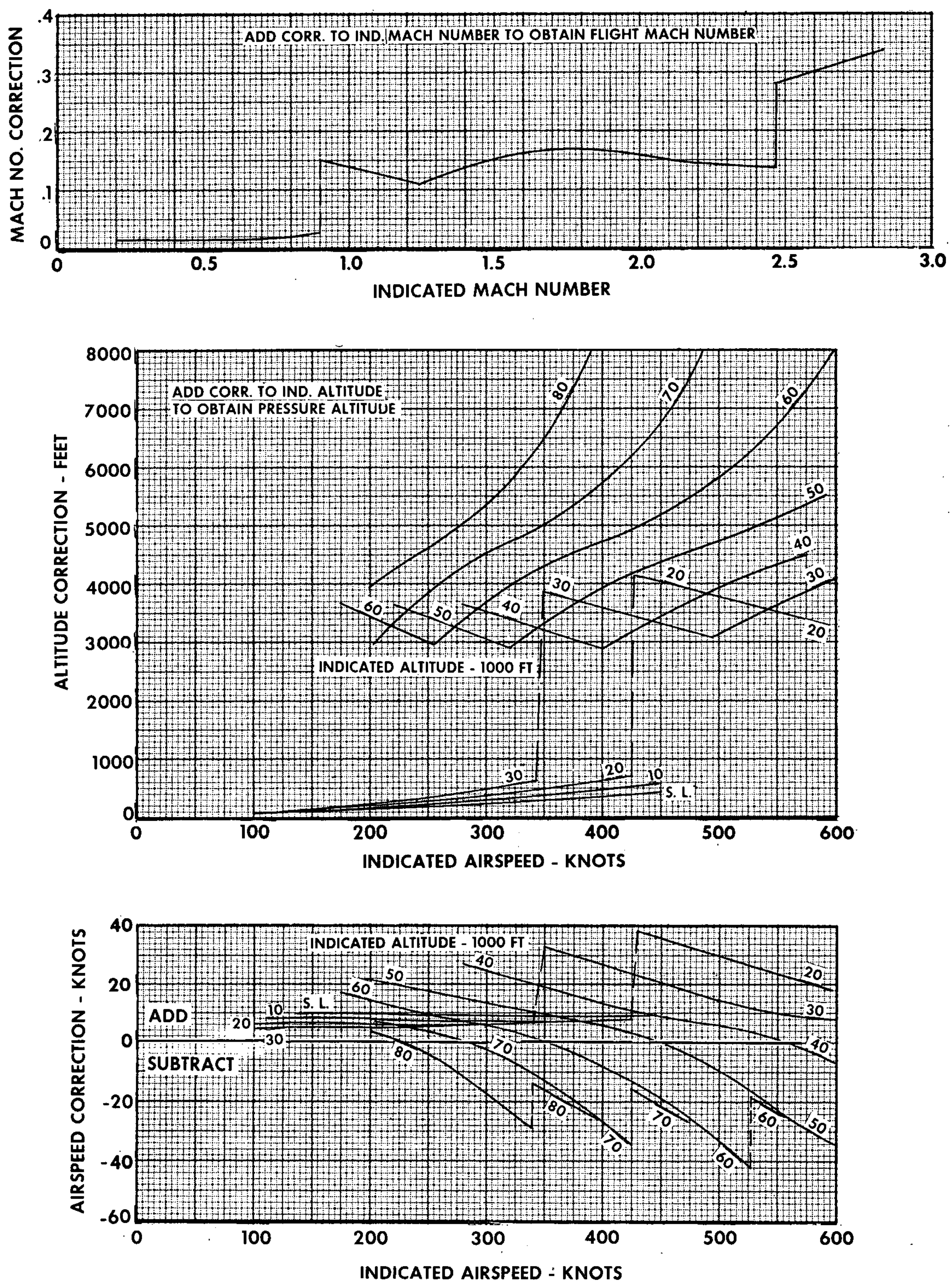


Figure A1-4

AIRSPEED COMPRESSIBILITY CORRECTION CHART

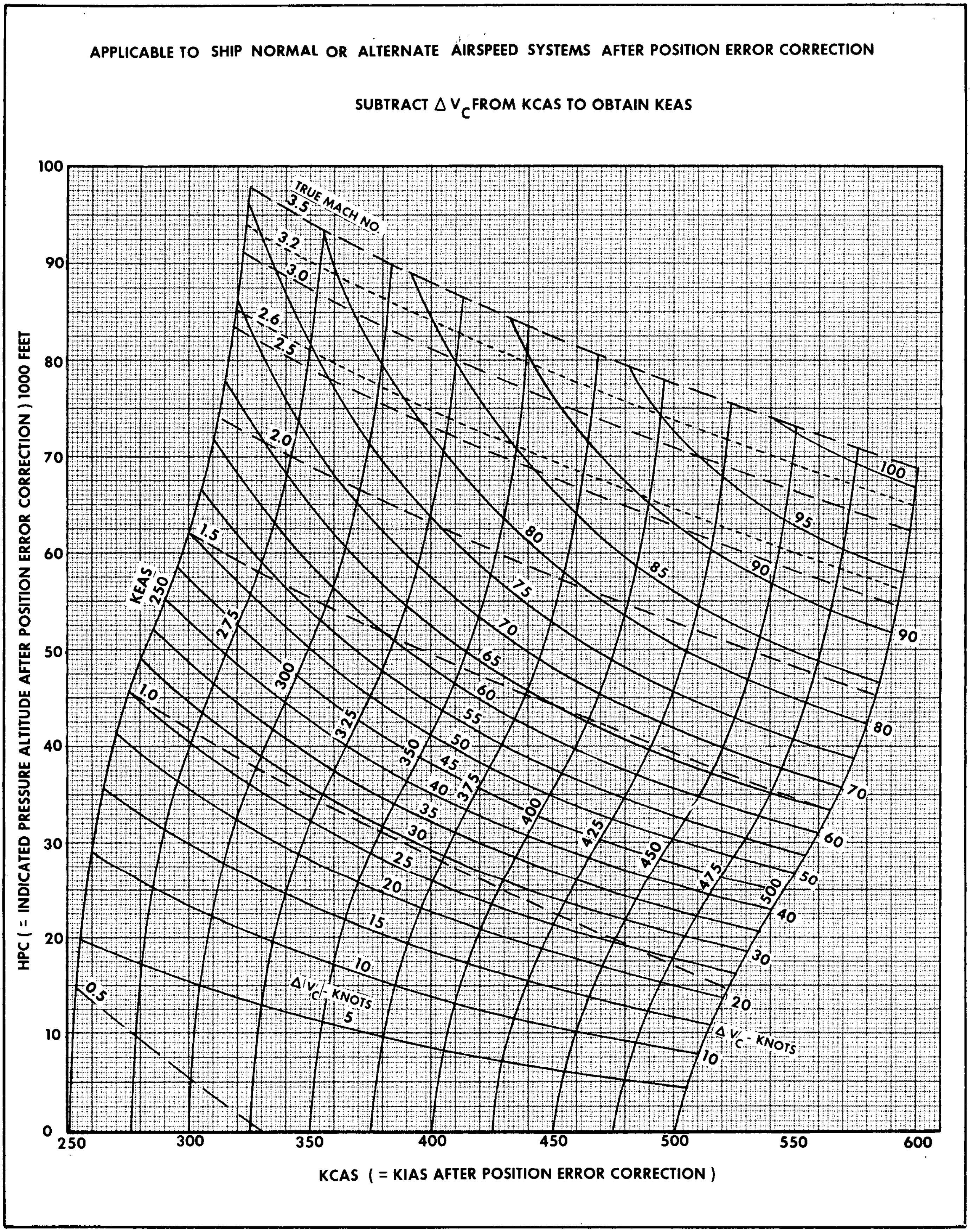


Figure A1-5

TRUE MACH NUMBER VS EQUIVALENT AIRSPEED

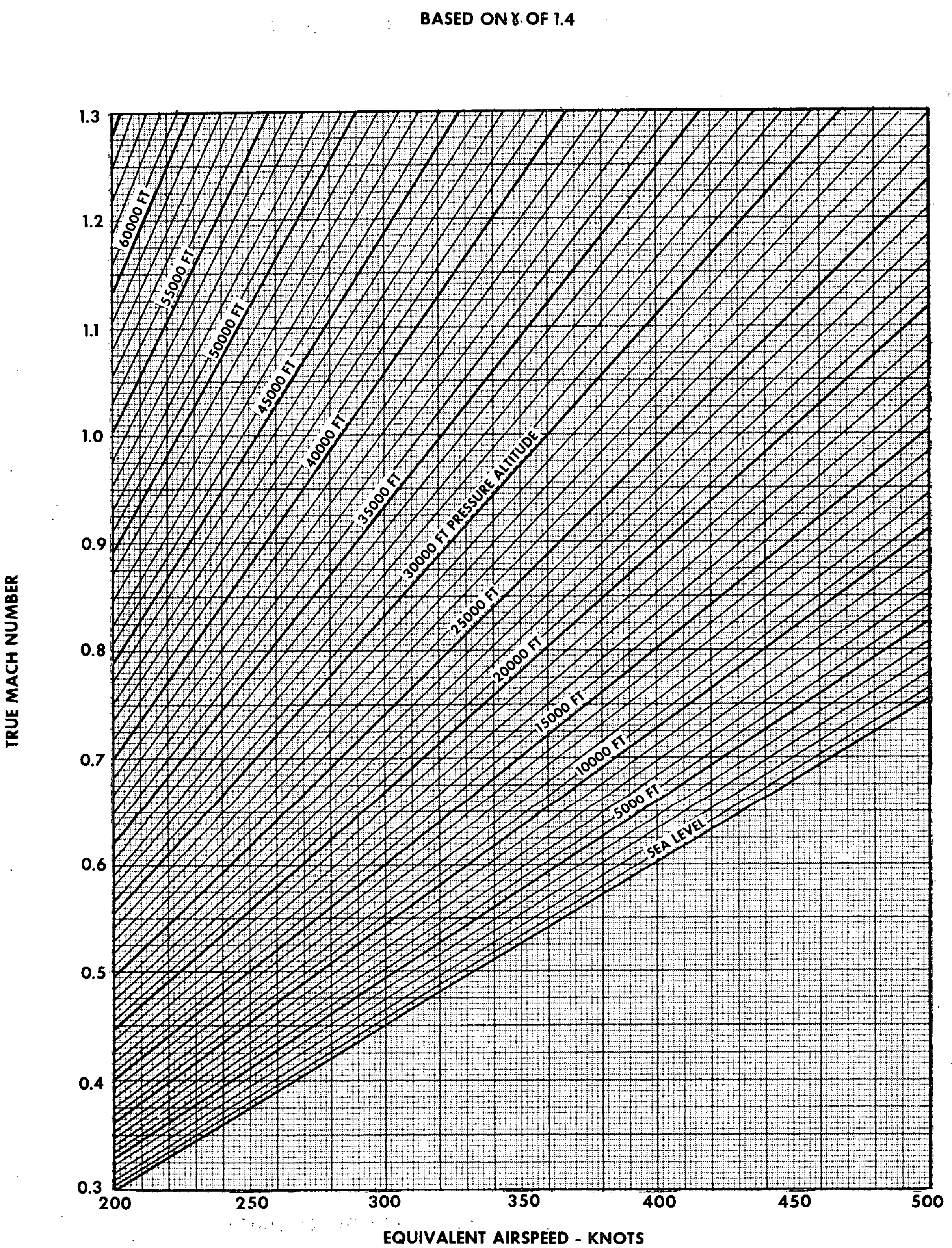


Figure A1-6
(Sheet 1 of 3)

TRUE MACH NUMBER VS EQUIVALENT AIRSPEED

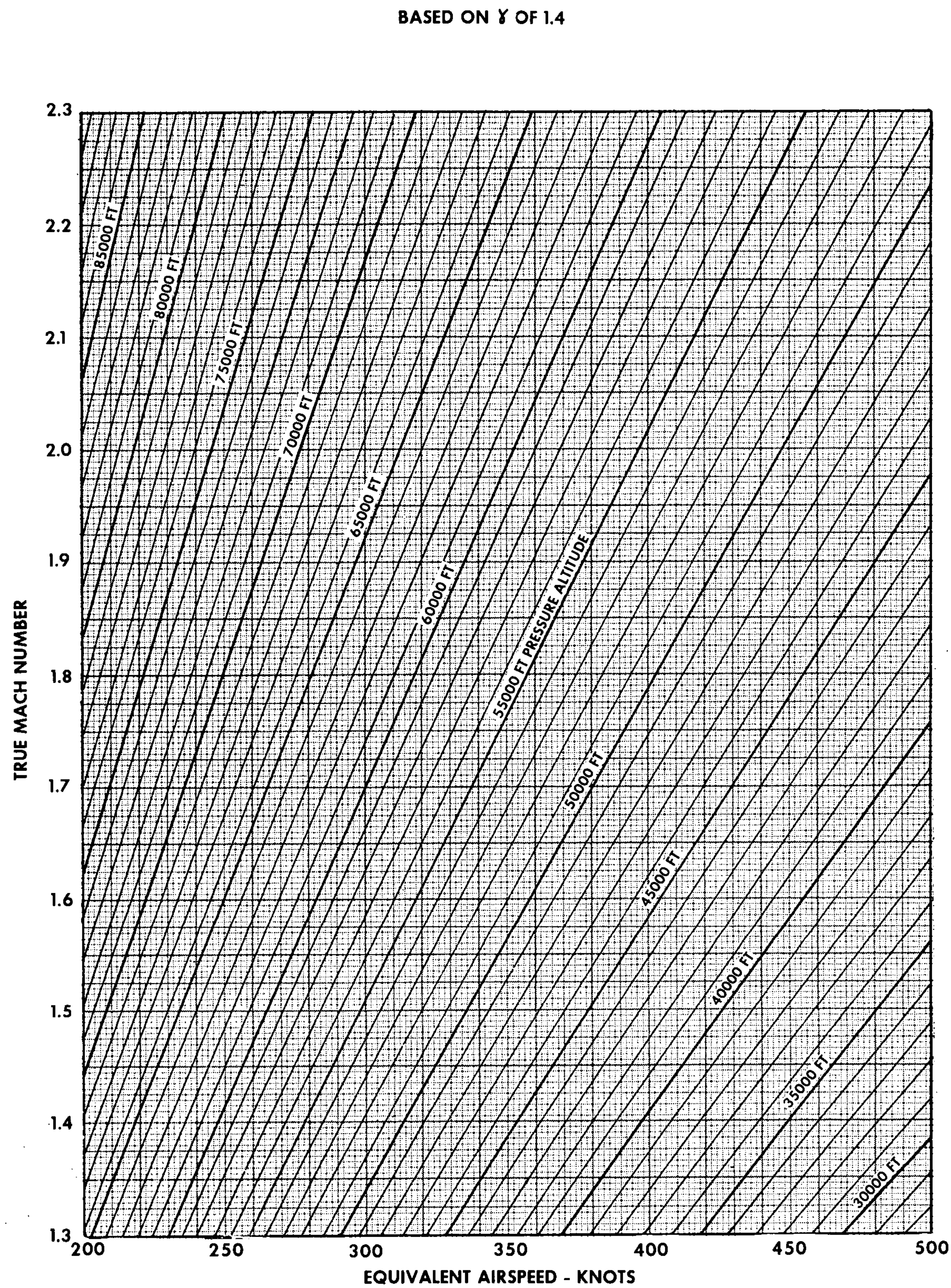


Figure A1-6
(Sheet 2 of 3)

TRUE MACH NUMBER VS EQUIVALENT AIRSPEED

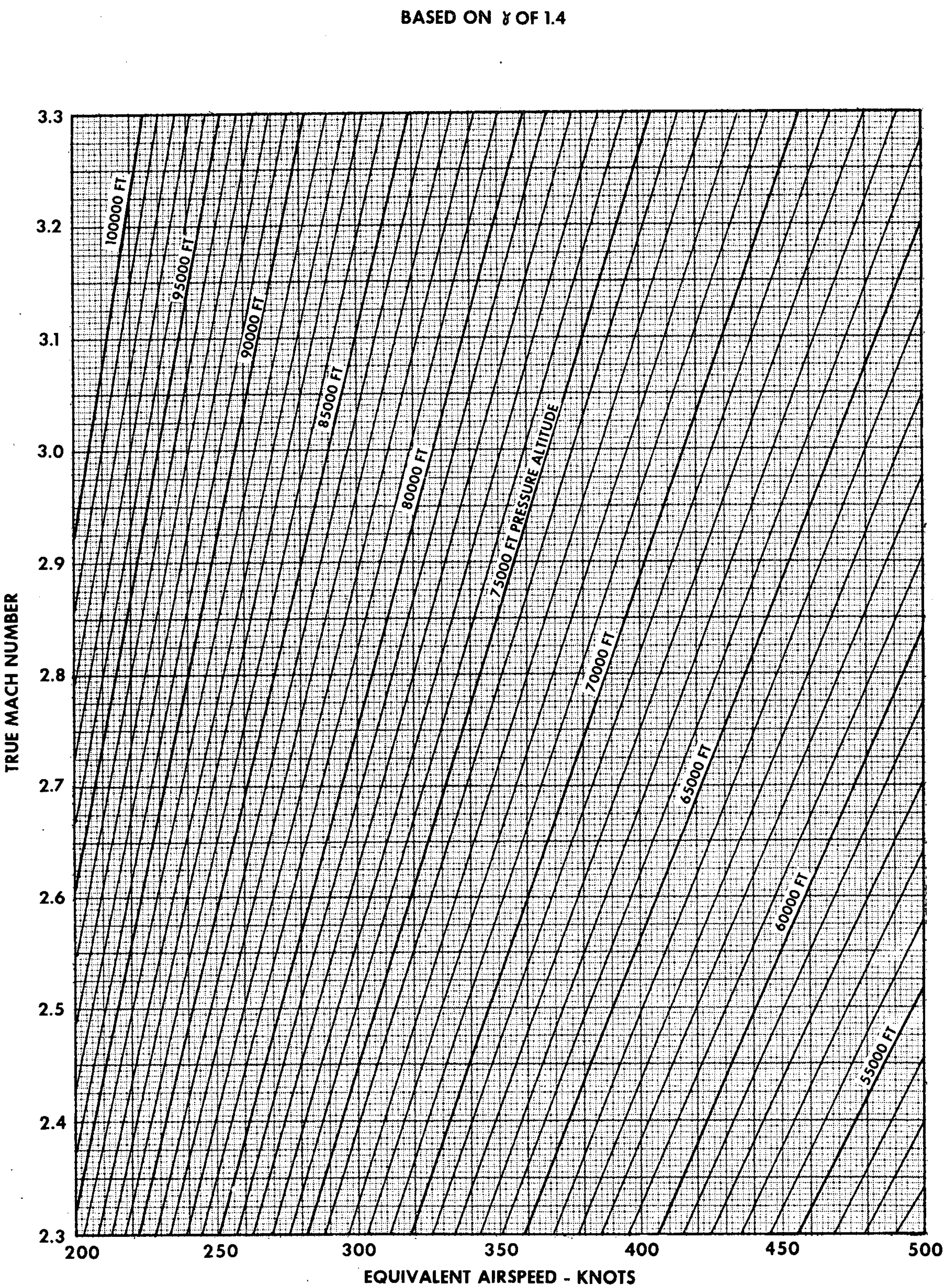


Figure A1-6
(Sheet 3 of 3)

MACH-AIRSPEED-TEMPERATURE CONVERSION CHART

BASED ON A VARIABLE γ

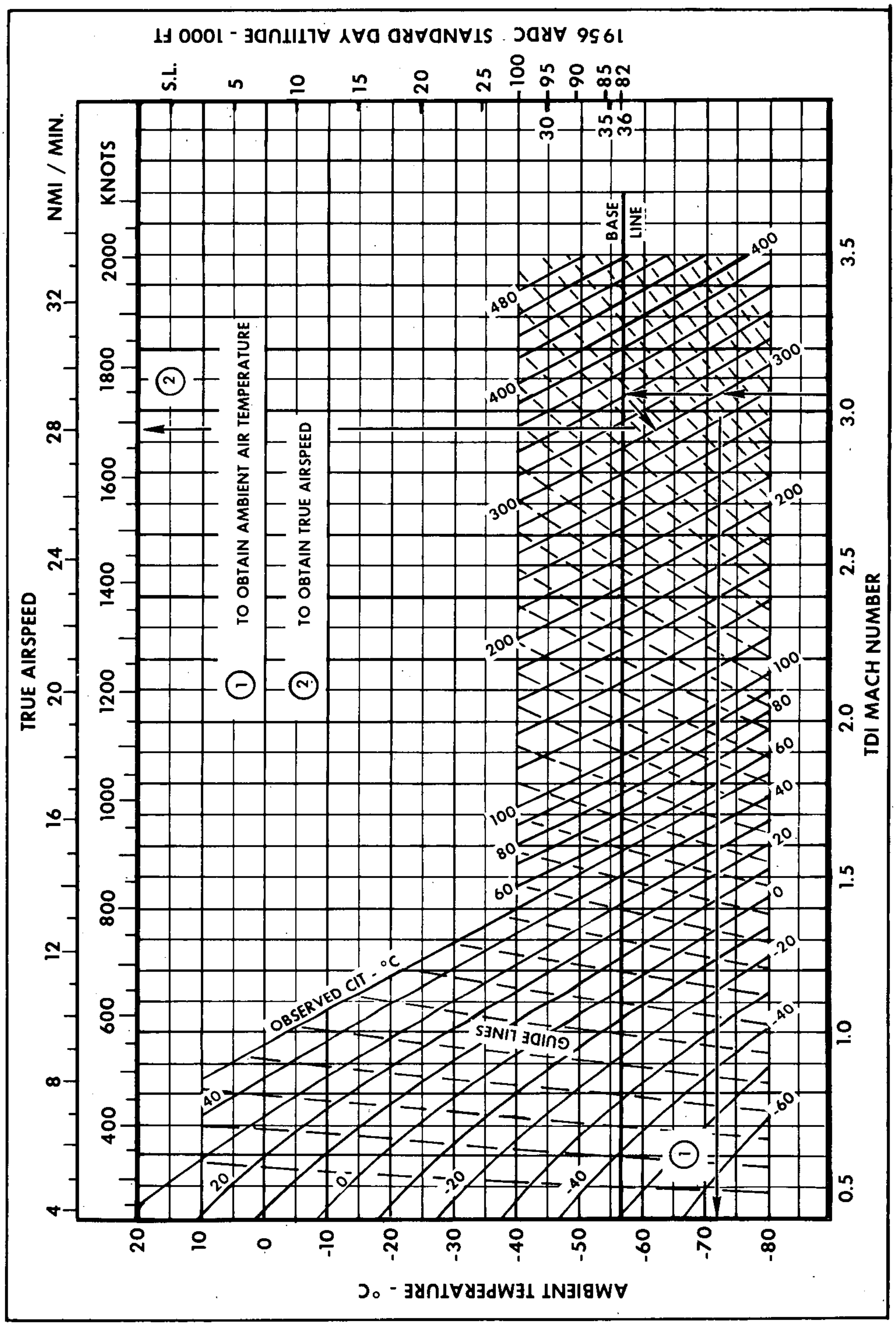


Figure A1-7

STANDARD ATMOSPHERE TABLE

ARDC MODEL ATMOSPHERE — 1956

Alt ft	Temp. t °F	Temp. t °C	Press. P in. Hg	Press. P lb/ft²	$\frac{\rho}{\rho_o} = \sigma$	$\sqrt{\frac{\rho}{\rho_o}}$	$\frac{P}{P_o} = \delta$	$\frac{T}{T_o} = \theta$	$\sqrt{\frac{T}{T_o}}$	$\frac{P}{P_o}\sqrt{\frac{T}{T_o}}$	c ft/sec	Alt ft
0	59.0	15.0	29.92	2116	1.000	1.000	1.000	1.000	1.000	1.000	1117	0
1000	55.4	13.0	28.86	2041	.9711	.9854	.9644	.9931	.9965	.9610	1113	1000
2000	51.9	11.0	27.82	1968	.9428	.9710	.9298	.9862	.9931	.9234	1109	2000
3000	48.3	9.1	26.82	1897	.9151	.9566	.8962	.9794	.9896	.8869	1105	3000
4000	44.7	7.1	25.84	1828	.8881	.9424	.8637	.9725	.9862	.8518	1101	4000
5000	41.2	5.1	24.90	1761	.8617	.9283	.8320	.9656	.9826	.8175	1098	5000
6000	37.6	3.1	23.98	1696	.8359	.9143	.8014	.9587	.9791	.7847	1094	6000
7000	34.0	+1.1	23.09	1633	.8106	.9003	.7716	.9519	.9757	.7529	1090	7000
8000	30.5	−0.8	22.22	1572	.7860	.8866	.7428	.9450	.9721	.7221	1086	8000
9000	26.9	−2.8	21.39	1513	.7620	.8729	.7148	.9381	.9686	.6924	1082	9000
10000	23.3	−4.8	20.58	1455	.7385	.8594	.6877	.9312	.9650	.6636	1078	10000
11000	19.8	−6.8	19.79	1400	.7156	.8459	.6614	.9244	.9615	.6360	1074	11000
12000	16.2	−8.8	19.03	1346	.6932	.8326	.6360	.9175	.9579	.6092	1070	12000
13000	12.6	−10.8	18.29	1294	.6713	.8193	.6113	.9106	.9543	.5834	1066	13000
14000	9.1	−12.7	17.58	1243	.6500	.8062	.5875	.9037	.9506	.5585	1062	14000
15000	5.5	−14.7	16.89	1194	.6292	.7932	.5643	.8969	.9470	.5344	1058	15000
16000	+1.9	−16.7	16.22	1147	.6090	.7804	.5420	.8900	.9434	.5113	1054	16000
17000	−1.6	−18.7	15.57	1101	.5892	.7676	.5203	.8831	.9397	.4889	1050	17000
18000	−5.2	−20.7	14.94	1057	.5699	.7549	.4994	.8762	.9361	.4675	1045	18000
19000	−8.8	−22.6	14.34	1014	.5511	.7424	.4791	.8694	.9324	.4467	1041	19000
20000	−12.3	−24.6	13.75	972.5	.5328	.7299	.4595	.8625	.9287	.4267	1037	20000
21000	−15.9	−26.6	13.18	932.4	.5150	.7176	.4406	.8556	.9250	.4076	1033	21000
22000	−19.5	−28.6	12.64	893.7	.4976	.7054	.4223	.8487	.9212	.3890	1029	22000
23000	−23.0	−30.6	12.11	856.3	.4806	.6933	.4046	.8419	.9176	.3713	1025	23000
24000	−26.6	−32.5	11.60	820.2	.4642	.6813	.3876	.8350	.9138	.3542	1021	24000
25000	−30.2	−34.5	11.10	785.3	.4481	.6694	.3711	.8281	.9100	.3377	1016	25000
26000	−33.7	−36.5	10.63	751.6	.4325	.6576	.3552	.8212	.9062	.3219	1012	26000
27000	−37.3	−38.5	10.17	719.1	.4173	.6460	.3398	.8144	.9024	.3066	1008	27000
28000	−40.9	−40.5	9.725	687.8	.4025	.6344	.3250	.8075	.8986	.2920	1004	28000
29000	−44.4	−42.5	9.297	657.6	.3881	.6230	.3107	.8006	.8948	.2780	999.4	29000
30000	−48.0	−44.4	8.885	628.4	.3741	.6116	.2970	.7937	.8909	.2646	995.1	30000
31000	−51.6	−46.4	8.488	600.3	.3605	.6004	.2837	.7869	.8871	.2517	990.7	31000
32000	−55.1	−48.4	8.106	573.3	.3473	.5893	.2709	.7800	.8832	.2393	986.4	32000
33000	−58.7	−50.4	7.737	547.2	.3345	.5784	.2586	.7731	.8793	.2274	982.0	33000
34000	−62.2	−52.4	7.382	522.1	.3220	.5675	.2467	.7662	.8753	.2159	977.7	34000
35000	−65.8	−54.3	7.041	498.0	.3099	.5568	.2353	.7594	.8714	.2050	973.3	35000
36089	−69.7	−56.5	6.683	472.7	.2971	.5450	.2234	.7519	.8671	.1937	968.5	36089
37000	−69.7	−56.5	6.397	452.4	.2844	.5333	.2138	.7519	.8671	.1854	968.5	37000
38000	−69.7	−56.5	6.097	431.2	.2710	.5206	.2038	.7519	.8671	.1767	968.5	38000
39000	−69.7	−56.5	5.811	411.0	.2583	.5082	.1942	.7519	.8671	.1684	968.5	39000
40000	−69.7	−56.5	5.538	391.7	.2462	.4962	.1851	.7519	.8671	.1605	968.5	40000
41000	−69.7	−56.5	5.278	373.3	.2346	.4844	.1764	.7519	.8671	.1530	968.5	41000
42000	−69.7	−56.5	5.030	355.8	.2236	.4729	.1681	.7519	.8671	.1458	968.5	42000
43000	−69.7	−56.5	4.794	339.1	.2131	.4616	.1602	.7519	.8671	.1389	968.5	43000
44000	−69.7	−56.5	4.569	323.2	.2031	.4507	.1527	.7519	.8671	.1324	968.5	44000
45000	−69.7	−56.5	4.355	308.0	.1936	.4400	.1455	.7519	.8671	.1262	968.5	45000
46000	−69.7	−56.5	4.151	293.6	.1845	.4295	.1387	.7519	.8671	.1203	968.5	46000
47000	−69.7	−56.5	3.956	279.8	.1758	.4193	.1322	.7519	.8671	.1146	968.5	47000
48000	−69.7	−56.5	3.770	266.7	.1676	.4094	.1260	.7519	.8671	.1093	968.5	48000
49000	−69.7	−56.5	3.593	254.1	.1597	.3996	.1201	.7519	.8671	.1041	968.5	49000
50000	−69.7	−56.5	3.425	242.2	.1522	.3901	.1145	.7519	.8671	.09928	968.5	50000
51000	−69.7	−56.5	3.264	230.8	.1451	.3809	.1091	.7519	.8671	.09460	968.5	51000
52000	−69.7	−56.5	3.111	220.0	.1383	.3719	.1040	.7519	.8671	.09018	968.5	52000
53000	−69.7	−56.5	2.965	209.7	.1318	.3630	.09909	.7519	.8671	.08592	968.5	53000
54000	−69.7	−56.5	2.826	199.8	.1256	.3544	.09444	.7519	.8671	.08189	968.5	54000
55000	−69.7	−56.5	2.693	190.5	.1197	.3460	.09001	.7519	.8671	.07805	968.5	55000
56000	−69.7	−56.5	2.567	181.5	.1141	.3378	.08578	.7519	.8671	.07438	968.5	56000
57000	−69.7	−56.5	2.446	173.0	.1087	.3297	.08176	.7519	.8671	.07089	968.5	57000
58000	−69.7	−56.5	2.331	164.9	.1036	.3219	.07792	.7519	.8671	.06756	968.5	58000
59000	−69.7	−56.5	2.222	157.2	.09877	.3143	.07426	.7519	.8671	.06439	968.5	59000
60000	−69.7	−56.5	2.118	149.8	.09414	.3068	.07078	.7519	.8671	.06137	968.5	60000
61000	−69.7	−56.5	2.018	142.8	.08972	.2995	.06746	.7519	.8671	.05849	968.5	61000
62000	−69.7	−56.5	1.924	136.1	.08551	.2924	.06429	.7519	.8671	.05575	968.5	62000
63000	−69.7	−56.5	1.833	129.7	.08150	.2855	.06127	.7519	.8671	.05313	968.5	63000
64000	−69.7	−56.5	1.747	123.6	.07767	.2787	.05840	.7519	.8671	.05064	968.5	64000
65000	−69.7	−56.5	1.665	117.8	.07403	.2721	.05566	.7519	.8671	.04826	968.5	65000
66000	−69.7	−56.5	1.587	112.3	.07055	.2656	.05306	.7519	.8671	.04600	968.5	66000
67000	−69.7	−56.5	1.513	107.0	.06724	.2593	.05056	.7519	.8671	.04384	968.5	67000
68000	−69.7	−56.5	1.442	102.0	.06409	.2532	.04819	.7519	.8671	.04179	968.5	68000
69000	−69.7	−56.5	1.374	97.19	.06108	.2471	.04592	.7519	.8671	.03982	968.5	69000
70000	−69.7	−56.5	1.310	92.63	.05821	.2413	.04377	.7519	.8671	.03795	968.5	70000

Figure A1-8
(Sheet 1 of 2)

STANDARD ATMOSPHERE TABLE

ARDC MODEL ATMOSPHERE – 1956

Alt ft	Temp. t °F	Temp. t °C	Press. P in. Hg	Press. P lb/ft²	$\frac{\rho}{\rho_o} = \sigma$	$\sqrt{\frac{\rho}{\rho_o}}$	$\frac{P}{P_o} = \delta$	$\frac{T}{T_o} = \theta$	$\sqrt{\frac{T}{T_o}}$	$\frac{P}{P_o}\sqrt{\frac{T}{T_o}}$	c ft/sec	Alt ft
71000	–69.7	–56.5	1.248	88.28	.05548	.2355	.04172	.7519	.8671	.03618	968.5	71000
72000	–69.7	–56.5	1.190	84.14	.05288	.2300	.03976	.7519	.8671	.03448	968.5	72000
73000	–69.7	–56.5	1.134	80.19	.05040	.2245	.03789	.7519	.8671	.03285	968.5	73000
74000	–69.7	–56.5	1.081	76.43	.04803	.2192	.03611	.7519	.8671	.03131	968.5	74000
75000	–69.7	–56.5	1.030	72.84	.04578	.2140	.03442	.7519	.8671	.02985	968.5	75000
76000	–69.7	–56.5	.9815	69.42	.04363	.2089	.03280	.7519	.8671	.02844	968.5	76000
77000	–69.7	–56.5	.9355	66.16	.04158	.2039	.03127	.7519	.8671	.02711	968.5	77000
78000	–69.7	–56.5	.8916	63.06	.03963	.1991	.02980	.7519	.8671	.02584	968.5	78000
79000	–69.7	–56.5	.8497	60.10	.03777	.1943	.02840	.7519	.8671	.02463	968.5	79000
80000	–69.7	–56.5	.8099	57.28	.03600	.1897	.02707	.7519	.8671	.02347	968.5	80000
81000	–69.7	–56.5	.7718	54.59	.03431	.1852	.02580	.7519	.8671	.02237	968.5	81000
82021	–69.7	–56.5	.7349	51.98	.03267	.1807	.02456	.7519	.8671	.02130	968.5	82021
83000	–68.1	–55.6	.7012	49.59	.03104	.1762	.02343	.7550	.8689	.02036	970.5	83000
84000	–66.4	–54.7	.6685	47.28	.02947	.1717	.02234	.7582	.8607	.01923	972.5	84000
85000	–64.8	–53.8	.6374	45.08	.02798	.1673	.02130	.7613	.8725	.01858	974.5	85000
86000	–63.2	–52.9	.6079	43.00	.02658	.1630	.02032	.7645	.8744	.01777	976.6	86000
87000	–61.5	–51.9	.5799	41.02	.02525	.1589	.01938	.7677	.8762	.01698	978.6	87000
88000	–59.9	–51.1	.5533	39.13	.02399	.1549	.01849	.7708	.8780	.01623	980.6	88000
89000	–58.2	–50.1	.5280	37.45	.02280	.1510	.01765	.7740	.8798	.01553	982.6	89000
90000	–56.6	–49.2	.5040	35.65	.02167	.1472	.01684	.7772	.8816	.01485	984.6	90000
91000	–54.9	–48.3	.4811	34.03	.02061	.1436	.01608	.7804	.8834	.01421	986.6	91000
92000	–53.3	–47.4	.4594	32.49	.01960	.1400	.01535	.7835	.8852	.01359	988.6	92000
93000	–51.6	–46.4	.4387	31.03	.01864	.1365	.01466	.7867	.8870	.01300	990.6	93000
94000	–50.0	–45.6	.4191	29.64	.01773	.1332	.01401	.7899	.8888	.01245	992.6	94000
95000	–48.3	–44.6	.4004	28.32	.01687	.1299	.01338	.7931	.8906	.01192	994.6	95000
96000	–46.7	–43.7	.3826	27.06	.01606	.1267	.01279	.7962	.8923	.01141	996.6	96000
97000	–45.1	–42.8	.3656	25.86	.01529	.1236	.01222	.7994	.8941	.01093	998.6	97000
98000	–43.4	–41.9	.3495	24.72	.01455	.1206	.01168	.8026	.8959	.01046	1001	98000
99000	–41.8	–41.0	.3341	23.63	.01386	.1177	.01117	.8058	.8977	.01003	1003	99000
100000	–40.1	–40.1	.3195	22.60	.01320	.1149	.01068	.8089	.8994	.009606	1005	100000
110000	–23.7	–30.9	.2062	14.58	.008196	.09053	.006890	.8407	.9170	.006318	1024	110000
120000	–7.19	–21.8	.1352	9.561	.005179	.07197	.004518	.8724	.9340	.004220	1043	120000
130000	+9.27	–12.6	.09000	6.365	.003327	.05768	.003008	.9041	.9508	.002860	1062	130000
140000	25.7	–3.50	.06076	4.297	.002170	.04658	.002031	.9359	.9674	.001965	1081	140000
150000	42.2	+5.67	.04156	2.940	.001436	.03789	.001389	.9676	.9837	.001366	1099	150000
200000	–6.78	–21.5	.00621	0.440	.000238	.01542	.000208	.8732	.9345	.000194	1044	200000

ATMOSPHERIC STANDARDS

	English	Metric
Gravity	32.17405 ft/sec²	9.80665 m/sec²
Absolute zero	–459.688°F	–273.16°C
Standard Values at Sea Level		
Pressure	29.92 in. Hg	760 mm Hg
Pressure	2116 lb/ft²	10332 kg/m²
Temp	59°F	15°C
Abs temp	518.688°R	288.16°K
Specific wt $g\rho_o$	0.076475 lb/ft³	1.2250 kg/m³
Density	0.0023769 lb sec²/ft⁴	0.12492 kg sec²/m⁴
Standard Values at Altitude		
Isothermal alt H	36,089.2 ft	11,000 m
Isothermal temp	–69.7°F	–56.5°C

GENERAL PROPERTIES OF GASES

$Pv = RT$ or $P = \rho gRT$ or $PV = mRT$

Constant Volume $P_1/P_2 = T_1/T_2$

Constant Pressure $V_1/V_2 = T_1/T_2$

Constant Temperature $P_1/P_2 = V_2/V_1$

Reversible Adiabatic $\frac{P_1}{P_2} = \left(\frac{V_2}{V_1}\right)^{\gamma}$

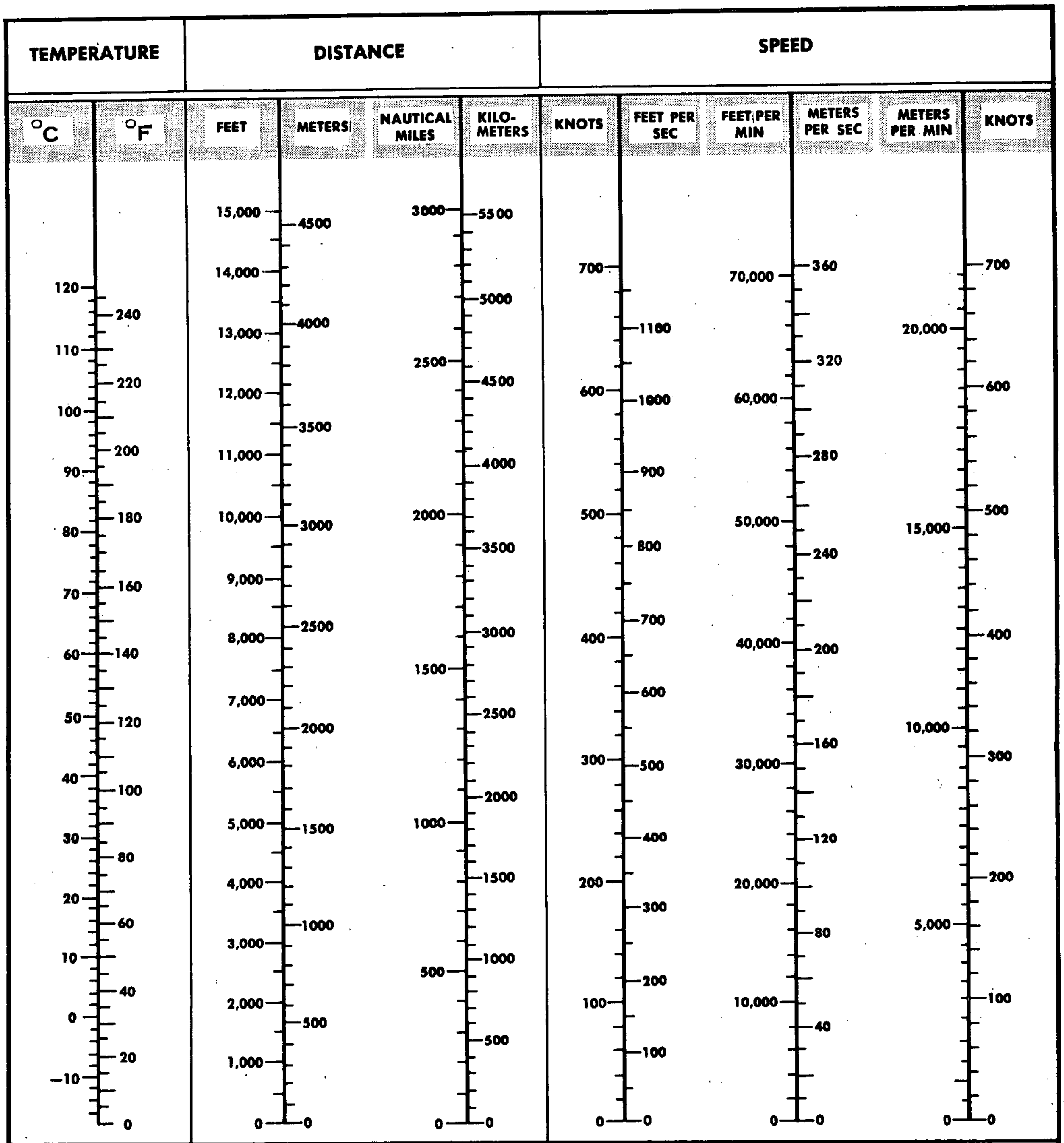
$$\frac{T_1}{T_2} = \left(\frac{V_2}{V_1}\right)^{\gamma-1} = \left(\frac{P_1}{P_2}\right)^{\frac{\gamma-1}{\gamma}}$$

Polytropic $P_1V_1^n = P_2V_2^n$

$$\frac{T_1}{T_2} = \left(\frac{V_1}{V_2}\right)^{1-n} = \left(\frac{P_1}{P_2}\right)^{\frac{n-1}{n}}$$

Figure A1-8
(Sheet 2 of 2)

STANDARD UNITS CONVERSION CHART



NOTE:

TO OBTAIN U S GALLONS MULTIPLY LITERS BY 0.264

TO OBTAIN IMPERIAL GALLONS MULTIPLY LITERS BY 0.220

TO OBTAIN INCHES OF MERCURY MULTIPLY MILLIBARS BY .0295

TO OBTAIN POUNDS MULTIPLY KILOGRAMS BY 2.20

Figure A1-9

PART II

FIELD LENGTH REQUIREMENTS

TAKEOFF

Takeoff performance data are supplied for two types of takeoff operations. One applies to normal operation when field length is not critical with respect to takeoff distance. This type of takeoff is based on a rotation speed of 190 KIAS for airplane gross weights of 110,000 pounds or more and 180 KIAS for all lower gross weights. This permits a variable liftoff speed and allows a slight margin for takeoff with tailwind before being restricted by tire limit speed (239 knots groundspeed).

The other type of takeoff applies to maximum performance operation where takeoff and rotation speeds are varied with gross weight so that takeoff speed corresponds to a lift coefficient of 0.60. Airspeeds at takeoff and the resultant ground run distance with this schedule are always less than for the normal performance schedule. Pitch angle at takeoff is approximately 11° at 22% c.g. This schedule results in minimal tail clearance at liftoff. Therefore, this schedule is recommended only when the normal schedule or an intermediate schedule is inadequate for takeoff or refusal requirements and/or tailwind conditions.

Normal Takeoff Performance and Rotation Speed Schedule

The normal performance takeoff speed is based on a constant nosewheel liftoff speed of 190 knots for gross weights of 110,000 pounds or more and 180 knots for gross weights less than 110,000 pounds. Time from nosewheel off to main gear off is assumed to be 4.5 seconds, based on average rotation time from test data. (Start of stick input to initiate rotation should anticipate nosewheel off by about 15 knots or 2.5 seconds.) The normal performance takeoff speed schedule based on constant rotation speed is incorporated in the takeoff ground run distance chart. When the takeoff is to be made with a tailwind component, the nosewheel liftoff speed may be decreased slightly, if necessary, to avoid exceeding tire limit speed. Takeoff speed is also reduced by one knot per knot decrease in rotation speed. Reducing the rotation and takeoff speeds results in a one percent decrease in ground run distance per knot decrease in airspeed.

The normal performance takeoff speed provides a margin of control during climbout in the event of engine failure just after liftoff if immediate corrective action is taken. Takeoff speeds are higher than the minimum single engine control speeds for steady flight (speeds at which 5° to 10° of bank with up to 5° sideslip can be used to maintain flight path, utilizing up to full rudder deflection with maximum thrust on the operating engine. See figure 3-2). After takeoff, a sideslip and bank toward the operating engine are recommended with up to 9° rudder trim to minimize drag. The trim required decreases with increasing airspeed.

The takeoff speed schedule for normal performance is incorporated in the takeoff ground run distance chart, figure A2-1.

Maximum Performance Rotation and Takeoff Speed Schedule

The maximum performance rotation and takeoff speed schedules are shown in figure A2-2 as part of the takeoff distance chart. Maximum performance takeoff speeds are based on the takeoff attitude which provides a lift coefficient of 0.60 in ground effect at 22% c.g. Therefore, takeoff speed is a direct function of airplane gross weight and takeoff speeds are listed on the gross weight lines of the takeoff distance chart. Rotation or nosewheel liftoff speed is that speed where the airplane rotation is initiated and is scheduled to occur 4.5 seconds prior to liftoff. Rotation speeds are plotted on the chart as a function of ground run distance and as affected by wind and slope.

TAKEOFF GROUND RUN DISTANCE

Figures A2-1 and A2-2 present normal and maximum performance takeoff ground run distances as a function of ambient temperature, pressure altitude and gross weight. Correction grids for wind and slope effects are included. Limit tailwind areas are incorporated for reference and may be used as an indication of takeoff overspeed margin (the difference between takeoff speed and tire limit speed). The takeoff distances are based on test data and have no service allowance included.

Normal Performance Takeoff Ground Run Distance

Figure A2-1 shows normal performance takeoff distances obtained by use of the normal performance rotation speed and the takeoff speed schedules incorporated in this chart.

Example:

For an ambient temperature of 86°F, pressure altitude of 4500 feet and airplane gross weight of 120,000 pounds, determine the ground run distance and takeoff speed.

Enter figure A2-1 at the ambient temperature and pressure altitude, proceed horizontally to the gross weight and read down to determine a zero wind zero slope distance of 8300 feet. Continue down to the 190 knot rotation speed line (applicable to weights over 110,000 lb.) and read to the right horizontally to determine the zero wind and zero slope takeoff speed of 213 knots. For a headwind of 10 knots and a downslope of 1%, continue to read down to a distance of 7300 feet. The wind does not affect the takeoff speed but the 1% downhill slope decreases the takeoff speed to 212 knots.

Maximum Performance Takeoff Ground Run Distance

Figure A2-2 shows maximum performance takeoff distances consistent with the $C_L = 0.6$ maximum performance takeoff speeds and the rotation speed schedules which are also shown in this chart.

Example:

Using the same conditions as in the previous example, determine the maximum performance ground run distance, rotation speed and takeoff speed. Enter figure A2-2 at the temperature and pressure altitude condition, proceed horizontally to the gross weight and read down to the zero wind zero slope distance of 6700 feet. The takeoff speed listed on the distance line for 120,000 pounds is 192 knots. Continuing to read down, intersect the rotation speed curve, read to the right for the zero wind and zero slope rotation speed of 168 knots. Continuing vertically, determine the distance with wind and slope as 6050 feet. For the wind and slope case, the wind does not affect the rotation speed but the slope decreases the rotation speed to 167 knots.

Intermediate Takeoff Speed Schedule

When the normal performance schedule is inadequate because of runway length and takeoff weight and temperature, or other conditions, an intermediate takeoff speed should be considered before reverting fully to the maximum performance schedule. When rated tire speed is the limiting factor because of a tailwind condition, base the takeoff speed on the rated tire speed. Rated tire speed can be determined from figure 5-7. If a nominal "pad" of 5 knots is desired, the intermediate takeoff speed will be the rated tire speed minus the 5 knots. The corresponding takeoff distance can be obtained by using the following method: At the same temperature, pressure altitude, gross weight, wind and slope conditions, find the normal performance takeoff ground run distance. Subtract the intermediate takeoff speed from the normal takeoff speed. This number is equal to the percent reduction of the normal performance distance. Do not schedule takeoffs at speeds lower than the schedule for maximum performance.

Acceleration Check Speed

Figure A2-3 provides a means for making a speed check at any required distance during the takeoff run. Use the takeoff speed and distance values found from figures A2-1 or A2-2 to locate the position of a guide line on the acceleration check speed below the intersection of this guide line and the check distance value selected. The break in the acceleration lines at 50 knots approximates the change in acceleration as maximum thrust is obtained.

Example:

For example, in the 120,000 pound normal performance takeoff example where the zero wind distance was 8300 feet at 213 KIAS, the guide line illustrated shows that an acceleration check speed of 127 KIAS would be reached at a 3000-foot check distance. In the case where the takeoff run was 7300 feet with a 10 knot headwind and downslope, a guide line drawn from a point at 7300 feet and 212 KIAS intersects the 3000-foot check distance at 133 KIAS. The 3000-foot check distance point is recommended for operation at weights over 100,000 lb, since airspeeds reached at this distance allow reasonable accuracy in making the speed check. The 2000-foot check distance, however, is recommended at light weight or low temperature conditions.

Takeoff Fuel Allowance

Ramp fuel load can be adjusted to allow for fuel consumption up to the lift off point. Idle fuel flow is approximately 55 lb/minute/engine. Fuel consumption during a takeoff run is approximately 1000 pounds. A normal allowance for ground operation and takeoff would be 2000 pounds for a 10 minute ground operating period from first engine start, assuming 2 minutes is required to start the second engine.

REFUSED TAKEOFFS

Planning data for determination of acceleration check and refusal speeds may be obtained from the refusal speed charts, figures A2-4 through A2-7. Refusal speed without chute may be used as the acceleration check speed instead of the normal line speed check, if desired, provided the corresponding check distance is also computed. Either the scheduled rotation speed or the maximum refusal speed with chute, whichever is lower, is the maximum speed at which a decision to abort a takeoff is recommended.

The charts show actual maximum performance refused takeoff capability without conservatism or service allowances. However, various factors may contribute to performance less than optimum, such as blown tires, delay in drag chute deployment, etc. Brake energy capacity is assumed to be 90% of full rated one-stop capability, thus allowing some normal service use prior to the refused takeoff. This factor is presented as maximum refusal speed. For abort conditions where brake burn-out might occur before a stop can be made the aircraft is assumed to free roll at relatively low speed and not stop.

Refusal Speed With Drag Chute

The refusal speed with drag chute charts are shown in figures A2-4 and A2-5 for dry and wet runways, respectively. The abort speeds are given as function of temperature, pressure altitude and gross weight for available runway length. Assumptions made in the refusal speed calculations are as follows:

1. Normal rate of acceleration is maintained to the refusal speed at which time complete and instantaneous loss of one engine occurs.

2. Maximum afterburning thrust is maintained on the operating engine and zero thrust is obtained from the failed engine for 3 seconds before the throttle on the operating engine is retarded to idle.

Note

No rotation is attempted when a takeoff emergency occurs before reaching rotation speed, even though airspeed may exceed rotation speed during this recognition and action period.

3. If the takeoff is aborted after rotation has been initiated, aerodynamic braking is utilized until the aircraft has decelerated to chute deployment speed of 190 knots. (Refer to ABORT procedure, Section III.)

4. The nose is lowered before brake application if aerodynamic braking has been required. (See 3 above.)

5. Braking torque is obtained one second after retarding the throttles unless rotation has been initiated. The allowance for chute full deployment is 4.75 seconds after drag chute switch actuation.

6. Optimum wheel braking is continued until the aircraft is stopped.

7. Drag chute is jettisoned at 60 knots on a dry runway and is retained to full stop on a wet runway. (The chute should always be retained until stopping is assured.)

8. Zero wind and zero sope.

9. Hard surface runway. (The effects of water, slush, or snow on acceleration have not been considered.)

10. The takeoff is continued if rotation has been initiated prior to an engine failure when a positive climbout capability exists.

Example:

Using the same conditions as in the takeoff example, i.e., 86°F temperature, 4500 feet pressure altitude, 120,000 pounds gross weight, find the refusal speed with drag chute for a 12,000 foot dry runway.

Enter figure A2-4 at the temperature and pressure altitude conditions, proceed horizontally to the gross weight, then downward to the available runway length (accelerate and stop distance available) and read a refusal speed of 170 knots. (This refusal speed is usable only if 90% of the brake energy isn't exceeded.) Proceed downward to 120,000 lb dashed line and read a maximum refusal speed of 135 knots and interpolate the distance to accelerate and stop as 8500 ft.

Using the same procedure for the wet runway case, enter figure A2-5 and read a refusal speed of 151 knots.

Refusal Speed Without Drag Chute

Refusal speeds without drag chute are presented in figures A2-6 and A2-7 for dry and wet runways, respectively. The refusal speeds are given as a function of temperature, pressure altitude and gross weight for the available runway length. Assumptions made in the no chute refusal speed calculations are the same as those made for calculating refusal speeds with chute with the following exceptions:

1. Drag chute deployment is attempted as the nose is lowered at 190 KIAS (if rotation has been accomplished) or at start of braking if aborting from a lower speed. Drag chute failure recognition is normal chute deploy time of 4.75 seconds plus 3.0 seconds recognition time.

2. With a wet runway, one engine is shut down after recognition of chute failure, up-elevon drag is used (but the nose down attitude maintained), anti-skid is turned off and the stop is with all tires blown.

Example:

Using the same conditions as in the previous examples, find the refusal speed for dry and wet runways.

For a dry runway, enter figure A2-6 at the temperature and altitude conditions, proceed horizontally to the gross weight, then proceed downward to the maximum refusal speed line for 120,000 lbs and read a maximum refusal speed of 112 knots. Using the same procedures for the wet runway conditions, enter figure A2-7 and read a refusal speed of 107 knots.

SINGLE ENGINE CLIMB CAPABILITY

Three curves of single engine climb capability are supplied to show the effect of speed and temperature as an aid in judging performance at takeoff weight with maximum thrust. Figures A2-8, A2-9 and A2-10, show the effect of airspeed on maximum weight for gear down in ground effect, gear up in ground effect, and gear up out of ground effect, respectively. The illustrated performance represents wind tunnel tests results. A degradation factor of 10,000 lb should be applied before use and a supplemental scale incorporating this factor is provided. The values shown are for cg = 22% MAC. For deviation from 22% cg, decrease gross weight by 1500 lb for each one-percent forward shift from 22% cg, or increase gross weight by 1500 lb for each one-percent aft shift from 22% cg. If operating at less than the maximum weight for climbout, the excess thrust indicated by the maximum weights shown can be used for acceleration and delayed climb, instead of immediate climb at low airspeeds. This procedure is usually permitted by the takeoff situation at the operating base. The best climb speed with gear down close to the ground is approximately 250 KIAS. The gear would ordinarily be retracting during an acceleration to this speed, so the value represents a target speed for transition to a shallow climb attitude. The best single engine climb speed with gear up away from ground effect is above 400 KIAS; however, 300 KIAS provides an adequate angle for single engine climb to pattern altitudes. In normal operation, 300 KIAS represents a target speed for gradual pullup to normal climb speed.

Example:

Using the same conditions as on the takeoff case for gear down in ground effect find the single engine capability speed. Enter figure A2-8 at 86°F and 4500 ft altitude and using the temporary decrement weight scale gives the speed as over 250 KEAS. Use of the gear up out of ground effect curve, figure A2-10, gives the speed as 232 KEAS.

LANDING FIELD LENGTH REQUIREMENTS

Landing speed schedules and landing rollout distance information are provided for dry and wet runways, with and without drag chute, and for normal and maximum performance techniques.

NORMAL AND MAXIMUM PERFORMANCE LANDING SPEED SCHEDULES

Figure A2-11 shows the normal and maximum (heavy weight) performance landing speed schedules as a function of gross weight down to 60,000 pounds. At gross weights less than 60,000 pounds the landing speed is a constant 145 KIAS for normal performance and 135 KIAS for maximum performance operation. The maximum performance landing speeds are 10 knots less than normal landing speeds for all weight conditions.

In addition to the landing speed schedule, the tailwind at which tire limit speed will be exceeded may be obtained from this chart.

Example:

1. For a normal landing at 70,000 pounds gross weight, determine final approach and landing speeds and limit tailwind for a pressure altitude of 4500 feet and ambient temperature of 86°F.

   Enter the chart at 70,000 pounds, proceed up to intercept the normal approach speed line at 175 KIAS and the normal landing speed schedule at 155 KIAS. Enter the temperature altitude chart at 86°F and 4500 feet, read up to intersect the 155 knot landing speed line. This determines the limit tailwind component to avoid exceeding tire limit speed as over 30 knots.

2. Determine final approach and landing speeds and limit tailwind for touchdown at 120,000 pounds, 4500 feet pressure altitude and 86°F ambient temperature. Enter the chart at 120,000 pounds gross weight, proceed up to intercept the final approach speed schedule at 235 KIAS and the heavy weight landing schedule line at 195 KIAS. Enter the temperature-altitude chart at 86°F, proceed horizontally to the 4500 foot line, read up to the intersection with the 195 knot landing speed line, and read 22 knots as the limit tailwind component.

LANDING GROUND ROLL DISTANCE

Normal Performance Landing Ground Roll Distance With Drag Chute

The normal performance landing ground roll distance with drag chute for dry and wet runways is shown in figures A2-12 and A2-13, respectively. Performance is given as a function of ambient temperature, pressure altitude and gross weight. Wind and slope effects are included. Standard landing technique assumes chute deploy switch actuation approximately 1 second after touchdown, chute fully deployed approximately 6 seconds after touchdown, and the nose down at 120 KIAS. Full braking pressure requires about 1 second after initial pedal depression. The chute is assumed to be jettisoned at 60 knots for the dry runway case and is retained to full stop for wet runway conditions.

Example:

For conditions of 86°F air temperature, 4500 feet pressure altitude and 70,000 pounds gross weight, find the normal performance landing ground roll distance with drag chute.

1. Enter figure A2-12 for the dry runway at the temperature and altitude condition, proceed horizontally to the gross weight and read downward to determine zero wind, zero slope ground roll distance of 4100 feet. For a headwind of 10 knots and a downhill slope of 1% the ground roll distance would be 3700 feet, as shown in the chart.

2. Applying the same procedure in the wet runway chart, figure A2-13, shows a zero wind, zero slope distance of 5950 feet. For the wind and slope case the distance would be 5300 feet.

Normal Performance Landing Ground Roll Distance Without Drag Chute

Normal performance landing ground roll distance for landing without chute is shown in figures A2-14 and A2-15 for dry and wet runways. Normal performance without chute assumes the same sequence of events as for landing with chute. The nose of the airplane is lowered at or before reaching 120 KIAS and brakes applied. In the no chute wet runway case it is assumed that one engine is shut down and anti-skid is turned off at start of braking.

Example:

Using the same conditions as in the landing with chute example, find the normal performance landing distance without drag chute.

1. For the dry runway case, enter figure A2-14 at the ambient temperature and pressure altitude conditions, proceed horizontally to the gross weight, then read downward to determine a zero wind, zero slope ground roll distance of 8500 feet. With wind and slope, the distance is 7900 feet as shown in the chart.

2. For a wet runway condition, the zero wind and slope distance is 13,800 feet, as shown in figure A2-15. The wind and slope distance is 13,100 feet.

Maximum Performance Landing Ground Roll Distance With Drag Chute

When using the minimum roll landing technique, distances with drag chute may be obtained in figures A2-16 and A2-17 for dry and wet runways, respectively. Performance is given as a function of temperature, pressure altitude, and gross weight. Wind and slope effects are included. Minimum roll technique assumes touchdown at 10 knots slower speed than normal. If touchdown is at speeds less than 190 knots, chute deployment is assumed to be initiated and the nose lowered as soon as the main gear touches. If at speeds over 190 knots, chute deployment and lowering the nose is delayed until 190 knots is reached. Brakes are applied as soon as the nose gear is on the ground. The chute is assumed jettisoned at 60 knots for the dry runway and is retained to full stop for the wet runway.

Example:

Using the same conditions as in the normal landing examples for 70,000 lb find the maximum performance landing distance with chute.

1. For the dry runway case, enter figure A2-16 at the ambient temperature and pressure altitude, proceed horizontally to the gross weight. Read downward to determine a zero wind, zero slope ground roll distance of 3600 feet. With wind and slope the distance is 3300 feet.

2. In the case of a wet runway, the zero wind, zero slope distance is 5500 feet as shown in figure A2-17. The wind and slope effect gives a distance of 4900 feet.

Maximum Performance Landing Ground Roll Distance Without Drag Chute

Maximum performance landing distances without drag chute are presented in figures A2-18 and A2-19 for dry and wet runways, respectively. The same sequence of events is assumed as for landings with the drag chute. A three second recognition time of chute failure is incorporated before shutdown of the right engine and turning anti-skid off for the wet runway landing.

Example:

Using the same conditions as used previously, find the maximum performance landing distance without chute.

1. For the dry runway case enter figure A2-18 at the ambient temperature and pressure altitude, proceed horizontally to the gross weight. Read downward to determine a zero wind, zero slope distance of 6450 feet. Continuing through the wind and slope corrections gives a distance of 5800 feet.

2. In the wet runway case, the zero wind and zero slope distance is 13,200 feet as shown in figure A2-19. With wind and slope, the distance is 12,600 feet, as shown in the chart.

A-12

TAKEOFF AND LANDING DATA CARD EXAMPLE

T.O. wt 120,000 Lb   Press alt 4500 Ft

Runway temp 86 °F   Wind (H)-T) 10 Kn

Grade 1 % (Up-(Dn))   Runway Dry - Wet

Acceleration check speed

@ 3000 ft (____ marker) 133 KIAS

Predicted ground run 7300 Feet

Rotation 190 KIAS

Takeoff ... 212 KIAS

Min single engine (gear down 0 wind) over 250 KIAS

Runway length available 12,000 Feet

Max refusal with chute (0 wind) 135 KIAS

Max braking with chute No Limit KIAS

Max refusal no chute (0 wind) 112 KIAS

Max braking no chute 123 KIAS

Runway available 12K Ft   Press alt 4500 Ft

Runway temp 86 °F   Wind (H--T) 0 Kn

Grade 0 % (Up-Dn)   Runway Dry - Wet

Fuel remaining	KIAS Approach	KIAS Land	Landing Roll* Chute	Landing Roll* No chute
15,000	175	155	4100	8500 Ft

Landing Immediately After Takeoff:

115,000 Lb	220	190	6200	11,400 Ft

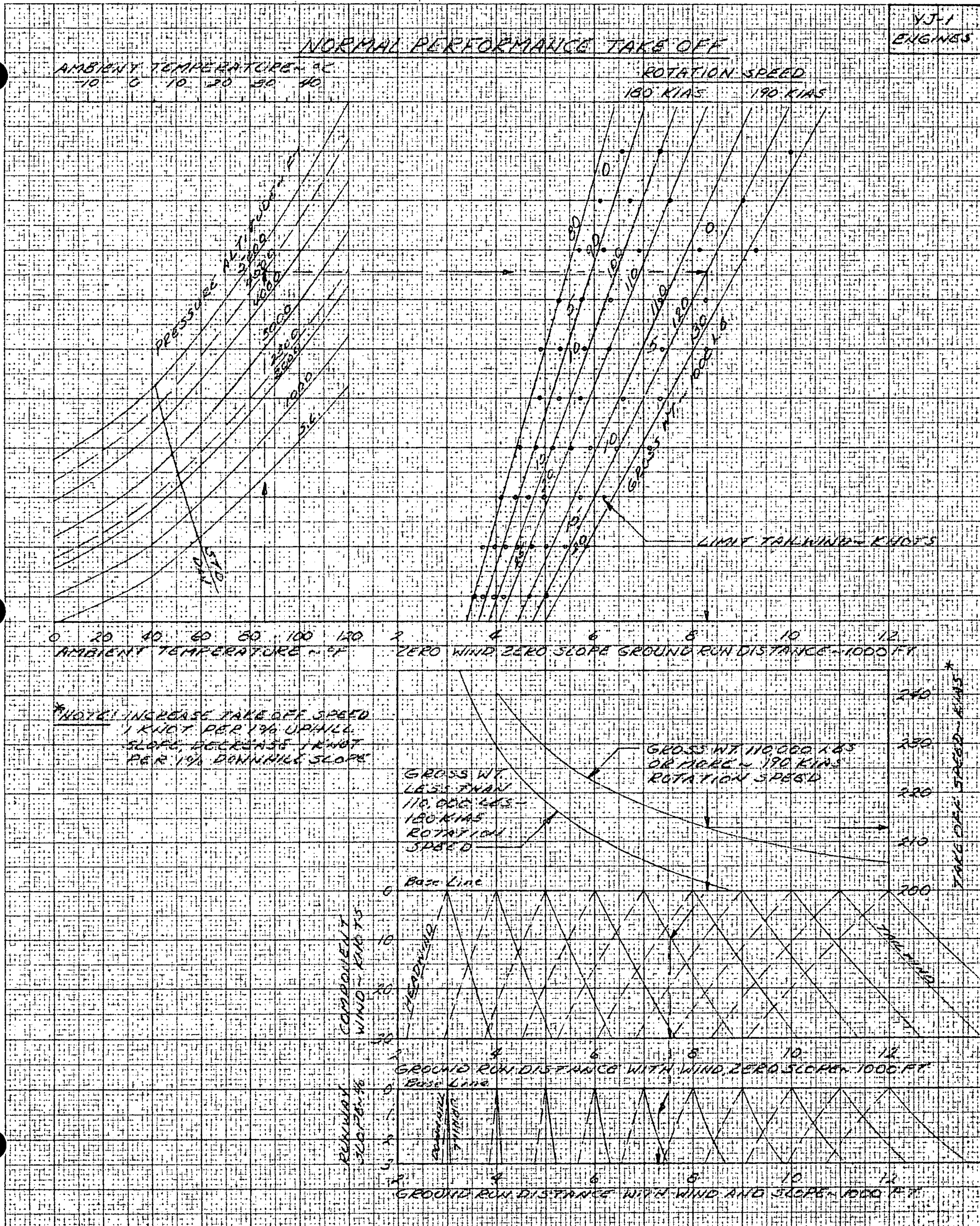
MAXIMUM BRAKING SPEEDS:

Fuel remaining	Chute	No chute
15,000 Lb	No Limit	158 KIAS

Landing Immediately After Takeoff:

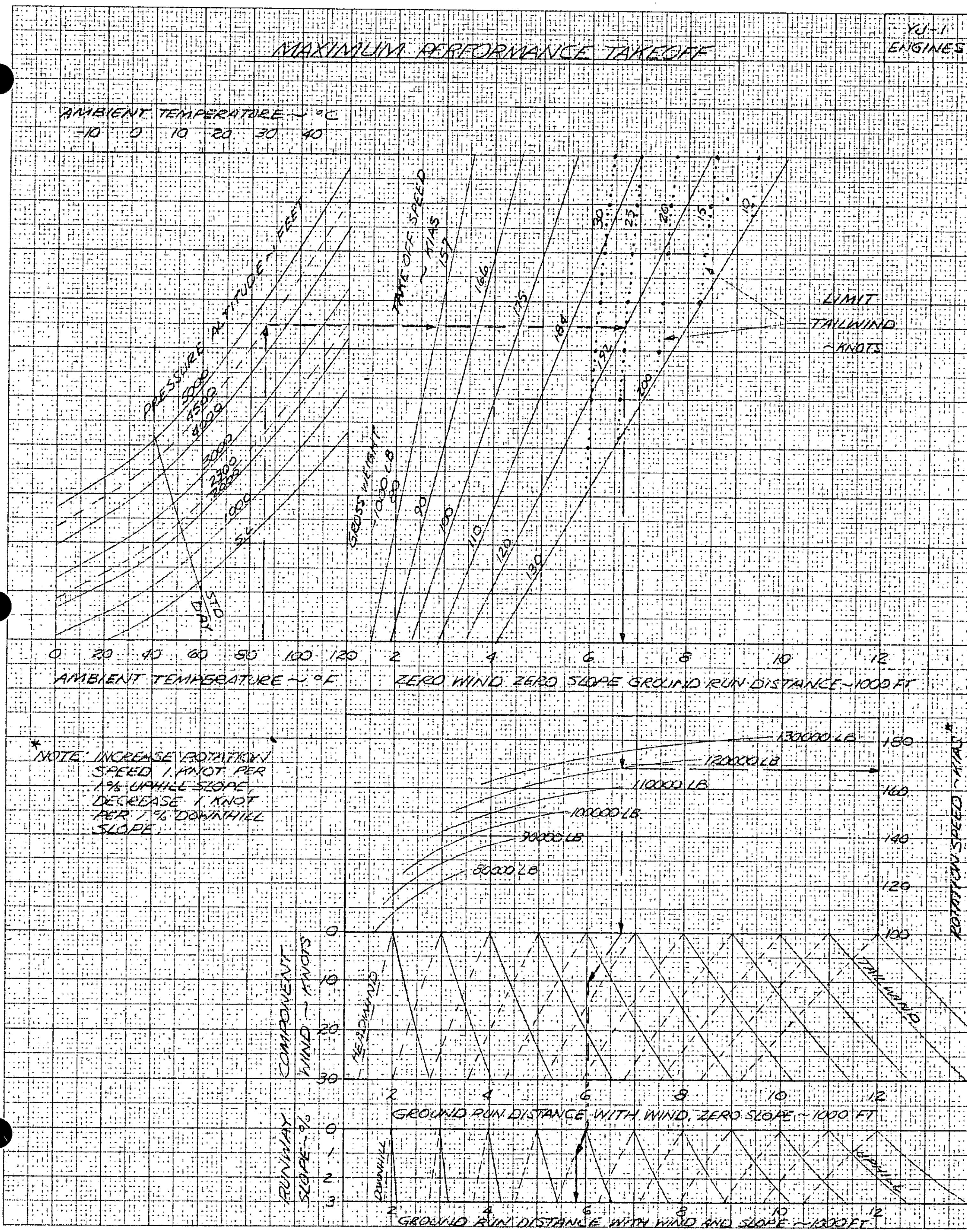
115,000 Lb	No Limit	115 KIAS

* ± 1% per knot head or tail wind component.



FORM 5278A

Figure A2-1



FORM 5278A

Figure A2-2

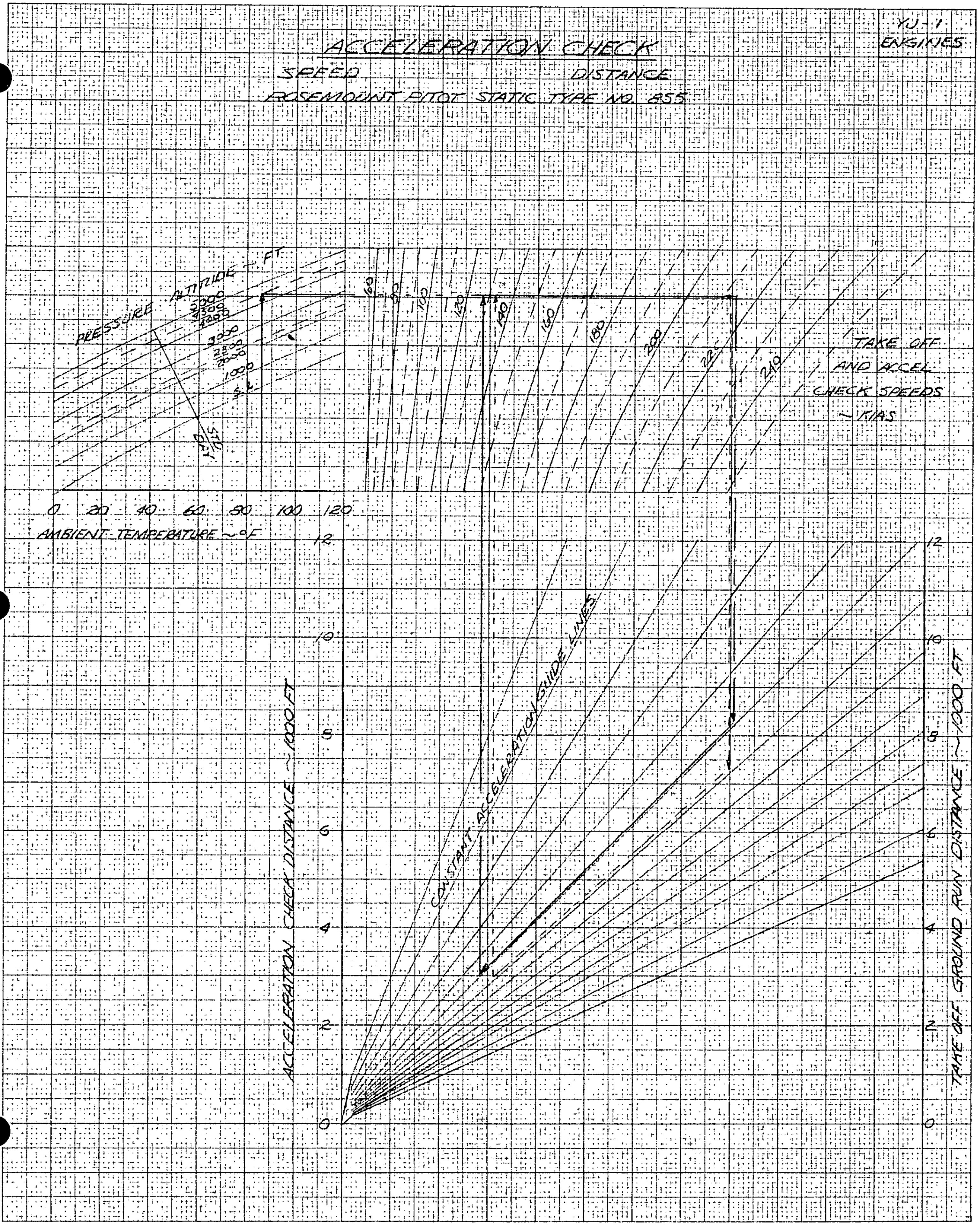

YJ-1
ENGINES
ACCELERATION CHECK
SPEED DISTANCE
ROSEMOUNT PITOT STATIC TYPE NO. 855
PRESSURE ALTITUDE ~ FT
STD DAY
0 20 40 60 80 100 120
AMBIENT TEMPERATURE ~ °F
60 80 100 120 140 160 180 200 220 240
TAKE OFF
AND ACCEL
CHECK SPEEDS
~ KIAS
CONSTANT ACCELERATION GUIDE LINES
ACCELERATION CHECK DISTANCE ~ 1000 FT
TAKE OFF GROUND RUN DISTANCE ~ 1000 FT
0 2 4 6 8 10 12

Figure A2-3

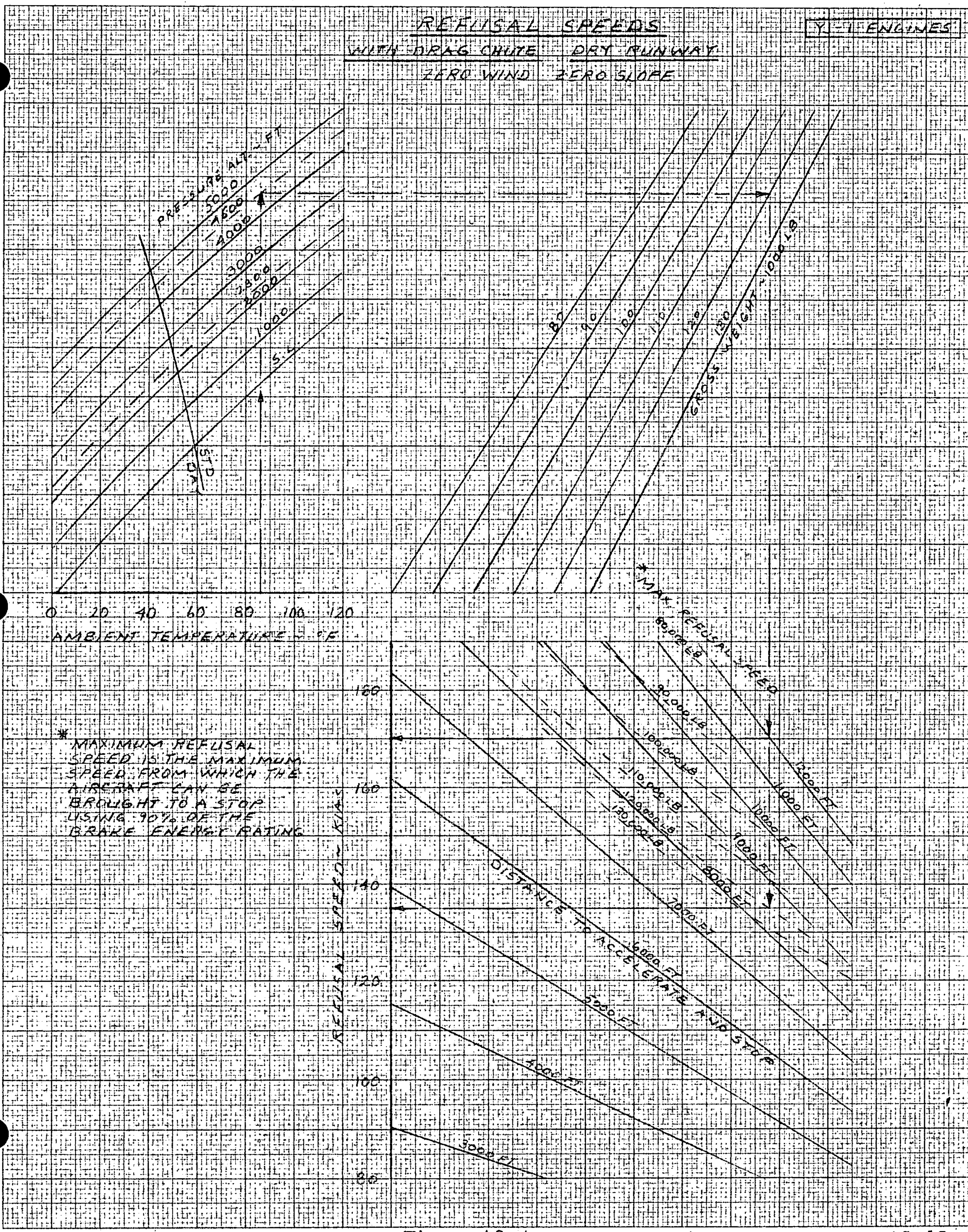

REFUSAL SPEEDS
WITH DRAG CHUTE DRY RUNWAY
ZERO WIND ZERO SLOPE
Y-1 ENGINES
PRESSURE ALT. - FT
5000
4000
3000
2000
1000
S.L.
STD DAY
0 20 40 60 80 100 120
AMBIENT TEMPERATURE ~ °F
GROSS WEIGHT ~ 1000 LB
80 90 100 110 120 130
*MAX REFUSAL SPEED
80,000 LB
90,000 LB
100,000 LB
110,000 LB
120,000 LB
130,000 LB
DISTANCE TO ACCELERATE AND STOP
12000 FT
11000 FT
10000 FT
9000 FT
8000 FT
7000 FT
6000 FT
5000 FT
4000 FT
3000 FT
REFUSAL SPEED ~ KIAS
180
160
140
120
100
80
* MAXIMUM REFUSAL SPEED IS THE MAXIMUM SPEED FROM WHICH THE AIRCRAFT CAN BE BROUGHT TO A STOP USING 90% OF THE BRAKE ENERGY RATING

Figure A2-4

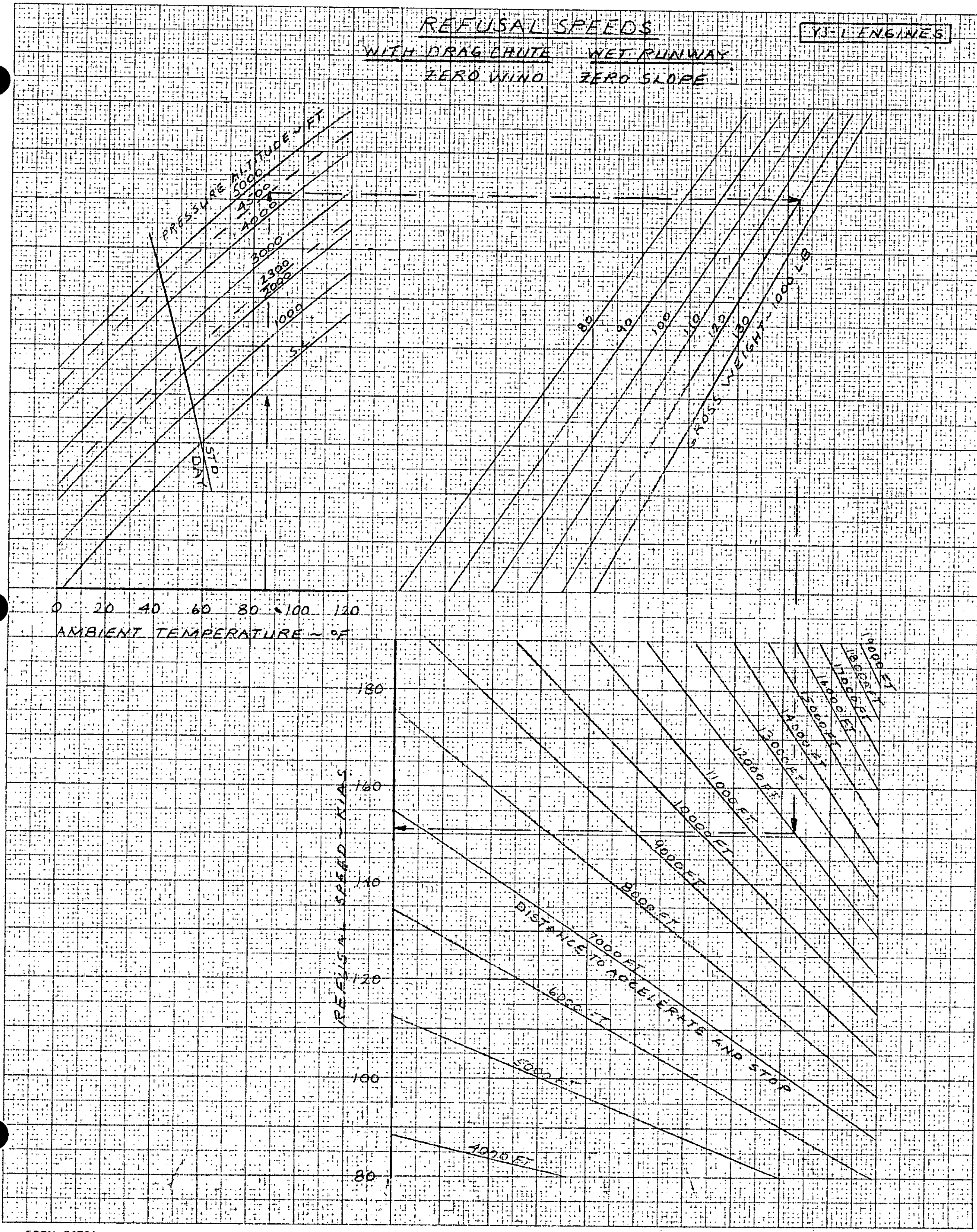

REFUSAL SPEEDS
WITH DRAG CHUTE   WET RUNWAY
ZERO WIND   ZERO SLOPE
YJ-1 ENGINES
PRESSURE ALTITUDE ~ FT
5000
4500
4000
3000
2300
2000
1000
SL
STD DAY
0 20 40 60 80 100 120
AMBIENT TEMPERATURE ~ °F
80
90
100
110
120
130
GROSS WEIGHT ~ 1000 LB
REFUSAL SPEED ~ KIAS
180
160
140
120
100
80
19000 FT
18000 FT
17000 FT
16000 FT
15000 FT
14000 FT
13000 FT
12000 FT
11000 FT
10000 FT
9000 FT
8000 FT
7000 FT
6000 FT
5000 FT
4000 FT
DISTANCE TO ACCELERATE AND STOP

Figure A2-5

PREPARED BY
DATE
CHECKED BY

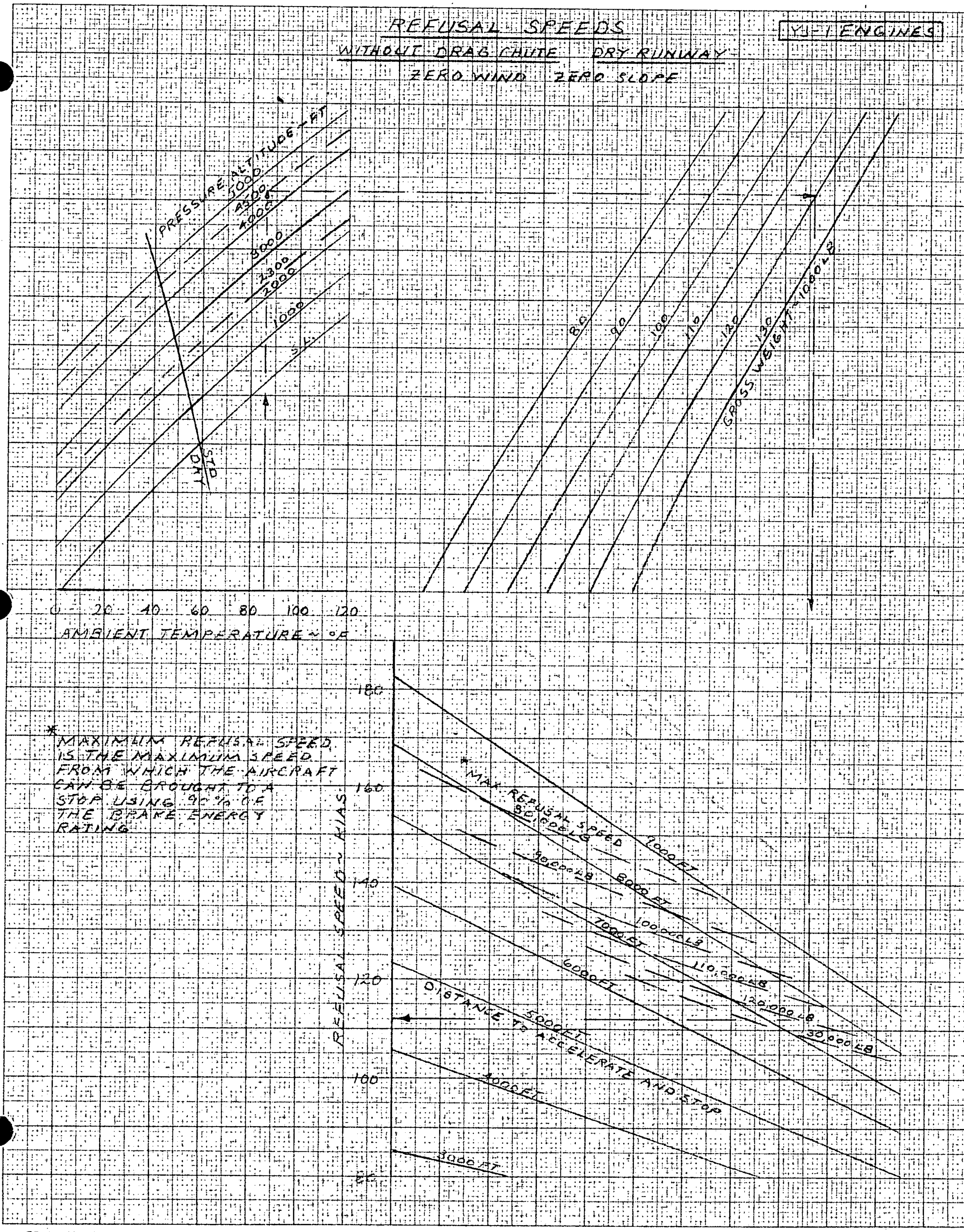


Figure A2-6

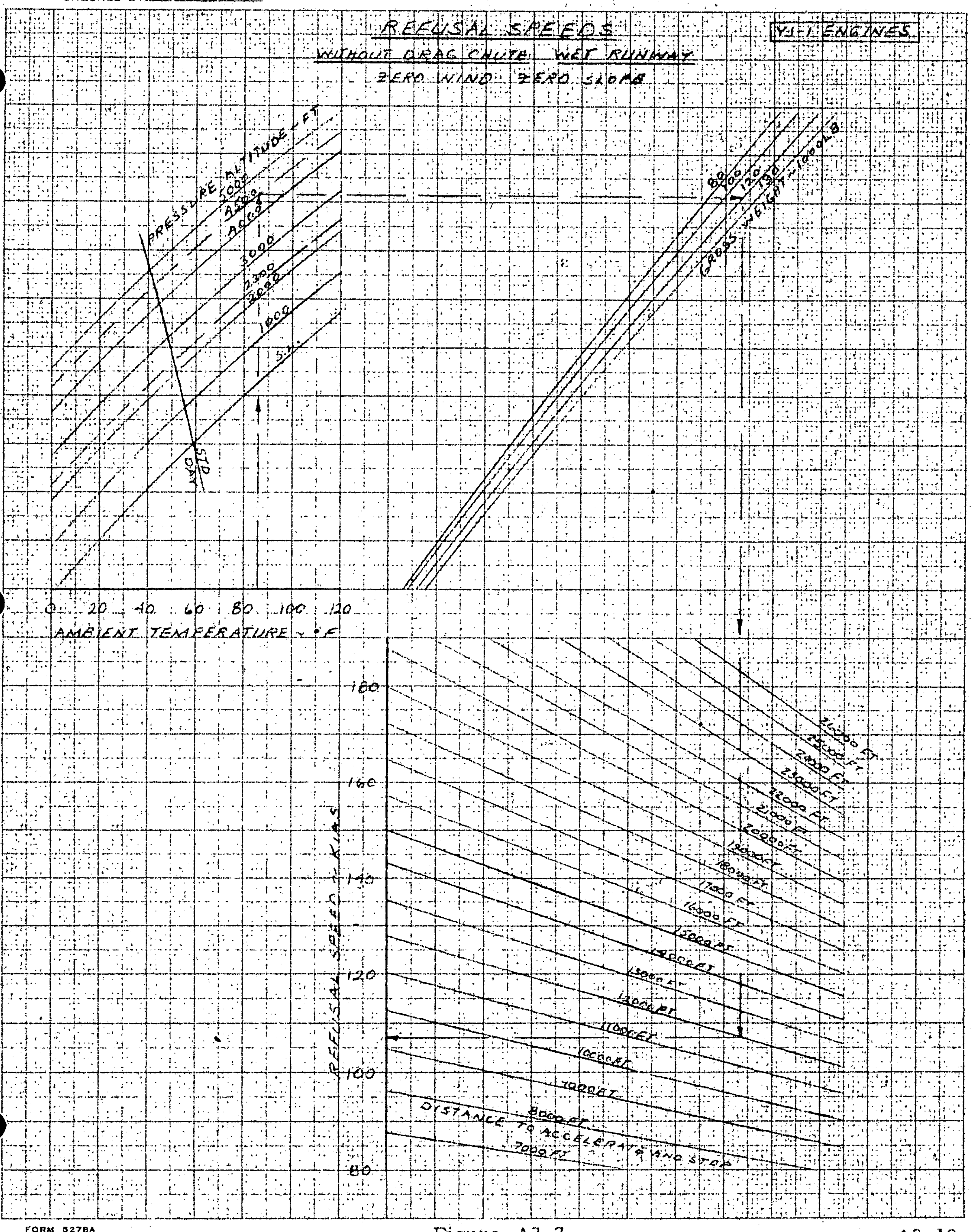

REFUSAL SPEEDS
WITHOUT DRAG CHUTE WET RUNWAY
ZERO WIND ZERO SLOPE
YJ-1 ENGINES
PRESSURE ALTITUDE - FT
5000
4500
4000
3000
2500
2000
1000
S.L.
STD DAY
80
100
120
140
GROSS WEIGHT ~ 1000 LB
0
20
40
60
80
100
120
AMBIENT TEMPERATURE ~ °F
180
160
140
120
100
80
REFUSAL SPEED ~ KIAS
26000 FT
25000 FT
24000 FT
23000 FT
22000 FT
21000 FT
20000 FT
19000 FT
18000 FT
17000 FT
16000 FT
15000 FT
14000 FT
13000 FT
12000 FT
11000 FT
10000 FT
9000 FT
8000 FT
7000 FT
DISTANCE TO ACCELERATE AND STOP

Figure A2-7

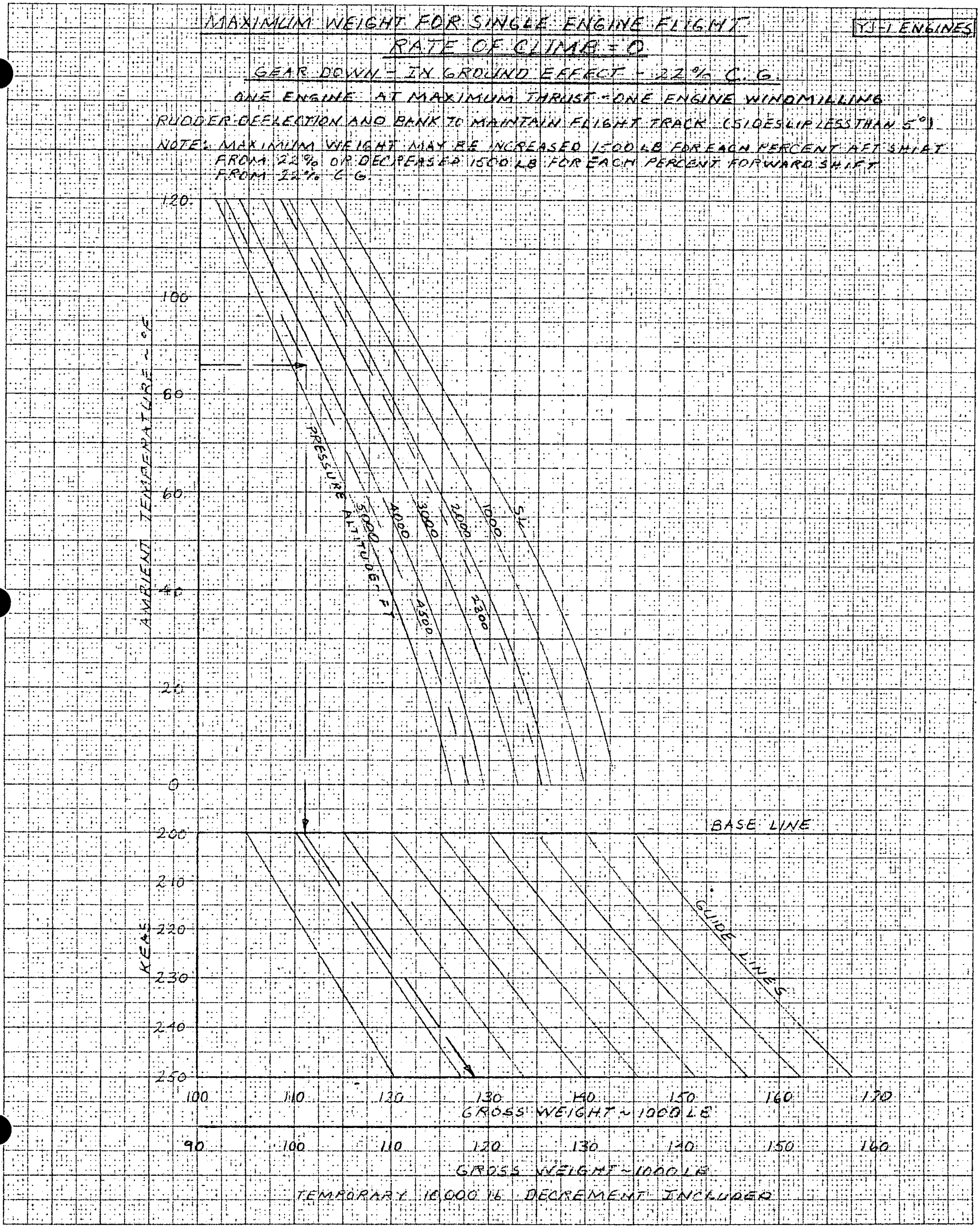
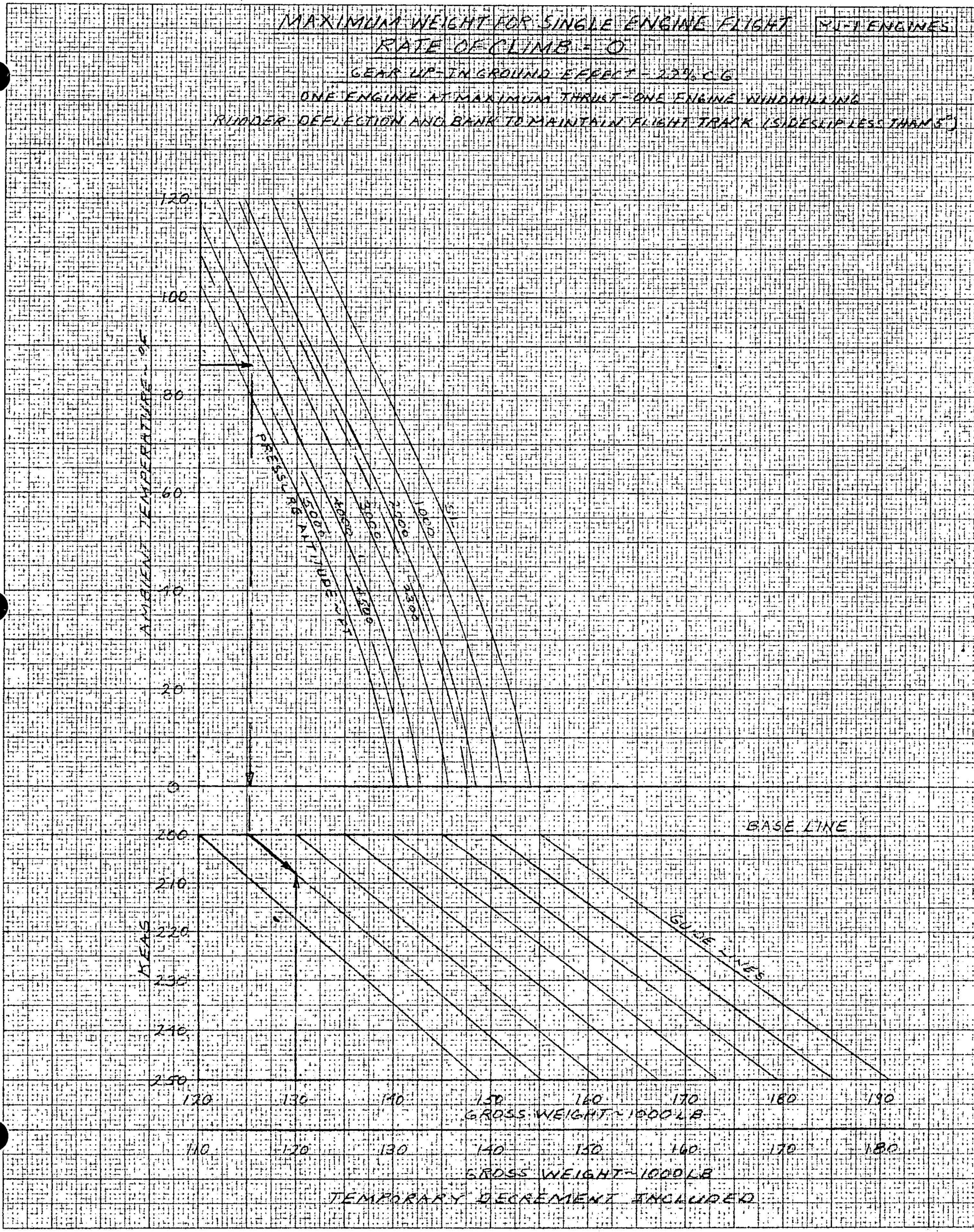

MAXIMUM WEIGHT FOR SINGLE ENGINE FLIGHT
RATE OF CLIMB = 0
GEAR DOWN - IN GROUND EFFECT - 22% C.G.
ONE ENGINE AT MAXIMUM THRUST - ONE ENGINE WINDMILLING
RUDDER DEFLECTION AND BANK TO MAINTAIN FLIGHT TRACK (SIDESLIP LESS THAN 5°)
NOTE: MAXIMUM WEIGHT MAY BE INCREASED 1500 LB FOR EACH PERCENT AFT SHIFT FROM 22% OR DECREASED 1500 LB FOR EACH PERCENT FORWARD SHIFT FROM 22% C.G.
YJ-1 ENGINES
AMBIENT TEMPERATURE ~ °F
120
100
80
60
40
20
0
PRESSURE ALTITUDE FT
5000
4000
3000
2000
1000
SL
4500
2500
BASE LINE
KEAS
200
210
220
230
240
250
GUIDE LINES
100
110
120
130
140
150
160
170
GROSS WEIGHT ~ 1000 LB
90
100
110
120
130
140
150
160
GROSS WEIGHT ~ 1000 LB
TEMPORARY 16,000 [illegible] DECREMENT INCLUDED

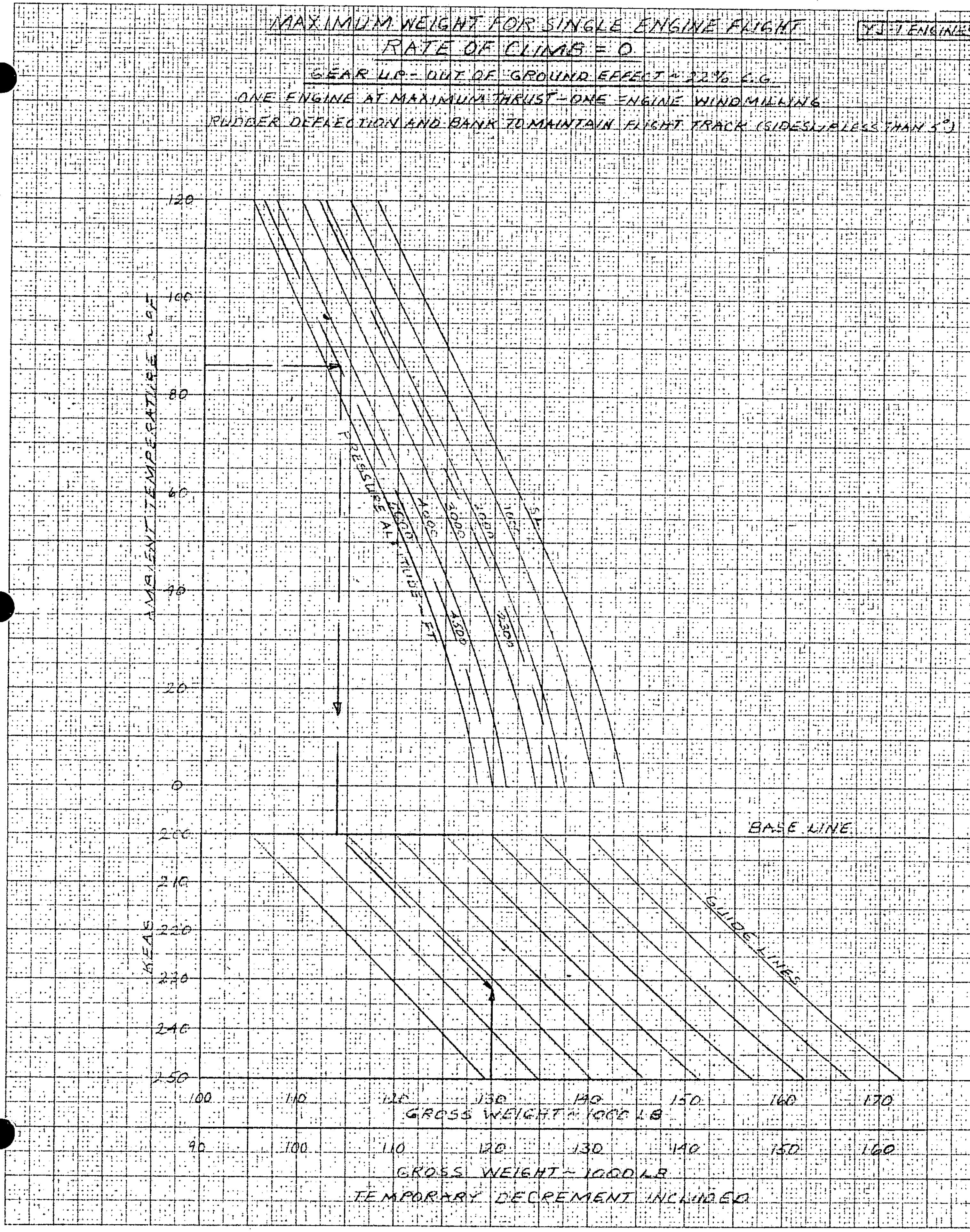
Figure A2-8



FORM 5278A

Figure A2-9

PREPARED BY
DATE
CHECKED BY



FORM 5278A

Figure A2-10

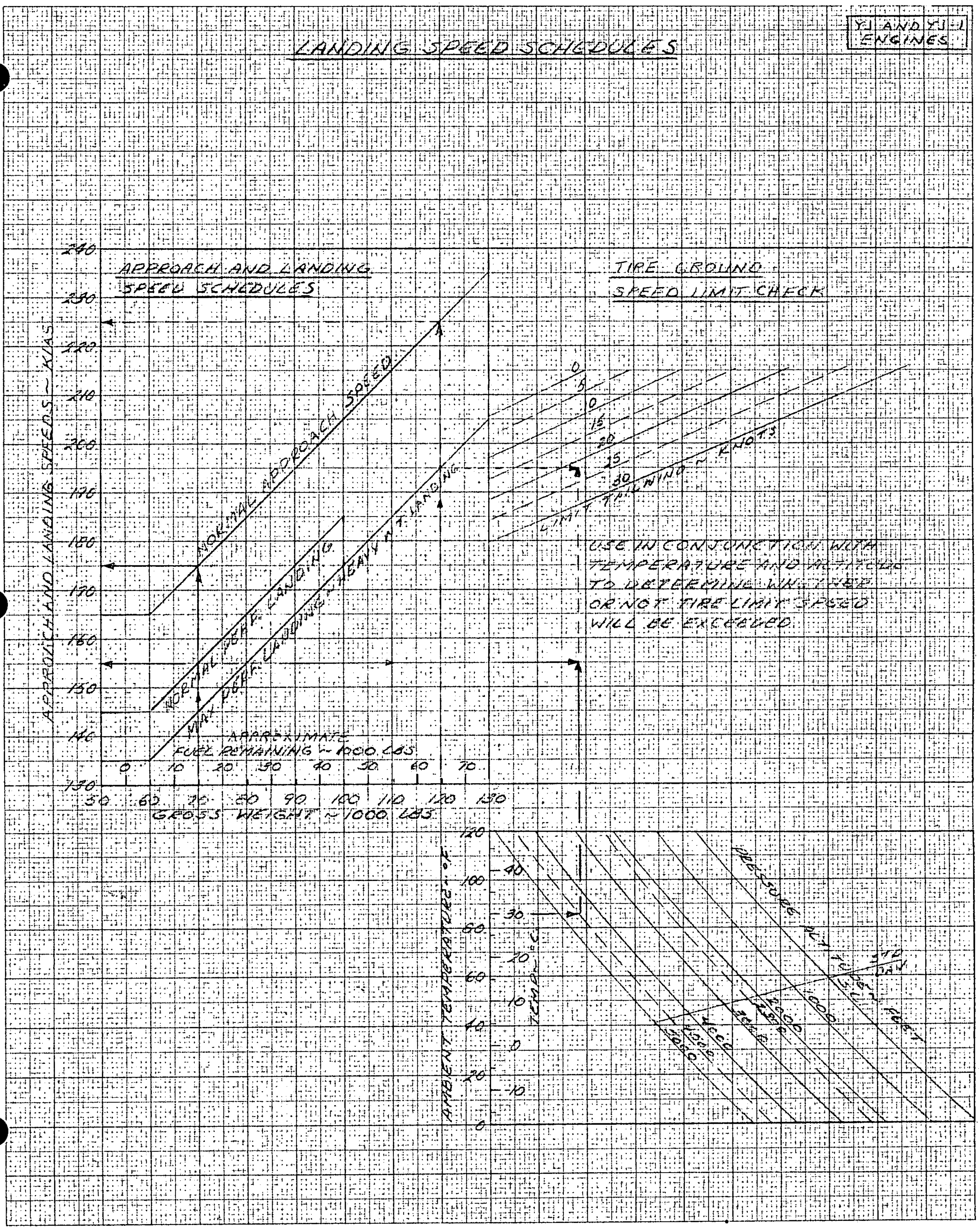

YJ AND YJ-1 ENGINES
LANDING SPEED SCHEDULES
APPROACH AND LANDING SPEED SCHEDULES
TIRE GROUND SPEED LIMIT CHECK
APPROACH AND LANDING SPEEDS ~ KIAS
NORMAL APPROACH SPEED
NORMAL PERF. LANDING
MAX PERF. LANDING ~ HEAVY WT. LANDING
APPROXIMATE FUEL REMAINING ~ 1000 LBS
GROSS WEIGHT ~ 1000 LBS
LIMIT TAILWIND ~ KNOTS
USE IN CONJUNCTION WITH TEMPERATURE AND ALTITUDE TO DETERMINE WHETHER OR NOT TIRE LIMIT SPEED WILL BE EXCEEDED
AMBIENT TEMPERATURE ~ °F
TEMP. °C
PRESSURE ALTITUDE ~ FEET
STD DAY

Figure A2-11

PREPARED BY__________
DATE__________
CHECKED BY__________

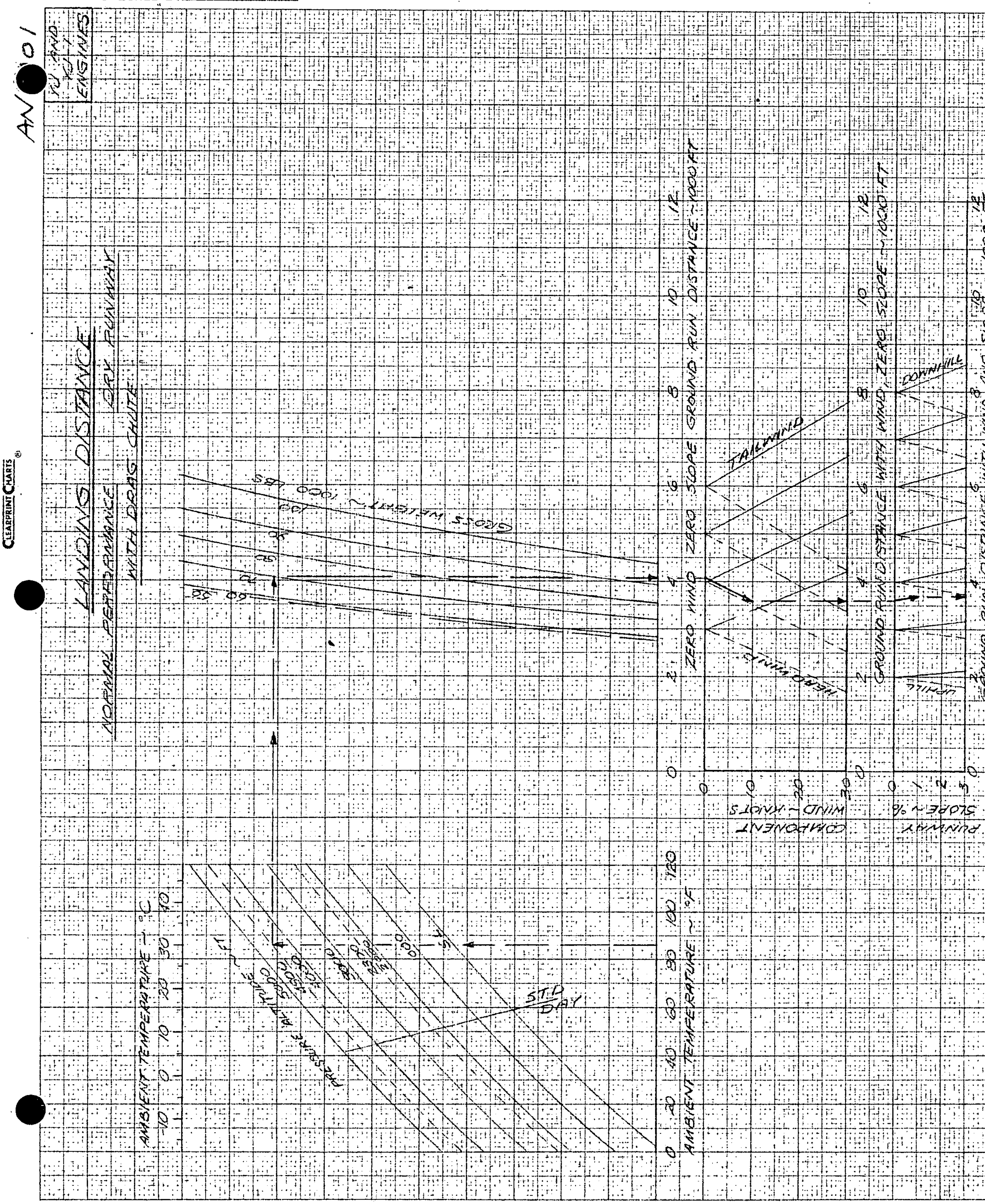


Figure A2-12

PREPARED BY
DATE
CHECKED BY

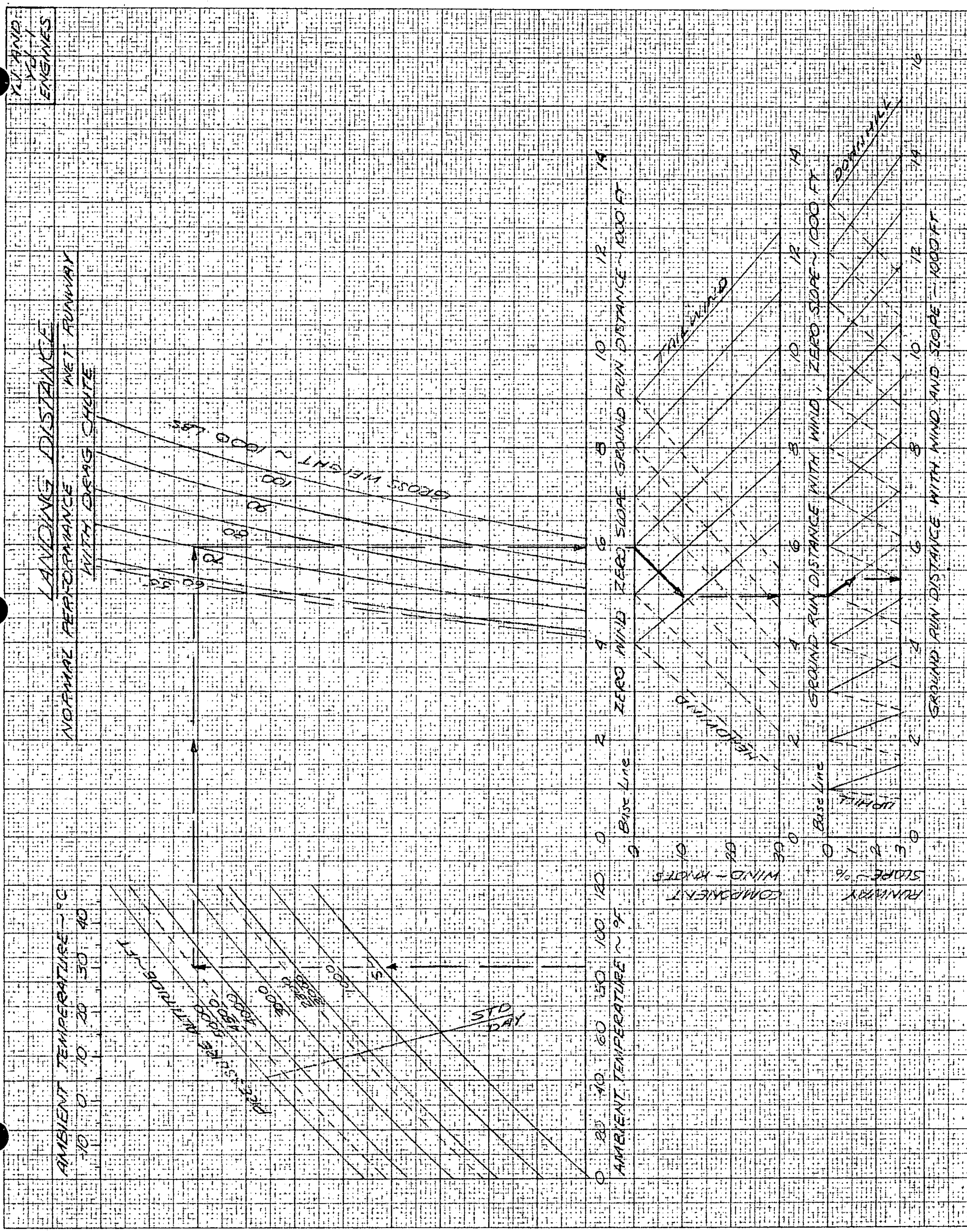
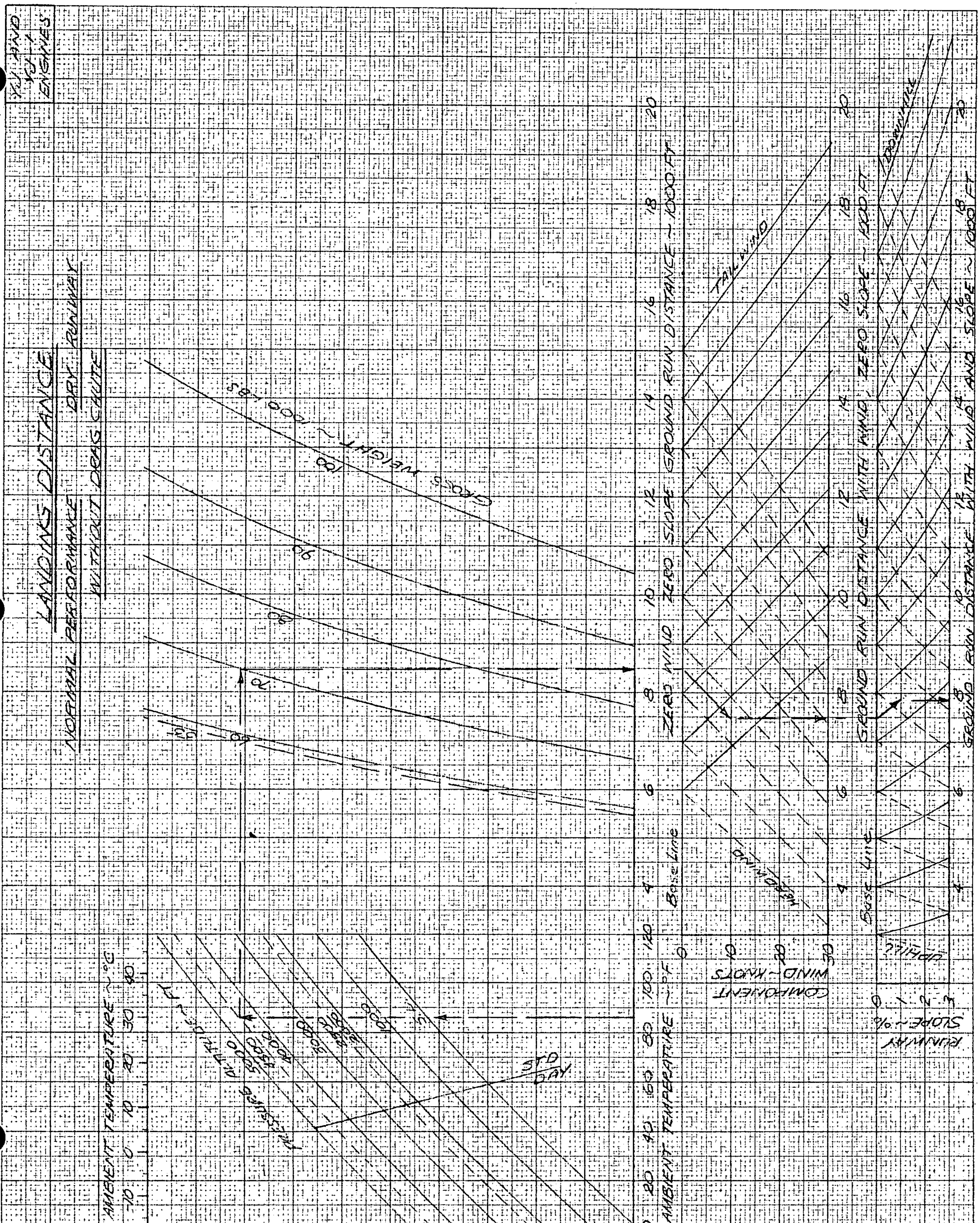


Figure A2-13

PREPARED BY
DATE
CHECKED BY



FORM 5278A

Figure A2-14

PREPARED BY
DATE
CHECKED BY

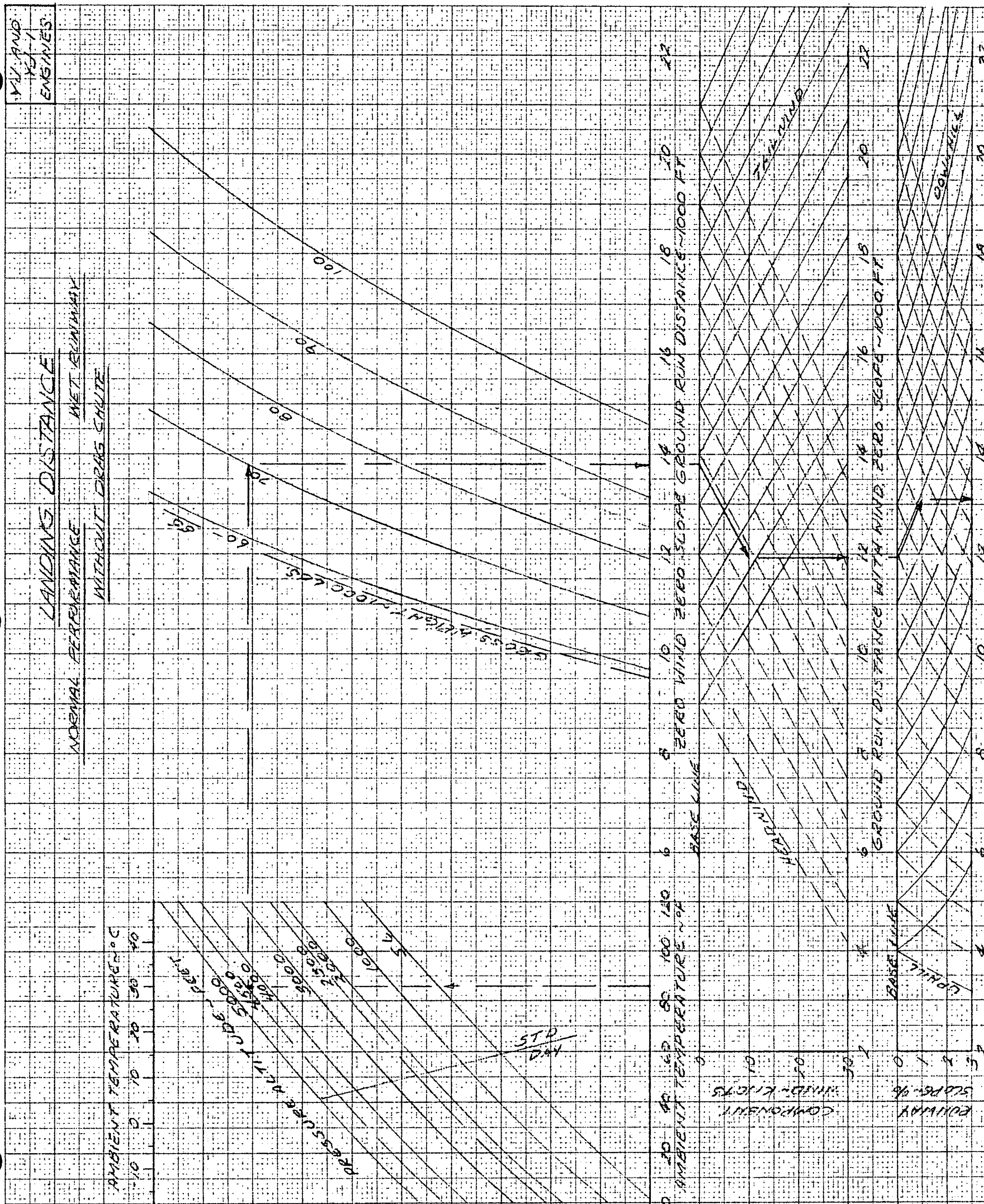
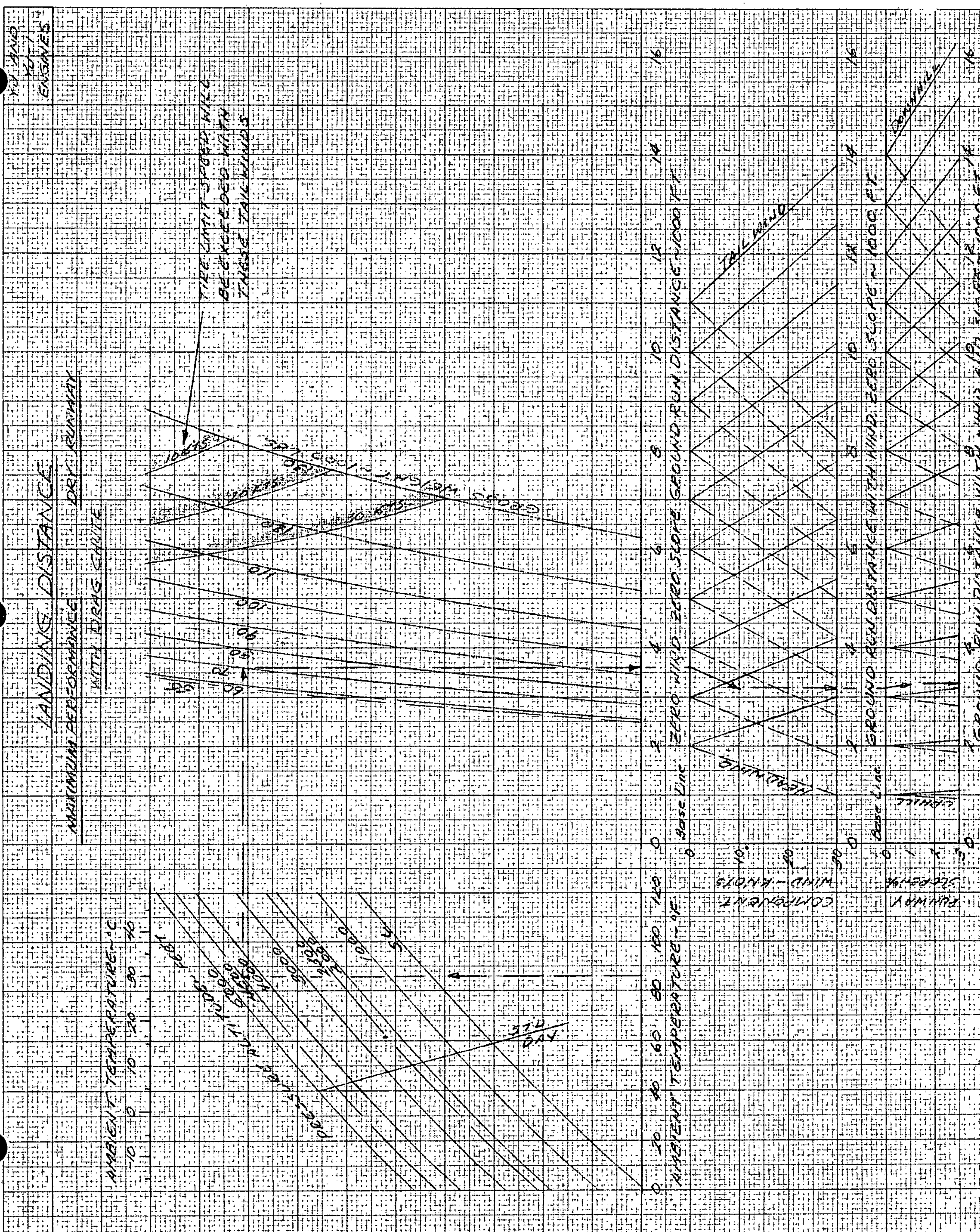


Figure A2-15

PREPARED BY
DATE
CHECKED BY

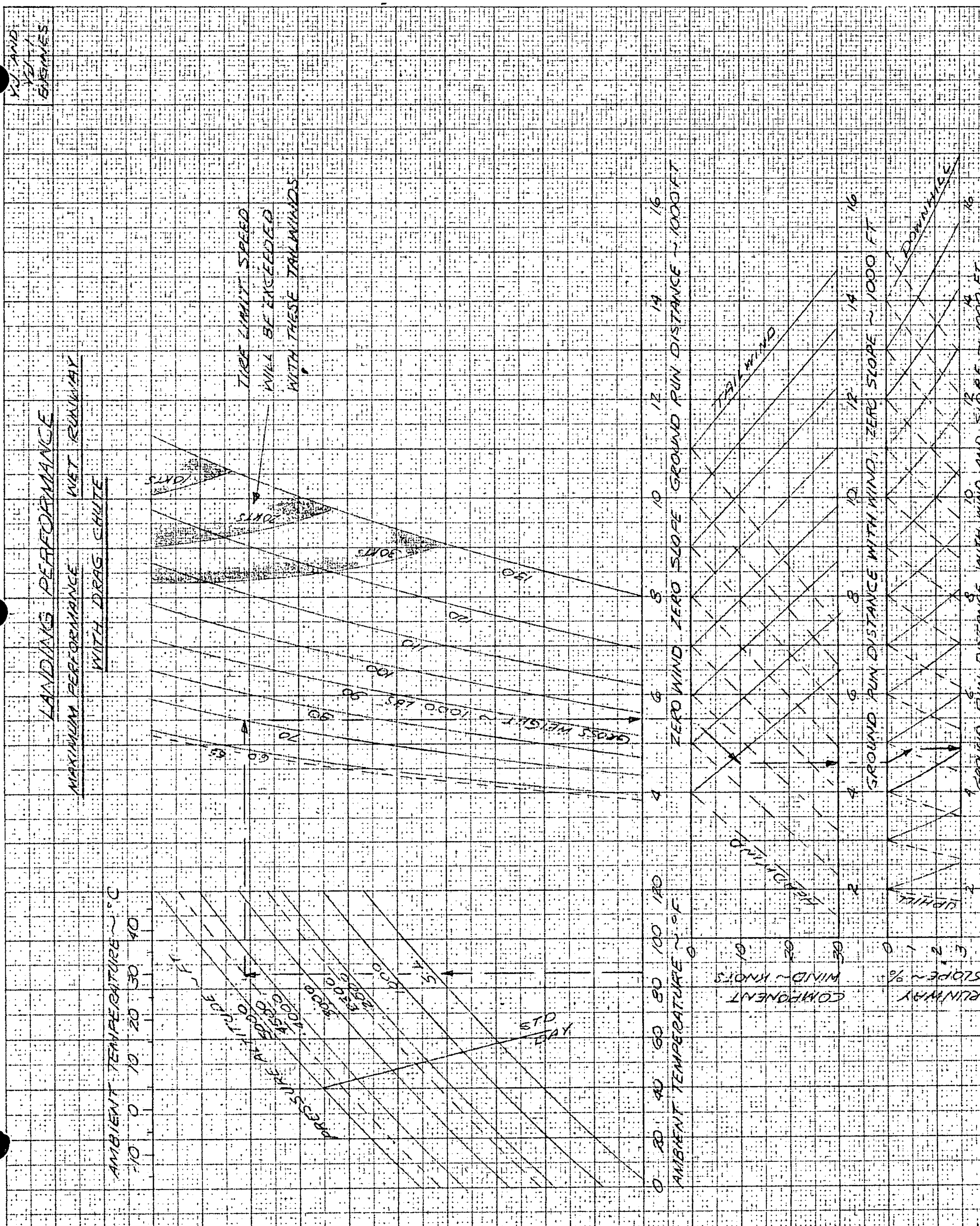
AM001



FORM 5278A

Figure A2-16

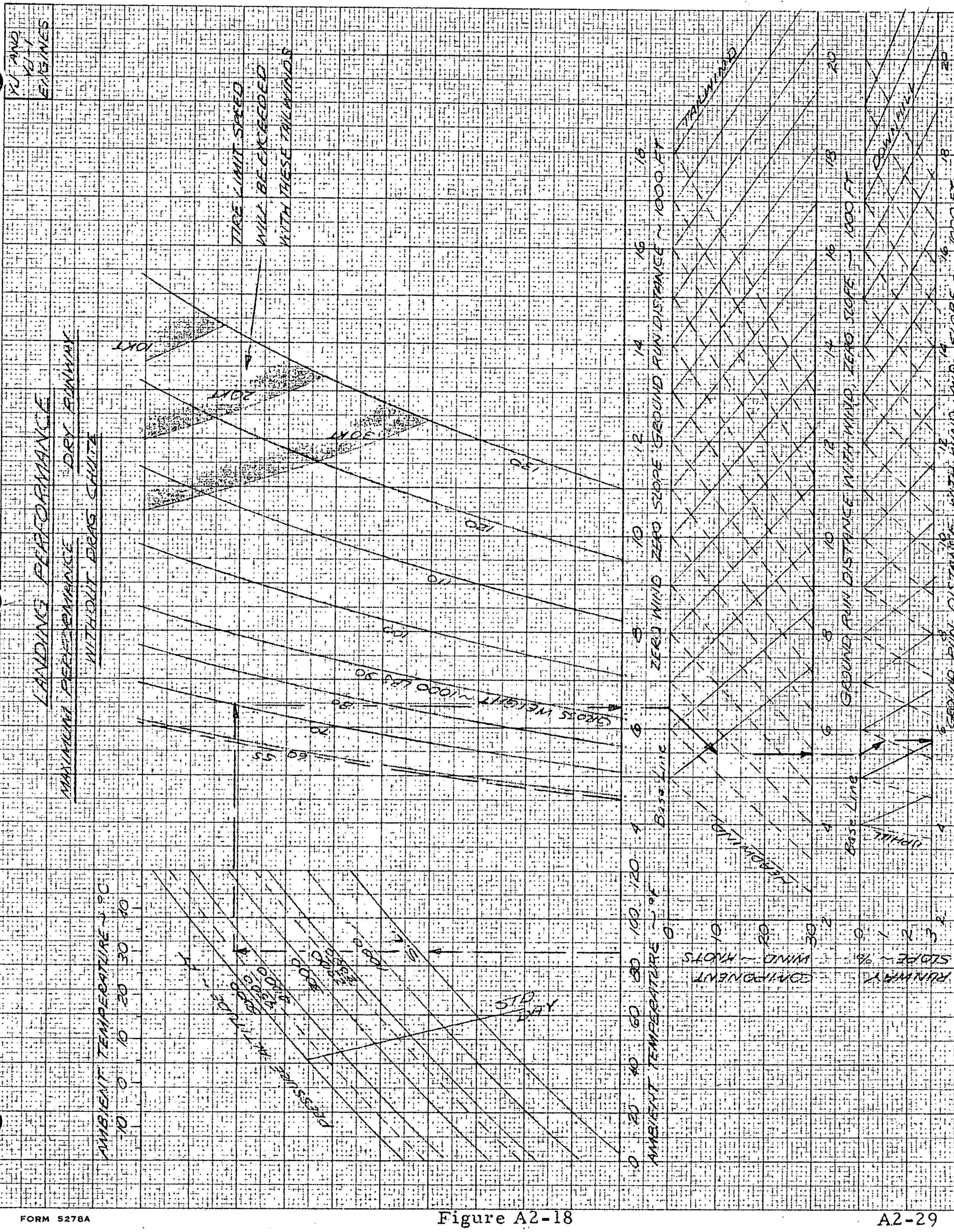
PREPARED BY
DATE
CHECKED BY



FORM 5278A

Figure A2-17

AM 101



FORM 5278A

Figure A2-18

PREPARED BY
DATE
CHECKED BY

AM 111

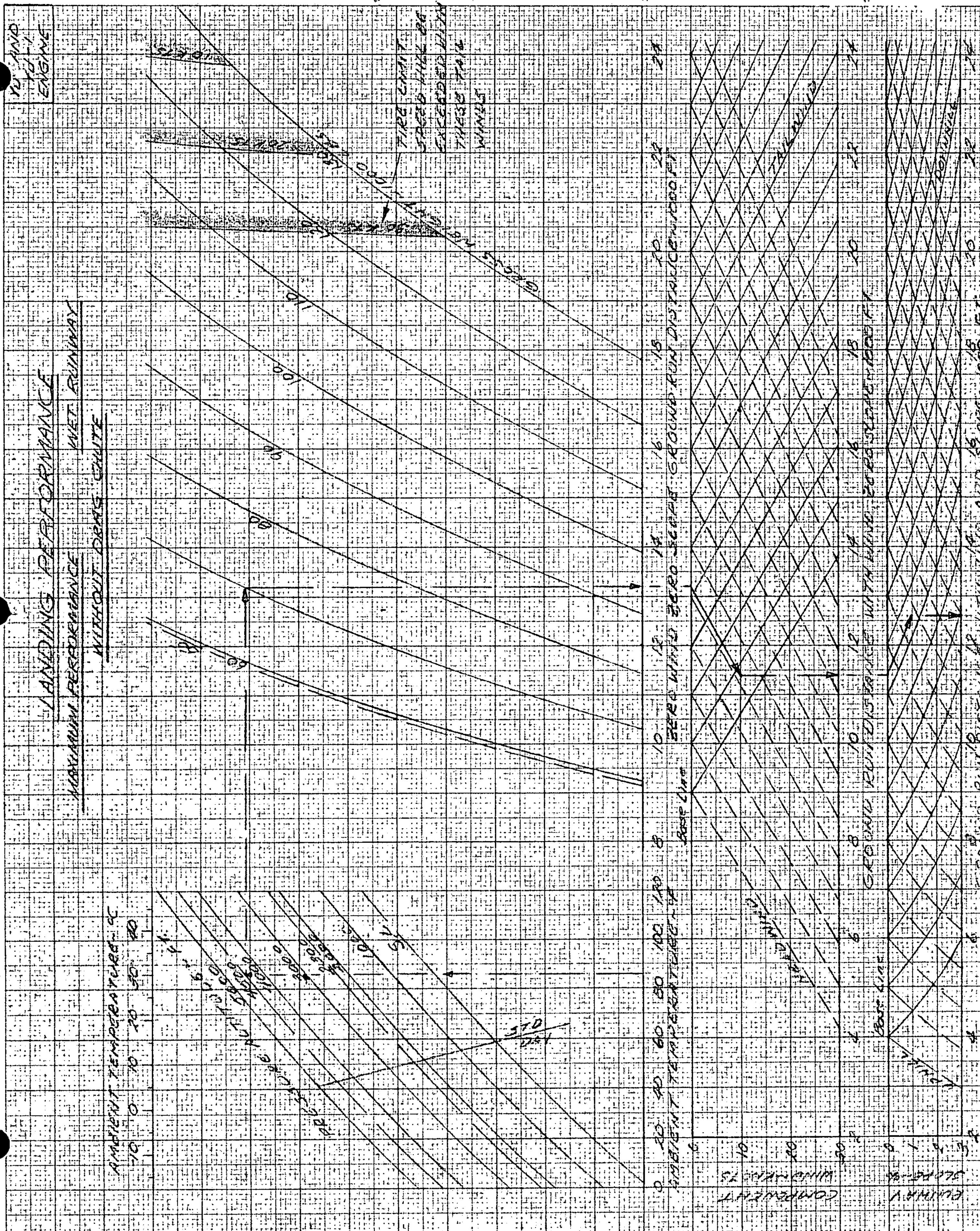


Figure A2-19

FORM 5278A

PART III

CLIMB AND DESCENT PERFORMANCE

List of Illustrations

NORMAL CLIMB PERFORMANCE

Figures A3-1 through A3-12 present normal performance to cruise altitudes for supersonic operation with 1956 ARDC Atmosphere and "MEAN TROPIC" Atmospheric conditions, respectively. The data is computed from results of Flight Test and Operational Testing with YJ-1 engines. The climb is segmented in three phases and includes the effects of varying gross weights and air temperatures on fuel used, time, and distance. Phase I is the subsonic portion of the climb from brake release at sea level to 38,000 feet and 0.90 Mach. Corrections for time, fuel, and distance are listed in the chart for takeoffs from other field elevations. Phase IA is the subsonic portion of the climb from various refuel altitudes to 38,000 feet and 0.90 Mach. Phase II is the transonic acceleration portion of the climb from 38,000 feet and 0.90 Mach to 30,000 feet and 1.25 Mach utilizing the "dive through" technique. Phase III is the supersonic portion of the climb from 30,000 feet and 1.25 Mach to the altitude at which cruise Mach number is first attained. Phase IIIA is the constant Mach portion of the climb from the end of Phase III to the altitude for start of cruise. The following is a tabulation of the average results of flight tests for Phase IIIA.

Cruise Profile Scheduled	Avg. R/C FPM	Power	Avg. Total Fuel Flow Lb/Min.
Long Range	2500	Cruise	666 (20,000/ PPH/eng)
High Altitude	4000	Max AB	900 (27,000/ PPH/eng)

Example (1):

Obtain the time, distance, and fuel required from brake release for takeoff at a field elevation of 4500 feet to 3.10 Mach and 73,000 feet for a standard day. Fuel load at brake release is 64,000 lb after subtracting ground fuel allowances for normal ground operation. (See Appendix, Part II, for ground allowance computation procedure.) Find the initial gross weight at brake release by adding the zero fuel weight and the fuel load remaining. If the zero fuel weight is 55,150 pounds, the initial gross weight is 119,150 pounds.

Enter figure A3-1 at the initial gross weight at brake release and read fuel used, time and distance for Phase I as 7800 pounds, 6.47 minutes, and 48.6 nautical miles, respectively.

From the table in table in figure A3-1 for the 4500 foot field elevation, reduce time, fuel, and distance by 0.30 minutes, 500 pounds, and 1.6 nautical miles. Therefore, fuel used, time, and distance for Phase I are 7300 lb (7800-500), 6.17 min. (6.47-0.30), and 47.0 nmi (48.6 - 1.6). Recompute the gross weight at the end of Phase I climb as 111,850 pounds (119,150 - 7300). Enter figure A3-3 at the recomputed gross weight and read fuel used, time and distance for Phase II as 1420 pounds, 1.20 minutes and 12.2 nautical miles. Summation of Phase I and Phase II results in the fuel used, time, and distance to the start of Phase III as 8720 pounds (7300 + 1420), 7.37 minutes (6.17 + 1.20), and 59.2 nautical miles (47.0 + 12.2). The recomputed gross weight for entering Phase III will be 110,430 pounds (119,150 - 8720). Enter figure A3-5 with the recomputed gross weight and at 73,000 feet and Mach 3.10, read fuel used, time, and distance for Phase III as 13,500 pounds, 9.9 minutes, and 205.6 nautical miles, respectively. Add all three phases and obtain fuel used, time, and distance as 22,200 pounds, 17.3 minutes, and 265 nautical miles, respectively. Fuel remaining at 73,000 feet is 41,800 pounds (64,000 - 22,200).

Service allowances and/or allowances for deviations from the normal climb schedule can be applied to an affected phase when required. (For example, a subsonic cruise operation prior to reaccelerating might be schedule in the flight plan.) The effect of such an allowance must be accounted for when computing the initial weight to be used for the next phase of the climb.

Example (2):

Obtain the MEAN TROPIC day time, distance, and fuel required from refuel at 29,000 feet to 0.90 Mach at 38,000 feet (start of Phase II). Enter fig. A3-8 at 29,000 feet and read fuel used, time, and distance for Phase IA as 3740 pounds, 3.60 minutes, and 31.6 nautical miles, respectively. The recomputed gross weight for entering Phase II will be 118,710 pounds (122,450 - 3740).

PHASE III CLIMB WITH TURNS

Turns during climb are not recommended, however, if mission requirements include a turn, compensation for range lost due to the turn must be included in the flight plan. For example, consider a 45° heading change with a 30° bank at an initial altitude of 45,000 feet.

To minimize the rate of climb loss due to turning, the recommended procedure is to advance power to Maximum A/B during the turn and maintain the speed schedule of 450 KEAS. Resume the normal climb procedure on completion of the turn.

Comparison of straightaway climb and turning climb on time, fuel and distance results in an overall range loss of 32 miles for a Mach 3.20 profile. On completion of the 45° turn, at 49,000 feet; time, fuel and distance to that altitude will be 0.35 min, 730 lb, and 6.4 mi greater than for a normal climb with no turn.

MILITARY THRUST CLIMB PERFORMANCE

Figures A3-13 thru A3-16 present Military climb performance for a schedule of 300 knots equivalent airspeed (KEAS) while below 33,300 feet and 0.90 Mach number when higher altitudes are attained. This power and speed schedule provides the most climb distance for the fuel consumed when subsonic cruising flight plans, such as for ferry or buddy missions, are used.

Example (1):

Find the time, distance and fuel required to climb to 30,000 feet from S. L. on a std -10°C day with an initial gross weight of 105,000 lb. Enter figure A3-13 at 30,000 ft, and at 105,000 lb initial gross weight read 8.5 min, 56.6 miles and 4200 lbs. Adding takeoff allowances results in time, distance and fuel values of 9.4 min. (8.5 + 0.9), 59.2 miles (56.6 + 2.6) and 6000 lb (4200 + 1800) for climb from sea level to 30,000 feet.

Example (2):

Find the time, distance and fuel required to climb to 30,000 feet from 4500 foot takeoff on a std day with an initial gross weight of 105,000 pounds. Enter figure A3-14 at 4500 feet and at 105,000 pound initial gross weight; read 0.4 min, 3.8 miles and 550 pounds. Reenter figure A3-14 at 30,000 feet and an adjusted initial gross weight of 105,550 pounds; read 8.6 min, 58.0 miles and 4300 pounds. Adding takeoff allowances and subtracting values for climb from sea level to 4500 feet results in time, distance and fuel values of 9.1 min (8.6 + .9 - .4), 56.8 miles (58.0 + 2.6 - 3.8) and 5550 pounds (4300 + 1800 - 550) for climb from takeoff at 4500 to 30,000 feet.

TWO ENGINE DESCENT PERFORMANCE

On course descent performance is shown on figures A3-17, A3-18, and A3-19. Figure A3-17 presents descent performance for the normal 300 KEAS schedule. Figures A3-18 and A3-19 present 350 KEAS descent performance with forward bypass doors in the automatic and open positions respectively.

SINGLE ENGINE DESCENT PERFORMANCE

Single Engine Descent data is presented for Military, Minimum afterburning and Maximum afterburning power at 300, 350 and 400 KEAS with 1956 ARDC and Mean Tropic Atmosphere conditions. Refer to figures A3-20 through A3-23B.

Allowances For Deceleration To Descent Speed:

When cruising at a higher KEAS than the desired descent schedule, the constant altitude deceleration is made at the same power setting as the constant KEAS descent. The constant Mach lines show the beginning point of the deceleration for each Mach number. In the situation where the cruise KEAS is less than the desired descent KEAS, the constant Mach descent is made with Maximum afterburning power. The constant Mach lines show the descent for different Mach numbers.

Comparison Of Descent Power and Speed Schedules:

The Maximum afterburning descent, as compared to the Minimum afterburning and Military power descents, results in a longer distance, a longer elapsed time and more fuel used. The 400 KEAS descent as compared to the 350 and 300 KEAS descents results in a slightly longer distance, less elapsed time and more fuel used. Maximum overall range results if a descent speed of 300 KEAS is used and if Military power is used in the descent and for cruise. There will be little overall range loss if either Minimum afterburning or Maximum afterburning descent power is used as long as the cruise is accomplished in Military power. The charts are indexed to an altitude of 50,000 feet so that a technique of power or airspeed change can be used and the resultant effect after power change in performance can be determined. The effect of changing KEAS at the indexed 50,000 feet has not been defined by flight testing and is not included in the data.

CAUTION

> When making a single engine descent with the operating engine in Military power, the Mach rate limit of 1.0 Mach in three minutes will be exceeded.

Single Engine Turning Descent

Figure A3-24 presents the effects of a 180° turn at 35° bank angle on a 350 KEAS descent. Approximately 23,000 feet of altitude is required to complete the 180° turn. For convenience in mission planning, a ground track profile is also provided.

Sample Use Of Charts

Example (1):

Find distance, time and fuel to descend from 80,000 feet to 29,000 feet, using Minimum afterburning power and 300 KEAS. Initial speed is Mach 3.1 (337 KEAS). Normal (ARDC Standard) atmosphere conditions are expected. Refer to Figure A3-20. Enter the chart at 80,000 feet and located the Minimum afterburning line for the 3.1 Mach, (337 KEAS) condition, and read distance, time and fuel to 50,000 feet.

Distance = 137 miles

Time = 6.8 minutes

Fuel = 1200 pounds

Enter the same chart at 29,000 feet and read distance, time and fuel from 50,000 feet to 29,000 feet.

Distance = 75 miles

Time = 8.5 minutes

Fuel = 2400 pounds

Add the above values to obtain distance time and fuel from 80,000 feet and 3.1 Mach to 29,000 feet in Minimum afterburning at 300 KEAS.

Distance = 212 miles

Time = 15.3 minutes

Fuel = 3600 pounds

Example (2):

Find the track time, distance, and fuel required to descend from 80,000 feet and Mach 3.10 using the 350 KEAS descent schedule. A 90° turn is to be completed above 50,000 feet, and Minimum AB is to be used below 50,000 feet. Enter figure A3-24 and note on the penetration distance curve that 90° of turn is completed at 65,000 feet altitude. Read time at that altitude as 3.0 minutes and fuel used as 1200 pounds. On the ground track profile note that the distance traveled is 80 nautical miles. Enter figure A3-21 at 65,000 feet (end of turn altitude) and read time, distance, and fuel required to 50,000 feet as 4.1 minutes, 73 nautical miles, and 1950 pounds. Reenter at the final altitude of 28,000 feet on the Minimum AB line and read time, distance, and fuel required as 3.4 minutes, 41 nautical miles and 1200 lb of fuel. Add the incremental readings and obtain 10.5 minutes, 194 nautical miles, and 4350 pounds of fuel.

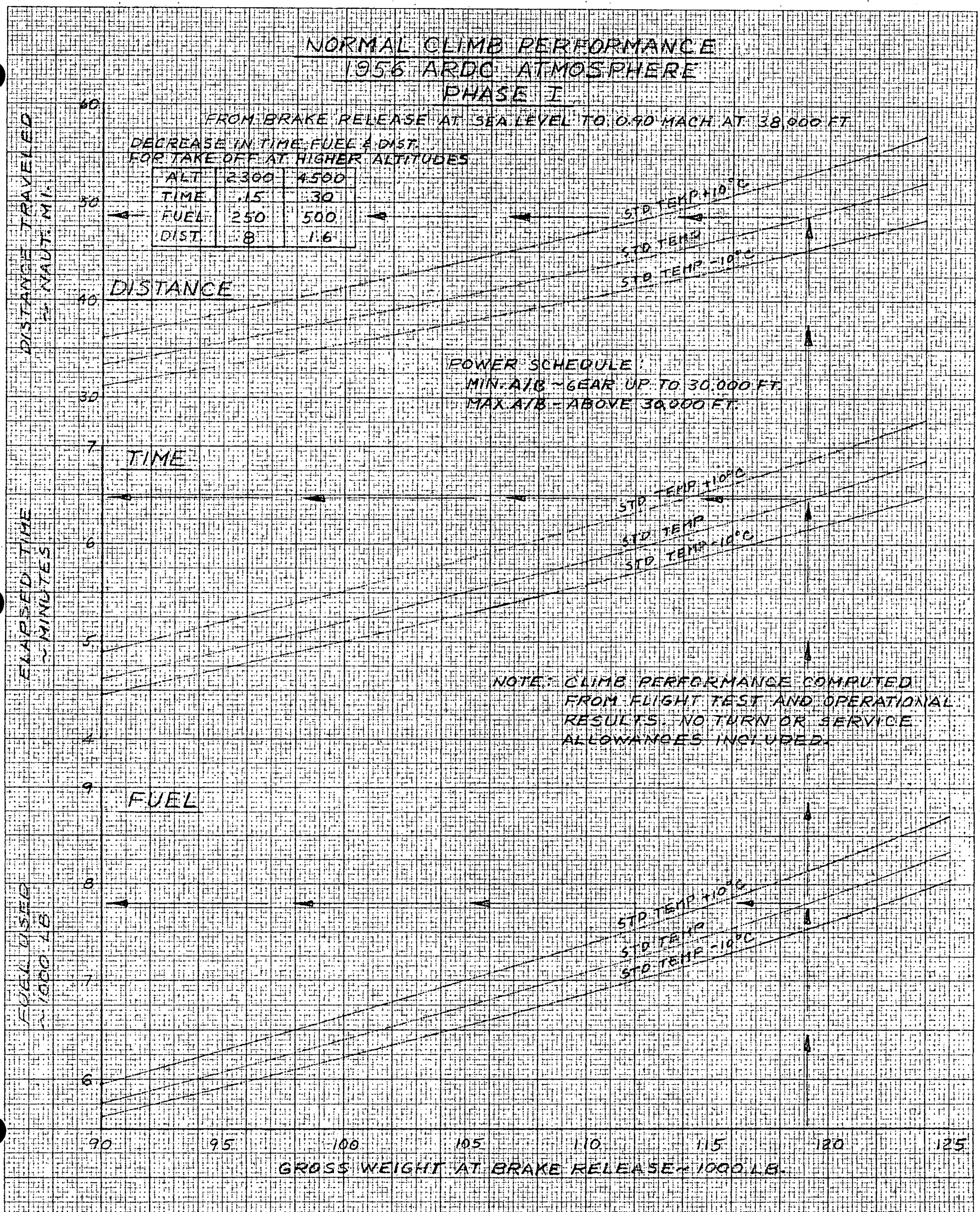
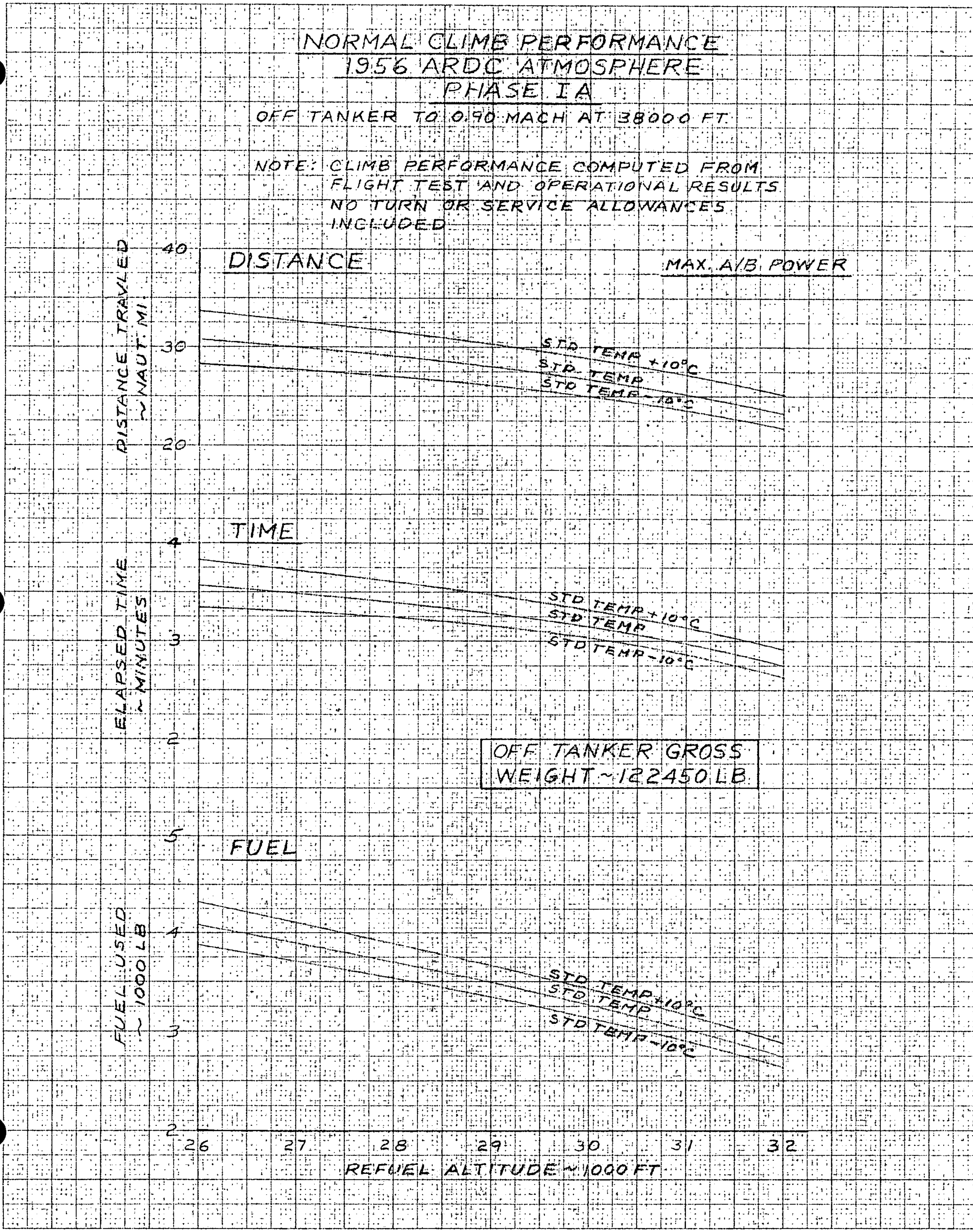
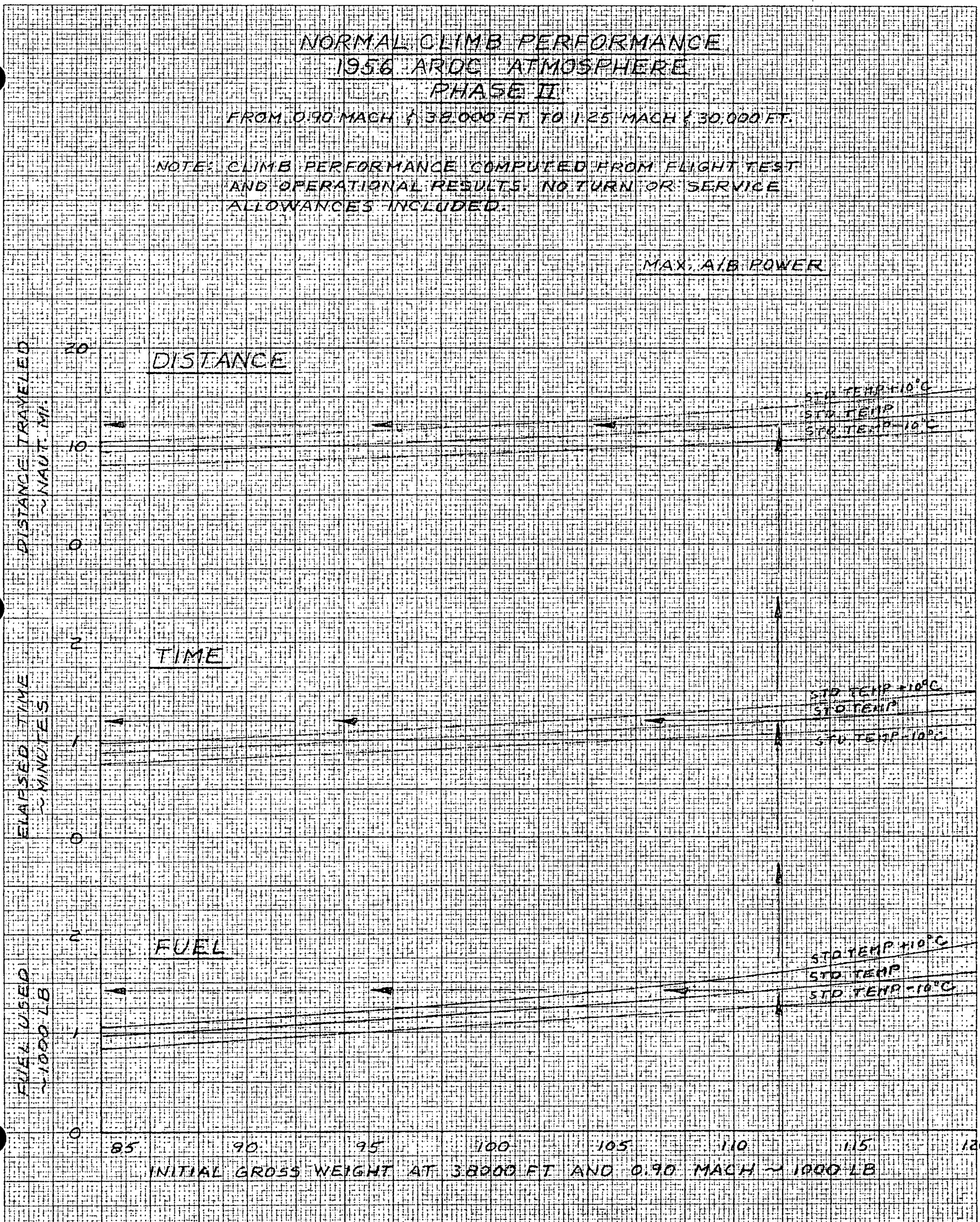

NORMAL CLIMB PERFORMANCE
1956 ARDC ATMOSPHERE
PHASE I
FROM BRAKE RELEASE AT SEA LEVEL TO 0.90 MACH AT 38,000 FT.
DECREASE IN TIME, FUEL & DIST.
FOR TAKE OFF AT HIGHER ALTITUDES
ALT 2300 4500
TIME .15 .30
FUEL 250 500
DIST .8 1.6
DISTANCE TRAVELED ~ NAUT. MI.
DISTANCE
STD TEMP +10°C
STD TEMP
STD TEMP -10°C
POWER SCHEDULE:
MIN. A/B ~ GEAR UP TO 30,000 FT.
MAX. A/B - ABOVE 30,000 FT.
ELAPSED TIME ~ MINUTES
TIME
NOTE: CLIMB PERFORMANCE COMPUTED FROM FLIGHT TEST AND OPERATIONAL RESULTS. NO TURN OR SERVICE ALLOWANCES INCLUDED.
FUEL USED ~ 1000 LB.
FUEL
GROSS WEIGHT AT BRAKE RELEASE ~ 1000 LB.

Figure A3-1


NORMAL CLIMB PERFORMANCE
1956 ARDC ATMOSPHERE
PHASE IA
OFF TANKER TO 0.90 MACH AT 38000 FT
NOTE: CLIMB PERFORMANCE COMPUTED FROM FLIGHT TEST AND OPERATIONAL RESULTS NO TURN OR SERVICE ALLOWANCES INCLUDED
DISTANCE
MAX. A/B POWER
DISTANCE TRAVLED ~ NAUT. MI
40
30
20
STD TEMP +10°C
STD TEMP
STD TEMP -10°C
TIME
ELAPSED TIME ~ MINUTES
4
3
2
OFF TANKER GROSS WEIGHT ~ 122450 LB
FUEL
FUEL USED ~ 1000 LB
5
4
3
2
26
27
28
29
30
31
32
REFUEL ALTITUDE ~ 1000 FT



Changed 15 June 1968

Figure A3-3

NORMAL CLIMB PERFORMANCE PHASE III

POWER SCHEDULE
1. MAX AB TO 1.50 MACH
2. 6000 TO 8000 LB/HR/ENG REDUCTION FROM MAX AB AT 1.50 MACH
3. AT 2.60 MACH - MAX A/B

1956 ARDC ATMOSPHERE
STANDARD DAY –10°C
FROM 1.25 MACH AND 30,000 FT. TO CRUISE MACH
YJ-1 ENGINES

DATA BASIS: Computed from Flight Test and Operational results. No Turn or Service Allowances Included. Refer to Page A3-2 for Phase IIIA Climb Performance.

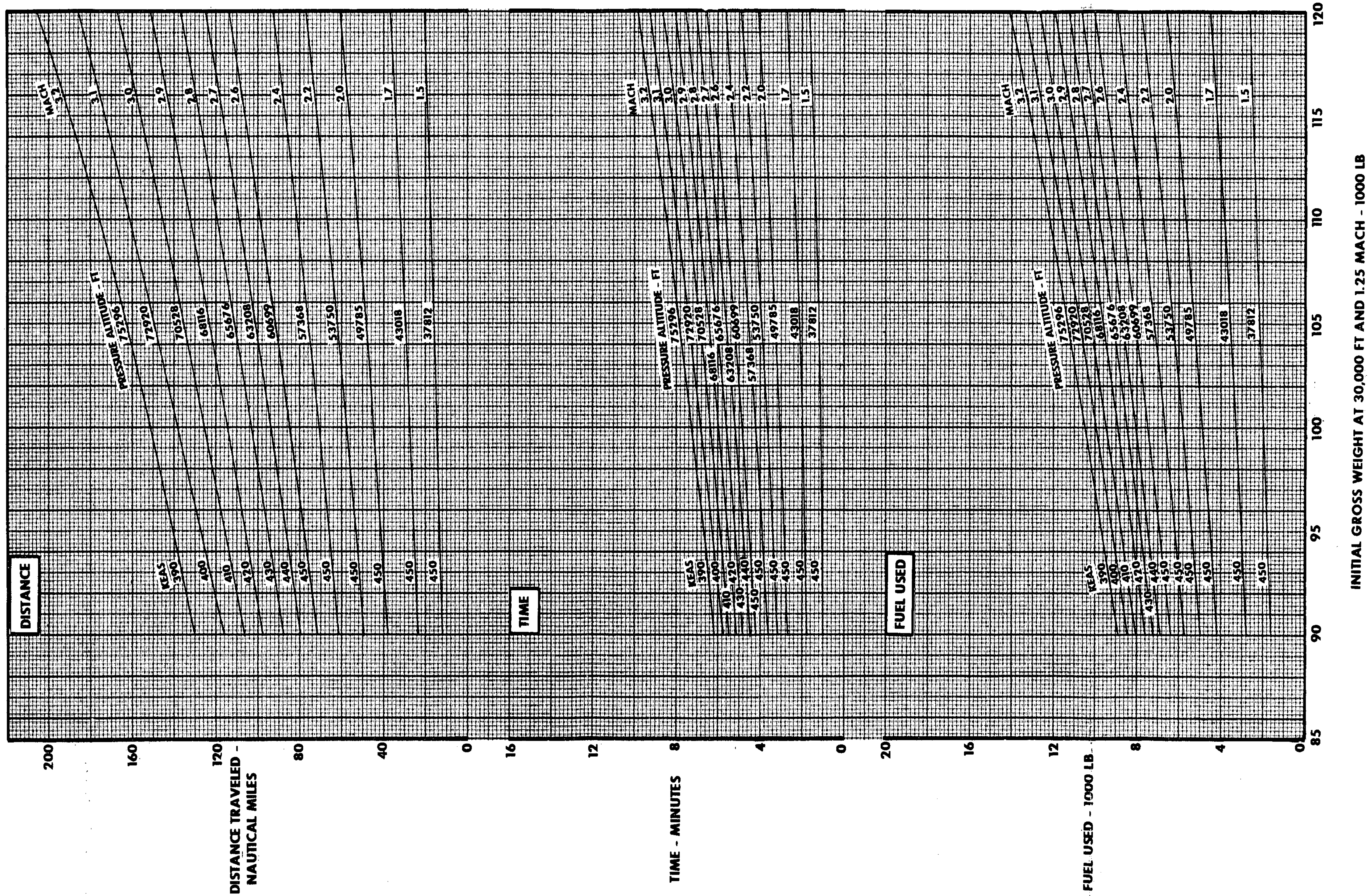


Figure A3-4

Approved for Release: 2017/07/25 C06535944

NORMAL CLIMB PERFORMANCE PHASE III

POWER SCHEDULE

1. MAX AB TO 1.50 MACH
2. 6000 TO 8000 LB/HR/ENG REDUCTION FROM MAX AB AT 1.50 MACH
3. AT 2.60 MACH-MAX AB

1956 ARDC ATMOSPHERE
STANDARD DAY
FROM 1.25 MACH AND 30,000 FT. TO CRUISE MACH
YJ-1 ENGINES

DATA BASIS: Computed from Flight Test and Operational results.

No Turn or Service Allowances Included

Refer to Page A3-2 for Phase IIIA Climb Performance

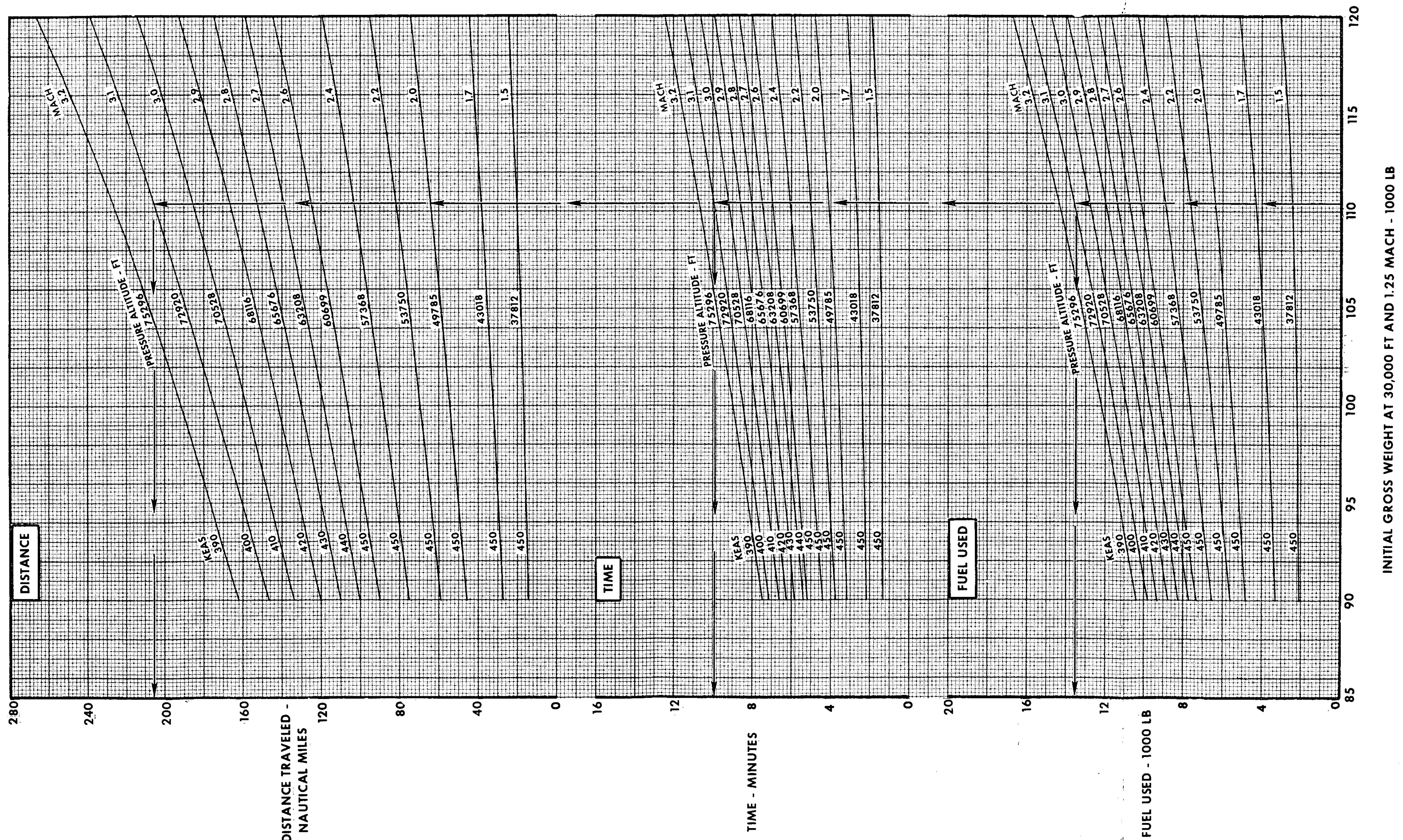


Figure A3-5

NORMAL CLIMB PERFORMANCE PHASE III

POWER SCHEDULE

1. MAX AB TO 1.50 MACH
2. 6000 TO 8000 LB/HR/ENG REDUCTION FROM MAX AB AT 1.50 MACH
3. AT 2.60 MACH - MAX A/B

1956 ARDC ATMOSPHERE
STANDARD DAY +10°C
FROM 1.25 MACH AND 30,000 FT. TO CRUISE MACH
YJ-1 ENGINES

DATA BASIS: Computed from Flight Test and Operational results.
No Turn or Service Allowances Included
Refer to Page A3-2 for Phase IIIA Climb Performance

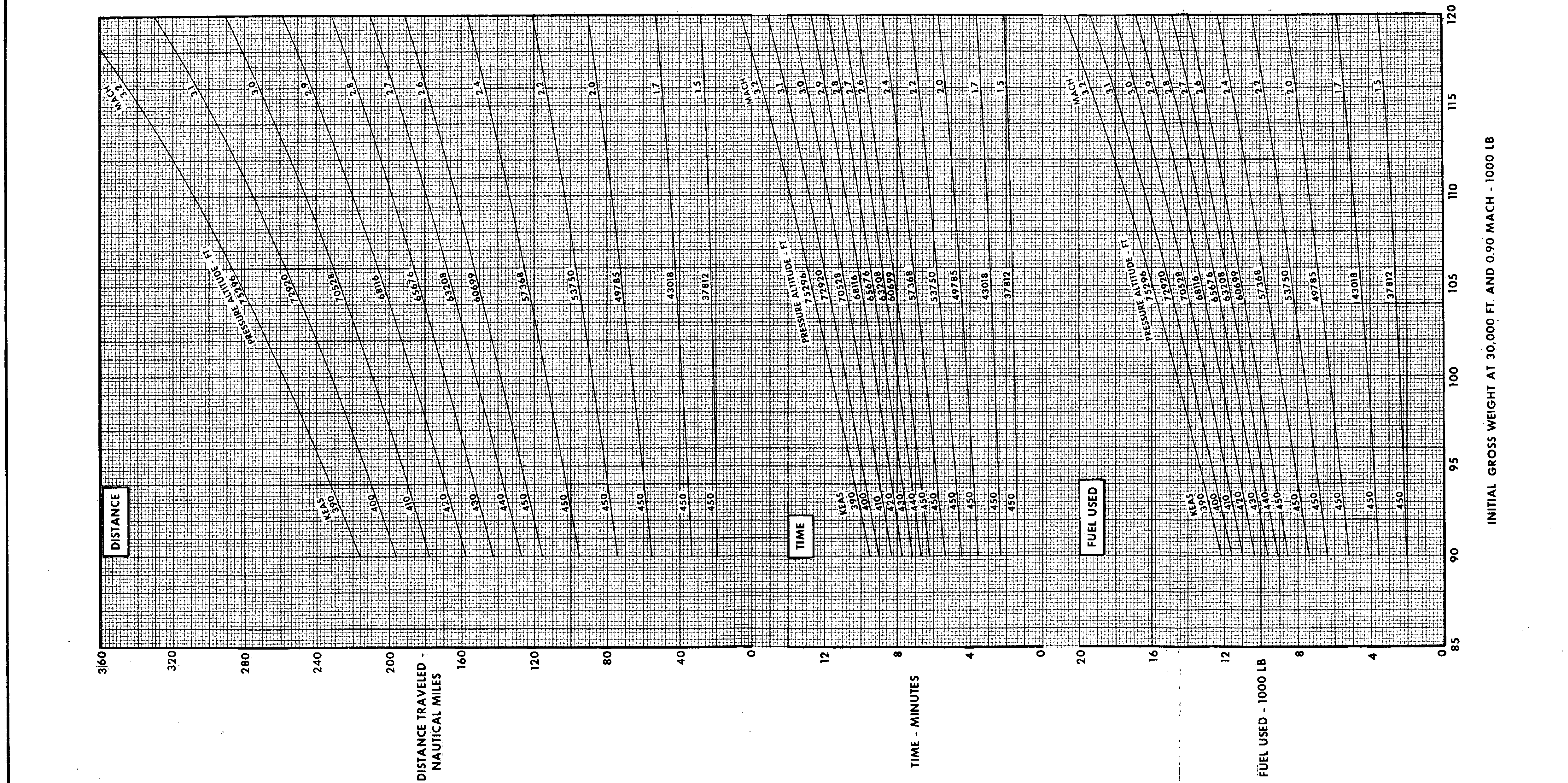


Figure A3-6

Approved for Release: 2017/07/25 C06535944

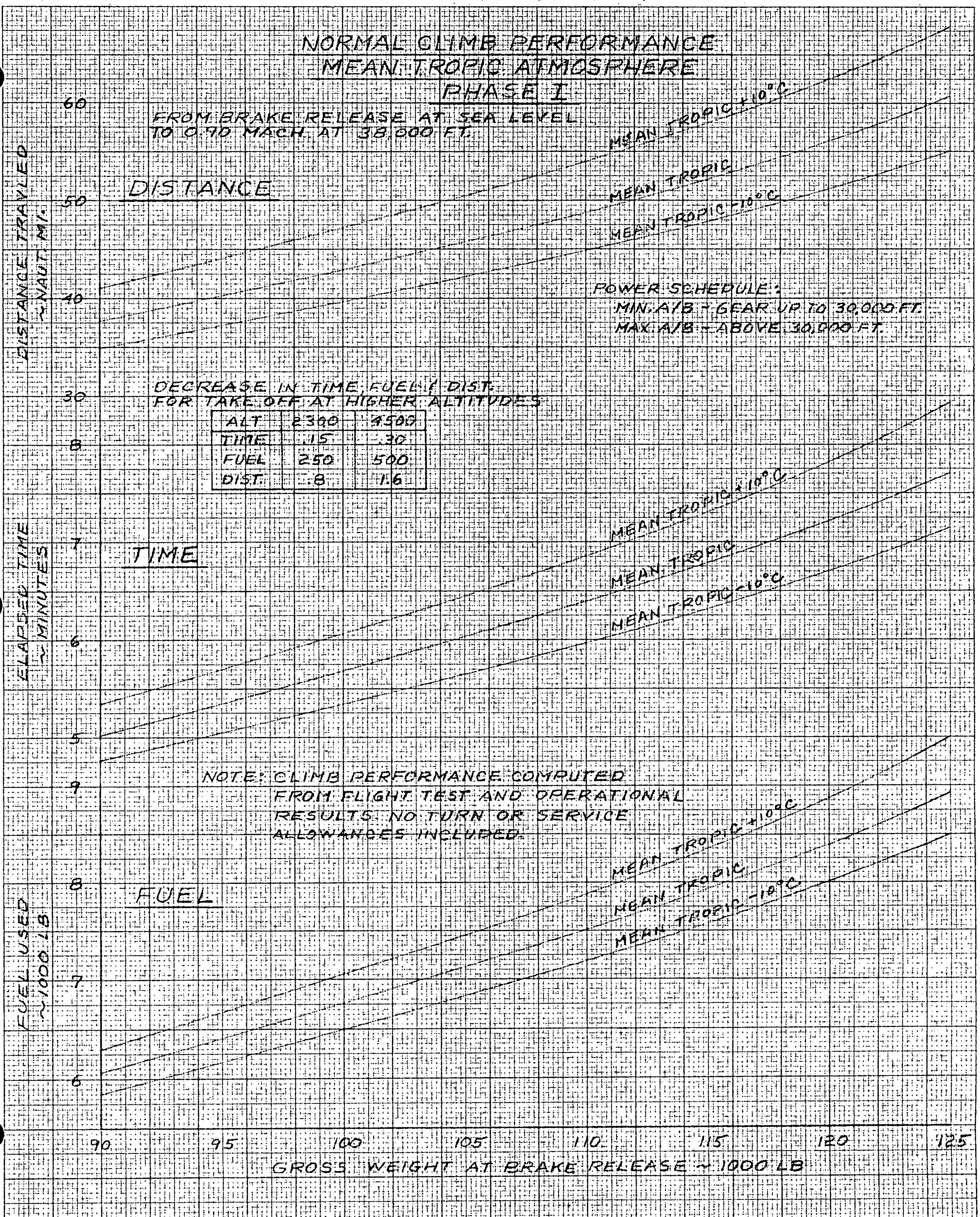
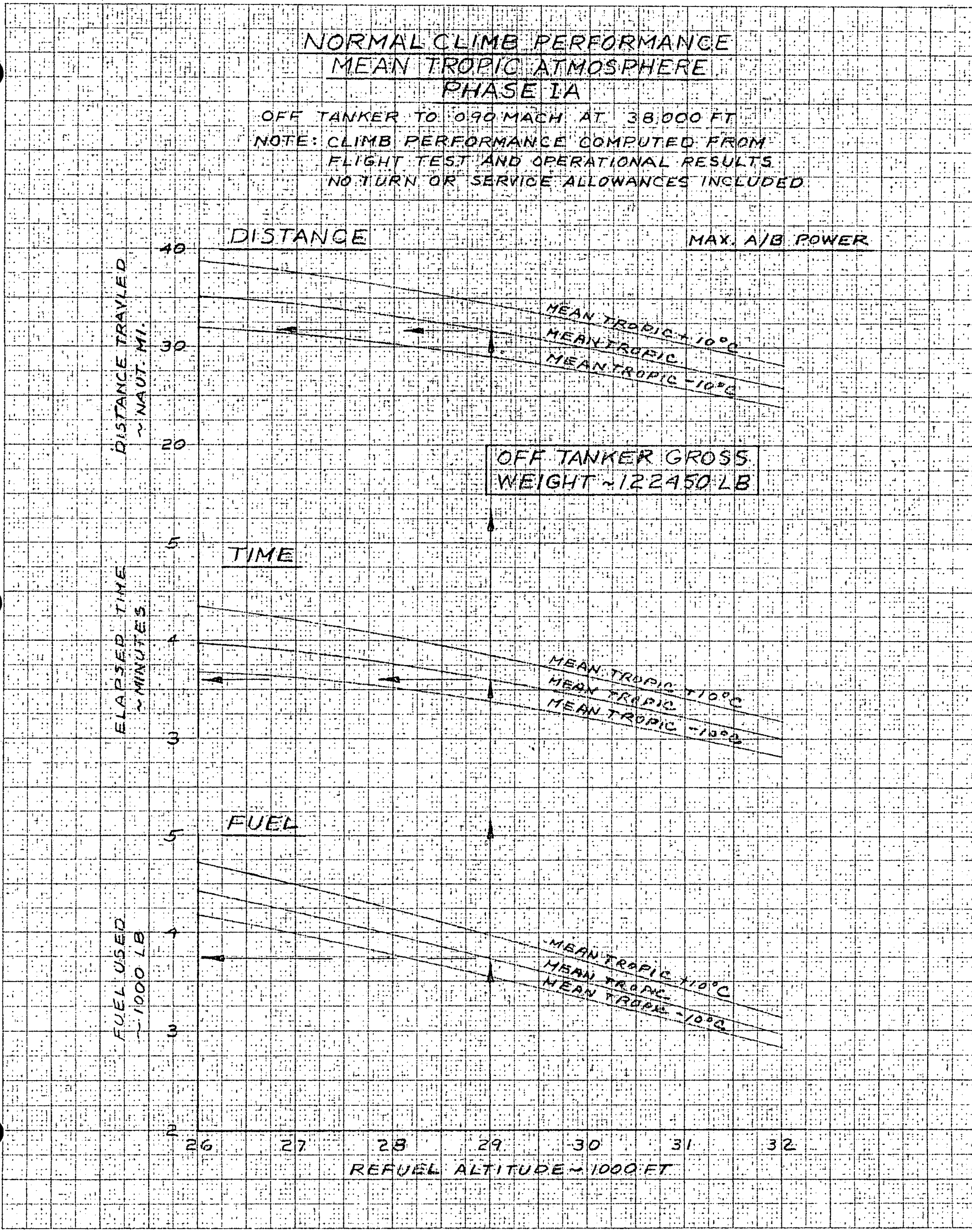

NORMAL CLIMB PERFORMANCE
MEAN TROPIC ATMOSPHERE
PHASE I
FROM BRAKE RELEASE AT SEA LEVEL
TO 0.90 MACH AT 38,000 FT.
DISTANCE
DISTANCE TRAVLED ~NAUT. MI.
MEAN TROPIC +10°C
MEAN TROPIC
MEAN TROPIC -10°C
POWER SCHEDULE:
MIN. A/B - GEAR UP TO 30,000 FT.
MAX. A/B - ABOVE 30,000 FT.
DECREASE IN TIME, FUEL & DIST.
FOR TAKE OFF AT HIGHER ALTITUDES
ALT 2300 4500
TIME .15 .30
FUEL 250 500
DIST. .8 1.6
TIME
ELAPSED TIME ~ MINUTES
NOTE: CLIMB PERFORMANCE COMPUTED
FROM FLIGHT TEST AND OPERATIONAL
RESULTS. NO TURN OR SERVICE
ALLOWANCES INCLUDED.
FUEL
FUEL USED ~1000 LB
60 50 40 30 8 7 6 5 9 8 7 6
90 95 100 105 110 115 120 125
GROSS WEIGHT AT BRAKE RELEASE ~ 1000 LB

Figure A3-7



Changed 15 June 1968

Figure A3-8

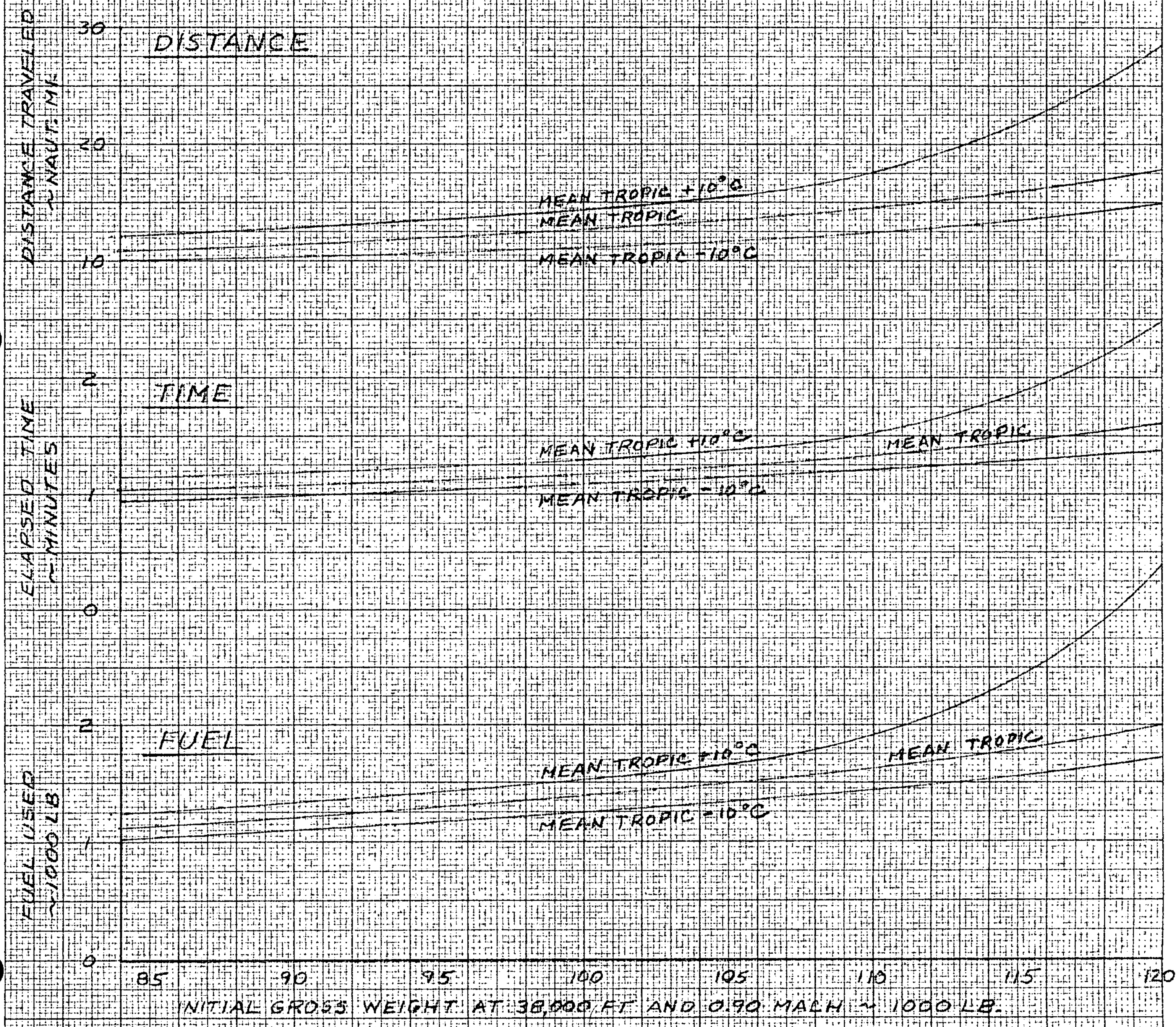
Approved for Release: 2017/07/25 C06535944

NORMAL CLIMB PERFORMANCE
MEAN TROPIC ATMOSPHERE
PHASE II

FROM 0.90 MACH & 38,000 FT TO 1.25 MACH & 30,000 FT

NOTE: CLIMB PERFORMANCE COMPUTED FROM FLIGHT TEST AND OPERATIONAL RESULTS. NO TURN OR SERVICE ALLOWANCES INCLUDED.

MAX A/B POWER



NORMAL CLIMB PERFORMANCE PHASE III

POWER SCHEDULE

1. MAX AB TO 1.50 MACH
2. 6000 TO 8000 LB/HR/ENG REDUCTION FROM MAX AB AT 1.50 MACH
3. AT 2.60 MACH - MAX A/B

MEAN TROPIC ATMOSPHERE
MEAN TROPIC DAY −10°C
FROM 1.25 MACH AND 30,000 FT. TO CRUISE MACH
YJ-1 ENGINES

DATA BASIS: Computed from Flight Test and Operational results. No Turn or Service Allowances Included. Refer to Page A3-2for Phase IIIA Climb Performance.

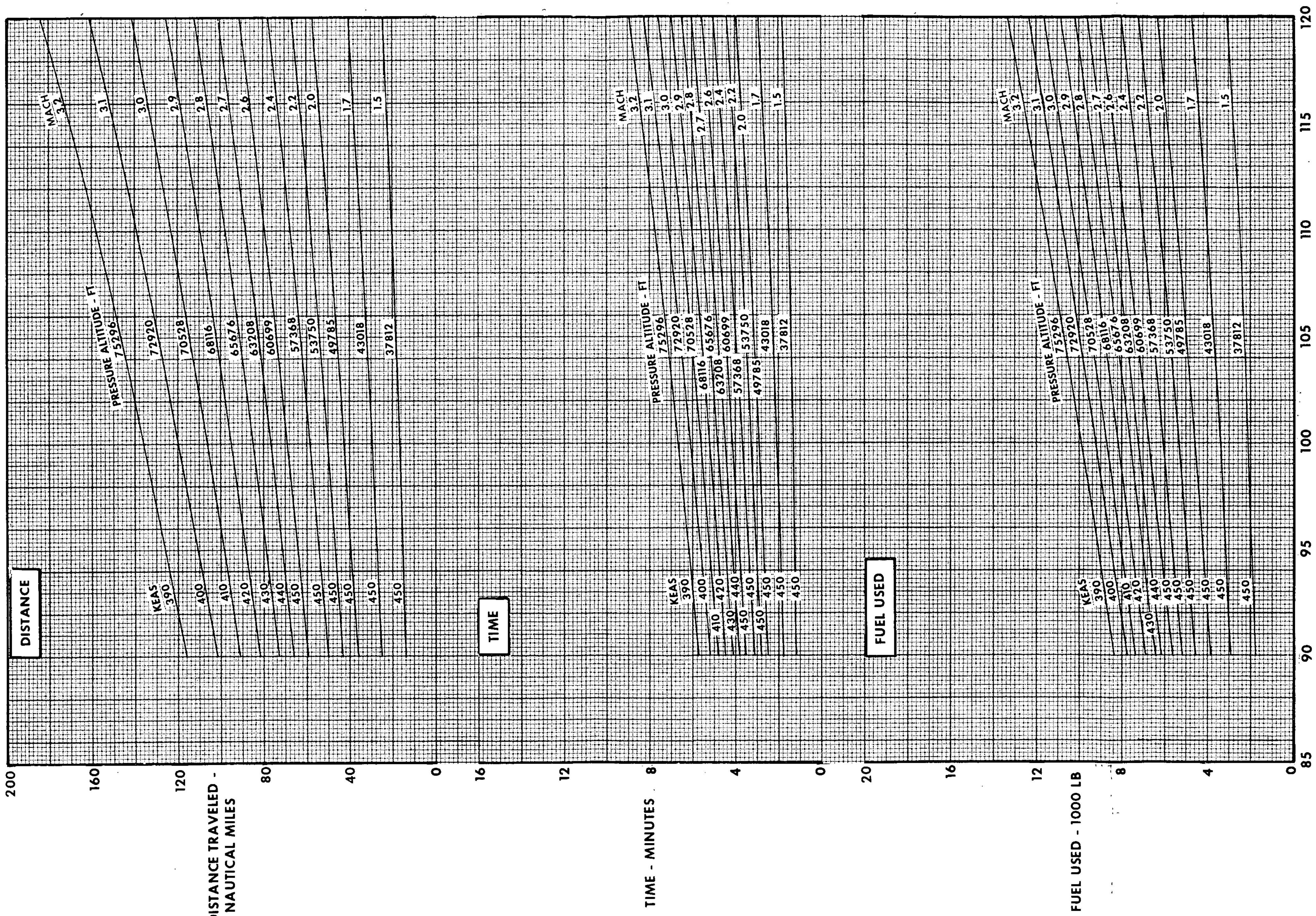


Figure A3-10

NORMAL CLIMB PERFORMANCE PHASE III

POWER SCHEDULE

1. MAX AB TO 1.50 MACH
2. 6000 TO 8000 LB/HR/ENG REDUCTION FROM MAX AB AT 1.50 MACH
3. AT 2.60 MACH - MAX A/B

MEAN TROPIC ATMOSPHERE
MEAN TROPIC DAY
FROM 1.25 MACH AND 30,000 FT. TO CRUISE MACH
YJ-1 ENGINES

DATA BASIS: Computed from Flight Test and Operational results.
No Turn or Service Allowances Included
Refer to Page A3-2 for Phase IIIA Climb Performance

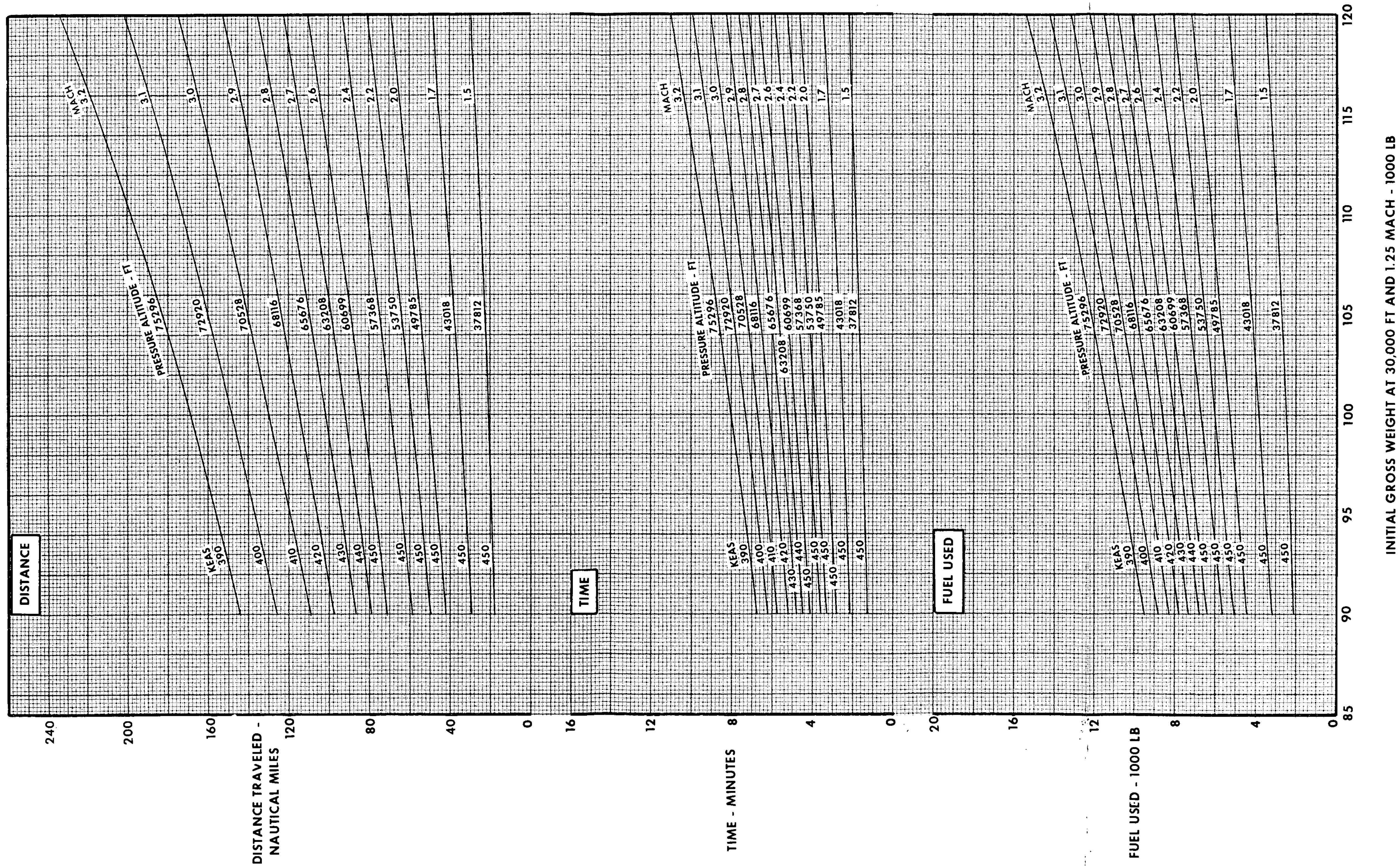


Figure A3-11

Approved for Release: 2017/07/25 C06535944

NORMAL CLIMB PERFORMANCE PHASE III

POWER SCHEDULE

1. MAX AB TO 1.50 MACH
2. 6000 TO 8000 LB/HR/ENG REDUCTION FROM MAX AB AT 1.50 MACH
3. AT 2.60 MACH - MAX A/B

MEAN TROPIC ATMOSPHERE
MEAN TROPIC DAY +10°C
FROM 1.25 MACH AND 30,000 FT. TO CRUISE MACH
YJ-1 ENGINES

DATA BASIS: Computed from Flight Test and Operational results.
No Turn or Service Allowances Included
Refer to Page A3-2 for Phase IIIA Climb Performance

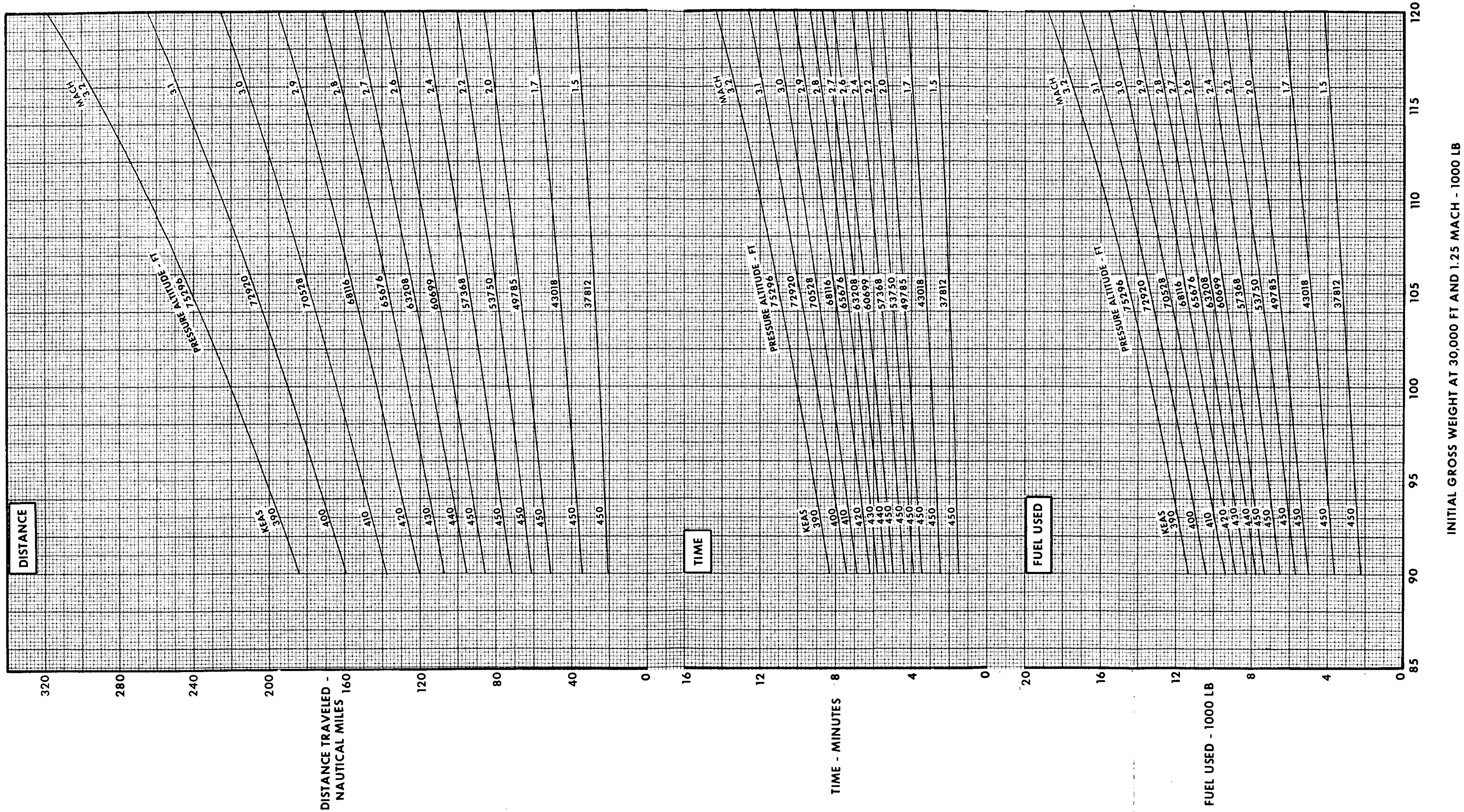


Figure A3-12

MILITARY THRUST CLIMB PERFORMANCE

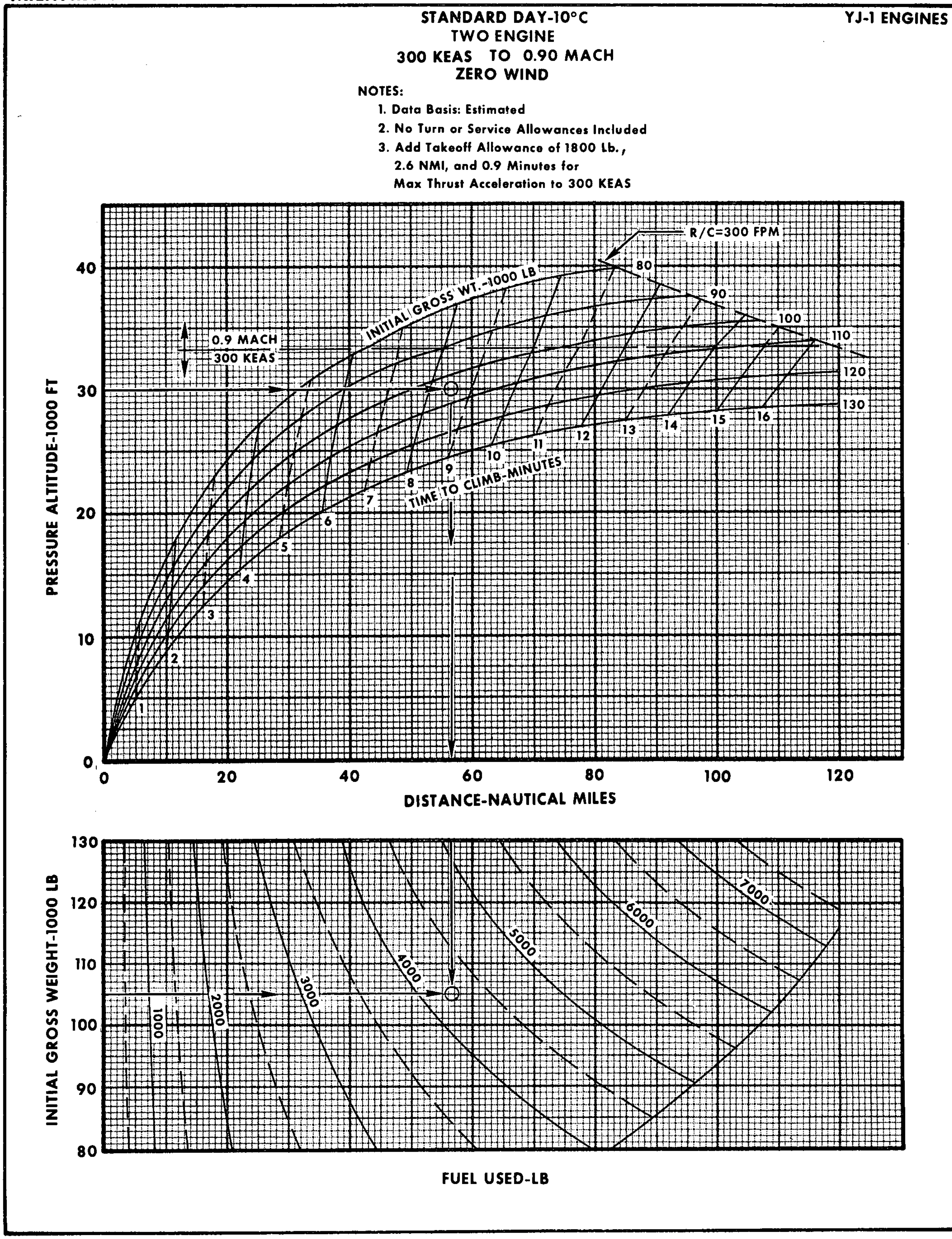


Figure A3-13

MILITARY THRUST CLIMB PERFORMANCE

STANDARD DAY
TWO ENGINE
300 KEAS TO 0.90 MACH
ZERO WIND

YJ-1 ENGINES

NOTES:

1. Data Basis: Estimated
2. No Turn or Service Allowances Included
3. Add Takeoff Allowance of 1800 Lb., 2.6 NMI, and 0.9 Minutes for Max Thrust Acceleration to 300 KEAS

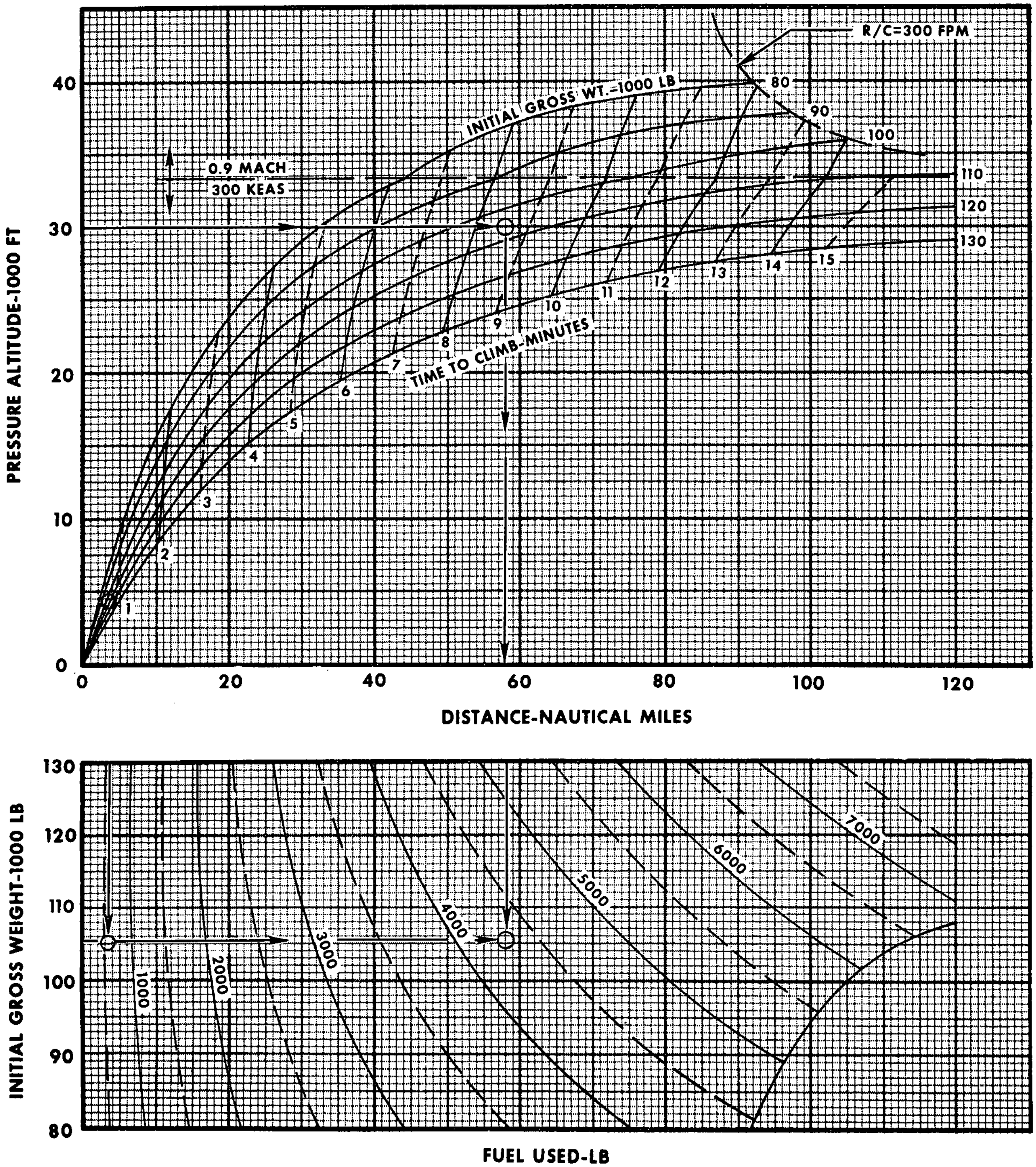


Figure A3-14

MILITARY THRUST CLIMB PERFORMANCE

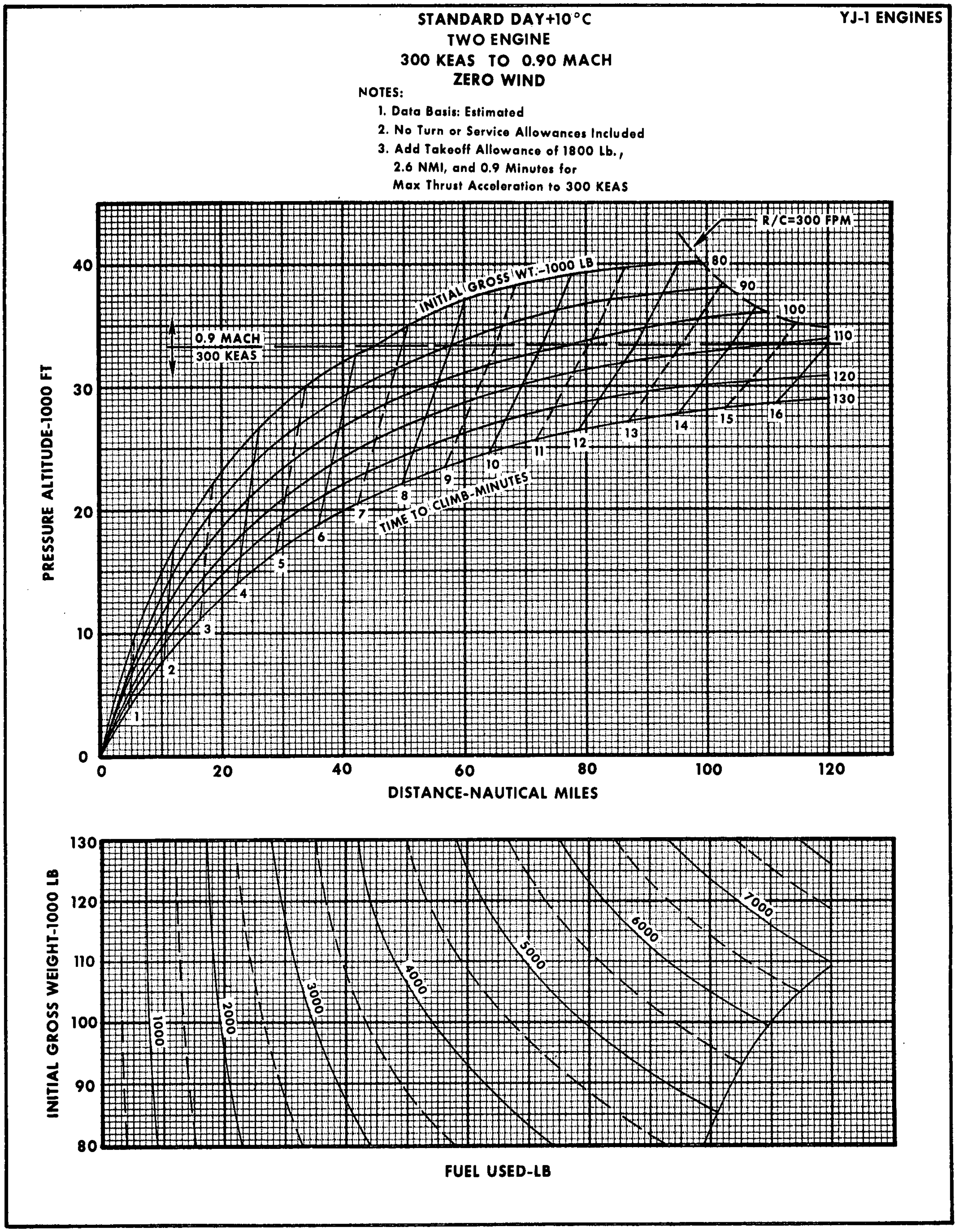


Figure A3-15

MILITARY THRUST CLIMB PERFORMANCE

STANDARD DAY+24.5°C
TWO ENGINE
300 KEAS TO 0.90 MACH
ZERO WIND

YJ-1 ENGINES

NOTES:
1. Data Basis: Estimated
2. No Turn or Service Allowances Included
3. Add Takeoff Allowance of 1800 Lb., 2.6 NMI, and 0.9 Minutes for Max Thrust Acceleration to 300 KEAS

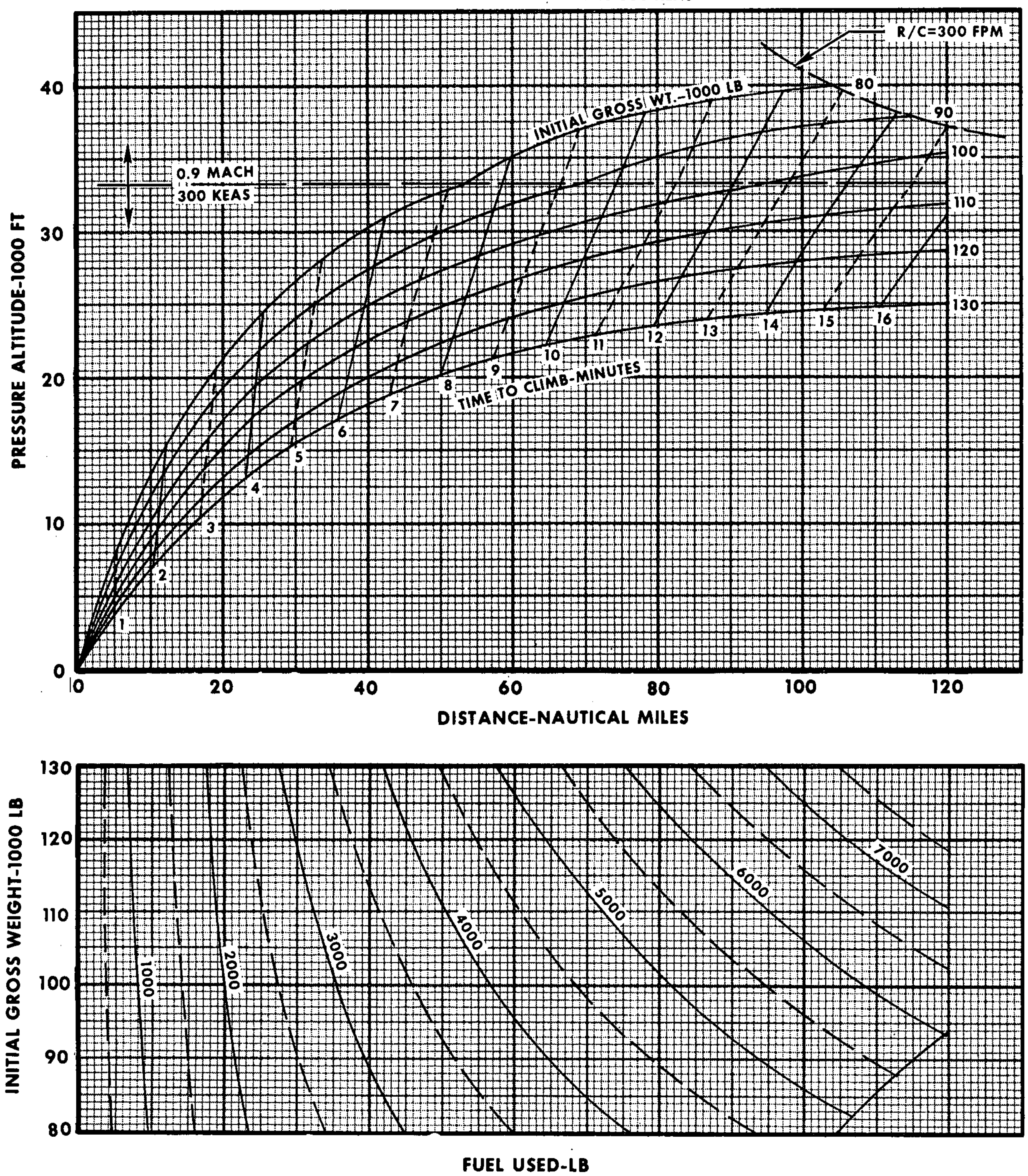


Figure A3-16

NORMAL DESCENT PERFORMANCE

TWO ENGINES
300 KEAS

DATA BASIS:
1.) Operational Tests with YJ & YJ-1 Engines.
2.) Power Schedule:
Military Power to 2.50 Mach
Set 6800 RPM at 2.50 Mach
Set 6000 RPM at 1.50 Mach
3.) Spikes & Forward Bypass Auto.
4.) Aft Bypass closed.
Position 'A' at 3.00 Mach
Position 'B' at 2.70 Mach
Closed at 1.70 Mach
5.) No turn or service allowances included.

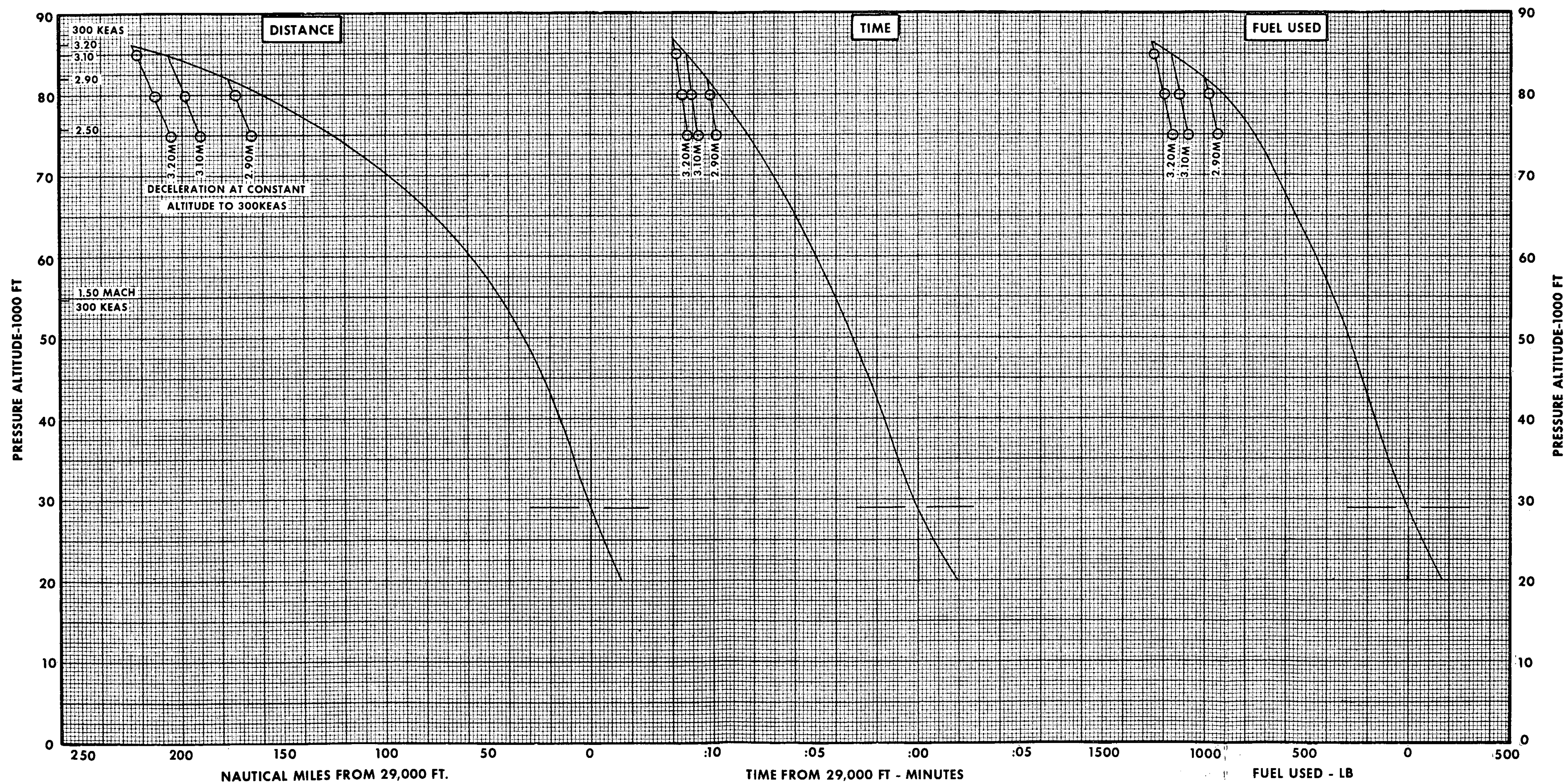


Figure A3-17

DESCENT PERFORMANCE

TWO ENGINES

350 KEAS

DATA BASIS:

1. Operational tests with YJ Engines.
2. No turn or service allowances included.
3. Spikes and Forward Bypass Auto.
4. Aft Bypass closed,
   Position A at 3.0 Mach,
   Position B at 2.7 Mach,
   Closed at 1.7 Mach.
5. Military thrust to 2.5 Mach, then 6800 RPM set.

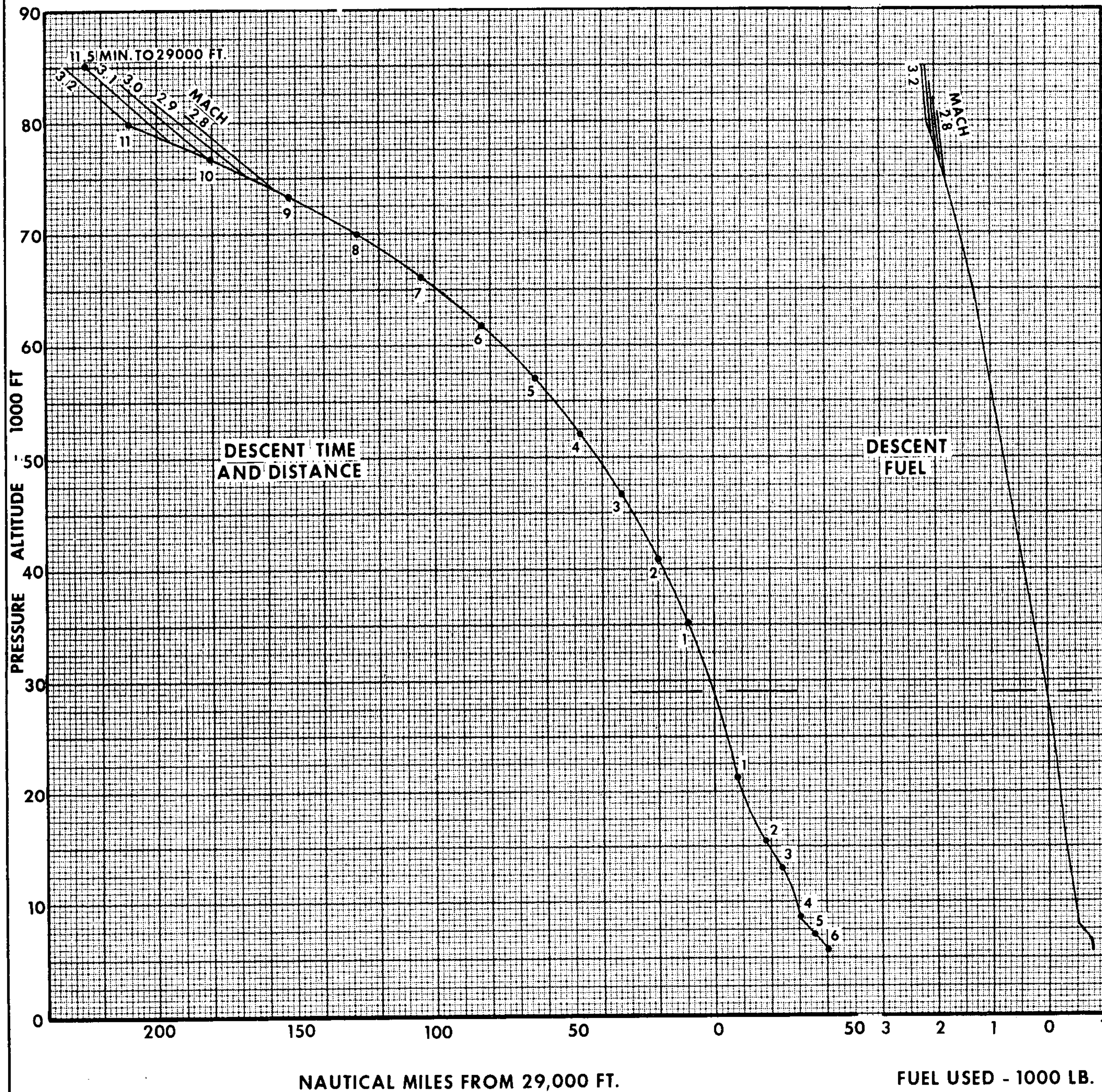


Figure A3-18

DESCENT PERFORMANCE

TWO ENGINES
350 KEAS
ALTERNATE PROCEDURES

DATA BASIS:

1. Operational tests with YJ Engines.
2. No turn or service allowances included.
3. Spikes Auto, Forward Bypass Manual Open, and Aft Bypass Closed.
4. Military Thrust to 2.5 Mach, then 6800 RPM set.

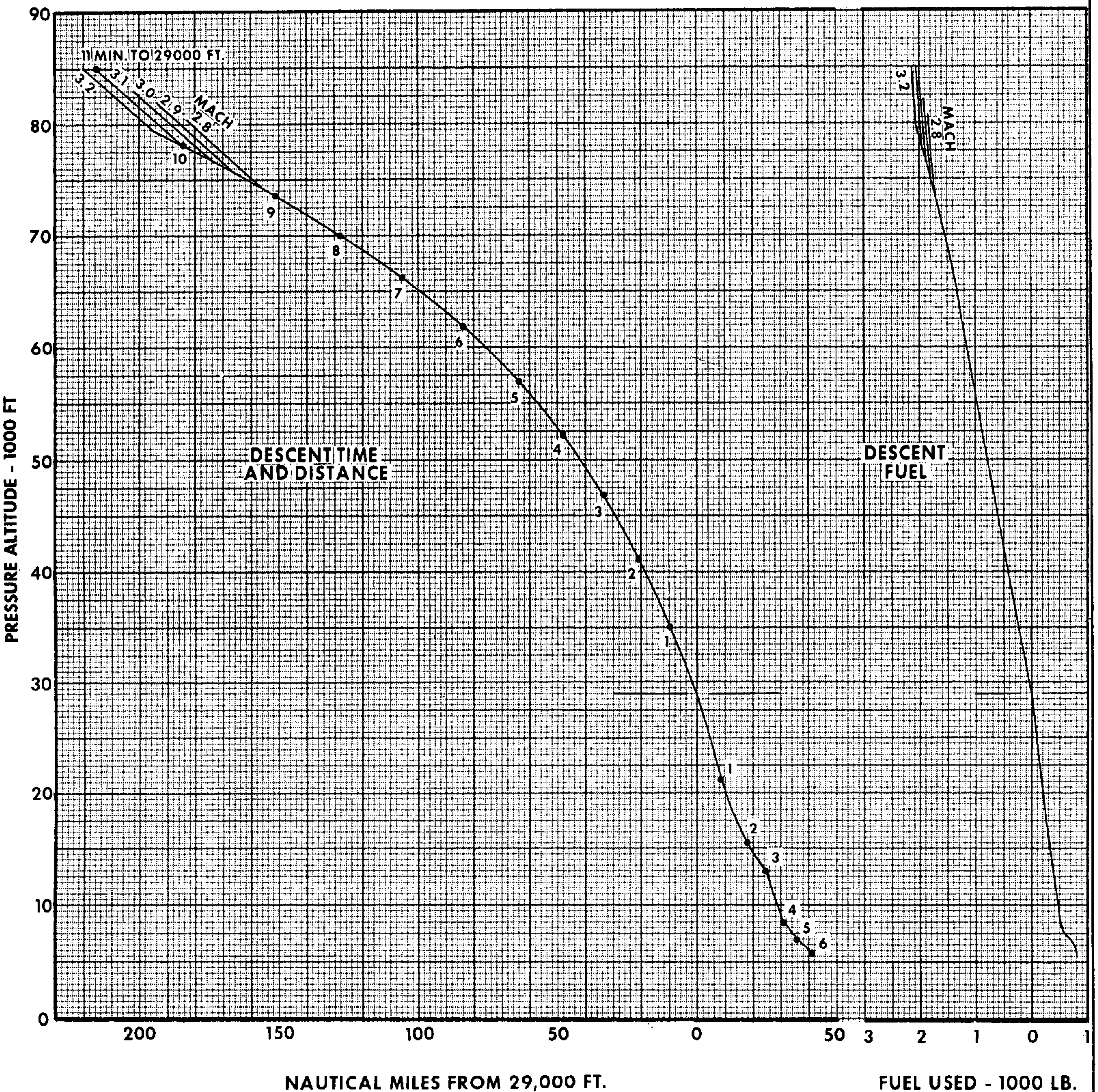


Figure A3-19

Approved for Release: 2017/07/25 C06535944

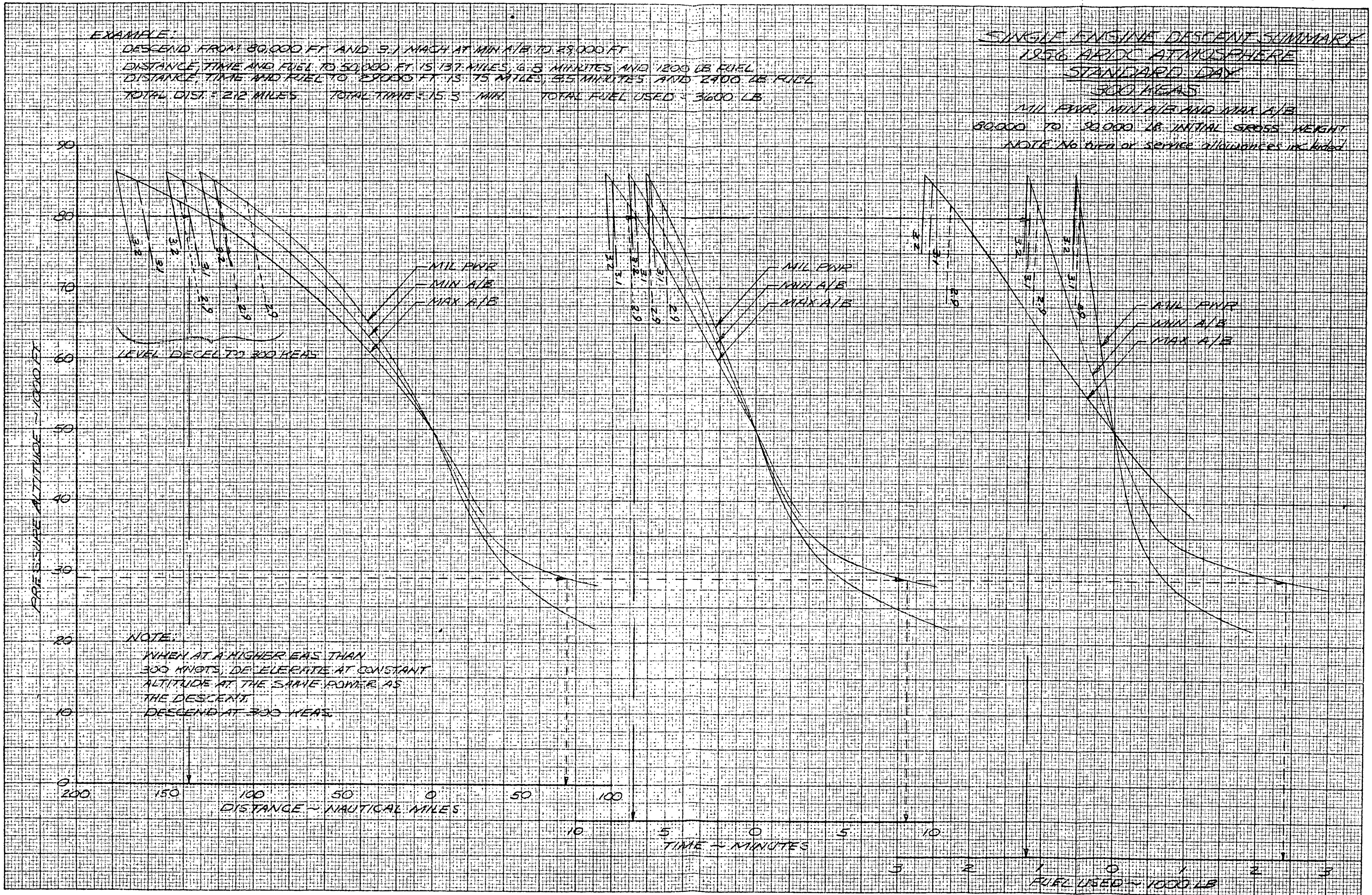

EXAMPLE:
DESCEND FROM 80,000 FT AND 3.1 MACH AT MIN A/B TO 29,000 FT
DISTANCE, TIME AND FUEL TO 50,000 FT IS 137 MILES, 6.5 MINUTES AND 1200 LB FUEL
DISTANCE, TIME AND FUEL TO 29000 FT IS 75 MILES, 3.5 MINUTES AND 2400 LB FUEL
TOTAL DIST = 212 MILES TOTAL TIME = 15.3 MIN. TOTAL FUEL USED = 3600 LB
SINGLE ENGINE DESCENT SUMMARY
1956 ARDC ATMOSPHERE
STANDARD DAY
300 KEAS
MIL PWR, MIN A/B AND MAX A/B
80000 TO 90,000 LB INITIAL GROSS WEIGHT
NOTE No turn or service allowances included
MIL PWR
MIN A/B
MAX A/B
LEVEL DECEL TO 300 KEAS
PRESSURE ALTITUDE ~ 1000 FT
NOTE:
WHEN AT A HIGHER EAS THAN
300 KNOTS, DECELERATE AT CONSTANT
ALTITUDE AT THE SAME POWER AS
THE DESCENT.
DESCEND AT 300 KEAS.
DISTANCE ~ NAUTICAL MILES
TIME ~ MINUTES
FUEL USED ~ 1000 LB

Figure A3-20

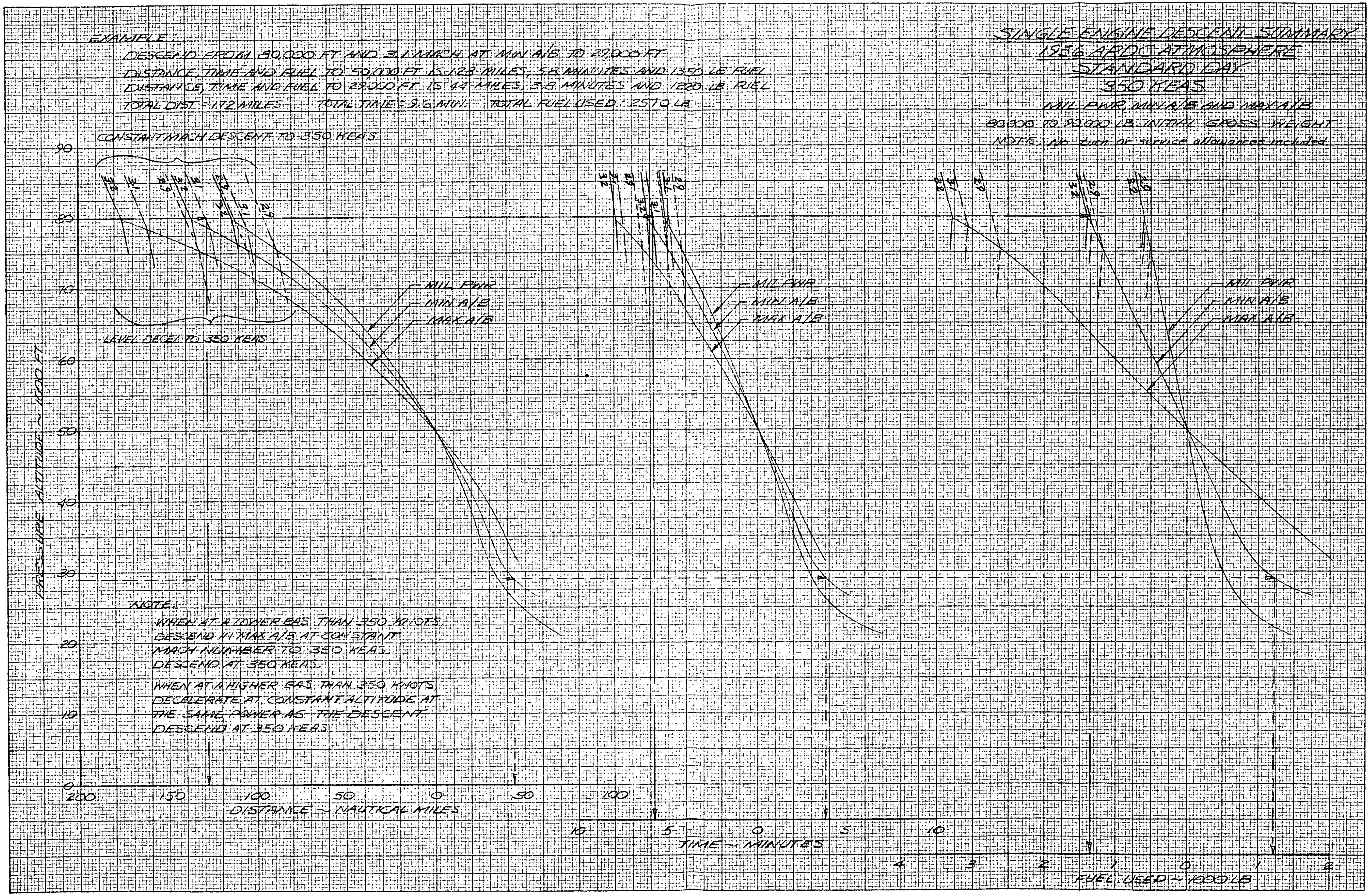
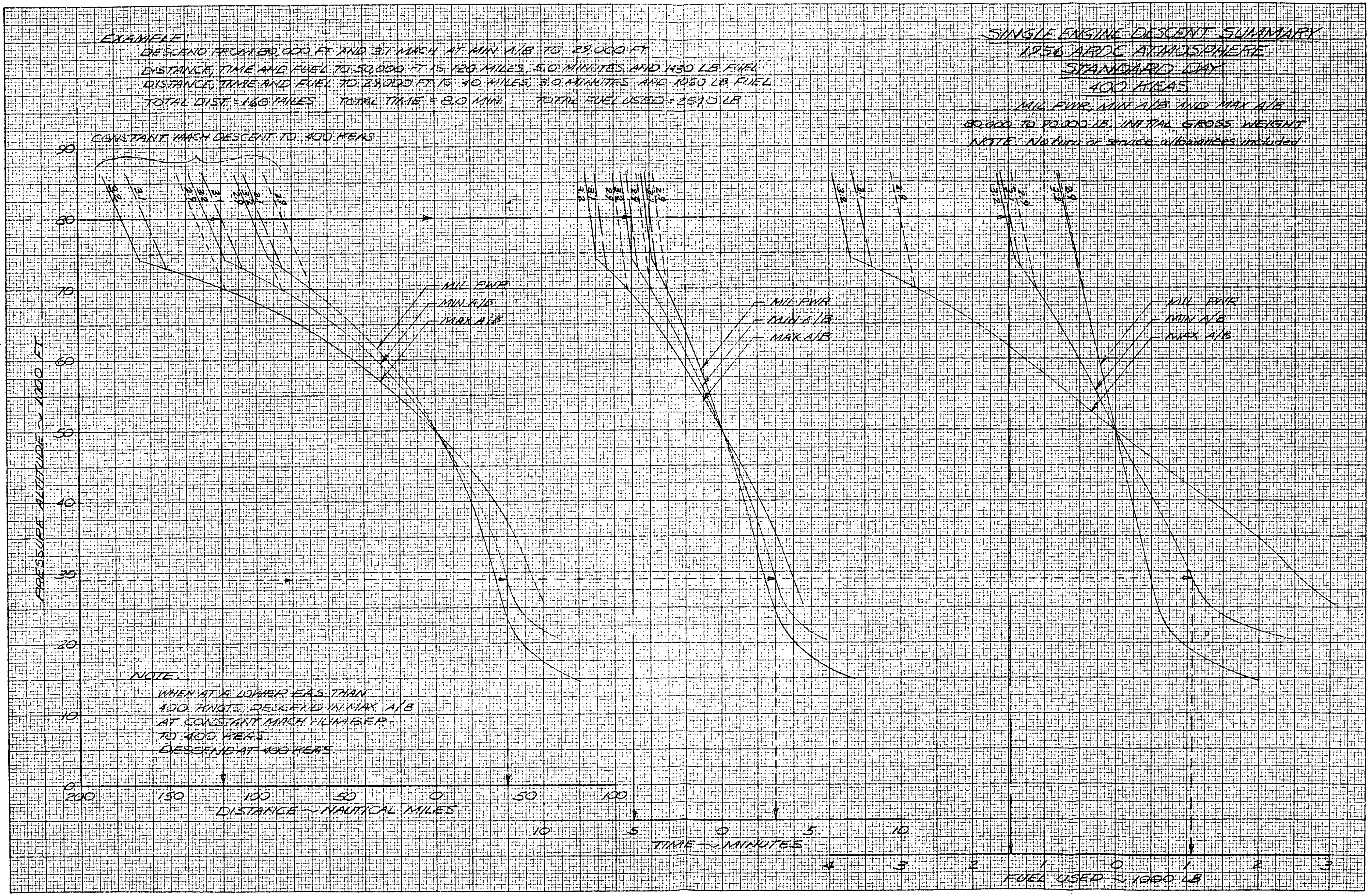

SINGLE ENGINE DESCENT SUMMARY
1956 ARDC ATMOSPHERE
STANDARD DAY
350 KEAS
MIL PWR, MIN A/B AND MAX A/B
80,000 TO 93,000 LB. INITIAL GROSS WEIGHT
NOTE: No turn or service allowances included
EXAMPLE:
DESCEND FROM 80,000 FT AND 3.1 MACH AT MIN A/B TO 29,000 FT
DISTANCE, TIME AND FUEL TO 50,000 FT IS 128 MILES, 5.8 MINUTES AND 1350 LB FUEL
DISTANCE, TIME AND FUEL TO 29,000 FT IS 44 MILES, 3.8 MINUTES AND 1220 LB FUEL
TOTAL DIST = 172 MILES
TOTAL TIME = 9.6 MIN.
TOTAL FUEL USED = 2570 LB
CONSTANT MACH DESCENT TO 350 KEAS
LEVEL DECEL TO 350 KEAS
MIL PWR
MIN A/B
MAX A/B
NOTE:
WHEN AT A LOWER EAS THAN 350 KNOTS, DESCEND IN MAX A/B AT CONSTANT MACH NUMBER TO 350 KEAS. DESCEND AT 350 KEAS.
WHEN AT A HIGHER EAS THAN 350 KNOTS, DECELERATE AT CONSTANT ALTITUDE AT THE SAME POWER AS THE DESCENT. DESCEND AT 350 KEAS.
PRESSURE ALTITUDE ~ 1000 FT
DISTANCE ~ NAUTICAL MILES
TIME ~ MINUTES
FUEL USED ~ 1000 LB

Figure A3-21



SINGLE ENGINE DESCENT SUMMARY
1956 ARDC ATMOSPHERE
STANDARD DAY
400 KEAS
MIL PWR, MIN A/B AND MAX A/B
80,000 TO 90,000 LB. INITIAL GROSS WEIGHT
NOTE: No turn or service allowances included
EXAMPLE:
DESCEND FROM 80,000 FT AND 3.1 MACH AT MIN. A/B TO 29,000 FT.
DISTANCE, TIME AND FUEL TO 50,000 FT IS 120 MILES, 5.0 MINUTES AND 1450 LB FUEL
DISTANCE, TIME AND FUEL TO 29,000 FT IS 40 MILES, 3.0 MINUTES AND 1060 LB FUEL
TOTAL DIST = 160 MILES   TOTAL TIME = 8.0 MIN.   TOTAL FUEL USED = 2510 LB
CONSTANT MACH DESCENT TO 400 KEAS
MIL PWR
MIN A/B
MAX A/B
NOTE:
WHEN AT A LOWER EAS THAN 400 KNOTS, DESCEND IN MAX A/B AT CONSTANT MACH NUMBER TO 400 KEAS.
DESCEND AT 400 KEAS.
PRESSURE ALTITUDE ~ 1000 FT
DISTANCE ~ NAUTICAL MILES
TIME ~ MINUTES
FUEL USED ~ 1000 LB

Figure A3-22

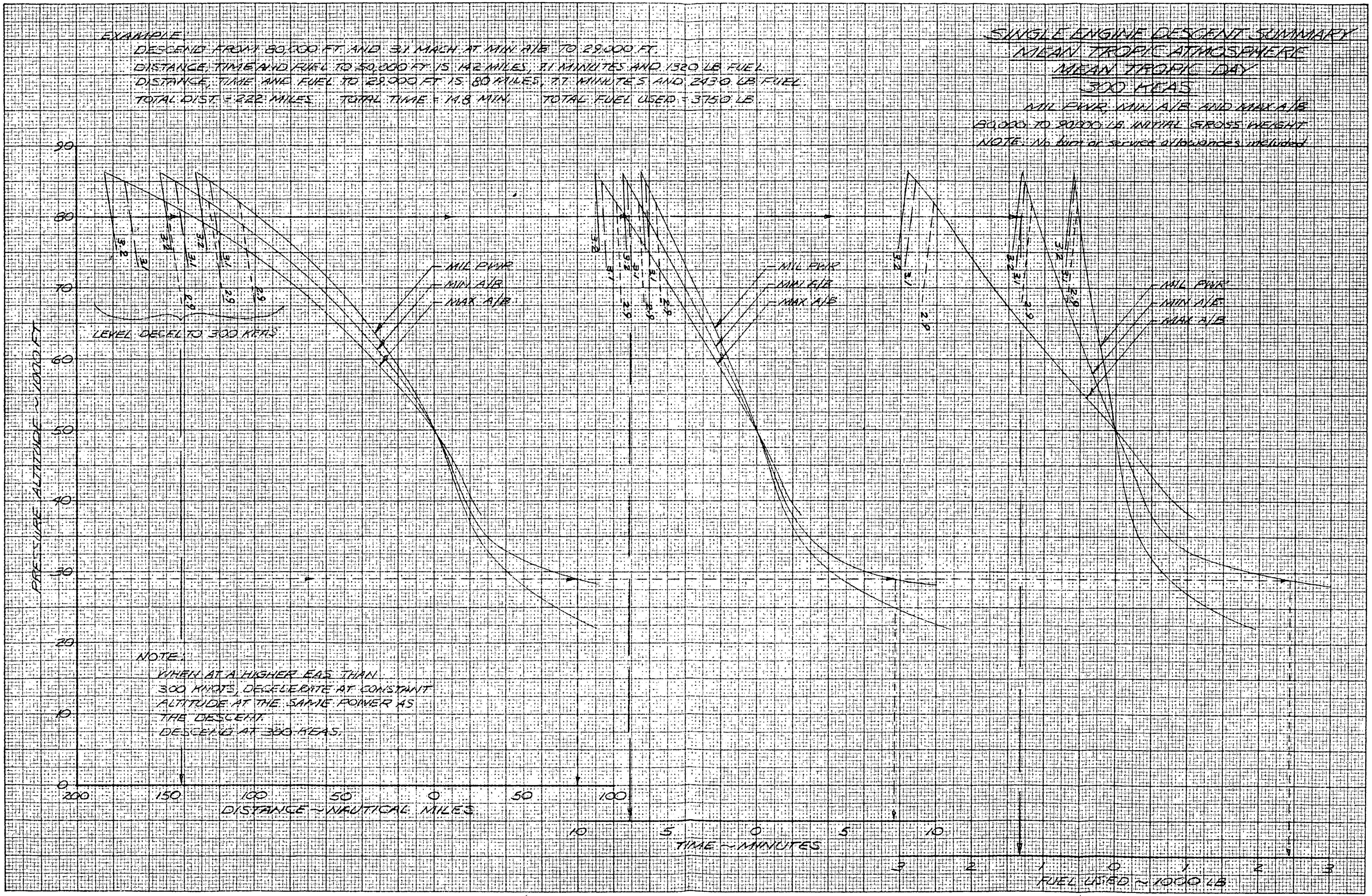

SINGLE ENGINE DESCENT SUMMARY
MEAN TROPIC ATMOSPHERE
MEAN TROPIC DAY
300 KEAS
MIL PWR, MIN A/B AND MAX A/B
80,000 TO 90,000 LB INITIAL GROSS WEIGHT
NOTE: No turn or service allowances included
EXAMPLE
DESCEND FROM 80,000 FT AND 3.1 MACH AT MIN A/B TO 29,000 FT.
DISTANCE, TIME AND FUEL TO 50,000 FT IS 142 MILES, 7.1 MINUTES AND 1320 LB FUEL.
DISTANCE, TIME AND FUEL TO 29,000 FT IS 80 MILES, 7.7 MINUTES AND 2430 LB FUEL
TOTAL DIST = 222 MILES
TOTAL TIME = 14.8 MIN
TOTAL FUEL USED = 3750 LB
LEVEL DECEL TO 300 KEAS
MIL PWR
MIN A/B
MAX A/B
NOTE:
WHEN AT A HIGHER EAS THAN 300 KNOTS, DECELERATE AT CONSTANT ALTITUDE AT THE SAME POWER AS THE DESCENT.
DESCEND AT 300 KEAS.
PRESSURE ALTITUDE ~ 1000 FT
DISTANCE ~ NAUTICAL MILES
TIME ~ MINUTES
FUEL USED ~ 1000 LB

Figure A3-23

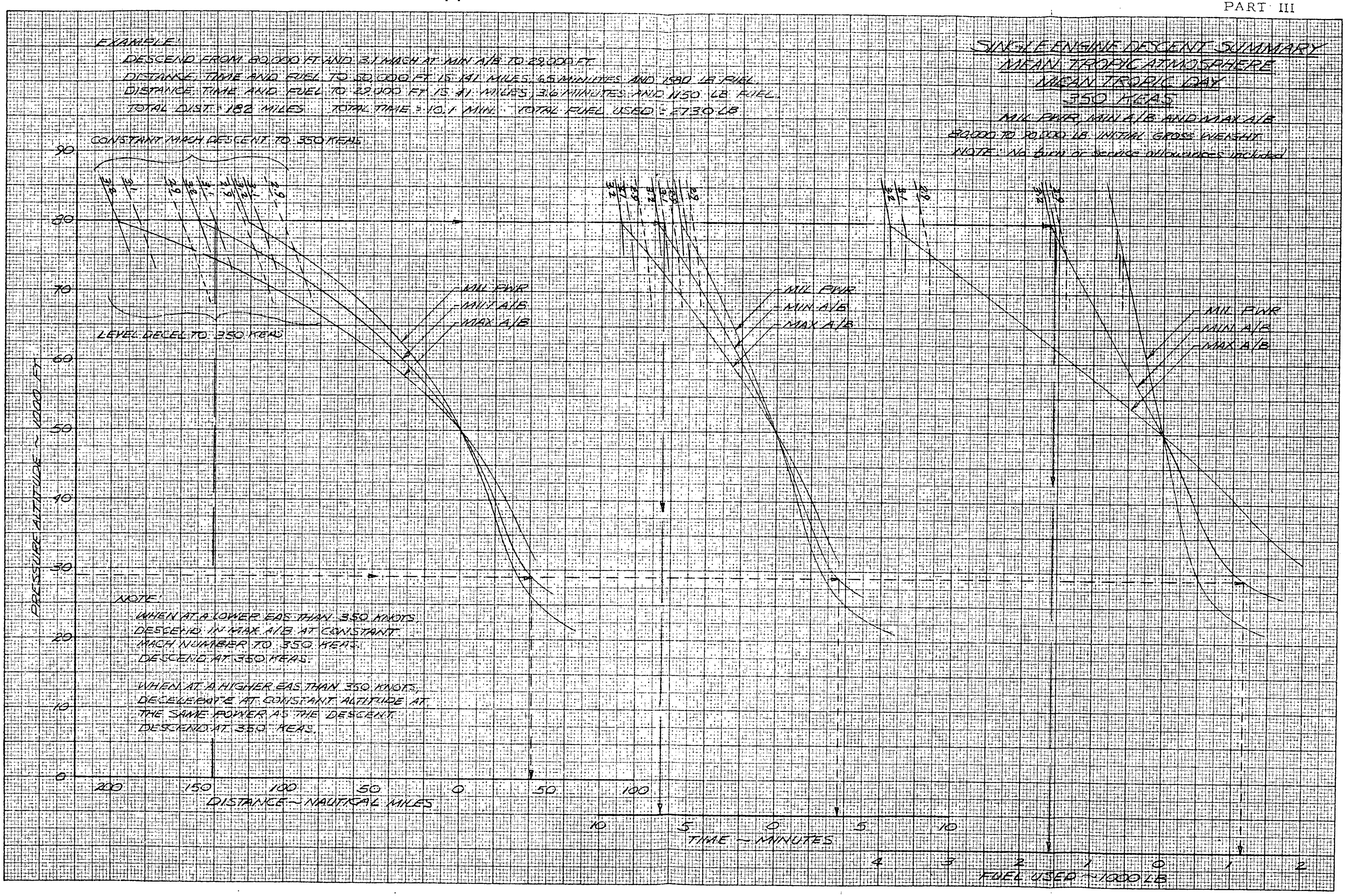


Figure A3-23A

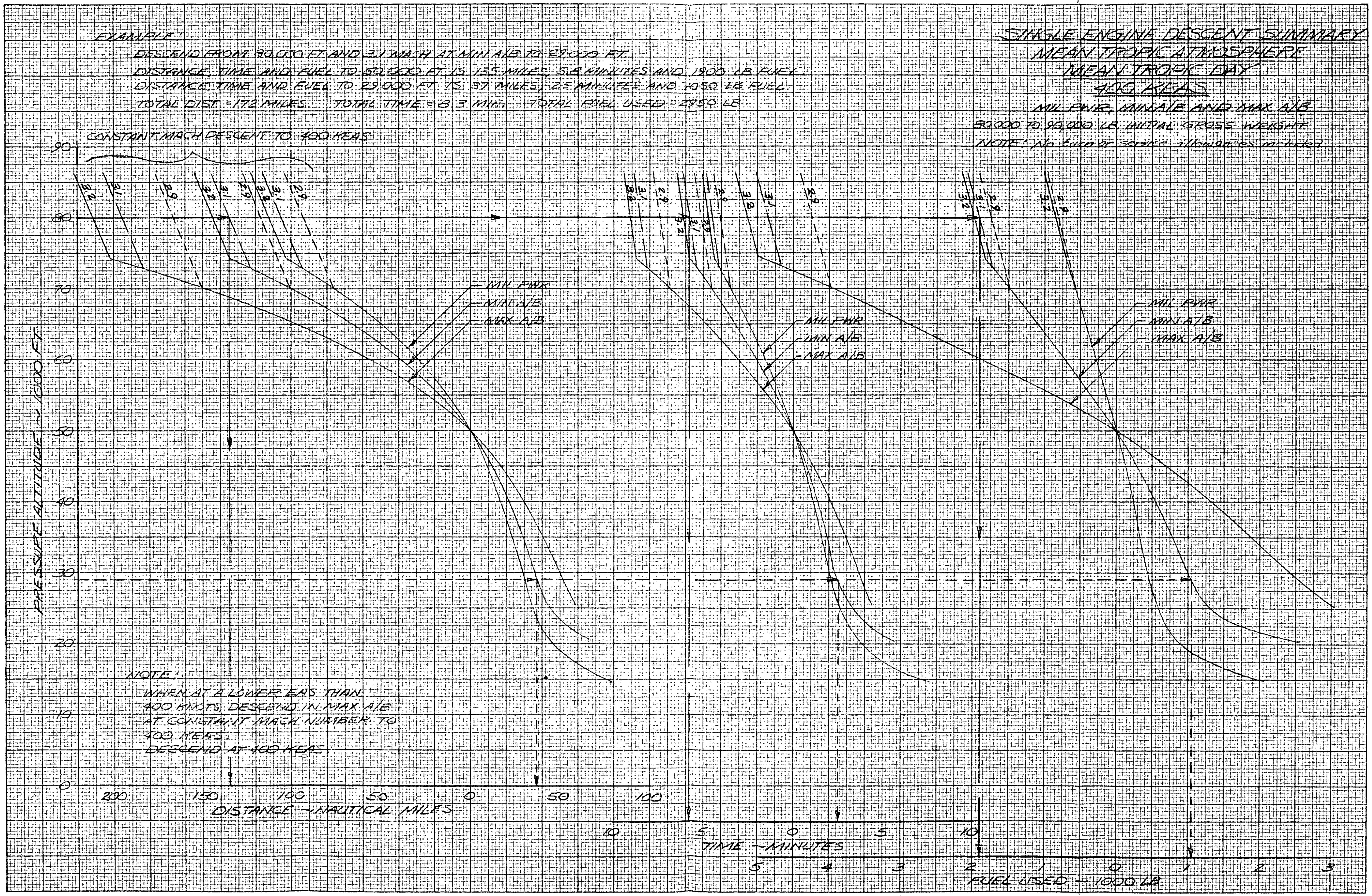
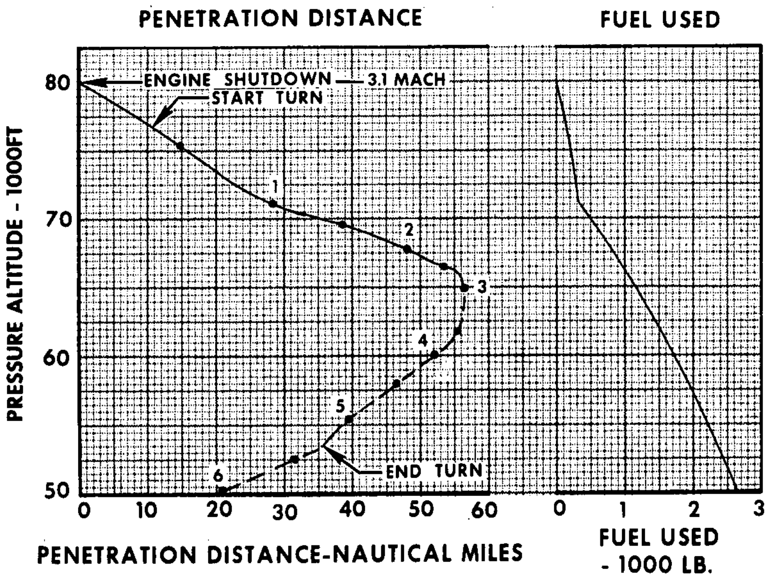


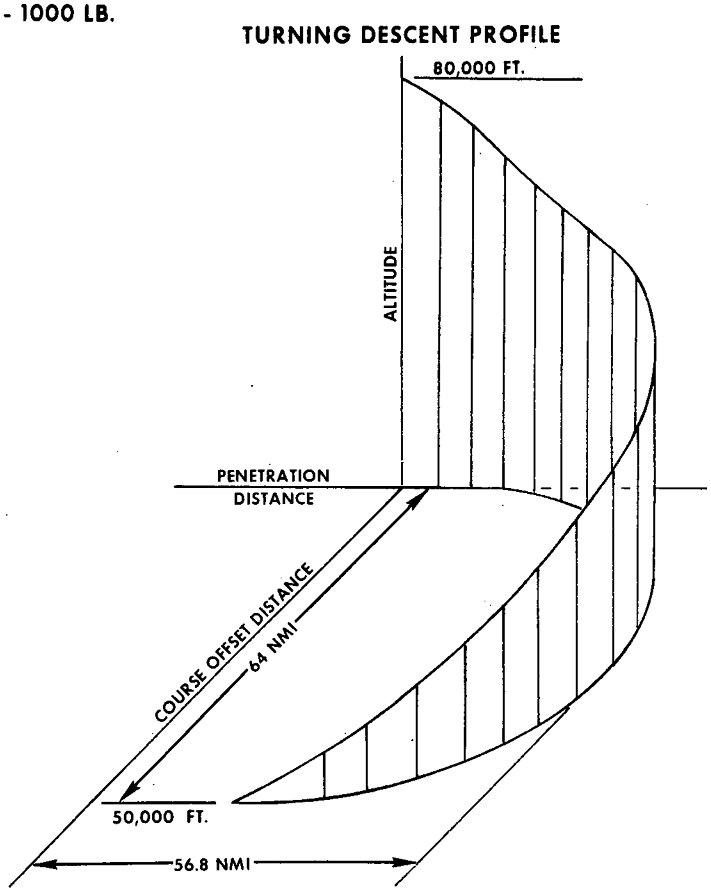
Figure A3-23B

SINGLE ENGINE TURNING DESCENT

MAXIMUM AB-350 KEAS-80,000 FT. TO 50,000 FT.
35 DEG. BANK-180 DEG. TURN
90,000 LB. INITIAL GROSS WEIGHT
NOTE: No service allowance included.



INLET CONFIGURATION			
ENGINE	SPIKE	FORWARD BYPASS	AFT BYPASS
OPERATING	AUTO	OPEN INITIALLY CLOSED AT MACH 1.0	CLOSED
SHUT DOWN	MANUAL FORWARD	OPEN	OPEN



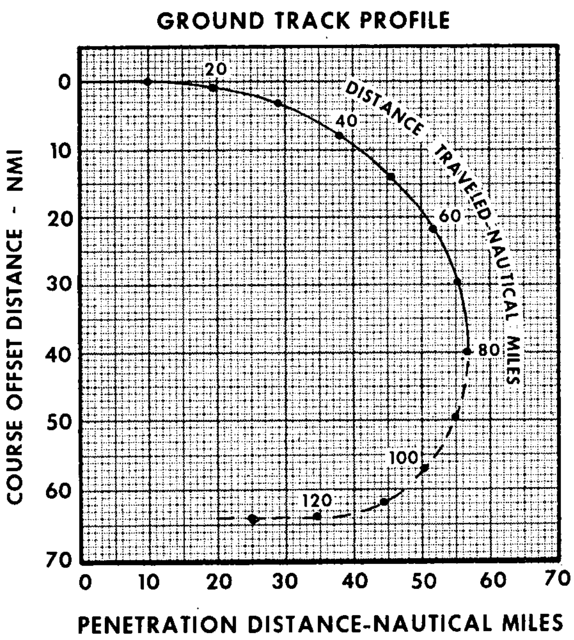


Figure A3-24

PART IV

SUBSONIC CRUISE PERFORMANCE

List of Illustrations

INTRODUCTION

This part of the appendix supplies two engine cruise and loiter performance data and single engine cruise performance data. The material for two engine operation includes a long range cruise chart, maximum specific range summaries for long range cruise-climb and KC-135 buddy missions, loiter performance, and specific range charts for altitudes from 10,000 feet to 40,000 feet. The single engine data show cruise climb range capability with and without afterburner, and a specific range chart for operation at Military thrust.

TWO ENGINE OPERATION

The two engine performance data applies to operation with YJ or YJ-1 engines when aircraft c.g. is at 25% MAC. Operation at more forward c.g. conditions reduces specific range 1% for each one percent shift in c.g., as noted on the specific range charts.

LONG RANGE CRUISE SUMMARY

Figure A4-1 presents the constant altitude, maximum range cruise climb, and Military thrust cruise climb capability of the aircraft in terms of distance to go to 65,000 lbs gross weight (approximately 10,000 lbs fuel remaining). The additional distance available to lower gross weights is also provided. Cruise speeds for constant altitude cruise are tabulated on the chart. The chart can be used on an incremental basis for any desired start and end cruise condition.

Example:

Determine the range available at 25,000 feet, 30,000 feet, and by cruise climbing with an initial gross weight of 120,000 lb if cruise is to be terminated at 10,000 lbs fuel remaining (approximately 65,000 lbs gross weight). Figure A4-1 shows that by cruising at 25,000 feet the range will be 1700 nmi. This range increases to 1810 nmi by cruising at 30,000 feet. Maximum range is available by cruise climbing at 0.88 Mach number. Under this condition cruise would be initiated at 29,400 feet and ended at 41,900 feet at 10,000 lbs fuel remaining. Distance traveled would be 1900 nmi.

MAXIMUM RANGE CRUISE CLIMB

Figure A4-2 presents the distance available to 65,000 lbs gross weight (approximately 10,000 lb fuel remaining) for maximum range cruise climb at 0.88 Mach number and 382,000 lb W/δ. The chart can be used on an incremental basis for any desired start and end cruise condition.

MAXIMUM SUBSONIC SPECIFIC RANGE SUMMARY

Figure A4-3 presents the maximum specific range summary for cruise climb at various Mach numbers. Note that the optimum cruise climb occurs at Mach 0.88. This summary is obtained from the subsonic range factor chart, figure A4-4, by the equations Range Factor (instantaneous) = Specific Range (instantaneous) x W (instantaneous) and δ (and its corresponding pressure altitude) = $W/W/\delta$. (Refer to section on equations).

RANGE FACTOR

Figure A4-4 presents the subsonic range factor for long range cruise climb at any Mach number. The chart shows there is a range factor and corresponding cruise climb schedule (W/δ) for a given cruise Mach number. This provides a quick means for calculating best range available for any given cruise Mach. The chart also shows that the optimum range factor (3100 lb-nmi/lb) occurs at Mach 0.88 and the corresponding cruise climb schedule (W/δ) is 382,000 lb.

Definition of Terms

W/δ = Weight/pressure ratio, lb

W = Aircraft gross weight, lb

δ = Pressure ratio, P/P_0, for the flight pressure altitude (figure A1-8)

W_F = Total fuel flow, lb per hour

KTAS = True airspeed, knots

Ln = Natural logarithm

Equations

$$\text{Specific Range (avg)} = \frac{\text{Distance flown}}{\text{Fuel Used}}, \frac{\text{nmi}}{\text{lb}}$$

Specific Range (instantaneous) = $\frac{KTAS}{W_F}$, $\frac{nmi}{lb}$

Range Available = Specific Range (avg) x Fuel Used, nmi

Range Factor (avg) = Specific Range (avg) x W (avg), $\frac{nmi}{lb}$ x lb

Range Factor (instantaneous) = Specific Range (instantaneous) x W (instantaneous), $\frac{nmi}{lb}$ x lb, or $\left(\frac{KTAS}{W_F} \times W\right)$

Range Available = $\frac{\text{Range Factor (avg) x}}{\text{W (avg)}}$

Fuel Used, nmi

Range Available = Range Factor (avg) x ln $\left(\frac{\text{initial W}}{\text{final W}}\right)$, nmi

or Range Factor (avg) = $\frac{\text{Distance flown}}{\ln\left(\frac{\text{initial W}}{\text{final W}}\right)}$,

lb x $\frac{nmi}{lb}$

$\delta = \frac{W}{W/\delta}$

Example (1):

Determine the range available and the cruise climb schedule for cruise at 0.80 Mach. (Note that this is not the optimum cruise speed.) The initial cruising weight is 100,000 lb, and 20,000 lb of fuel are to be used. Assume a standard day with zero wind.

a. Average gross weight is 90,000 lb.

b. From figure A4-4, at Mach 0.80, the cruise climb schedule (W/δ) is 275,000 lb and the range factor is 2915 lb - nmi/lb.

c. The range available = (2915 x 20,000/90,000) = 648 nmi.

d. The initial pressure ratio, δ, = (100,000/275,000) = 0.3636.

The final pressure ratio, δ, = (80,000/275,000) = 0.2929.

e. Enter the standard atmosphere table, figure A1-8, with the initial and final pressure ratios, and determine the approximate initial and final cruise altitudes as 25,500 ft and 30,500 feet, respectively.

Example (2):

Determine the cruise fuel required and cruise climb schedule for cruise at 0.75 Mach. The planned cruise distance is 650 nmi. Assume a standard day with zero wind. Planned initial cruise gross weight is 100,000 lb.

a. From figure A4-4, at Mach 0.75, the cruise climb schedule (W/δ) is 227,000 lb and the range factor is 2730 lb - nmi/lb.

b. From section on equations, $\ln \frac{\text{W (initial)}}{\text{W (final)}} = \frac{\text{Distance}}{\text{Range Factor}}$; $\ln \frac{100{,}000}{\text{W (final)}} = \frac{650}{2730}$, or 0.2380; $\frac{100{,}000}{\text{W (final)}} = 1.269$; W (final) = (100,000/1.269) = 78,800 lb.

Therefore, cruise fuel required = (100,000 - 78,800) = 21,200 lb.

c. Using the same method as in the previous example, the approximate initial and final cruise altitudes are 21,000 feet and 26,500 feet, respectively.

BUDDY MISSION CRUISE

Figure A4-5 presents the distance available to 65,000 lbs gross weight (approximately 10,000 lb fuel remaining) for Buddy Mission cruise at Mach 0.77 and 28,000 feet. The speed and altitude schedule is compatible with KC-135 tanker performance characteristics. The chart can be used on an incremental basis for any desired start and end cruise condition.

SPECIFIC RANGE - MACH 0.77

Figure A4-6 presents specific range data at Mach 0.77. The Buddy Mission altitude is listed on the chart. If desired, greater range is obtained by cruise climbing.

LOITER PERFORMANCE

Figure A4-7 presents loiter performance as minutes per 1000 lb of fuel used. The recommended speed schedule is listed in the chart.

Example:

Determine the loiter time available at 20,000 feet for an initial gross weight of 70,000 lb. A planned 10,000 lb of fuel is to be consumed. Enter figure A4-7 at 70,000 lbs gross weight and 20,000 feet and read 5.09 minutes per 1000 lb of fuel. Reenter at 60,000 lbs and 20,000 feet and read 5.62 minutes per 1000 lb of fuel. The average value is 5.35 minutes per 1000 lb of fuel. This provides 53.5 minutes for the planned 10,000 lbs of fuel consumption.

SPECIFIC RANGE - CONSTANT ALTITUDE

The specific range charts (figures A4-8 thru A4-15) present cruise data for various constant altitudes (from 10,000 ft to 40,000 ft) throughout the speed range from maximum endurance to Military thrust. Each chart presents nautical miles per 1000 lb of fuel (nmi/Klb) as a function of Mach number and gross weight with subscales of KEAS and KTAS for standard day. Also included are an overlay grid of fuel flow per engine, the maximum range speed schedule, and the recommended loiter speed schedule.

SINGLE ENGINE OPERATION

The single engine performance data applies to operation with YJ engines. A five percent service allowance is included. Refer to text for other items affecting the performance results. The long range cruise data for both Military and Afterburner operation can be used in conjunction with the single engine descent information in Part III. Transition from end of descent (as indicated in the single engine descent curves) to start of single engine cruise is accomplished by drift down. Duration of drift down is indeterminate and is largely dependent on piloting technique. Drift down consists of a slow sink period during which fuel economy is above the corresponding cruise values for the same weight as long as the actual altitude is above the scheduled cruise altitude. The difference in miles per pound can be neglected in planning and provides an operational contingency pad. Refer to Section III for fuel management during single engine cruise.

LONG RANGE CRUISE - AFTERBURNER OPERATION

Figure A4-21 presents single engine long range cruise performance for afterburner operation in terms of distance to go to 60,000 lbs gross weight (approximately 5000 lbs fuel remaining). The chart is based on zero wind distance without turns at test day conditions. Test EGT was trimmed between 780°C and 810°C for CIT range of -20°C to +20°C. The long range power and speed schedule is based on the following: Use Max AB and Mach 0.85 to 40,000 lb fuel remaining, then make a gradual power reduction to Min AB at 35,000 lb fuel and 300 KEAS. Cruise climb in minimum afterburning at 300 KEAS until Mach 0.75 is intercepted at approximately 25,000 feet, then cruise climb at Mach 0.75 to start of descent. Inlet configuration is both forward and aft bypass closed on the operating engine and both open on the windmilling engine.

LONG RANGE CRUISE - MILITARY THRUST

Figure A4-22 presents single engine long range cruise performance for Military operation in terms of distance to go to 60,000 lbs gross weight (approximately 5000 lbs fuel remaining). The chart is based on zero wind distance, without turns, at test day conditions for gross weights up to 80,000 pounds. Higher gross weight data is estimated. Test EGT was between 760°C and 820°C for CIT range of -5°C to +25°C. The long range speed schedule is based on the following: Cruise climb at 300 KEAS until Mach 0.60 is intercepted at 15,000 feet (approximately 22,500 pounds fuel remaining), then cruise climb at Mach 0.60 to start of descent. Inlet configuration is both forward and aft bypass closed on the operating engine and both open on the windmilling engine.

SPECIFIC RANGE - MILITARY THRUST

Figure A4-23 presents single engine Military Thrust specific range data in terms of Mach number and gross weight. The corresponding pressure altitude and KEAS schedule is provided separately. The data is based on flight tests, without turns, to 80,000 pounds gross weight. Higher gross weight data is estimated.

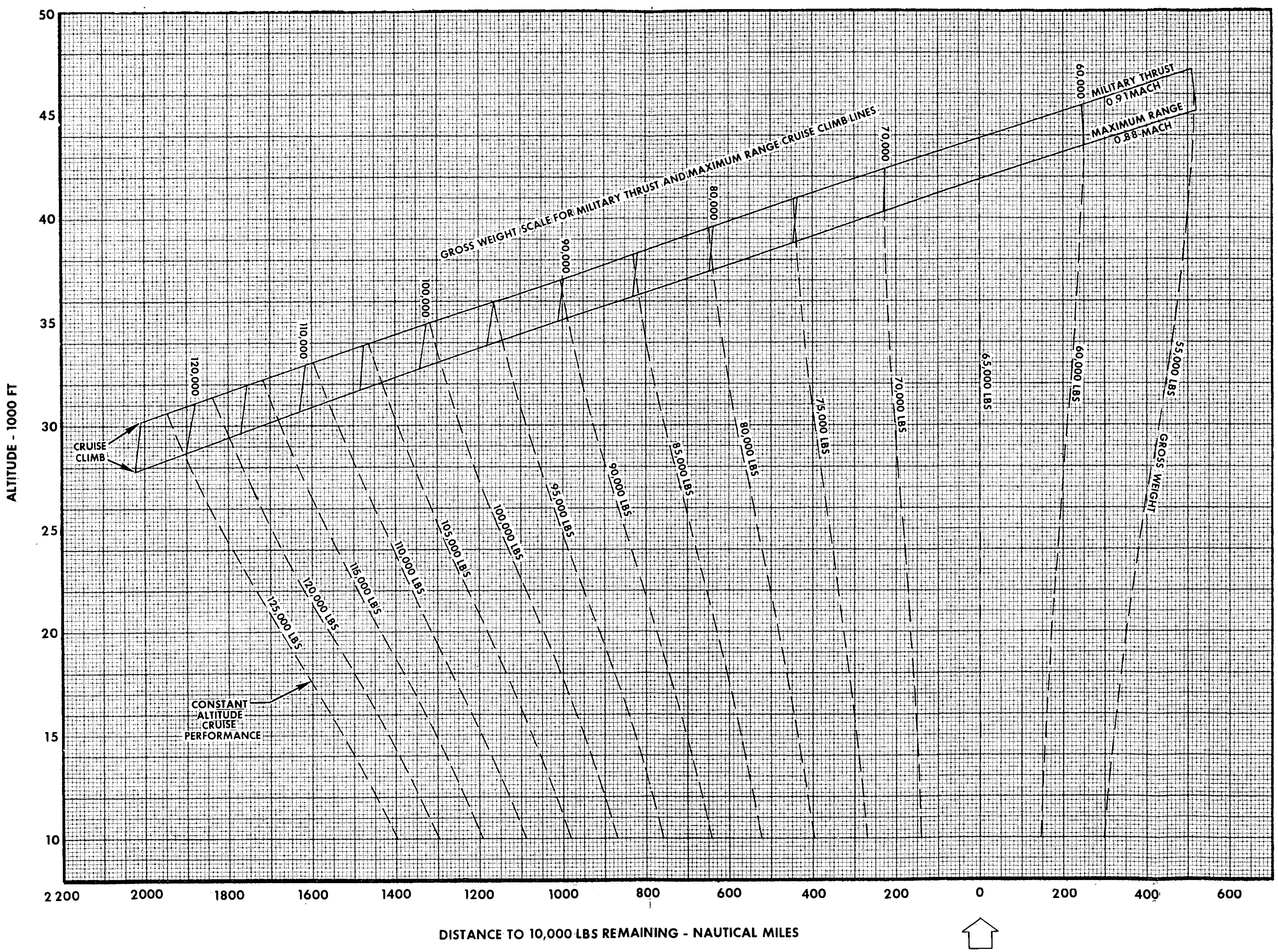
SINGLE ENGINE CRUISE TABULATIONS

Figure A4-24 presents AB and MILITARY cruise performance data in tabular form for convenience. Note that the listing of range available is based on a 5000 lb reserve.

SUBSONIC LONG RANGE CRUISE

TWO ENGINES
25% MAC C.G.
STANDARD DAY
ZERO WIND

YJ ENGINES
YJ-1 ENGINES



CONSTANT ALTITUDE CRUISE - 1000 FT	10	15	20	25	30	35	40
G. W.	125,000 TO 110,000 LB						
MACH	.72	.77	.82	.87	.91		
KEAS	395	383	367	350	328		
KTAS	459	483	504	524	536		
G. W.	110,000 TO 90,000 LB						
MACH	.68	.72	.76	.82	.87	.91	
KEAS	374	358	341	330	313	292	
KTAS	434	451	467	496	513	525	
G. W.	90,000 TO 70,000 LB						
MACH	.66	.68	.72	.77	.82	.88	.91
KEAS	363	338	323	310	295	282	259
KTAS	421	426	442	464	483	508	522
G. W.	70,000 TO 55,000 LB						
MACH	63	.65	.67	.71	.76	.82	.88
KEAS	346	323	300	285	273	263	250
KTAS	402	408	412	428	448	473	505

SHADED AREA DENOTES MILITARY THRUST CRUISE

Figure A4-1

SUBSONIC MAXIMUM RANGE CRUISE CLIMB

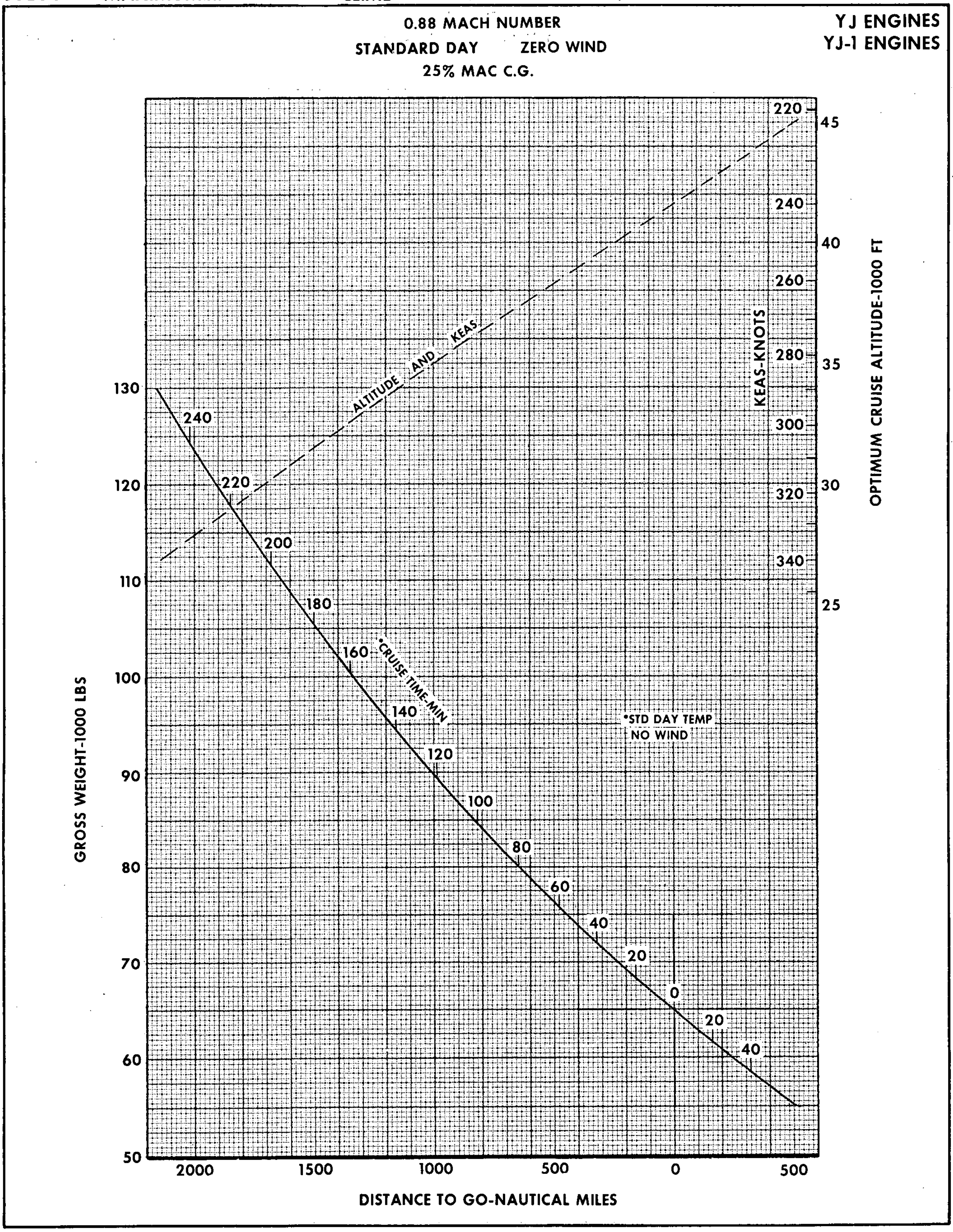


Figure A4-2

MAXIMUM SUBSONIC SPECIFIC RANGE SUMMARY

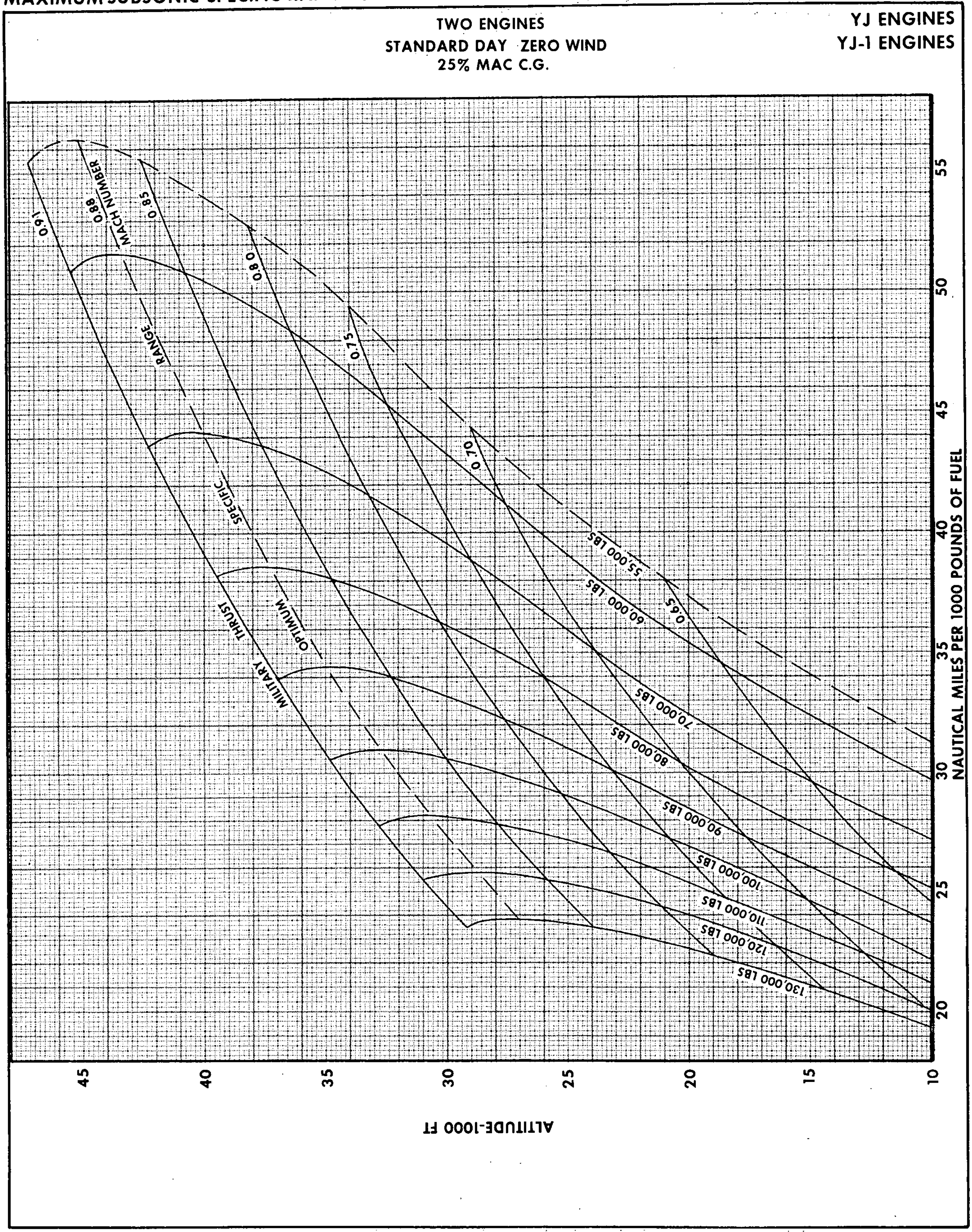


Figure A4-3

SUBSONIC RANGE FACTOR SUMMARY

TWO ENGINES
25% MAC C.G.

YJ ENGINES
YJ-1 ENGINES

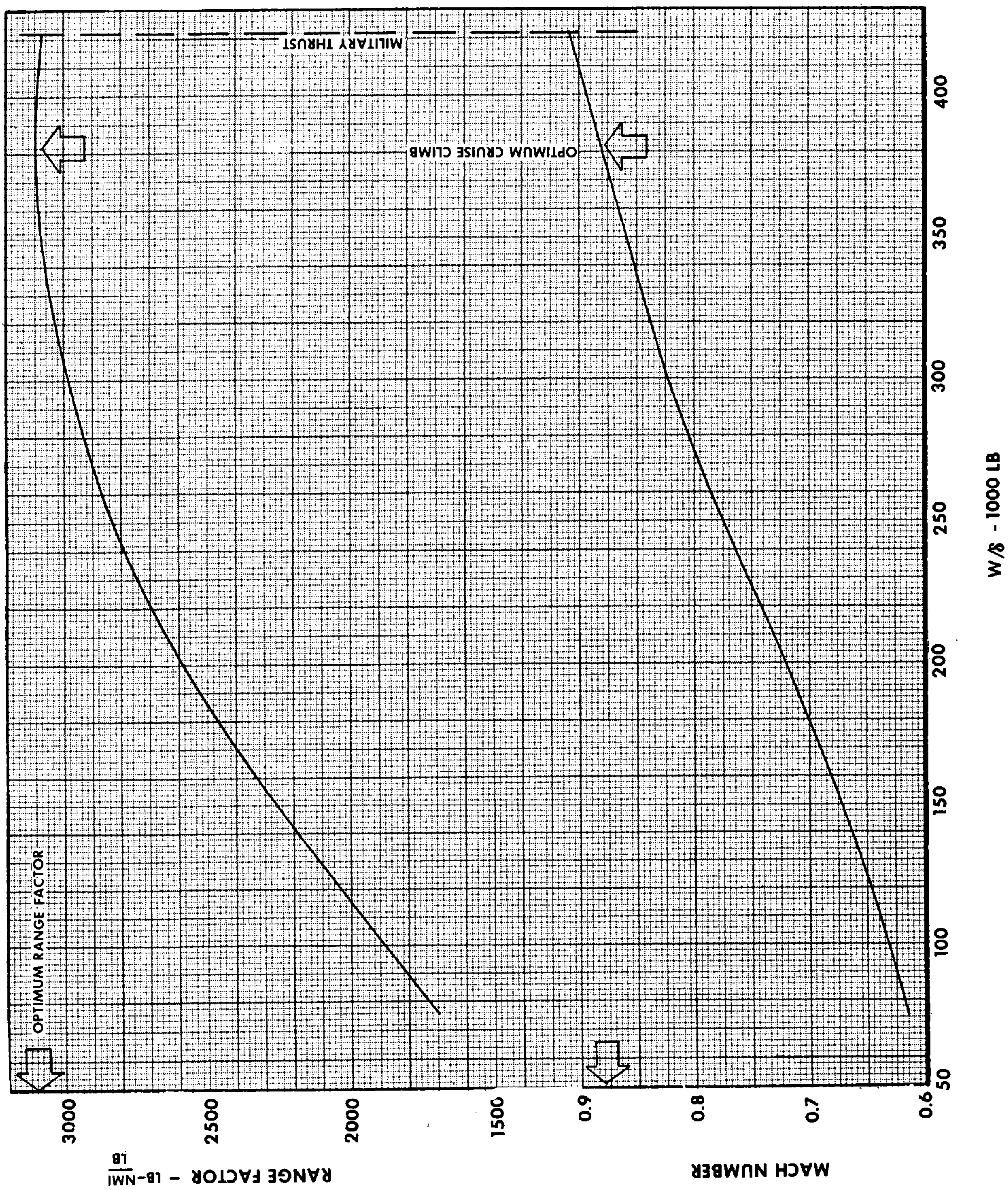


Figure A4-4

BUDDY MISSION CRUISE

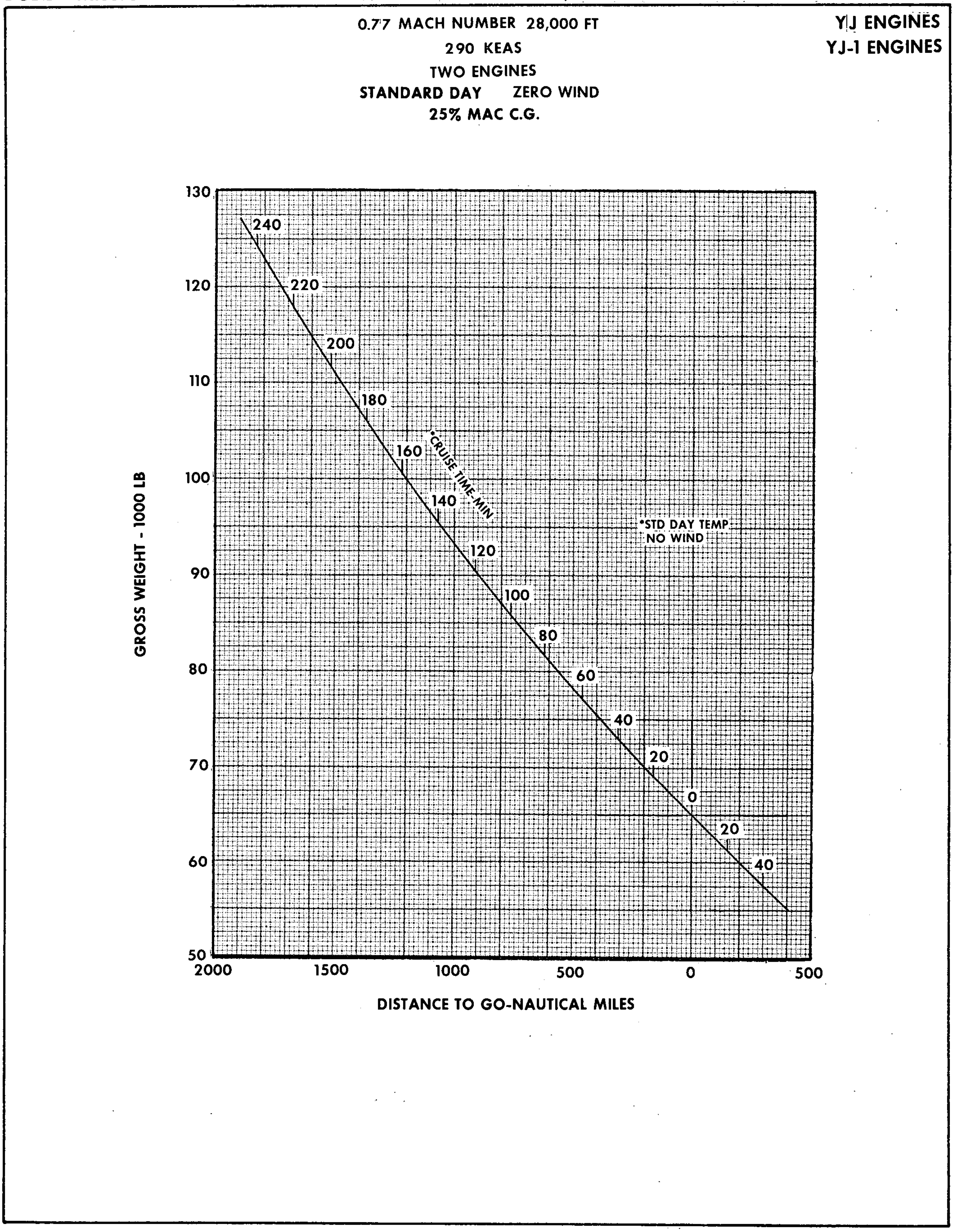


Figure A4-5

SUBSONIC SPECIFIC RANGE

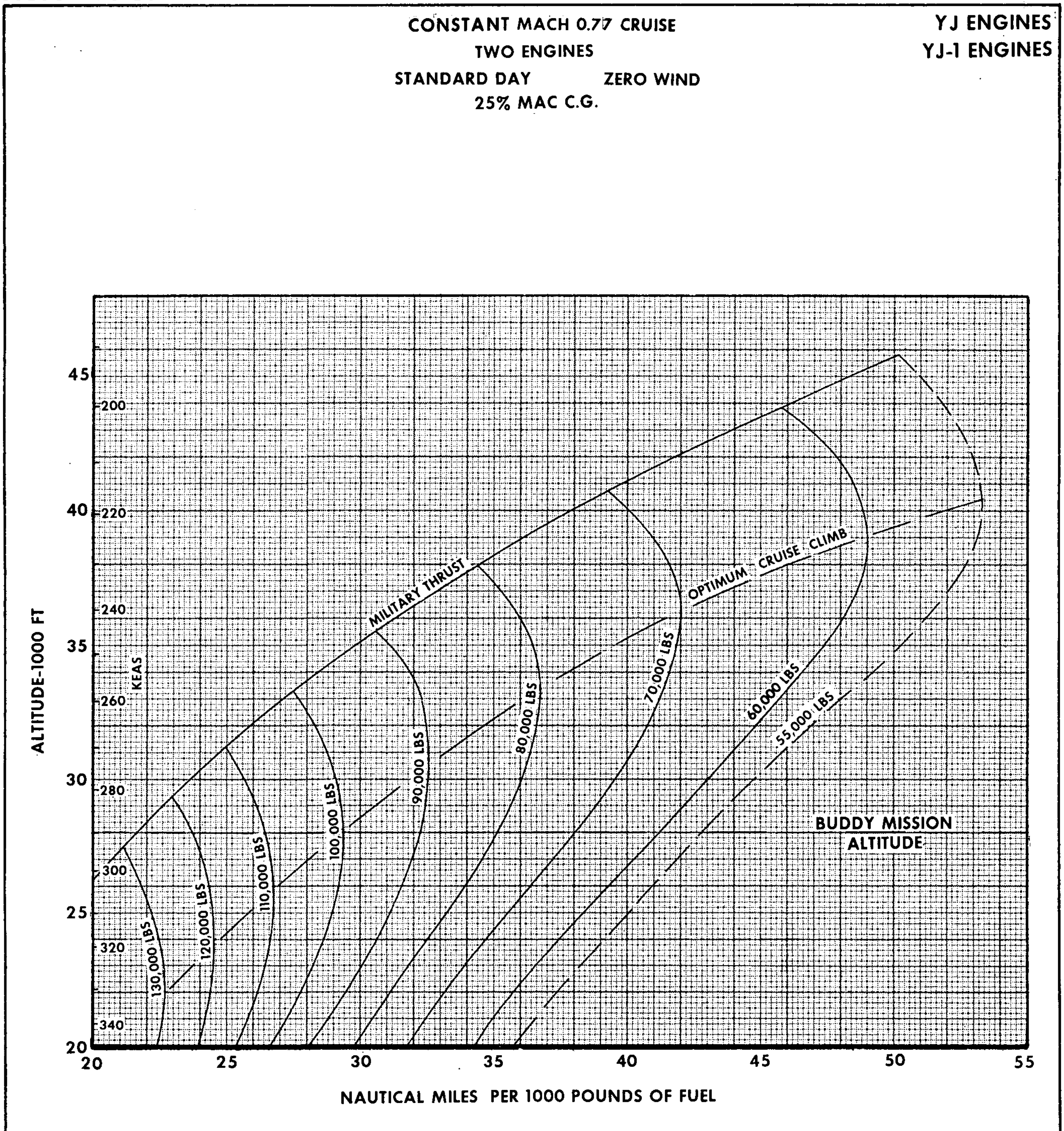


Figure A4-6

LOITER PERFORMANCE

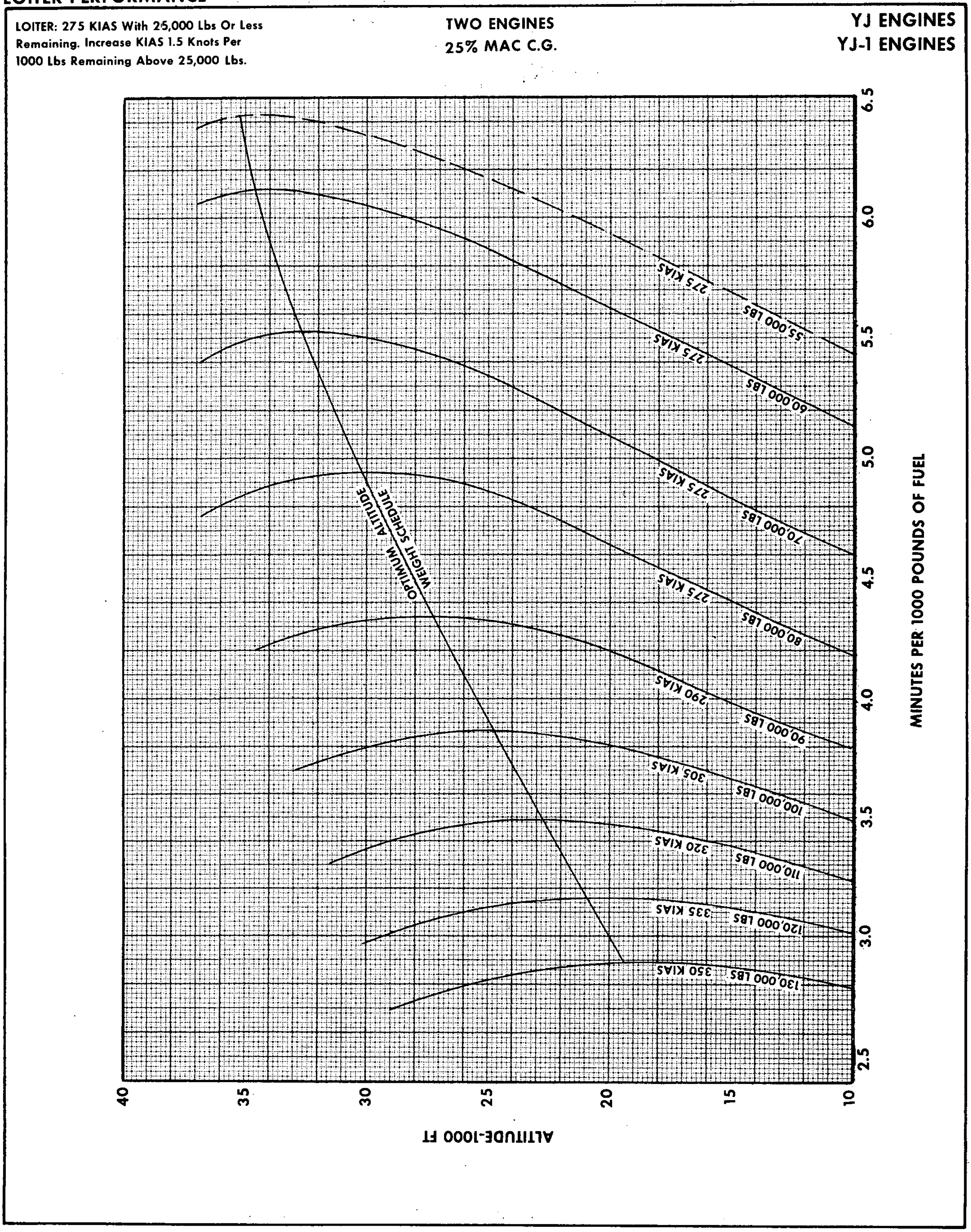


Figure A4-7

SUBSONIC SPECIFIC RANGE

YJ ENGINES - YJ-1 ENGINES

TWO ENGINES
10,000 FT ALTITUDE
STANDARD DAY   ZERO WIND
25% MAC C.G.

LOITER: 275 KIAS With 25,000 Lbs Or Less Remaining. Increase KIAS 1.5 Knots Per 1000 Lbs Remaining Above 25,000 Lbs.

Decrease Fuel Economy 1% For 1% Shift Of C.G. Forward Of 25% MAC.

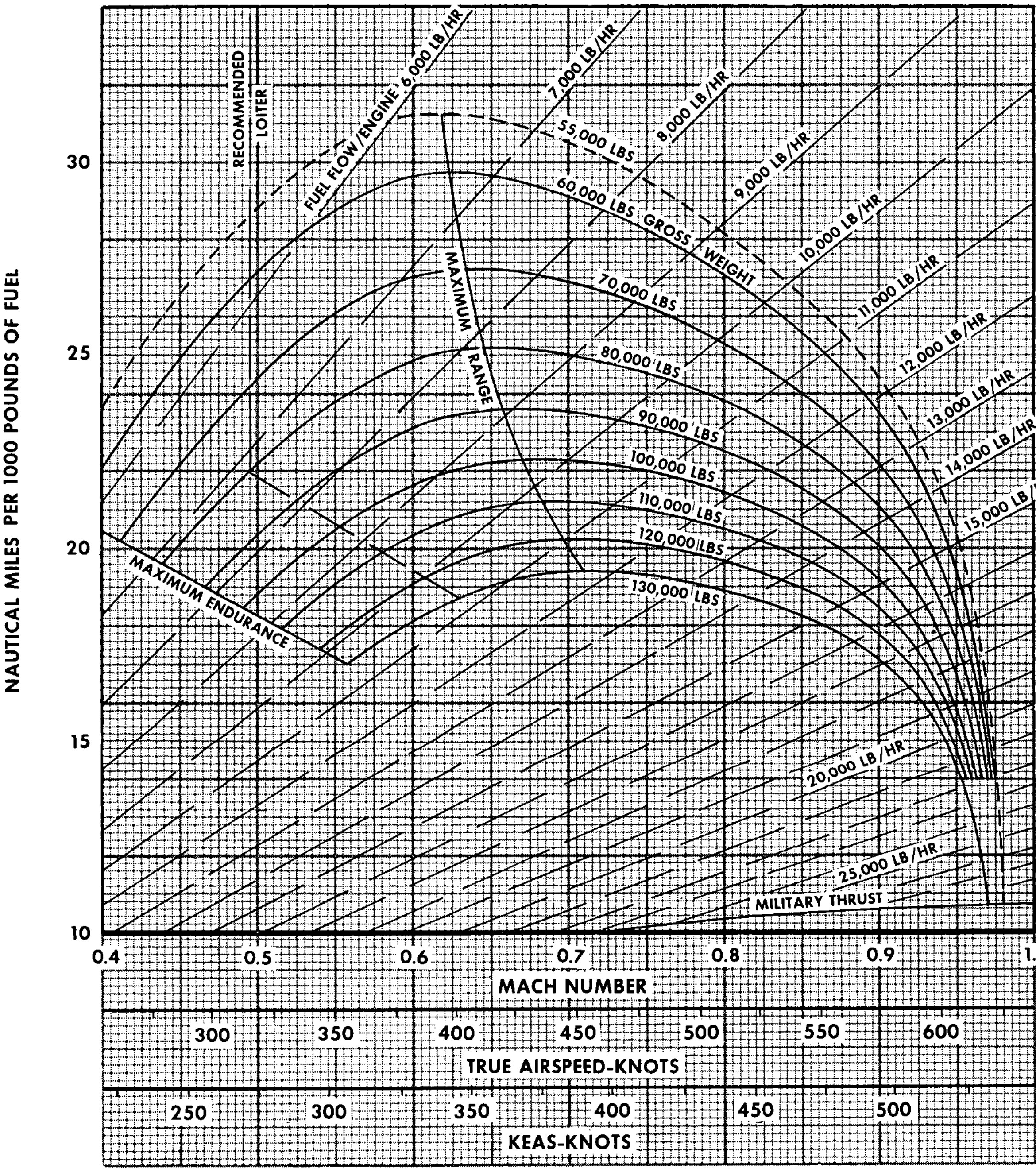


Figure A4-8

SUBSONIC SPECIFIC RANGE

YJ ENGINES - YJ-1 ENGINES

TWO ENGINES
15,000 FT ALTITUDE
STANDARD DAY ZERO WIND
25% MAC C.G.

LOITER: 275 KIAS With 25,000 Lbs Or Less Remaining. Increase KIAS 1.5 Knots Per 1000 Lbs Remaining Above 25,000 Lbs.

Decrease Fuel Economy 1% For 1% Shift Of C.G. Forward Of 25% MAC.

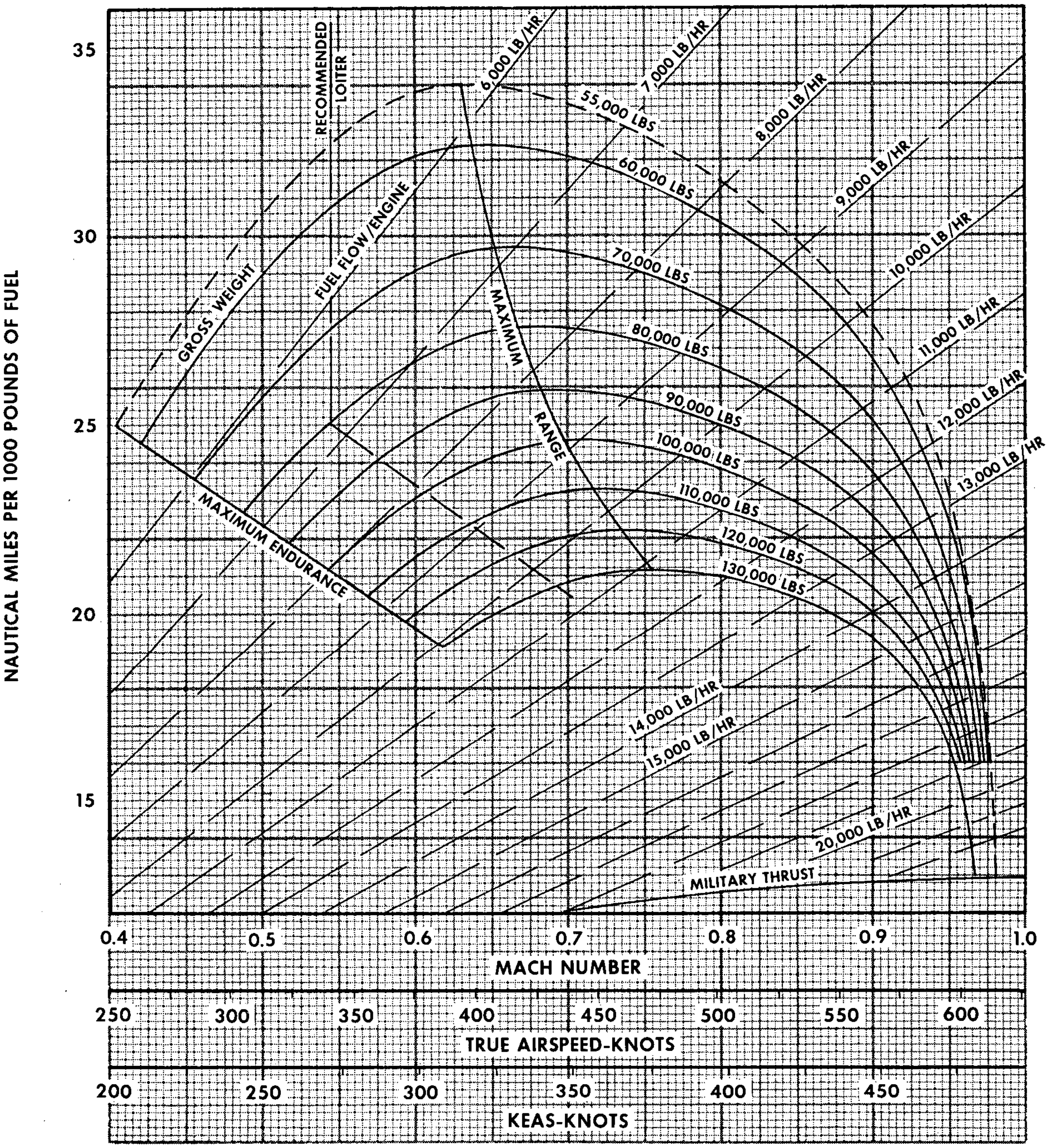


Figure A4-9

SUBSONIC SPECIFIC RANGE

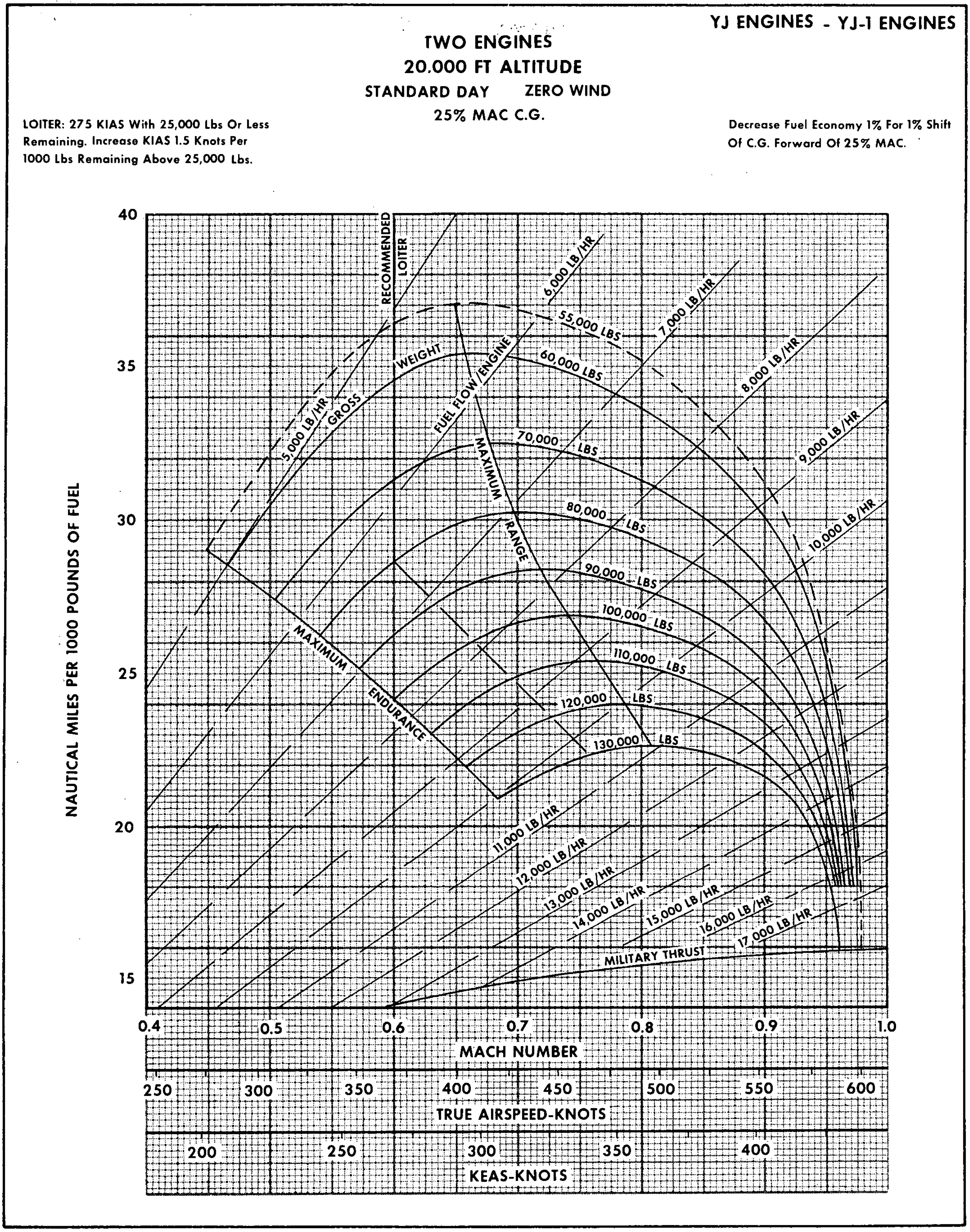


Figure A4-10

SUBSONIC SPECIFIC RANGE

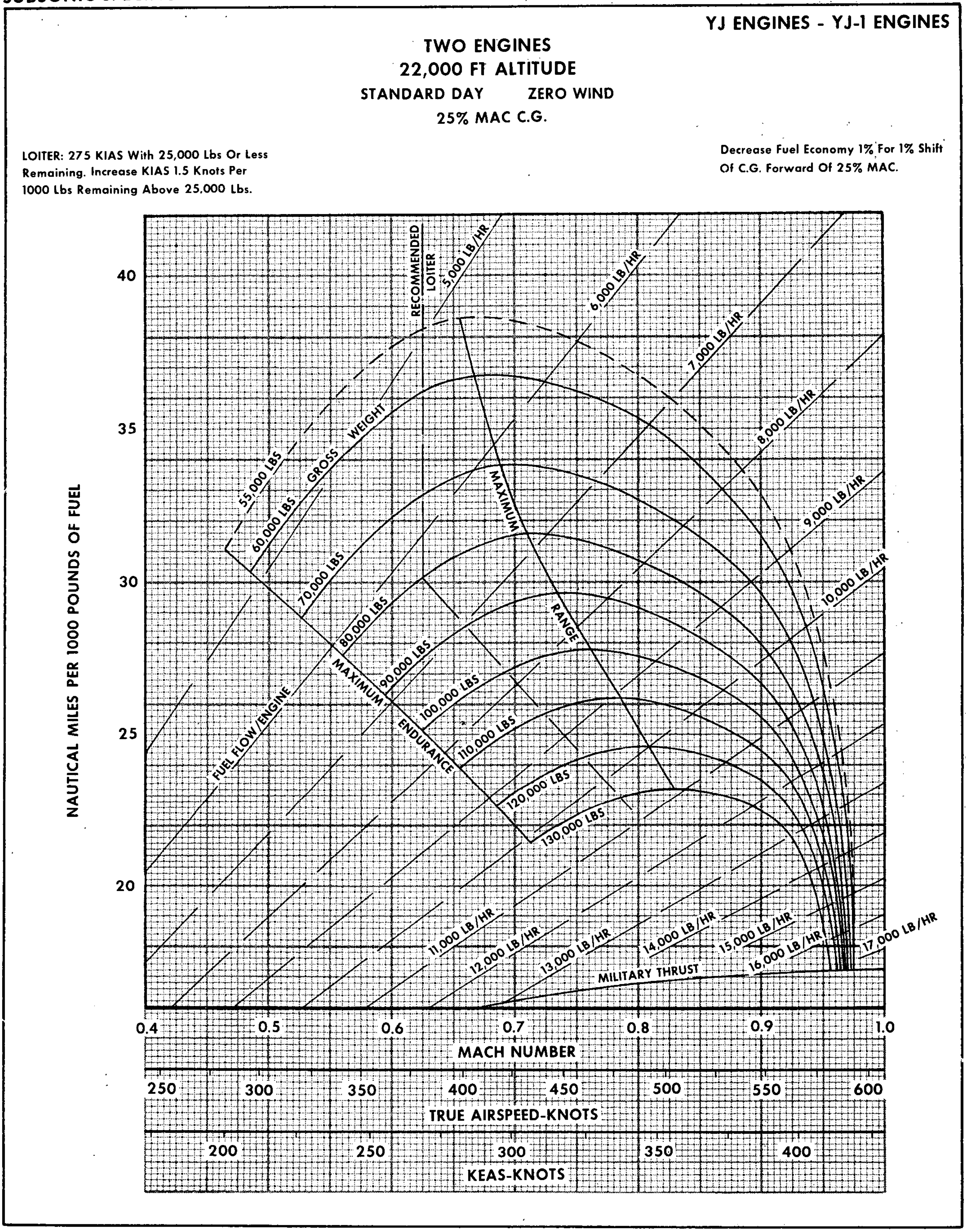


Figure A4-11

SUBSONIC SPECIFIC RANGE

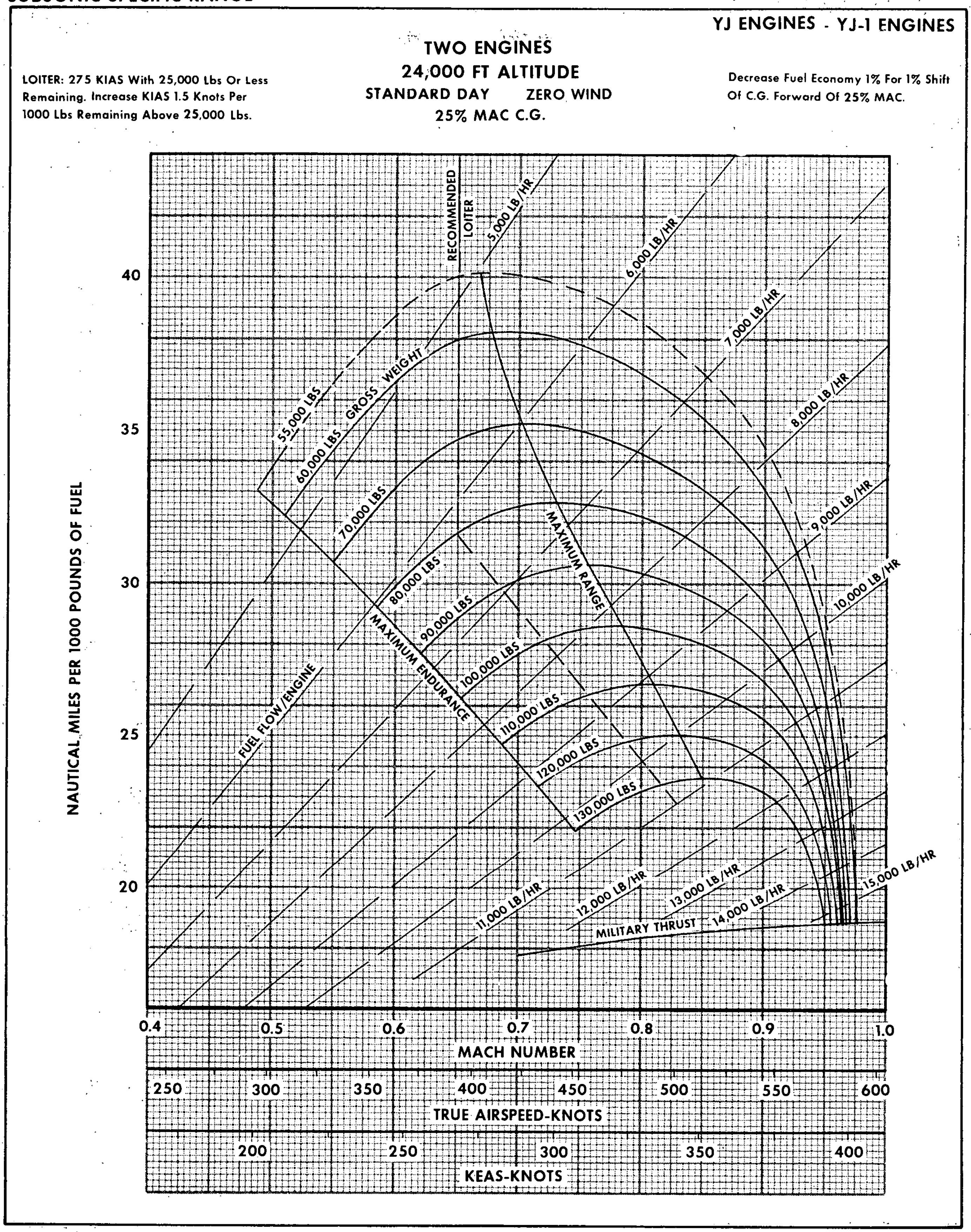


Figure A4-12

SUBSONIC SPECIFIC RANGE

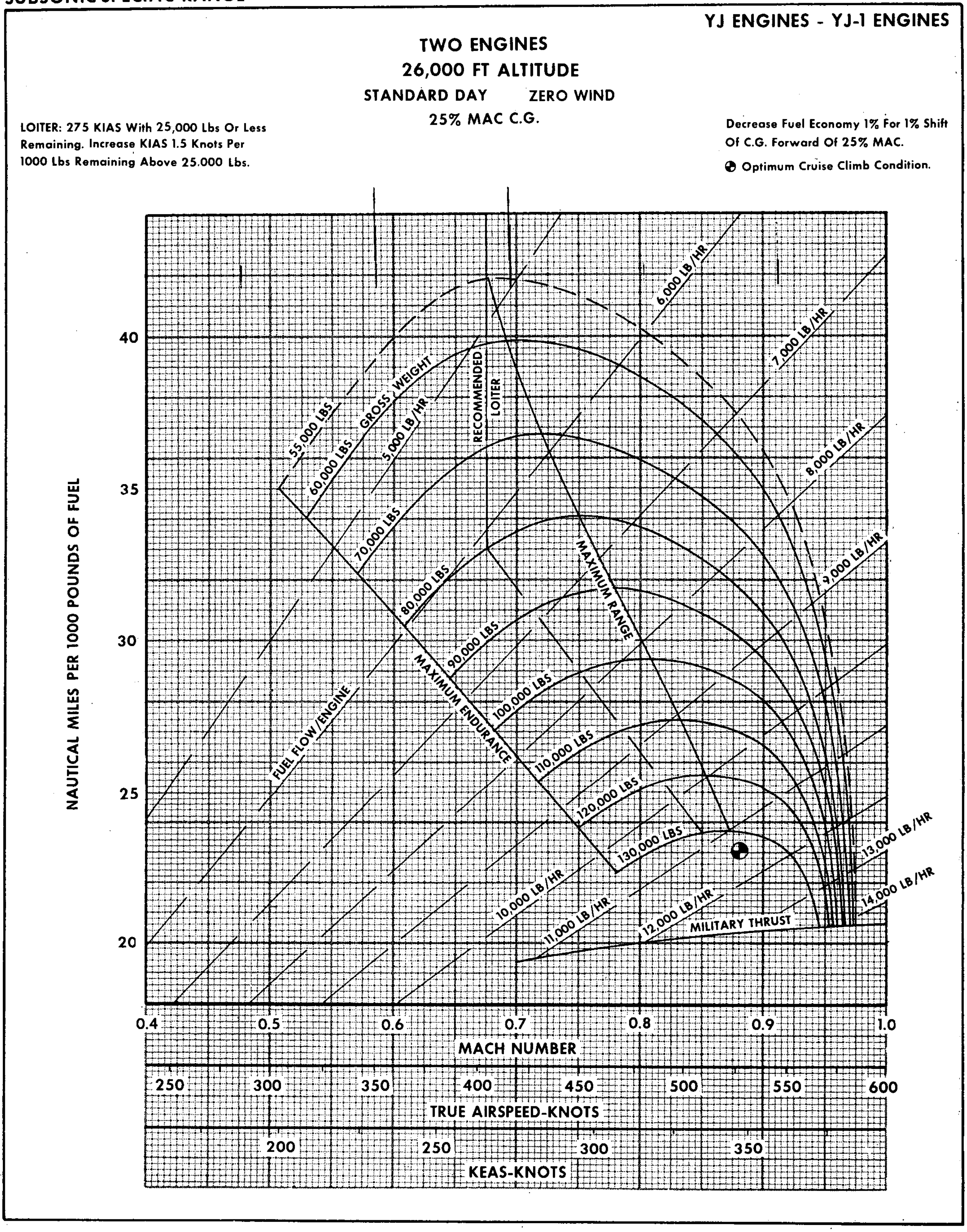


Figure A4-13

SUBSONIC SPECIFIC RANGE

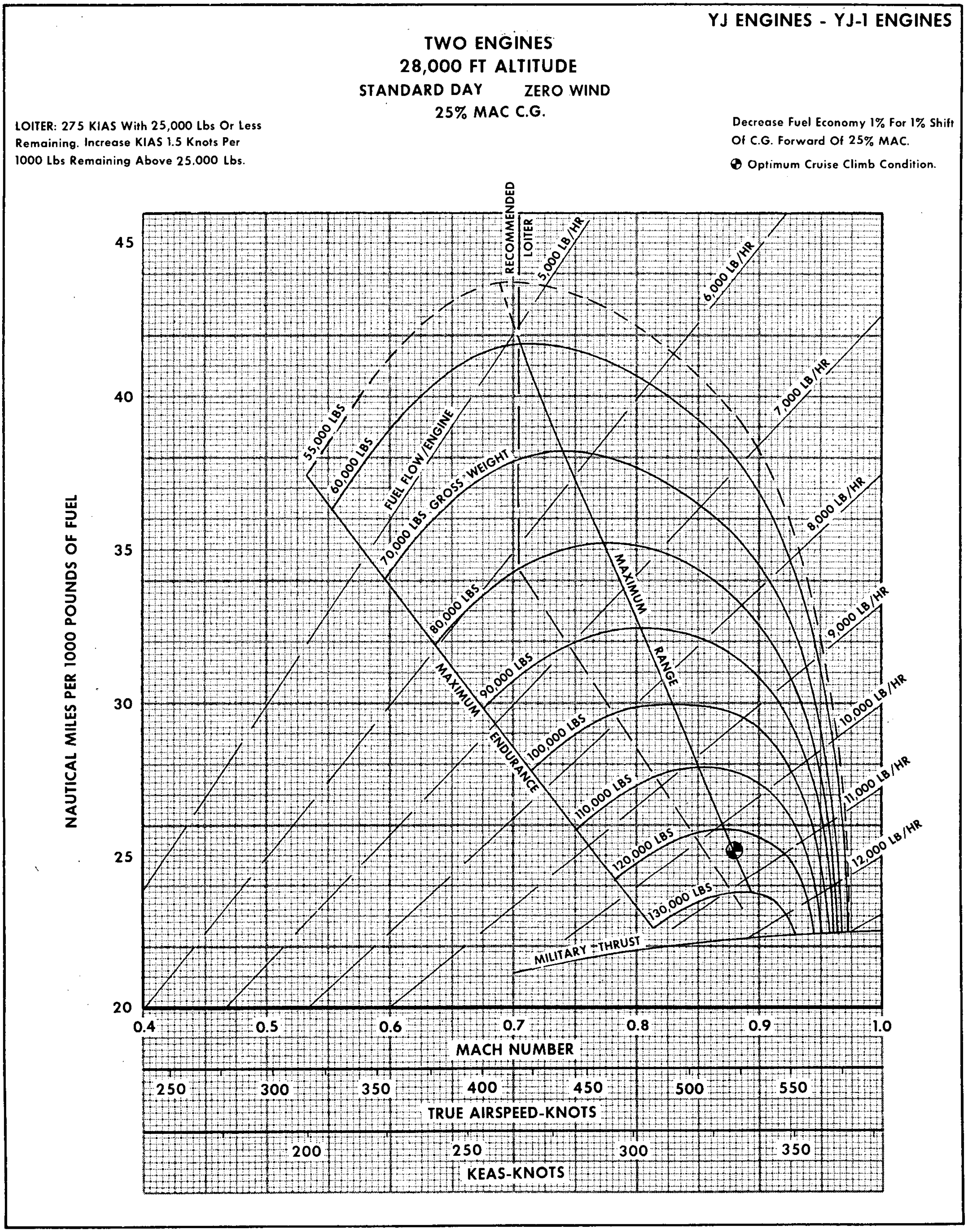


Figure A4-14

SUBSONIC SPECIFIC RANGE

YJ ENGINES - YJ-1 ENGINES

TWO ENGINES
30,000 FT ALTITUDE
STANDARD DAY ZERO WIND
25% MAC C.G.

LOITER: 275 KIAS With 25,000 Lbs Or Less Remaining. Increase KIAS 1.5 Knots Per 1000 Lbs Remaining Above 25,000 Lbs.

Decrease Fuel Economy 1% For 1% Shift Of C.G. Forward Of 25% MAC.

● Optimum Cruise Climb Condition.

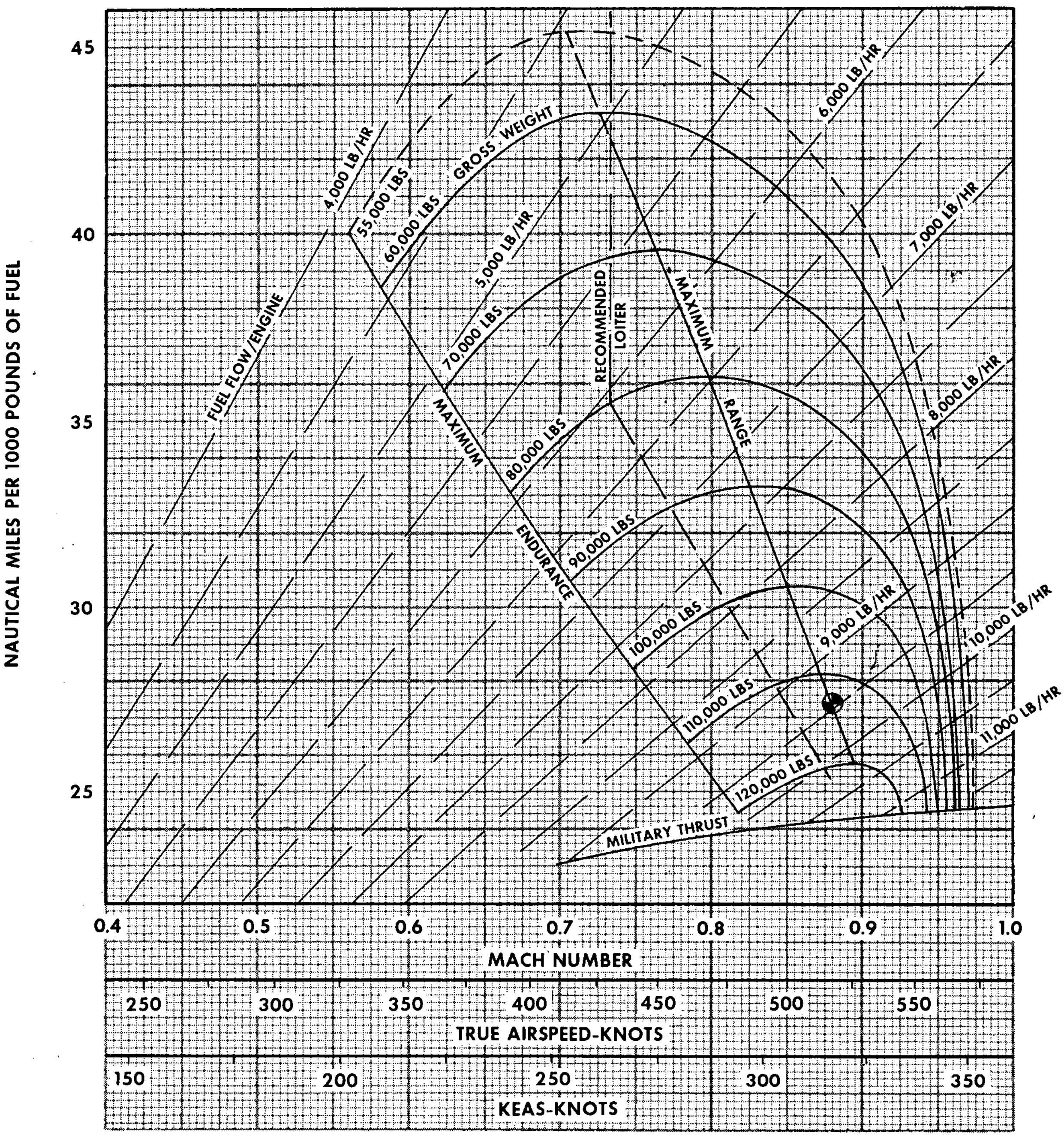


Figure A4-15

SUBSONIC SPECIFIC RANGE

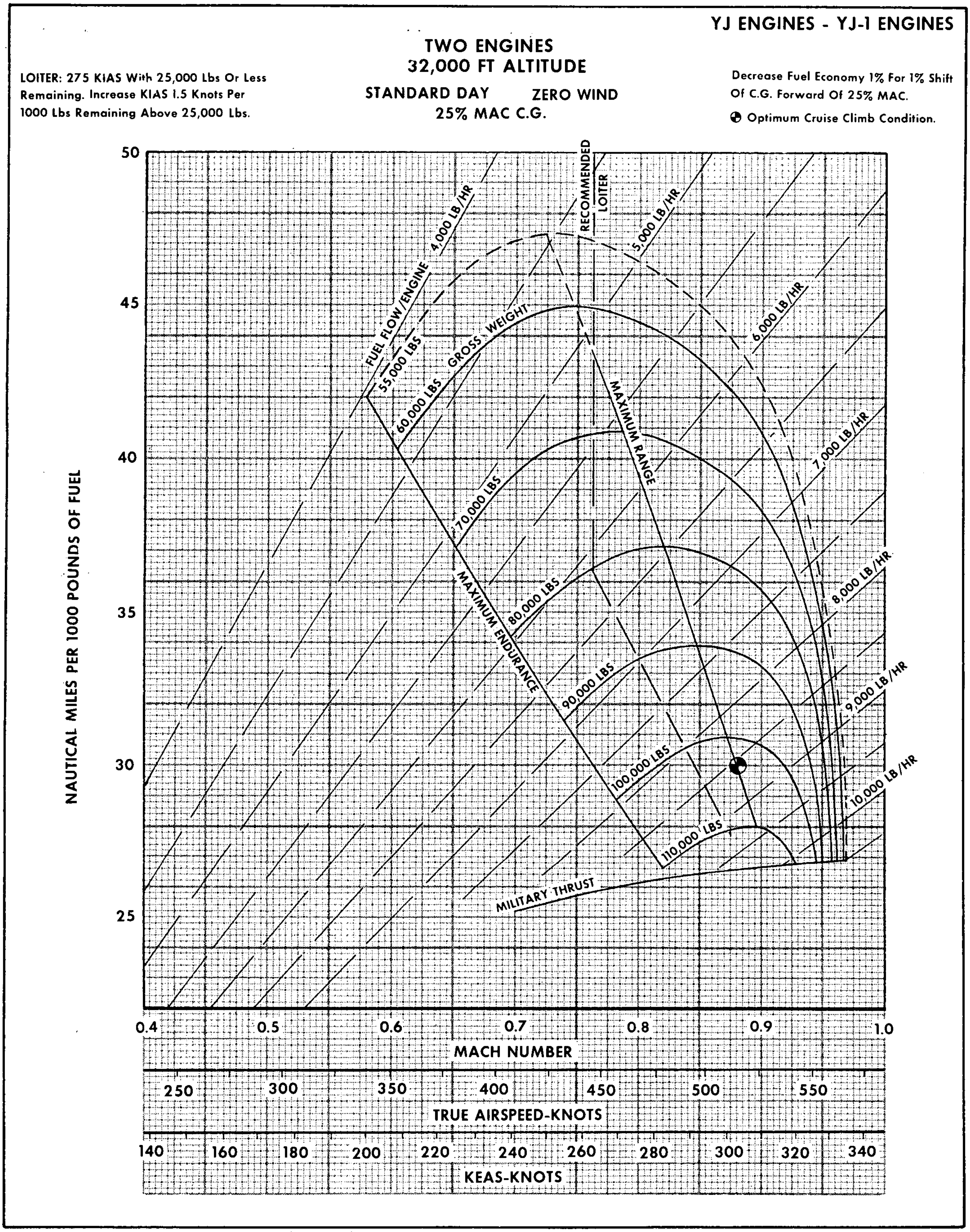


Figure A4-16

SUBSONIC SPECIFIC RANGE

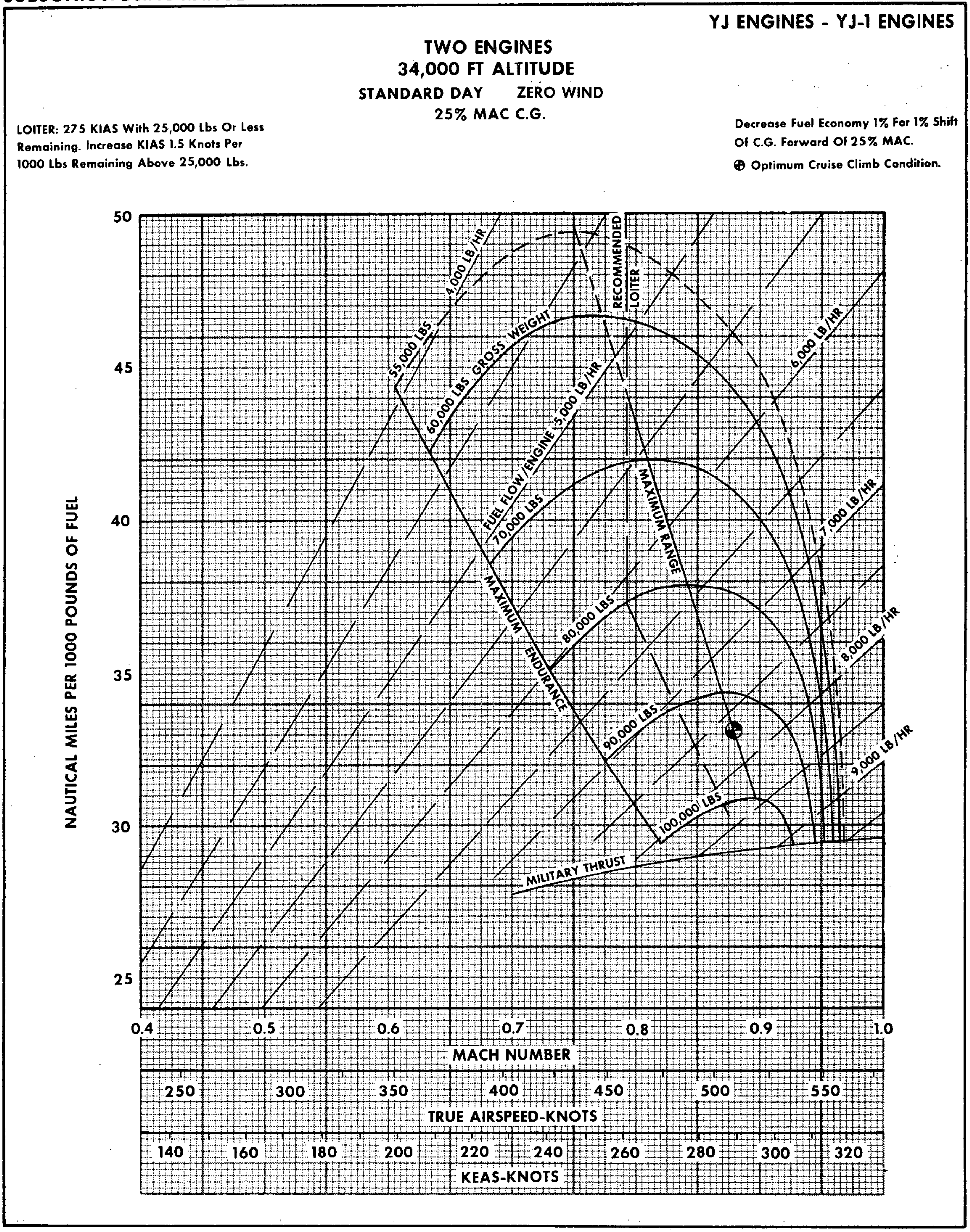


Figure A4-17

SUBSONIC SPECIFIC RANGE

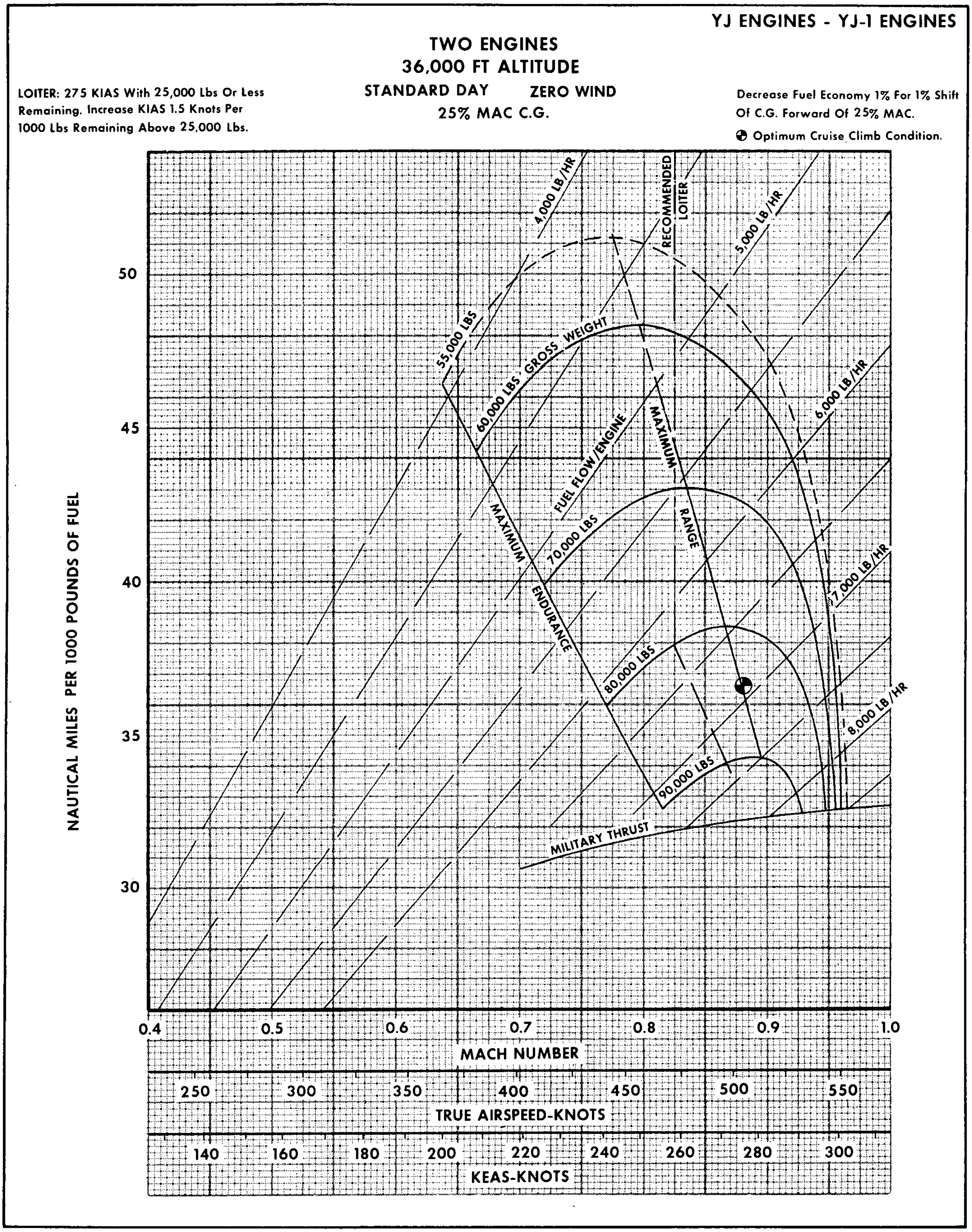


Figure A4-18

SUBSONIC SPECIFIC RANGE

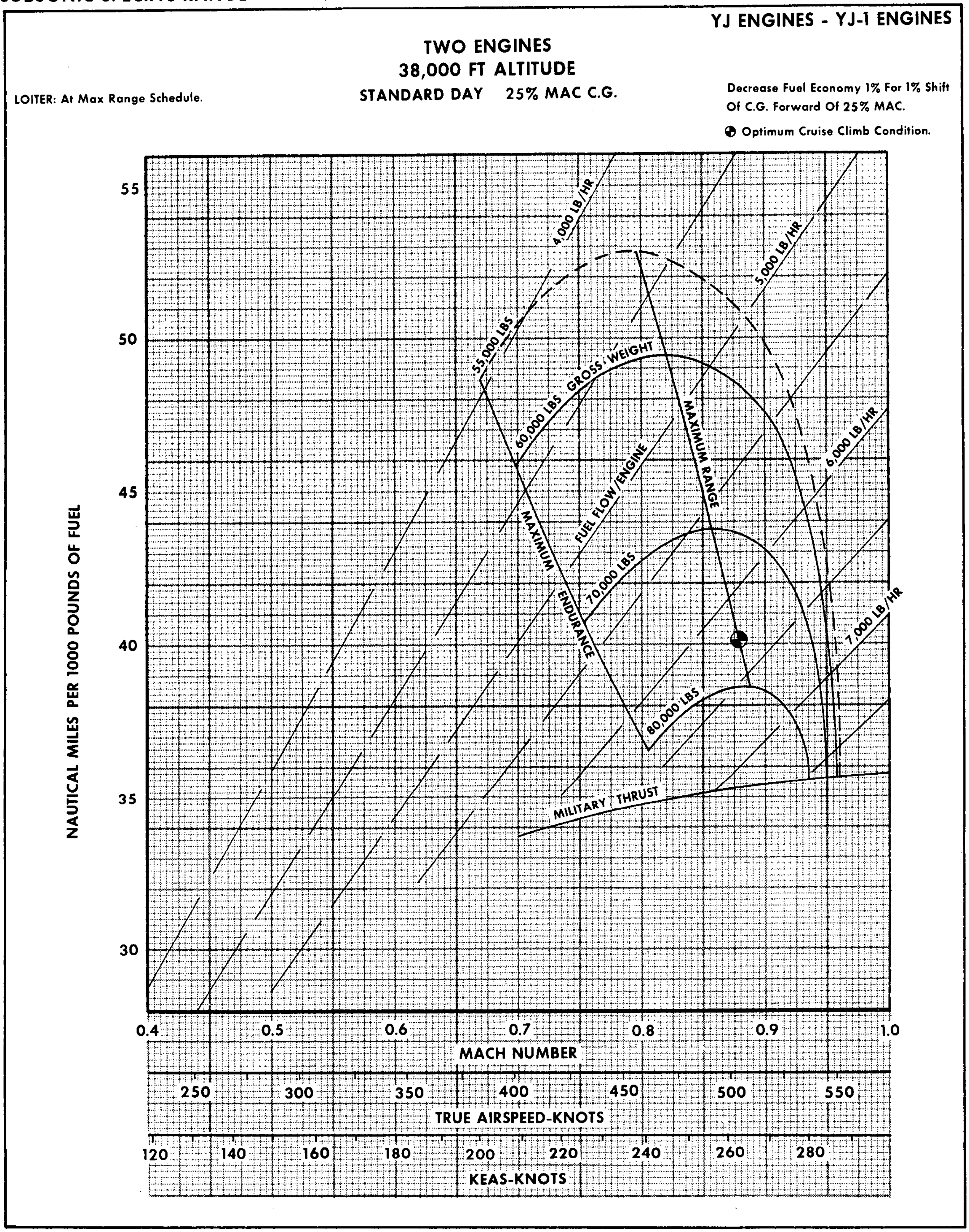


Figure A4-19

 Changed 15 March 1968

SUBSONIC SPECIFIC RANGE

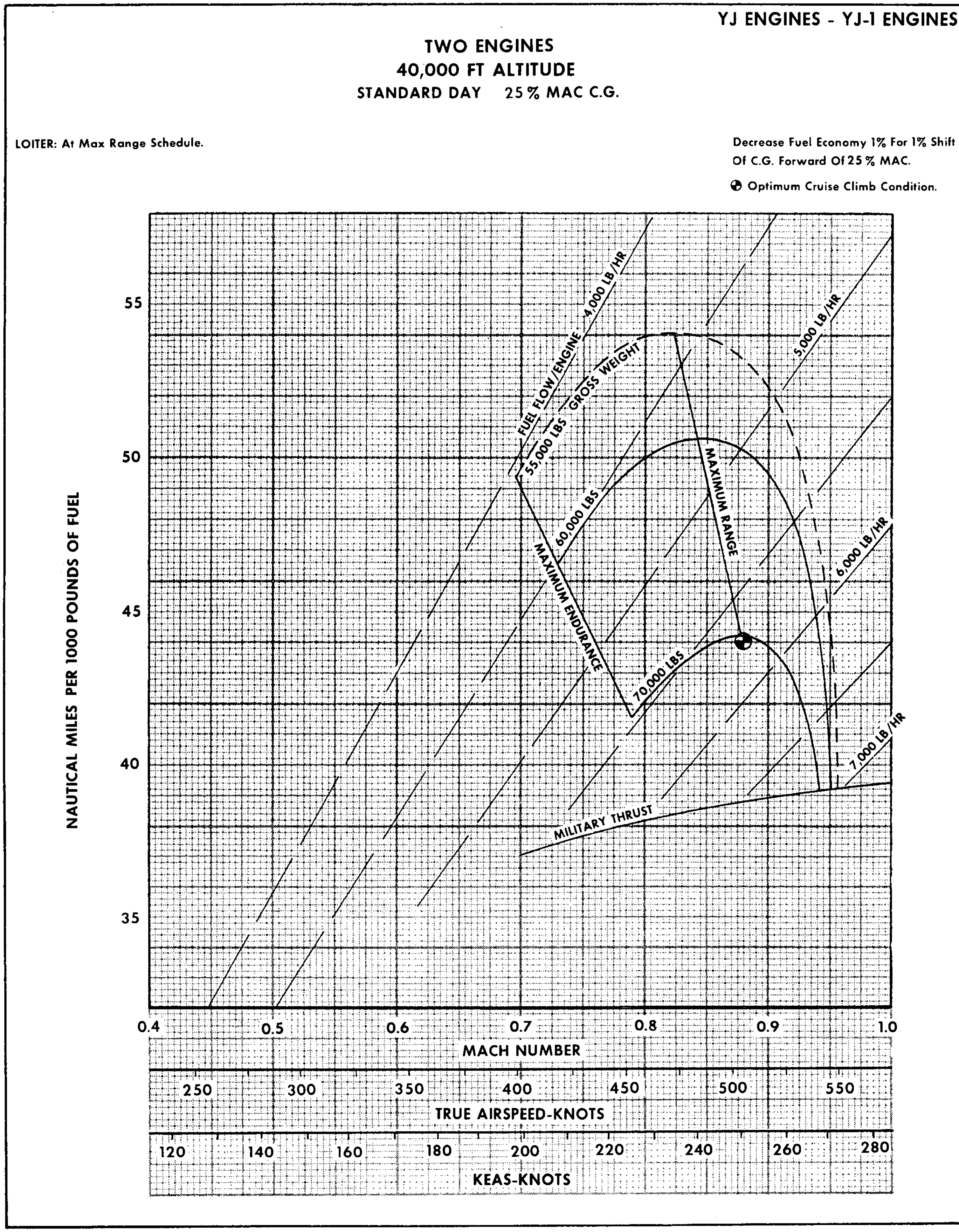


Figure A4-20

LONG RANGE CRUISE – AFTERBURNER OPERATION

SINGLE ENGINE **YJ ENGINES**

Note:
1. Zero wind distance without turns.
2. Five percent service allowance included.
3. Fwd. and aft bypass closed on operating engine. Fwd. and aft bypass open on windmilling engine.

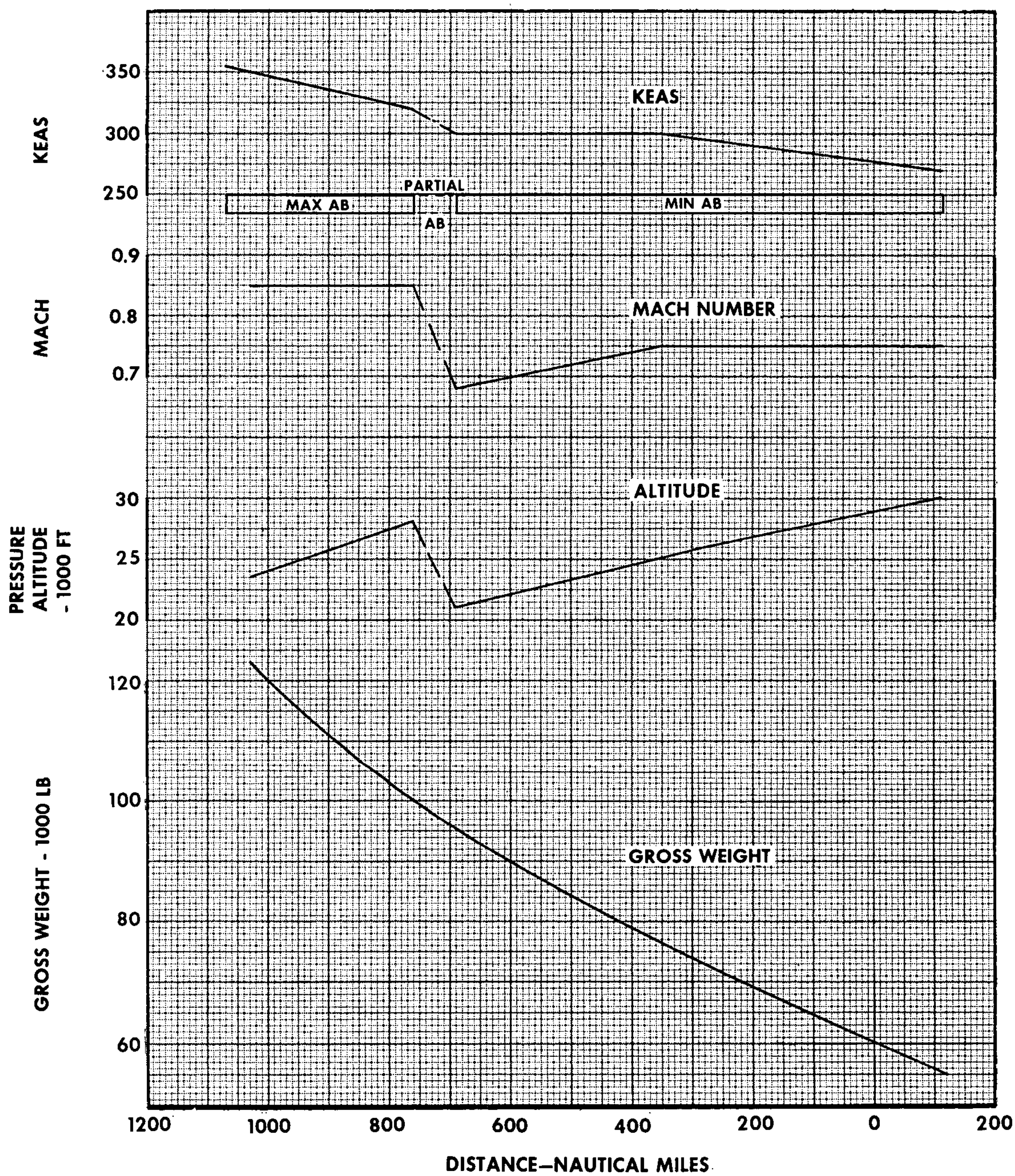


Figure A4-21

MILITARY THRUST LONG RANGE CRUISE

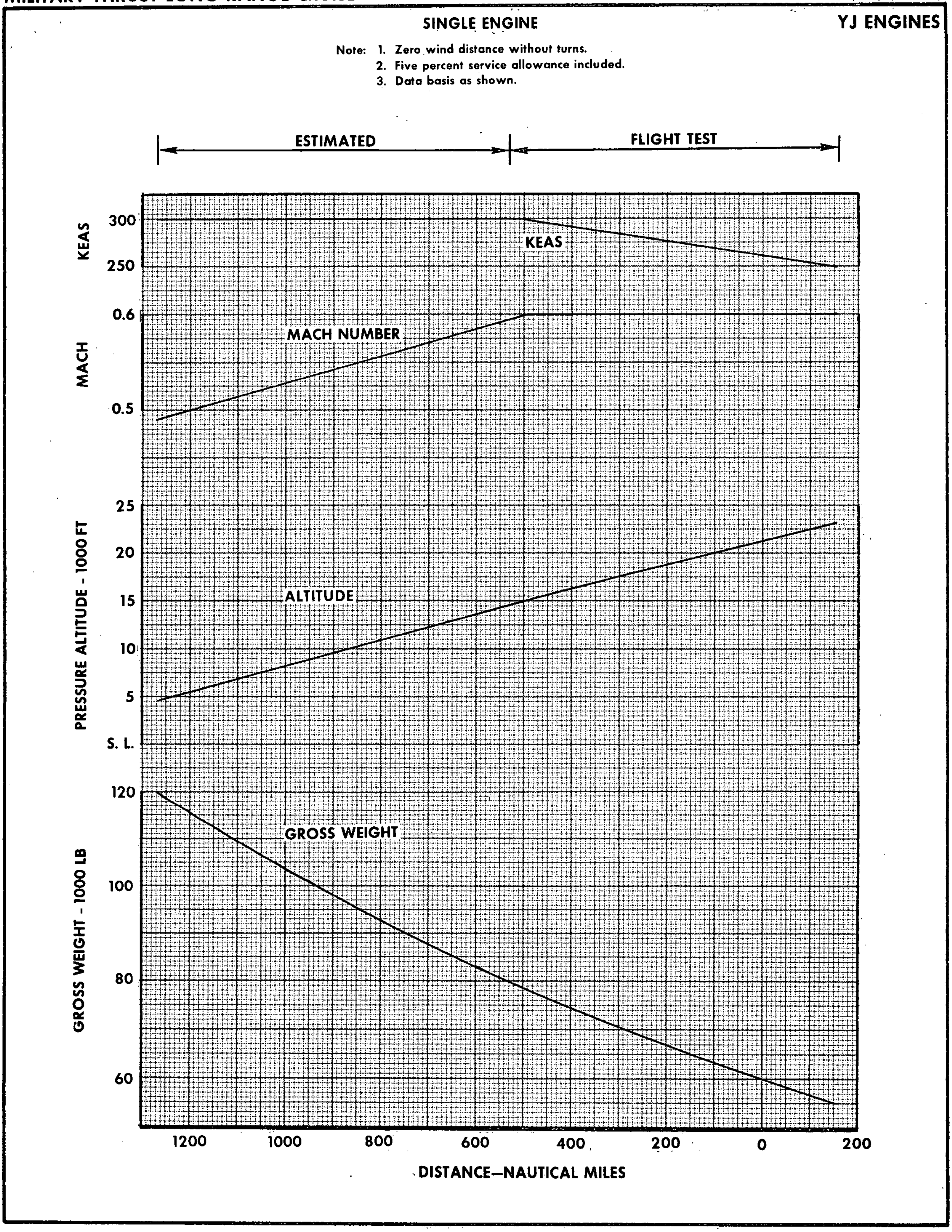


Figure A4-22

LONG RANGE CRUISE — AFTERBURNER OPERATION

SINGLE ENGINE — **YJ ENGINES**

Note:
1. Zero wind distance without turns.
2. Five percent service allowance included.
3. Fwd. and aft bypass closed on operating engine.
   Fwd. and aft bypass open on windmilling engine.

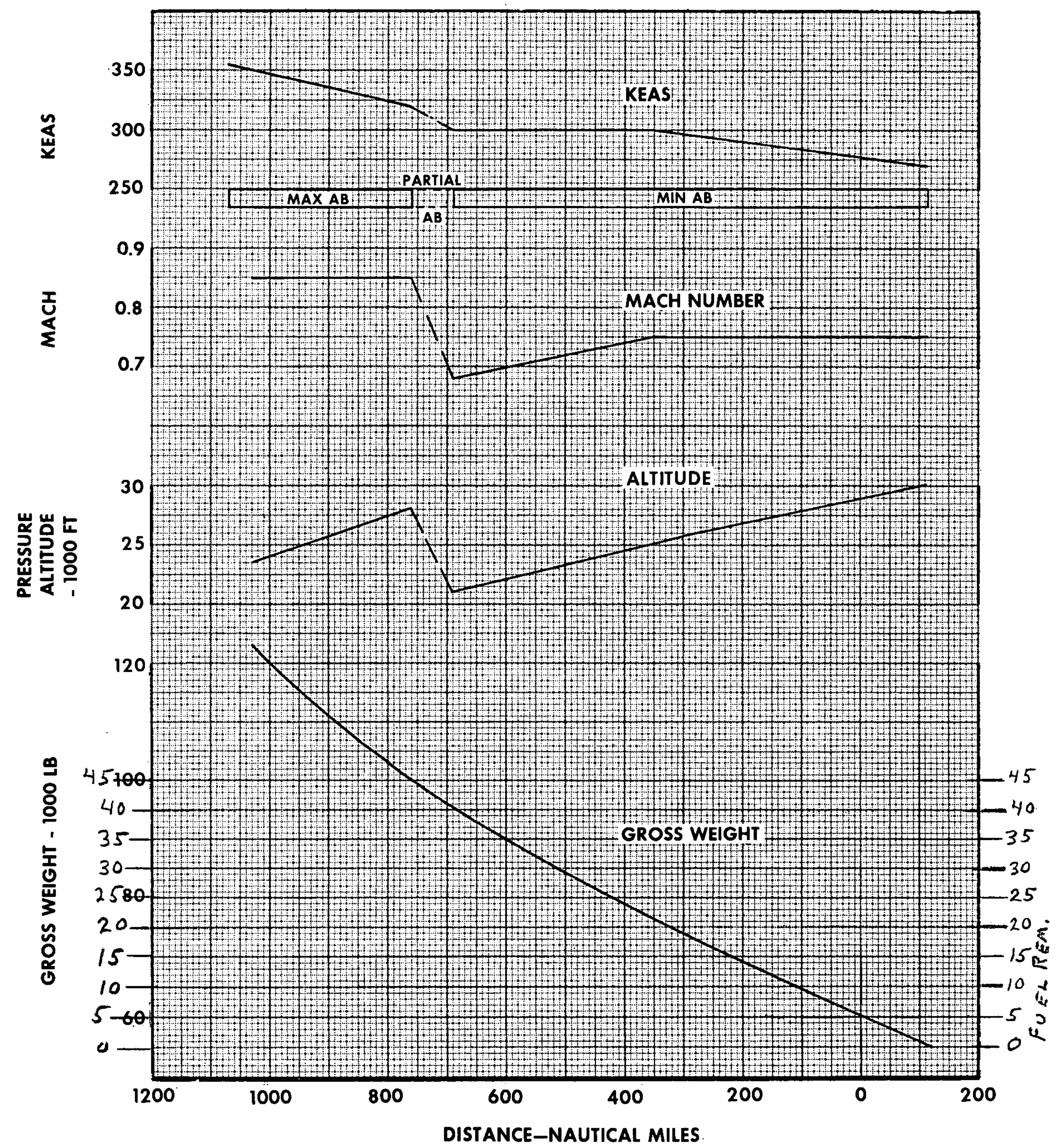


Figure A4-21

MILITARY THRUST LONG RANGE CRUISE

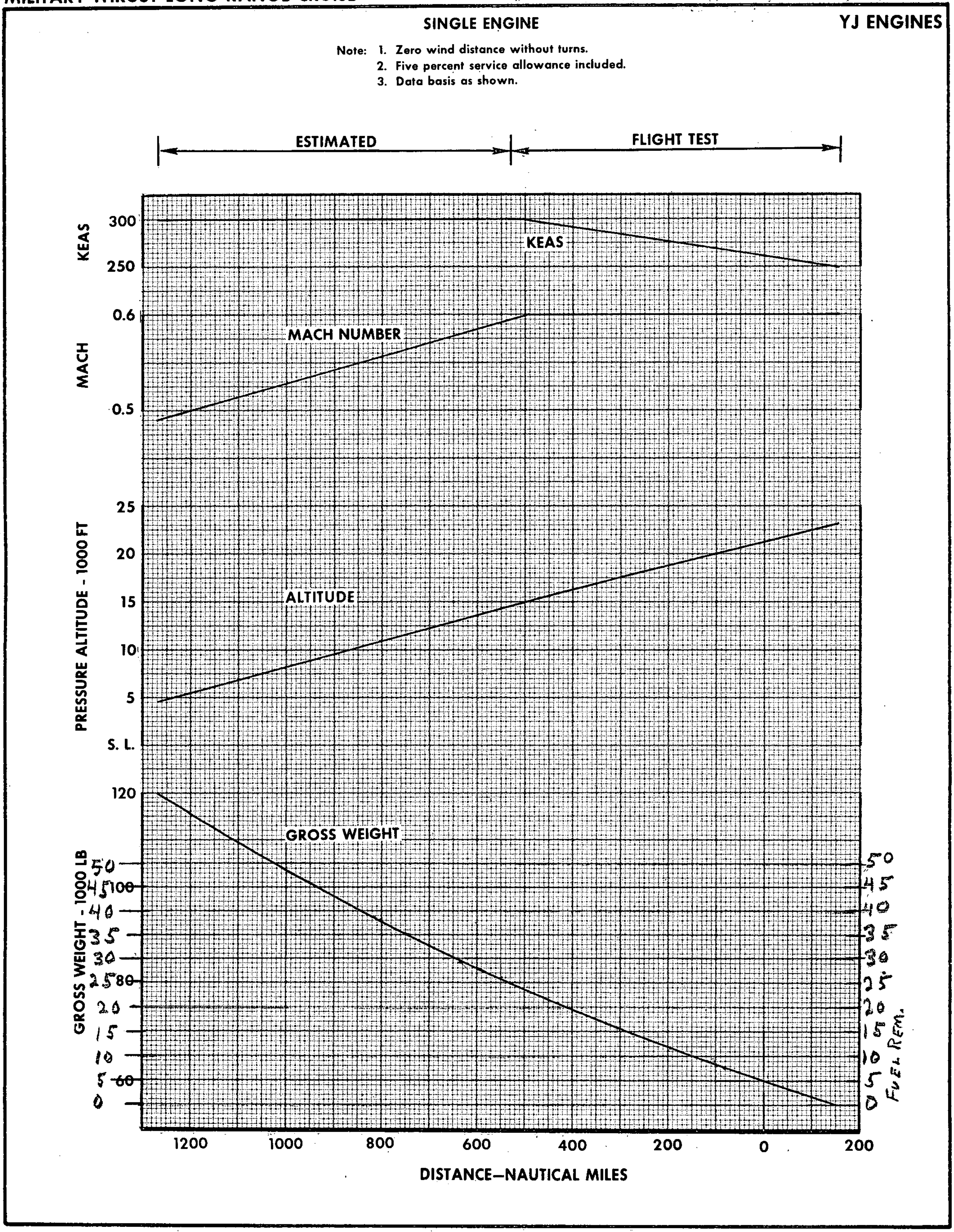


Figure A4-22

MILITARY THRUST SPECIFIC RANGE

Note: 1. 60,000 to 80,000 lb. gross weight data is based on flight test. Higher gross weight data is estimated.

2. A five percent service allowance is included.

SINGLE ENGINE

YJ ENGINES

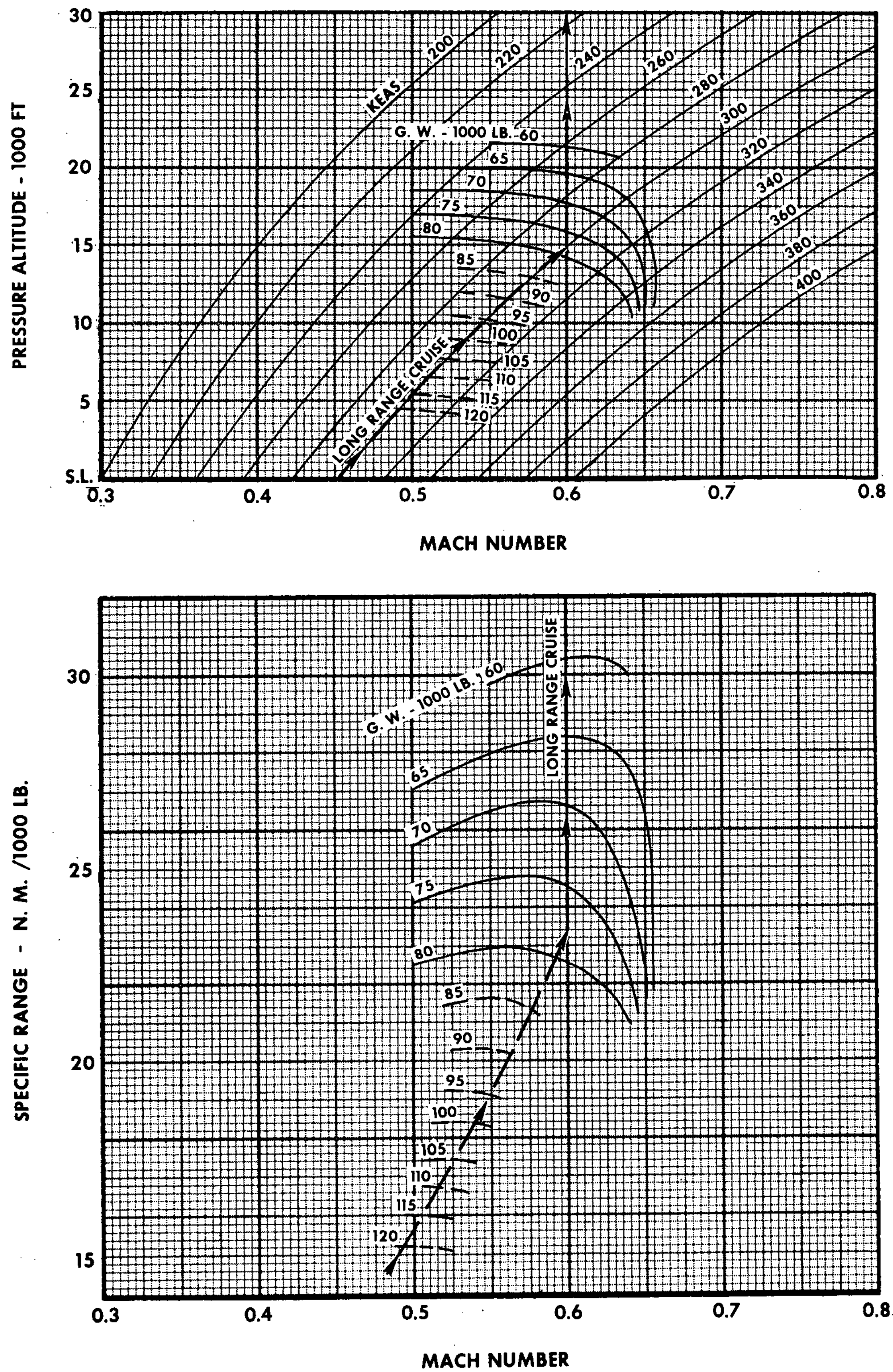


Figure A4-23

SINGLE ENGINE CRUISE TABULATION

YJ ENGINES

SINGLE ENGINE AFTERBURNER OPERATION

Fuel Remaining	300 KEAS Descent from 80,000 feet				300 KEAS Descent from 75,000 feet				Cruise Fuel Remaining	Winds		
	Power	Time	Fuel	Distance	Power	Time	Fuel	Distance		20,000'	25,000'	30,000'
	MAX/MIN	0:14	4400	228	MAX/MIN	0:11	3600	152				

Total Fuel	Cruise					1000 Lb/Hr	Nmi/1000 lb	Time to 5K Fuel	Range to 5K fuel			
	Power	KEAS	Altitude	Mach	KTAS				0 Wind	50 Kts HW	100 Kts HW	150 Kts HW
68K	Max	354	23500	0.85	515	49.0	10.6	2:15	1028	926	803	691
65K	Max	349	24100	0.85	513	47.8	11.0	2:11	997	898	778	669
60K	Max	342	25100	0.85	511	45.6	11.5	2:05	942	848	734	630
55K	Max	334	26100	0.85	509	43.4	12.0	1:58	884	786	687	589
50K	Max	326	27100	0.85	507	41.4	12.6	1:51	824	732	639	547
45K	Max	318	28200	0.85	505	39.2	14.7	1:43	761	675	589	503
40K	Min	300	21000	0.68	417	25.3	16.9	1:34	688	610	532	454
35K	Min	300	22000	0.70	425	24.5	17.8	1:22	604	536	468	400
30K	Min	300	23100	0.72	435	23.8	18.7	1:09	515	457	399	342
25K	Min	300	24300	0.74	445	23.2	19.7	:56	421	374	327	280
20K	Min	297	25500	0.75	451	22.4	20.6	:44	323	287	250	214
15K	Min	290	26600	0.75	448	21.4	21.5	:30	220	195	170	146
10K	Min	283	27900	0.75	445	20.4	22.4	:15	112	99	87	74
5K	Min	275	29000	0.75	443	19.4	23.3	0/:16*	0/117*	0/104*	0/90*	0/77*

Engine	Spike	Forward Bypass	Aft Bypass
Operating	Auto	Open-Closed at 1.0M	Closed
Windmilling	Forward	Open	Open

* Denotes cruise time and distance to zero fuel remaining.

Data Basis: Flight Tests with Subsonic EGT trimmed between 780 and 810°C for CIT range of -20° to +20°C
Data as of: 15 February 1966

4-7-66
F200-82(a)

SINGLE ENGINE MILITARY OPERATION

Fuel Remaining	300 KEAS Descent from 80,000 feet				300 KEAS Descent from 75,000 feet				Cruise Fuel Remaining	Winds		
	Power	Time	Fuel	Distance	Power	Time	Fuel	Distance		10,000'	15,000'	20,000'
	MAX/MIL	0:22	5300	284	MAX/MIL	0:20	4500	208				

Total Fuel	Cruise					1000 Lb/Hr	Nmi/1000 lb	Time to 5K Fuel	Range to 5K fuel			
	Power	KEAS	Altitude	Mach	KTAS				0 Wind	50 Kts HW	100 Kts HW	150 Kts HW
65K	MIL	300	4400	0.49	321	21.0	15.6	3:34	1271	1091	911	732
60K	MIL	300	5500	0.50	325	20.3	16.4	3:20	1193	1025	858	690
55K	MIL	300	6600	0.51	331	19.8	17.0	3:05	1111	956	801	646
50K	MIL	300	7800	0.52	336	19.3	17.7	2:50	1026	883	741	599
45K	MIL	300	9000	0.54	343	18.7	18.7	2:34	936	807	679	550
40K	MIL	300	10200	0.55	349	18.2	19.6	2:18	843	727	612	497
35K	MIL	300	11500	0.56	357	17.7	20.7	2:01	745	643	542	441
30K	MIL	300	12900	0.58	364	17.0	22.0	1:44	641	554	468	381
25K	MIL	300	14400	0.59	373	16.4	23.7	1:26	531	459	388	317
20K	MIL	293	16000	0.60	374	15.2	25.6	1:07	413	357	302	246
15K	MIL	283	17700	0.60	372	14.0	27.5	:46	285	246	208	169
10K	MIL	272	19600	0.60	370	13.0	29.4	:24	147	127	107	87
5K	MIL	261	21400	0.60	367	12.1	31.4	0/:26*	0/157*	0/136*	0/114*	0/93*

Engine	Spike	Forward Bypass	Aft Bypass
Operating	Auto	Open-Closed at 1.0M	Closed
Windmilling	Forward	Open	Open

* Denotes cruise time and distance to zero fuel remaining.

Data Basis: Flight Tests to 80,000 lb gross weight with subsonic EGT trimmed between 760° and 820° for CIT range of -5°C to +25°C. Higher gross weight data is estimated.
Data as of: 1 March 1966

4-7-66
F200-83(a)

Figure A4-24

PART V

SUPERSONIC CRUISE PERFORMANCE

List of Illustrations

List of Illustrations (Con't)

TURNING PERFORMANCE

Figure A5-1 presents generalized turning performance at constant Mach numbers for various ambient temperatures and bank angles. Turn radius, distance, and time are plotted for a selected range of Mach numbers, ambient temperatures, bank angles, and degrees of turn.

Example:

For a Mach 3.00 turn at a forecast ambient temperature of -56.5°C, 30° bank angle, and a planned 180° of turn, find the turn radius, distance, and time. As shown in the chart, enter figure A5-1 at Mach 3.00 and -56.5°C ambient temperature and note that true airspeed is 1720 knots. Proceed horizontally to 30° bank angle and read turn radius as 74.5 nautical miles. Proceed downward to 180° of turn and read turn distance as 235 nautical miles flown. Proceed horizontally to 1720 KTAS and read the turn time as 8.1 minutes.

SPECIFIC RANGE

Specific range charts are presented for speeds of Mach 3.20, 3.10, and 2.90 and for four ambient temperature conditions at each speed as shown by the list of illustrations. The data is computed from Flight Test and Operational Testing results with YJ-1 engines. Corrections for a range of bank angles are included on each chart to show the effect bank angle has on specific range and altitude capability while turning. Supplemental scales provide KEAS-altitude information and fuel flow conversions.

Example:

Refer to figure A5-13, Specific Range data for Mach 3.10 cruise at -56.5°C ambient temperature. Locate the Max Range cruise schedule line. At long range cruise power and 80,000 pounds gross weight the cruise climb altitude is 78,150 feet and the zero bank angle specific range is 61.0 nmi/1000 lb of fuel. For a turn at the same power setting, using a 30 degree bank angle, the specific range is 53.0 nmi/1000 lb of fuel and the altitude is 75,100 feet. The fuel flow per engine is 14,600 lb/hr at zero bank and 16,800 lb/hr at 30 degree bank for a -56.5°C ambient temperature day. At this temperature, Mach 3.1 corresponds to 1777 KTAS as listed in the chart.

LONG RANGE AND HIGH ALTITUDE CRUISE SUMMARIES

Long range cruise summaries are presented for Mach 3.20, 3.10, and 2.90. High altitude cruise summaries are presented for Mach 3.20 and 3.10. The high altitude profiles are based on the "90%" lines shown on the Specific Range charts, except that the performance shown conforms with the present 85,000 ft altitude restriction. These data are presented for both the 1956 ARDC Atmosphere and the "MEAN TROPIC" Atmosphere as shown in the list of illustrations. The climb and cruise data are computed from Flight Test and Operational Testing results with YJ-1 engines. Descent data is based on Flight Test and Operational testing at near standard temperatures. There are three sheets for each figure. The first sheet provides cruise summaries showing distance and time from end AR at 30,000 feet through the climb, cruise, and descent to 20,000 feet with either 5000 lbs or 7500 lbs of fuel reserve. The second sheet presents climb-cruise intercepts which are to be used in conjunction with sheet 3. The third sheet presents performance and flight planning data. The initial conditions shown are end AR at 30,000 feet, and brake release with either 64,000 lbs or 50,000 lbs fuel remaining using the normal climb schedule. The effect of various temperatures is shown for climb and cruise performance. The descent performance shown is based on operational testing and does not include the effect of temperature. Descent through a "Tropic" atmosphere may be approximated by increasing the presented descent data by the following increments:

Distance - 30 miles

Time - 1 minute

Fuel used - 100 pounds

Use of the chart is illustrated by the following example:

Example:

Refer to figure A5-7, sheet 2 of 3 and sheet 3 of 3.

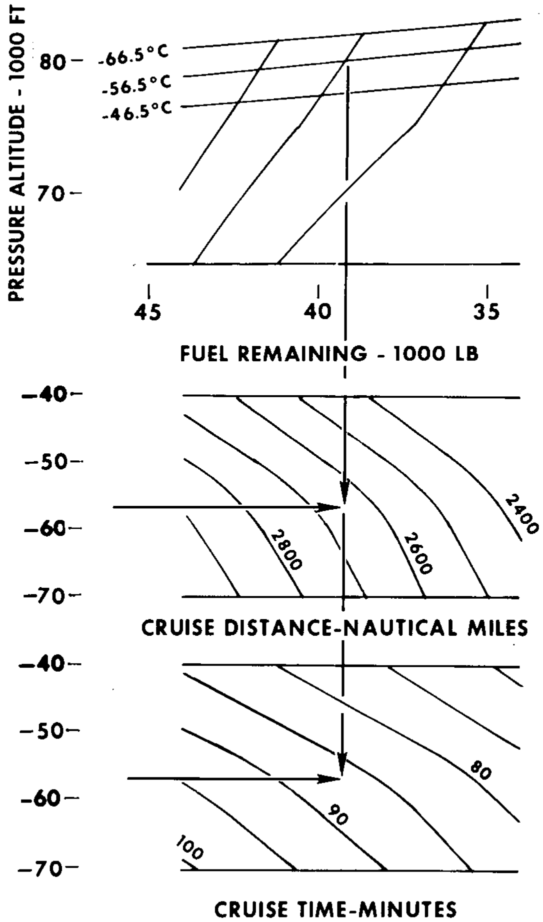
Find the total distance capability and time required for a Mach 3.2 high altitude cruise with a forecast ambient temperature condition of -56.5°C at cruise. A profile is planned consisting of a heavyweight takeoff at sea level with standard day climb, cruise without turn, normal descent, and 7500 lb fuel reserve at 20,000 feet. Planned fuel load at brake release is 64,000 lb.

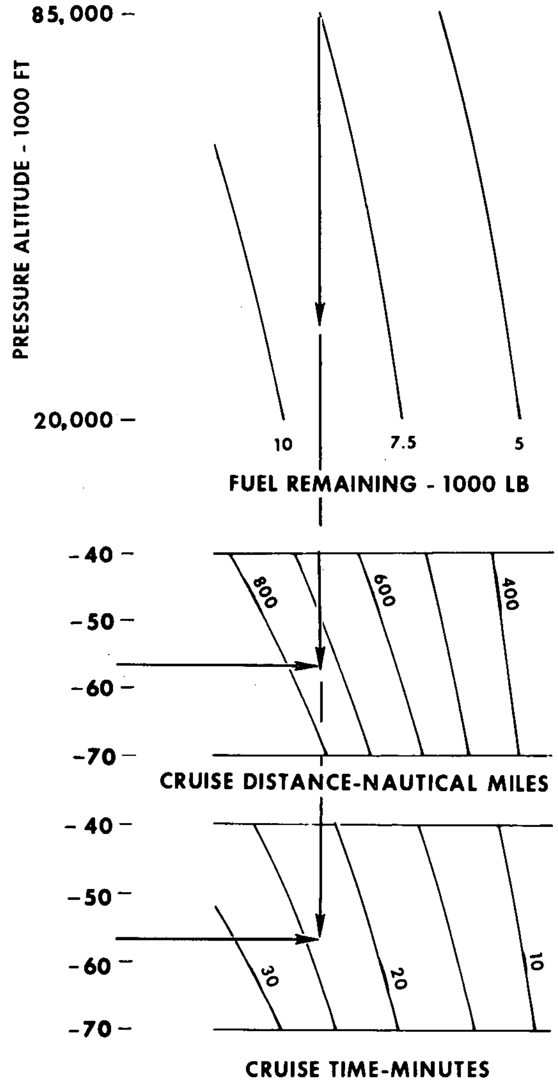
Enter figure A5-7, sheet 2 of 3, at 119,150 lb gross weight, sea level altitude, standard day climb temperature, and -56.5°C cruise temperature and read the cruise-climb intercept as 80,100 feet. Read climb distance as 345 miles, climb time as 20.1 minutes and fuel remaining as 39,250 lb. Referring to figure A5-7, sheet 3 of 3, the intercept of the standard day climb line and the -56.5°C cruise line is shown. The lower portion of sheet 3 of 3 shows cruise distance and cruise time to zero fuel remaining as a function of fuel remaining and cruise reference temperature. Entering the portion of the curve at the fuel remaining value of 39,250 lb and a cruise reference temperature of -56.5°C, read the cruise distance as 2655 miles and cruise time as 86.8 minutes. Then read on the cruise line (from beginning of the 7500 lb descent line) the fuel remaining as 8900 lb. Reading the distance and time to zero fuel remaining, the distance is 740 miles and the time is 24 minutes. This gives the incremental cruise distance as (2655 - 740) = 1915 miles and the cruise time as (86.8 - 24) = 62.8 minutes. The descent to 20,000 ft is 237 miles and 13.8 minutes as shown by the vertical scales at the right side of the profile portion of the chart.

Distance and time from brake release at sea level with 64,000 lb fuel to 20,000 feet with 7500 lb fuel remaining is:

Distance = (345 + 1915 + 237) = 2497 miles

Time = (20.1 + 62.8 + 13.8) = 96.7 minutes





MAXIMUM A/B CEILING CRUISE SUMMARIES

Maximum A/B Ceiling Cruise summaries are presented for Mach 3.20 and 3.10 as shown in the list of illustrations. The data were calculated from Flight Test and Operational Testing results with YJ-1 engines. There are two sheets for each figure. The first sheet presents cruise summaries showing distance and time from end AR at 32,000 feet through the climb, cruise, and descent to 20,000 feet with either 5000 lbs or 7500 lbs fuel reserve. The second sheet presents cruise summaries which are indexed at 10,000 lb fuel remaining at altitude (zero distance and time). The initial conditions shown are end AR at 30,000 feet and brake release with 64,000 lbs fuel remaining using the normal climb schedule. Distance and time allowances for reserves of 5000, 7500, and 10,000 lbs at 20,000 feet are shown in the charts. To obtain the total distance and time, add the two distances and times for the desired profile.

Example:

Refer to figure A5-18, sheet 2 of 2, and the example figure on the following page.

Find the total distance and time for a 3.10 Mach maximum A/B ceiling cruise at a forecast ambient temperature of -56.5°C at cruise. A profile is planned consisting of a heavyweight takeoff at sea level with standard day climb, cruise without turns, and 7500 lb reserve at 20,000 feet. Planned fuel load at brake release is 64,000 lb. Enter figure A5-18, sheet 2 of 2, at the climb line for the sea level 64,000 lb fuel remaining case and read distance and time as 1809 nmi, and 1 hr, 09.5 min. Reenter at the 7500 lb reserve descent line at 20,000 feet and read distance and time as 310 nmi and 16.7 min. Add the distances and times and obtain 2114 nmi and 1 hr, 26.2 min.

If forecast temperatures indicate standard day climb and cold day cruise, -64.5°C, the distance will be increased by two small increments. The cruise distance will be longer due to the colder temperature, and the climb distance will be longer due to the climb to higher altitude. Referring to the text illustration below, which is for 119,150 lb gross weight and 64,000 lb fuel remaining at brake release, the shaded triangles show where the standard day climb intercepts the four cruise lines. The cold day intercept shows a distance of 1635 nmi. Extend the climb curve to the altitude where the cold day cruise begins and read a distance of 1475 nmi. The difference between these distances (1635 - 1475 = 160) is the increase in range due to cold day cruise conditions. The corresponding time increment is 4.3 min. for the additional 160 nmi of cruise. This results in a total range and time of 2279 nmi and 1 hr, 30.5 min.

MISSION PLANNING FACTORS TABLE

A Mission Planning Factors Table is provided on figure A5-28 for quick reference in mission planning.

RAPID DEPLOYMENT TO ARCP

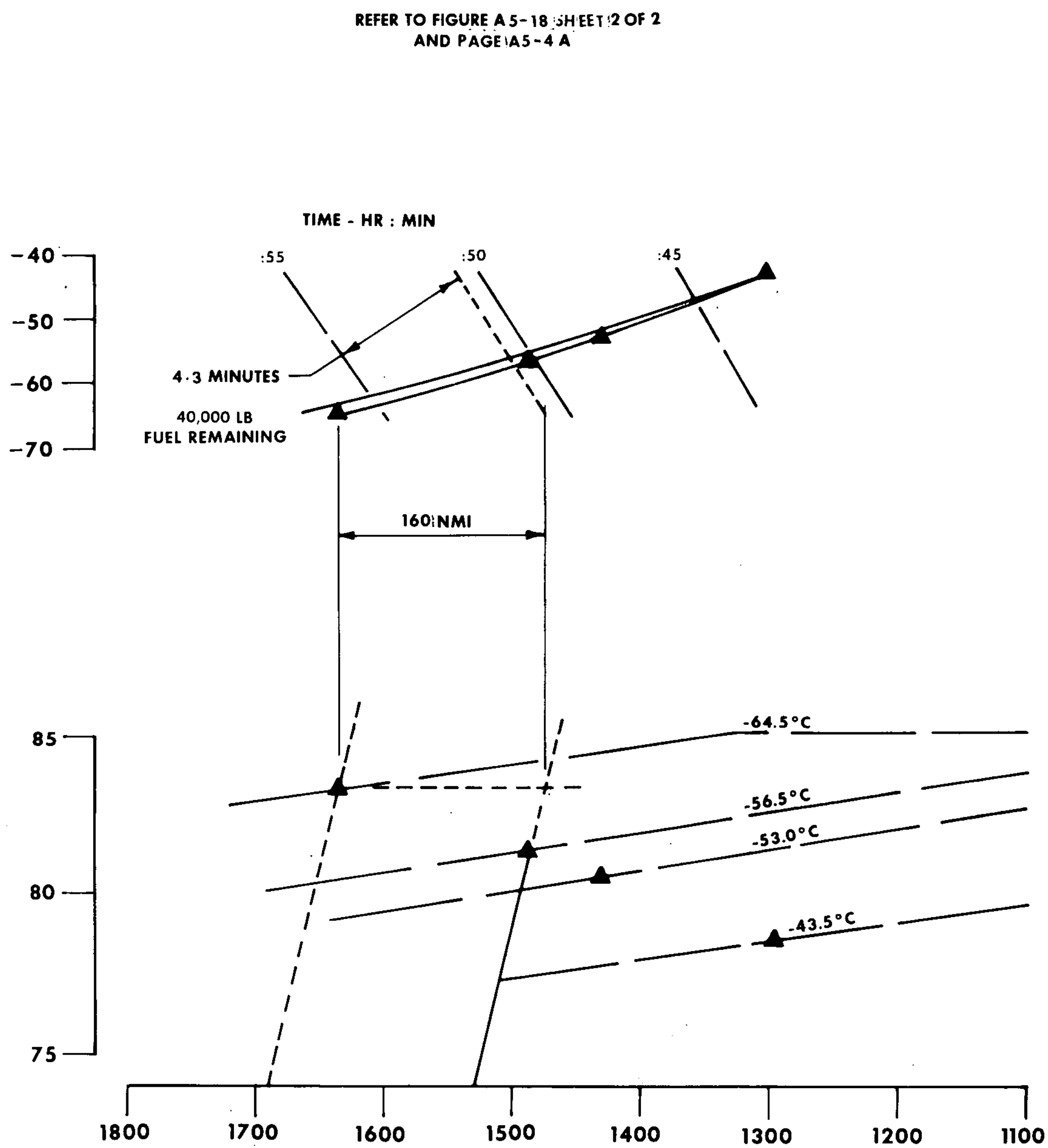
Figures A5-29 thru A5-32 present the data for a minimum time profile from brake release to ARCP.

The profile is defined as:

1. 50,000 pounds fuel remaining at brake release.
2. Normal climb schedule to cruise Mach number.
3. Climb to cruise altitude at constant Mach number.
4. Cruise for two minutes at 82° PLA.
5. Normal deceleration to 300 KEAS.
6. Normal 300 KEAS descent to reach 29,000 ft at a point 20 miles from ARCP.

The data are presented for both the 1956 ARDC and Mean Tropic atmospheres.

EXAMPLE FIGURE



Changed 15 June 1968

Figures A5-30 and A5-32 (sheet 1 of 2) show standard and tropic day mission profiles for five representative Mach numbers, and portray the climb, cruise and deceleration segments of the missions. Figures A5-30 and A5-32 (sheet 2 of 2) show the corresponding time and fuel remaining for the presented profiles.

Figures A5-29 and A5-31 give the necessary detail information for planning a flight of specific length. These curves present the overall mission time from brake release to ARCP, cruise Mach number, altitude to initiate constant Mach climb, cruise altitude and the DTG to start deceleration to arrive at 29,000 feet at a point 20 miles from the ARCP. Mach 1.25 is the minimum supersonic cruise Mach recommended, as this speed is the "break point" for minimum time between subsonic and supersonic flight plans. For a mission distance of less than 130 miles, the flight should be made at 0.91 Mach. Missions longer than 130 miles would be flown at the Mach number given by figures A5-29 and A5-31.

Example:

To select flight plan for minimum time to ARCP, with Mean Tropic day temperatures, and ARCP 300 miles from takeoff point.

Refer to figure A5-31, "Rapid Deployment to ARCP".

Mission time from brake release to ARCP is 23.5 minutes.

Cruise Mach = 2.31.

Start constant Mach climb = 55,300 feet.

Cruise altitude = 67,000 feet.

DTG at start decel = 117 miles.

PRELIMINARY

YJ-1 ENGINES

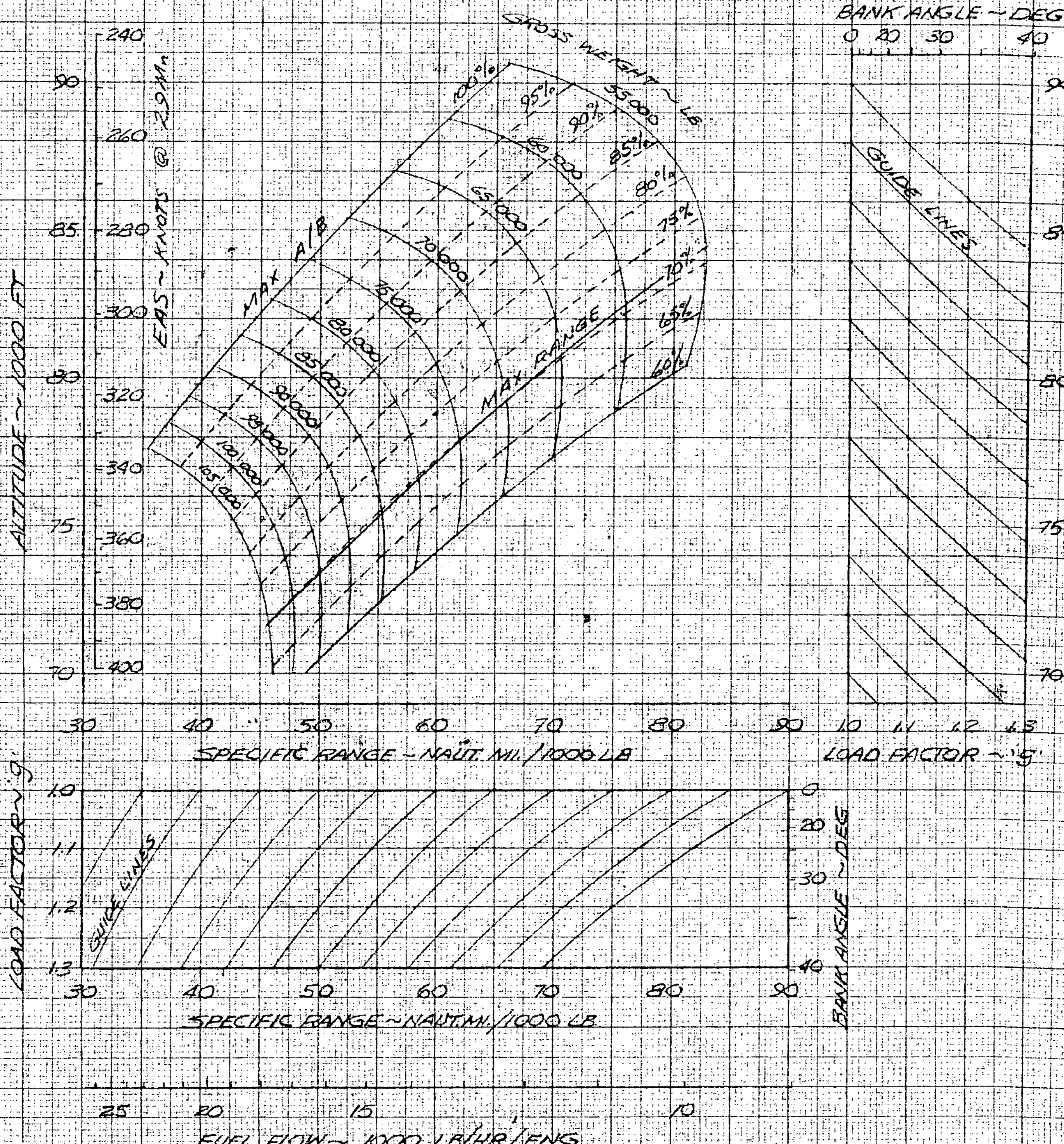
TWO ENGINE

SPECIFIC RANGE

AT MACH 2.90

AMBIENT TEMPERATURE ~ -66.0°C

CIT = 280°C



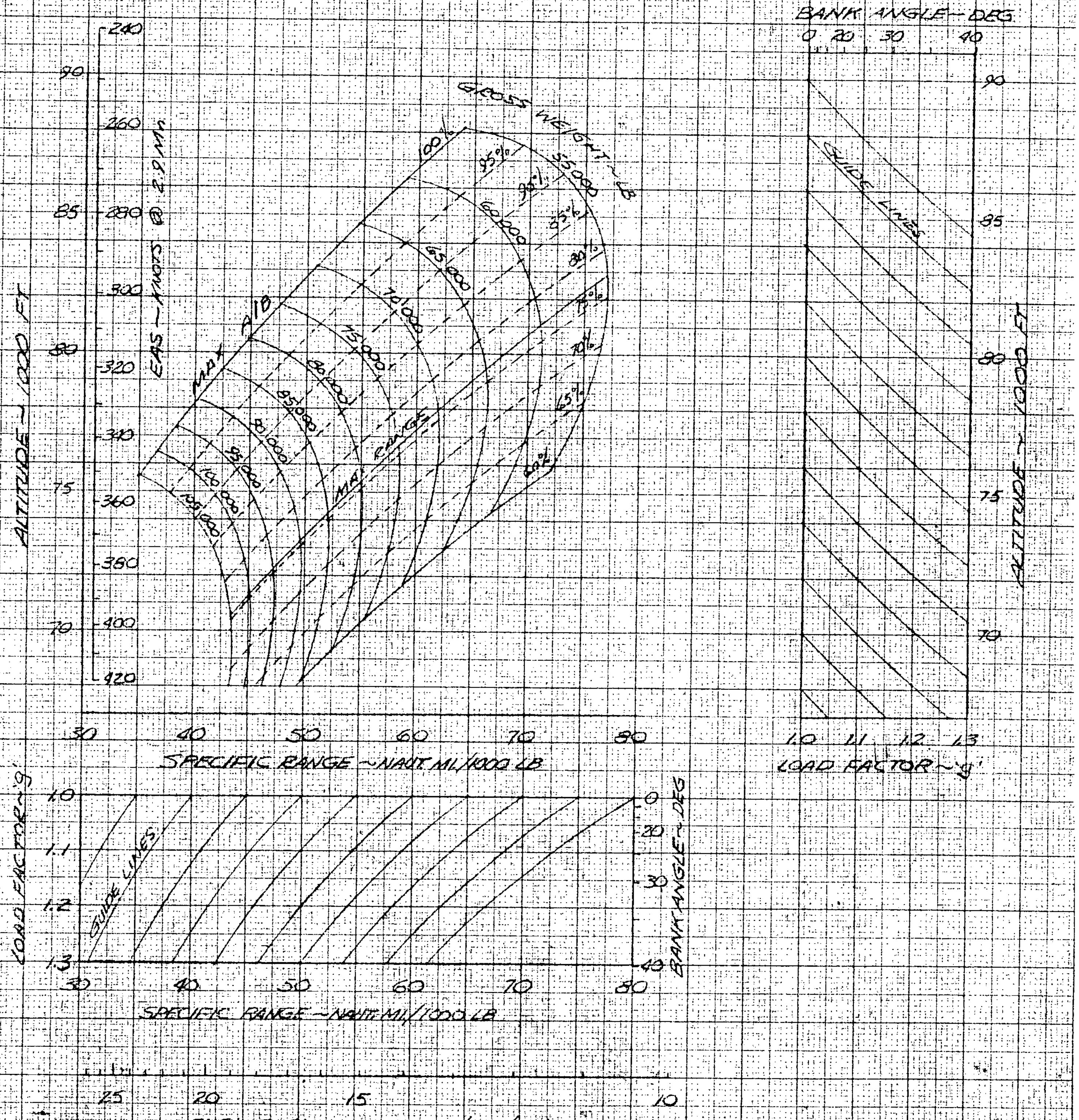
FORM 5278A

PRELIMINARY

PRELIMINARY

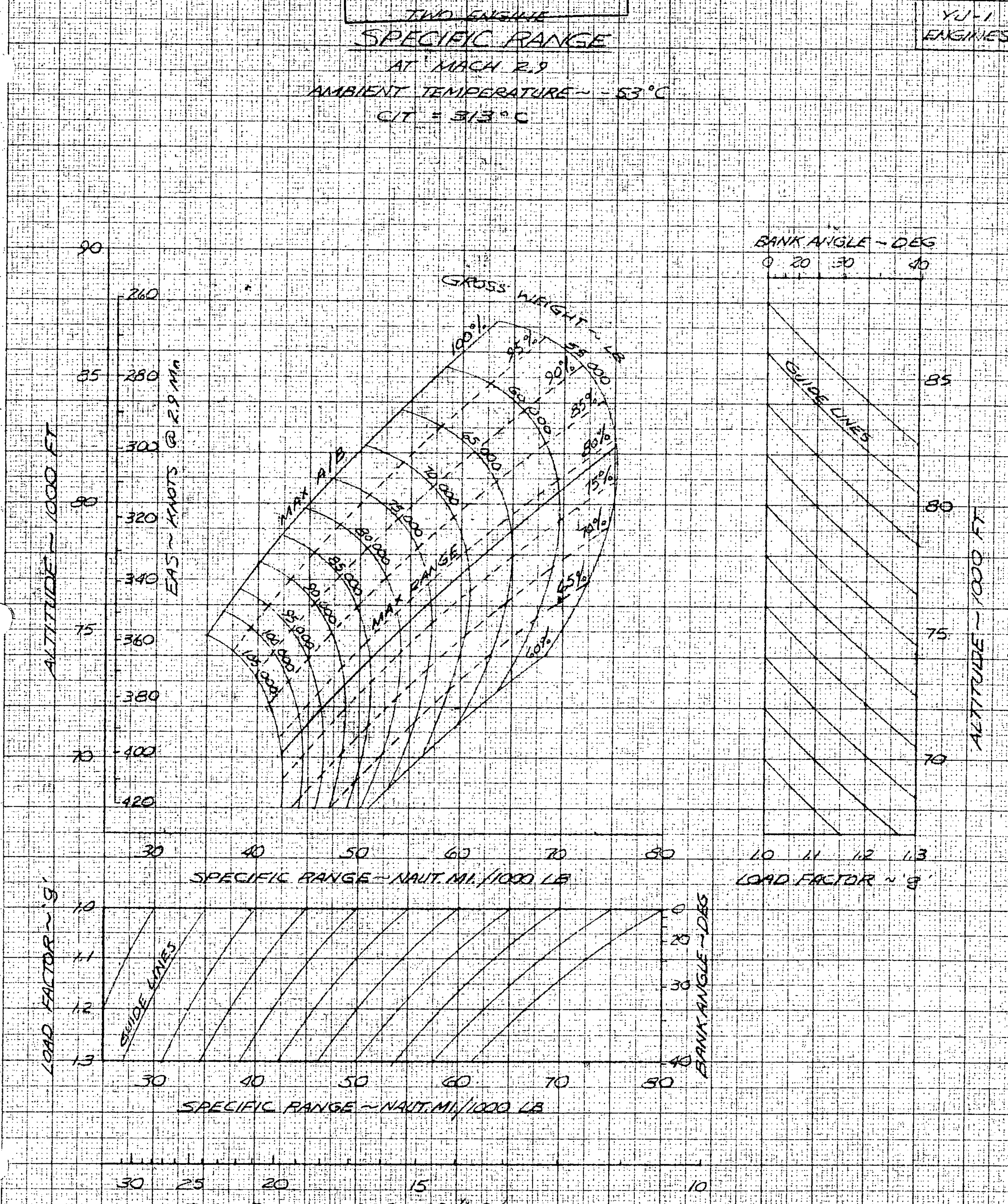
TWO ENGINE
SPECIFIC RANGE
AT MACH 2.9
AMBIENT TEMPERATURE ~ -56.5°C
CIT - 304°C

YJ-1 ENGINES



PRELIMINARY

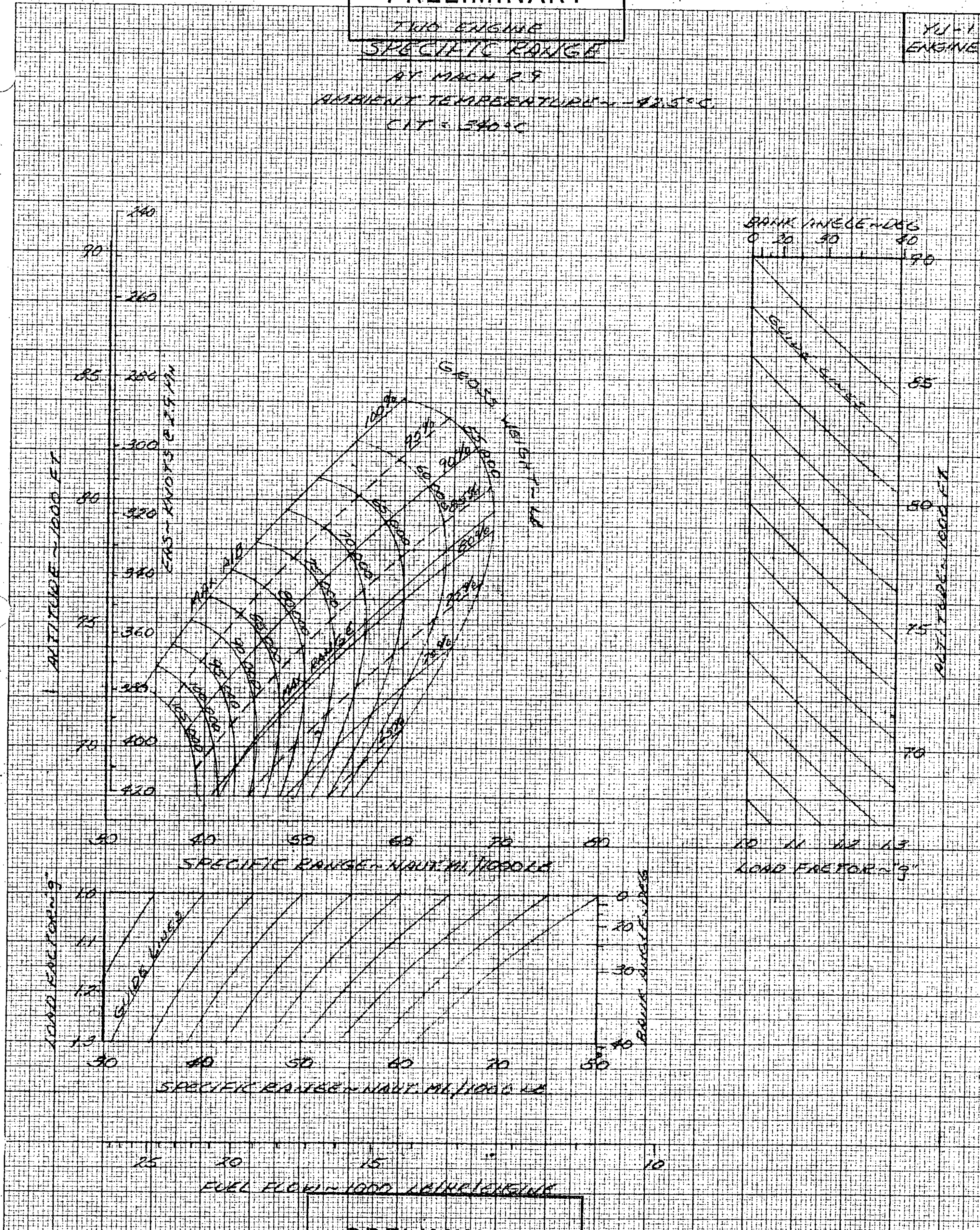
PRELIMINARY



FORM 5278A

PRELIMINARY

PRELIMINARY



PRELIMINARY

FORM 5278A

Approved for Release: 2017/07/25 C06535944

TURNING PERFORMANCE

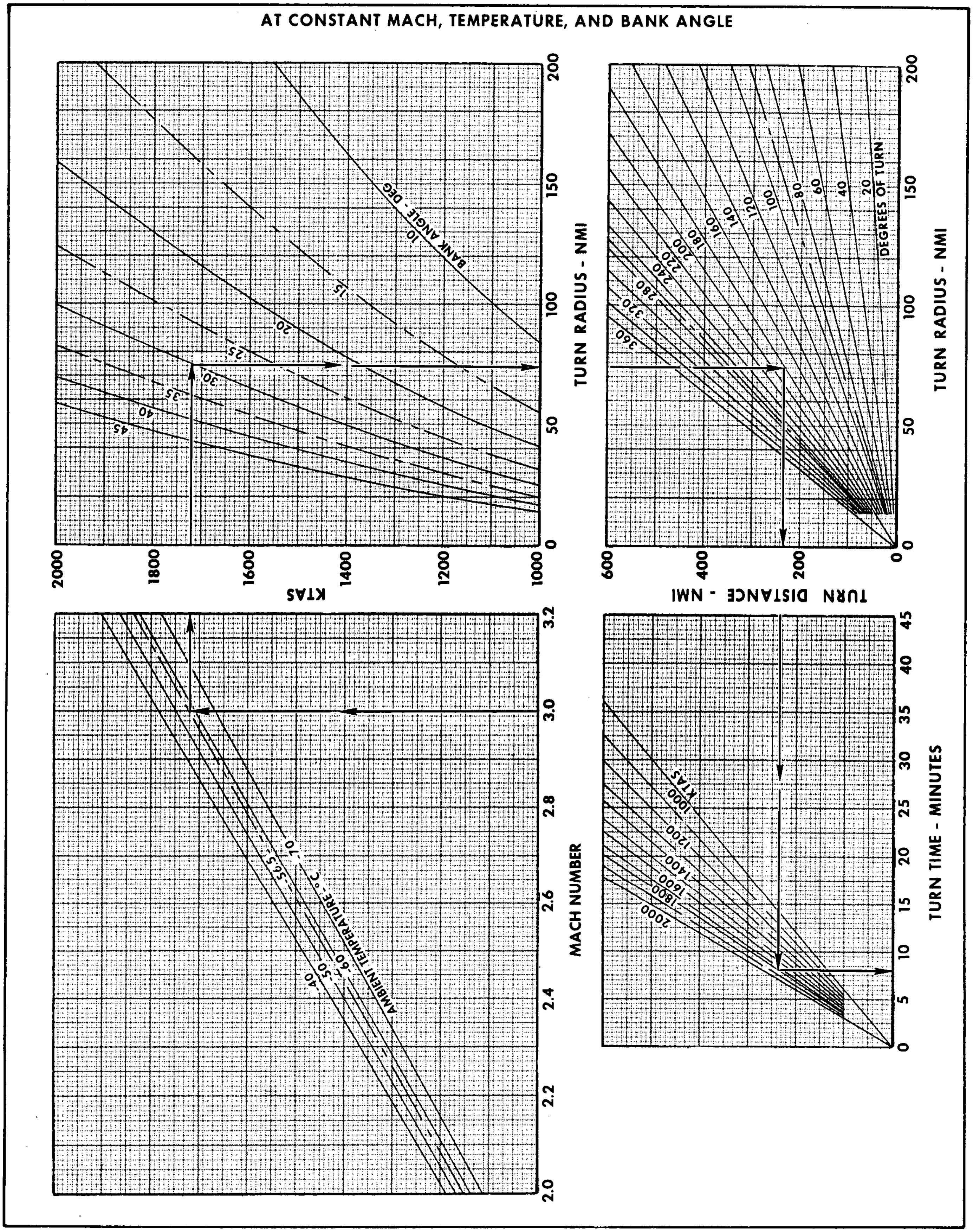


Figure A5-1

SPECIFIC RANGE AT MACH 3.20

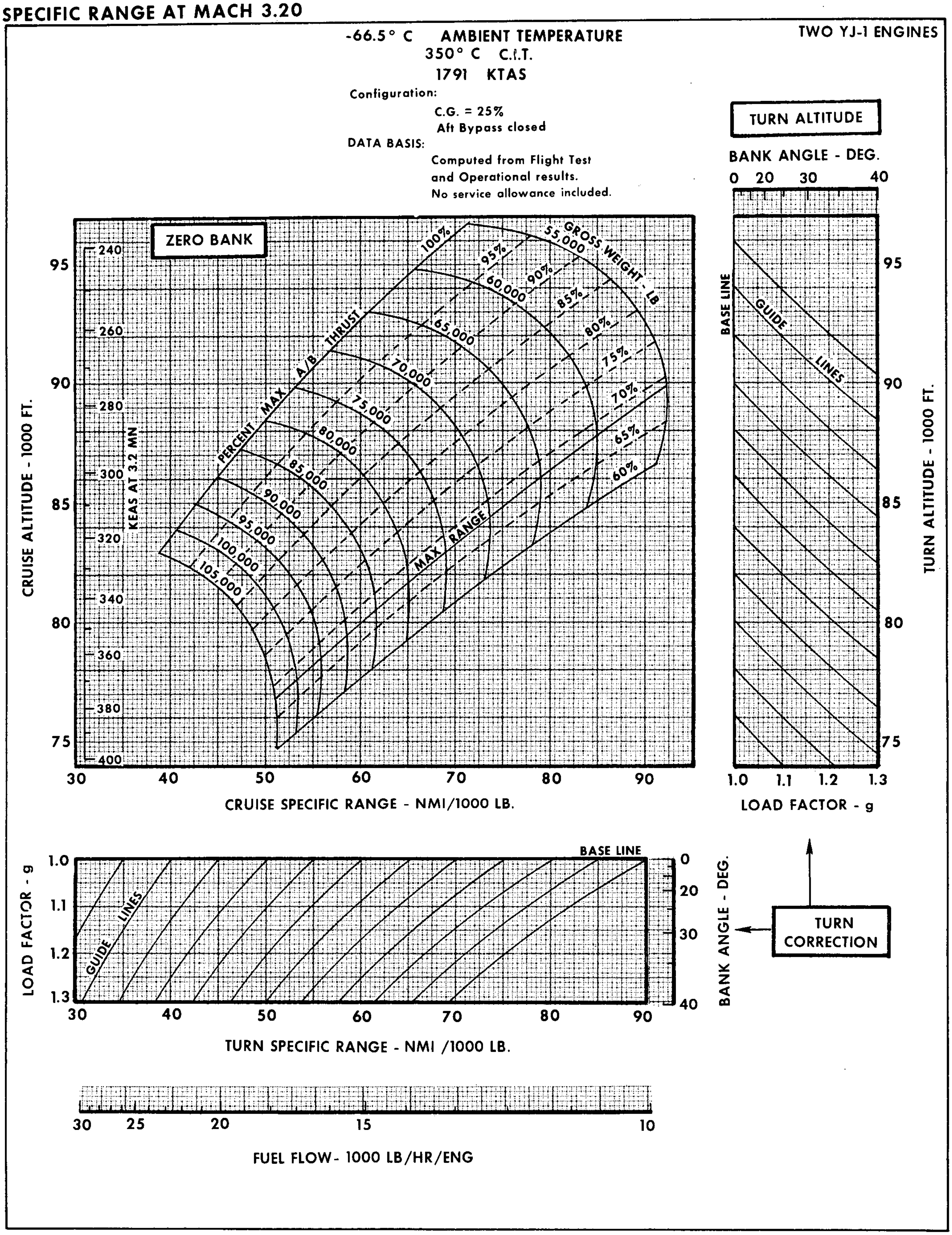


Figure A5-2

SPECIFIC RANGE AT MACH 3.20

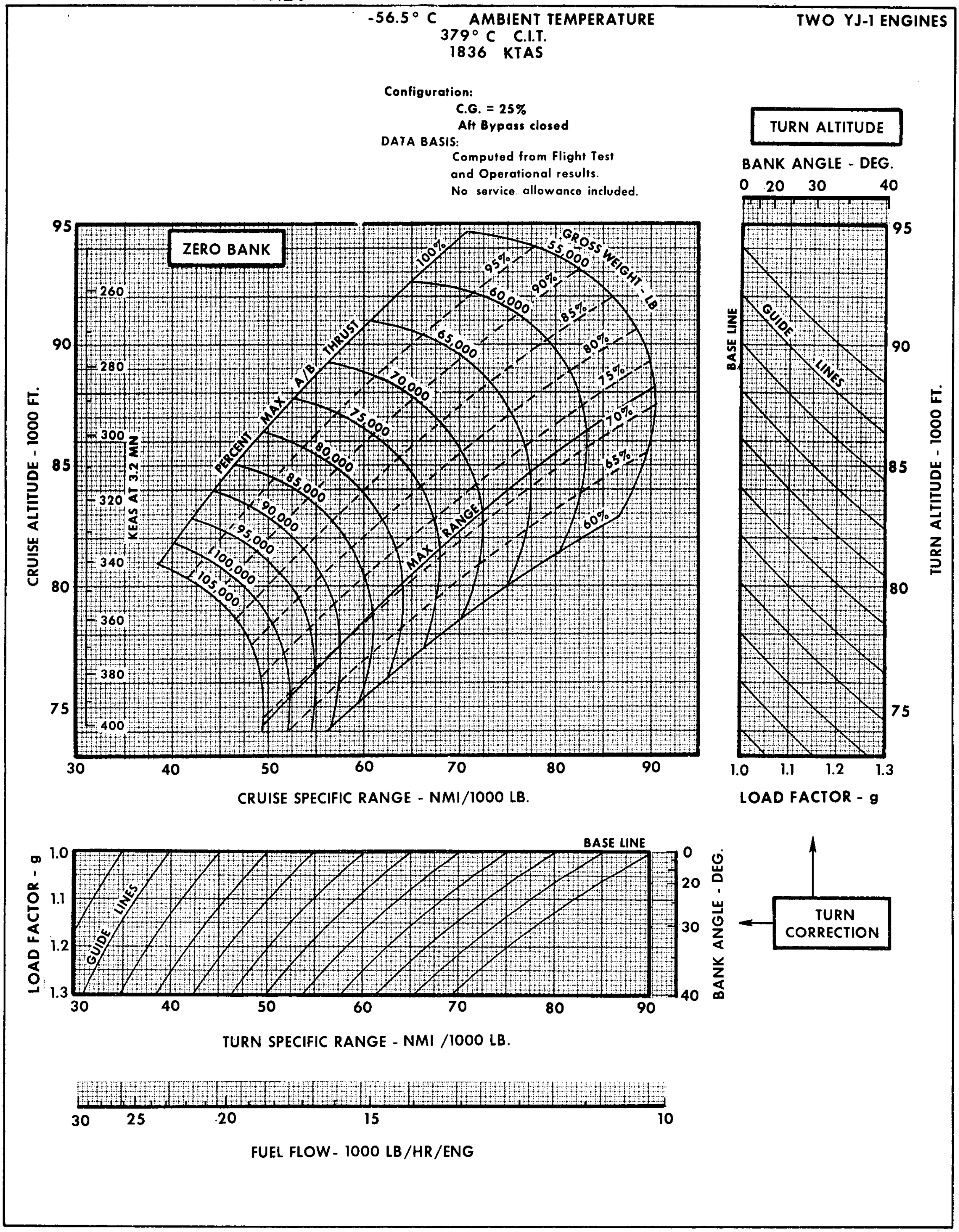


Figure A5-3

Changed 15 March 1968

SPECIFIC RANGE AT MACH 3.20

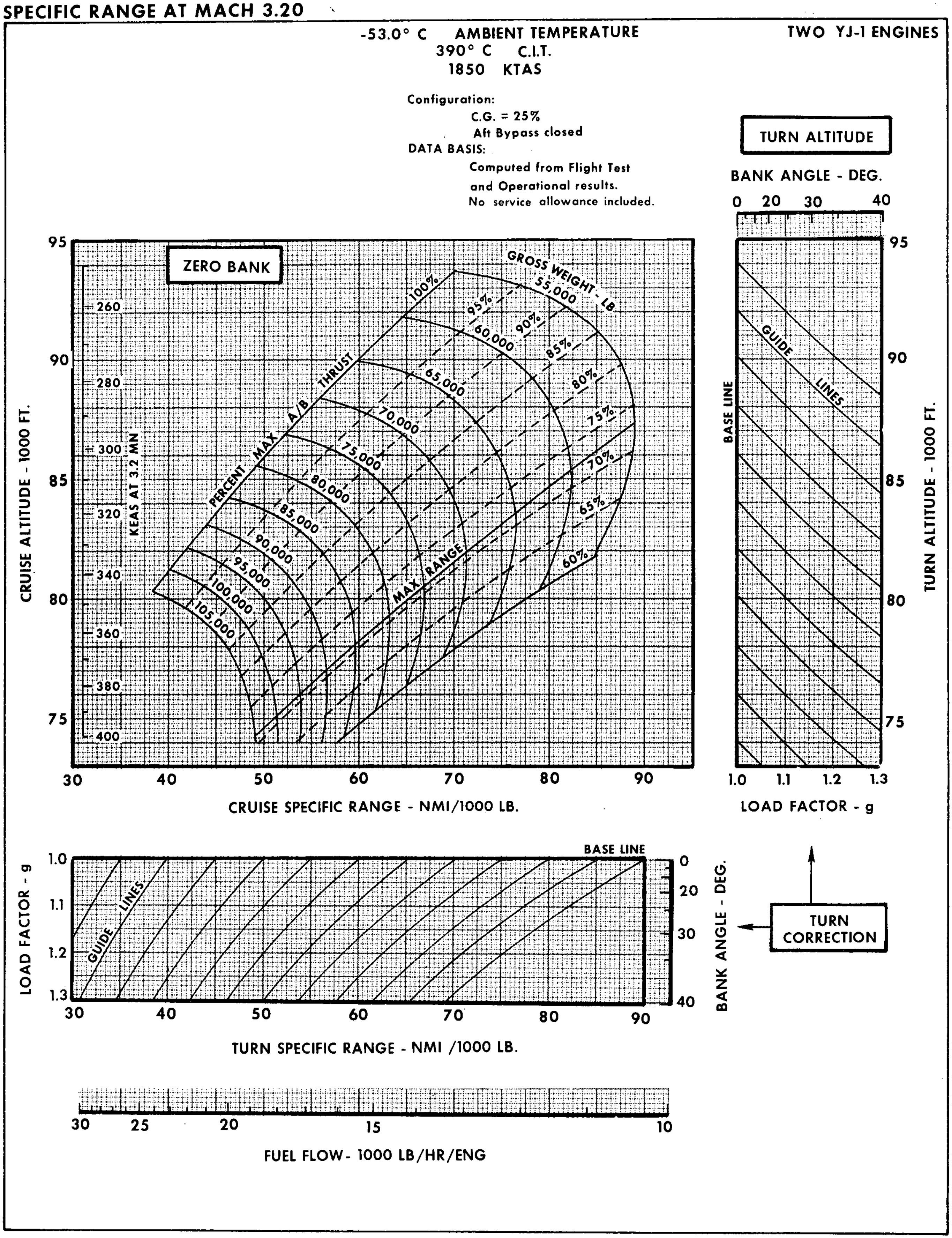


Figure A5-4

SPECIFIC RANGE AT MACH 3.20

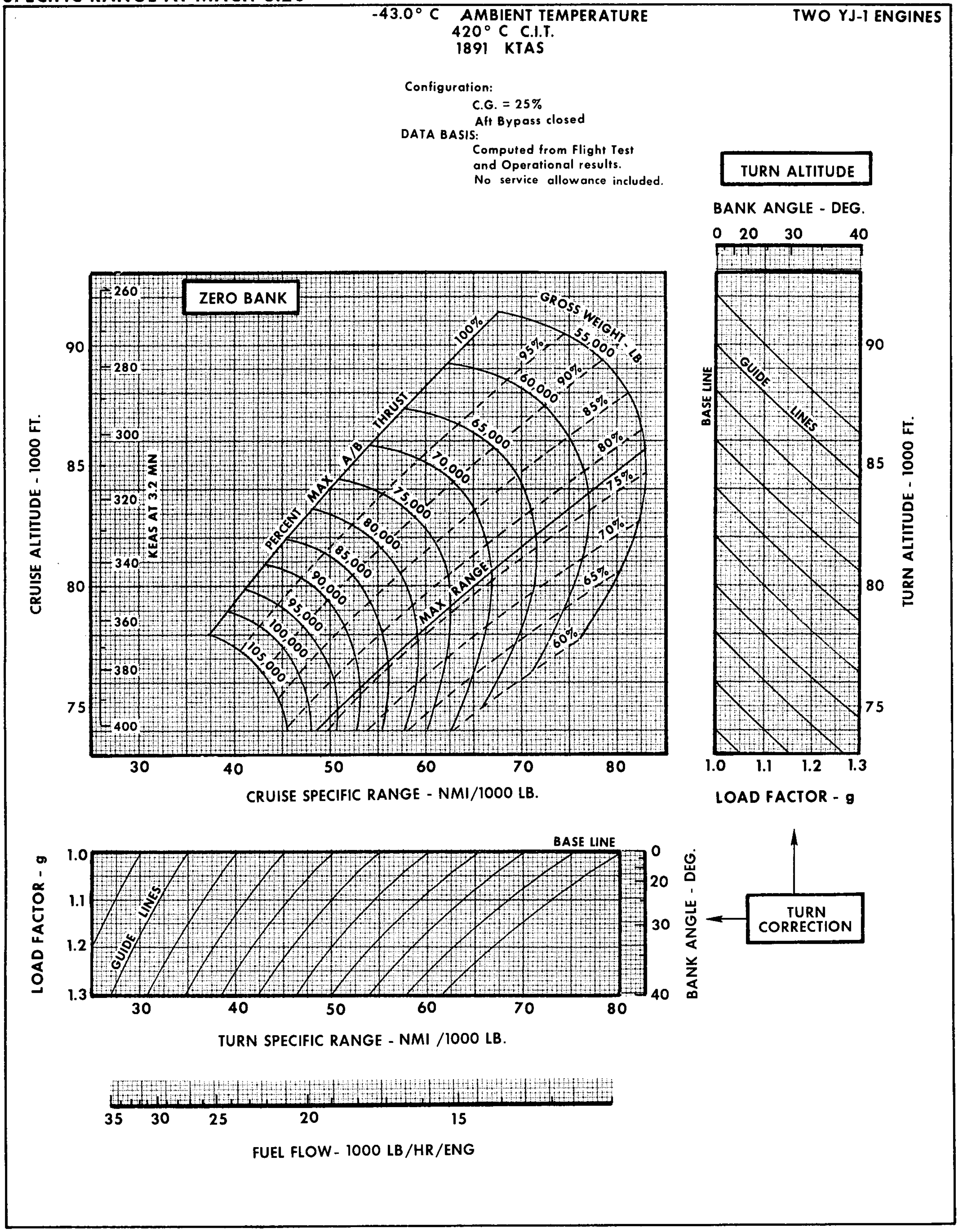


Figure A5-5

LONG RANGE CRUISE PROFILE

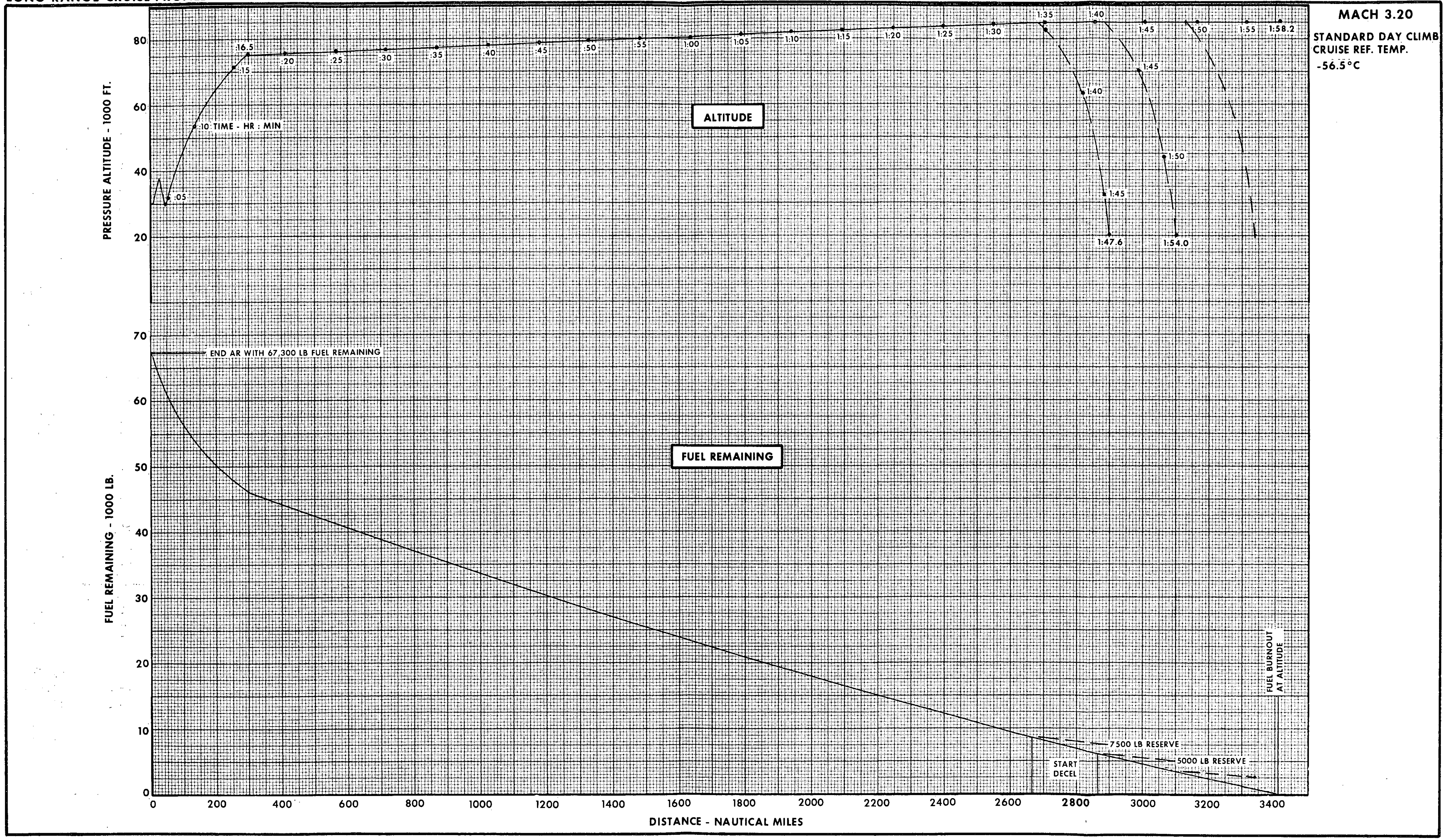


Figure A5-6

(Sheet 1 of 3)

Approved for Release: 2017/07/25 C06535944

PROFILE CHART: CLIMB - CRUISE INTERCEPT POINTS

1956 ARDC ATMOSPHERE

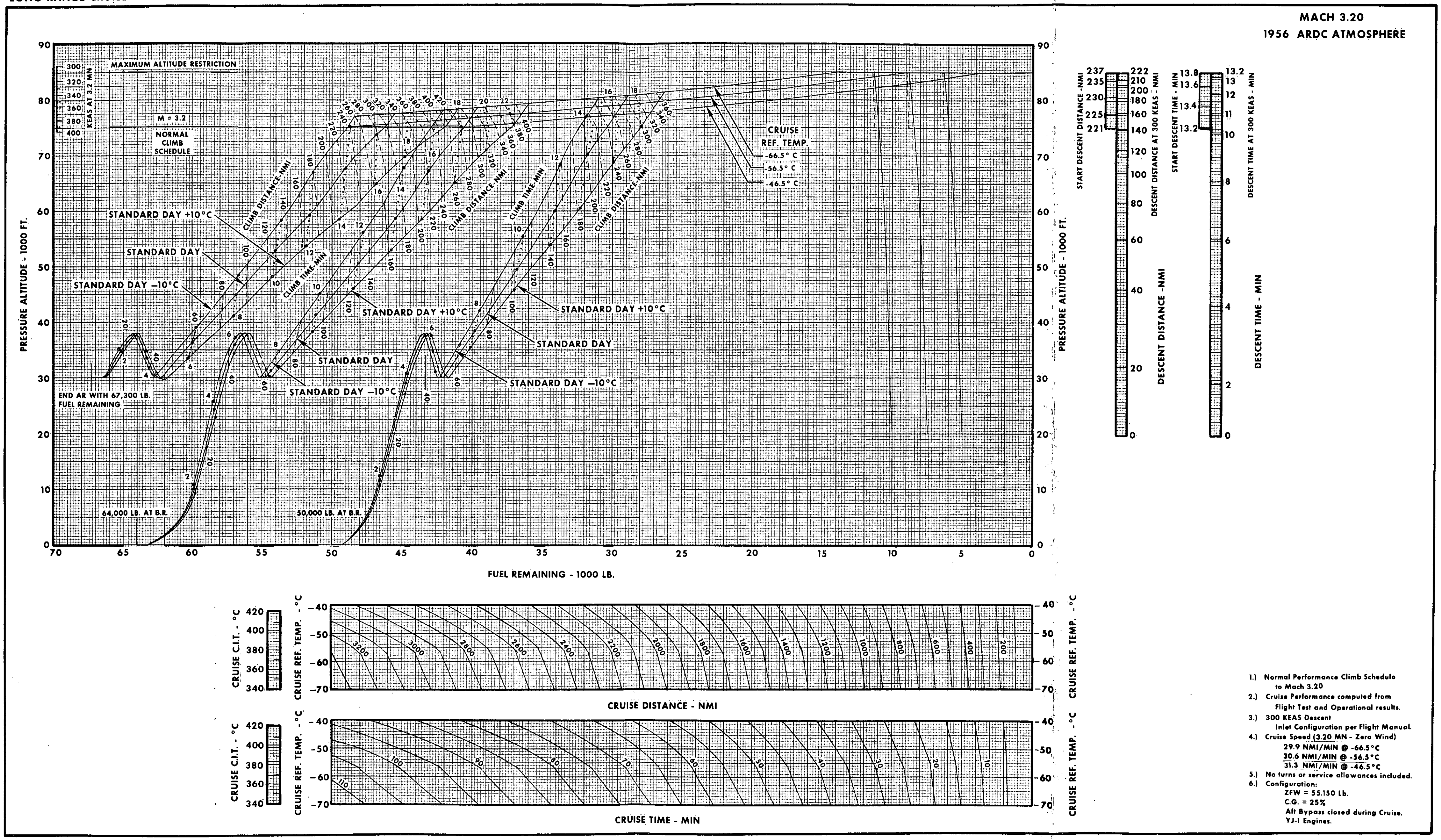
LONG RANGE CRUISE - MACH 3.20

INITIAL GR. WT. LB.	INITIAL ALTITUDE FT.	CLIMB TEMP °C	CRUISE TEMP. °C	CLIMB - CRUISE INTERCEPT			
				ALTITUDE FT.	DISTANCE N. MI.	TIME MIN.	FUEL REM. LB.
122,450	30,000	STD -10	-66.5	77,050	258	14.6	48,410
			-56.5	75,296	237	13.9	48,875
			-46.5	75,296	237	13.9	48,875
		STD	-66.5	77,500	326	17.4	45,620
			-56.5	75,500	302	16.6	46,150
			-46.5	75,296	299	16.5	46,205
		STD +10	-66.5	78,350	438	22.0	41,070
			-56.5	76,450	416	21.3	41,570
			-46.5	75,296	402	20.8	41,875
119,150	S.L.	STD -10	-66.5	78,200	267	16.9	42,130
			-56.5	76,200	244	16.1	42,665
			-46.5	75,296	233	15.8	42,905
		STD	-66.5	78,600	326	19.5	39,650
			-56.5	76,750	305	18.8	40,145
			-46.5	75,296	287	18.2	40,530
		STD +10	-66.5	79,350	421	23.6	36,075
			-56.5	77,400	398	22.8	36,595
			-46.5	75,800	379	22.1	37,020
105,150	S.L.	STD -10	-66.5	80,400	254	15.3	30,980
			-56.5	78,550	233	14.5	31,475
			-46.5	76,900	213	13.9	31,915
		STD	-66.5	80,800	301	17.3	28,915
			-56.5	79,050	281	16.6	29,380
			-46.5	76,400	249	15.5	30,085
		STD +10	-66.5	81,450	375	20.4	26,280
			-56.5	79,750	355	19.7	26,735
			-46.5	78,000	335	19.0	27,200

Figure A5-6
(Sheet 2 of 3)

LONG RANGE CRUISE PERFORMANCE

MACH 3.20
1956 ARDC ATMOSPHERE



1.) Normal Performance Climb Schedule to Mach 3.20
2.) Cruise Performance computed from Flight Test and Operational results.
3.) 300 KEAS Descent Inlet Configuration per Flight Manual.
4.) Cruise Speed (3.20 MN - Zero Wind)
29.9 NMI/MIN @ -66.5°C
30.6 NMI/MIN @ -56.5°C
31.3 NMI/MIN @ -46.5°C
5.) No turns or service allowances included.
6.) Configuration:
ZFW = 55.150 Lb.
C.G. = 25%
Aft Bypass closed during Cruise.
YJ-1 Engines.

Figure A5-6
(Sheet 3 of 3)

HIGH ALTITUDE CRUISE PROFILE

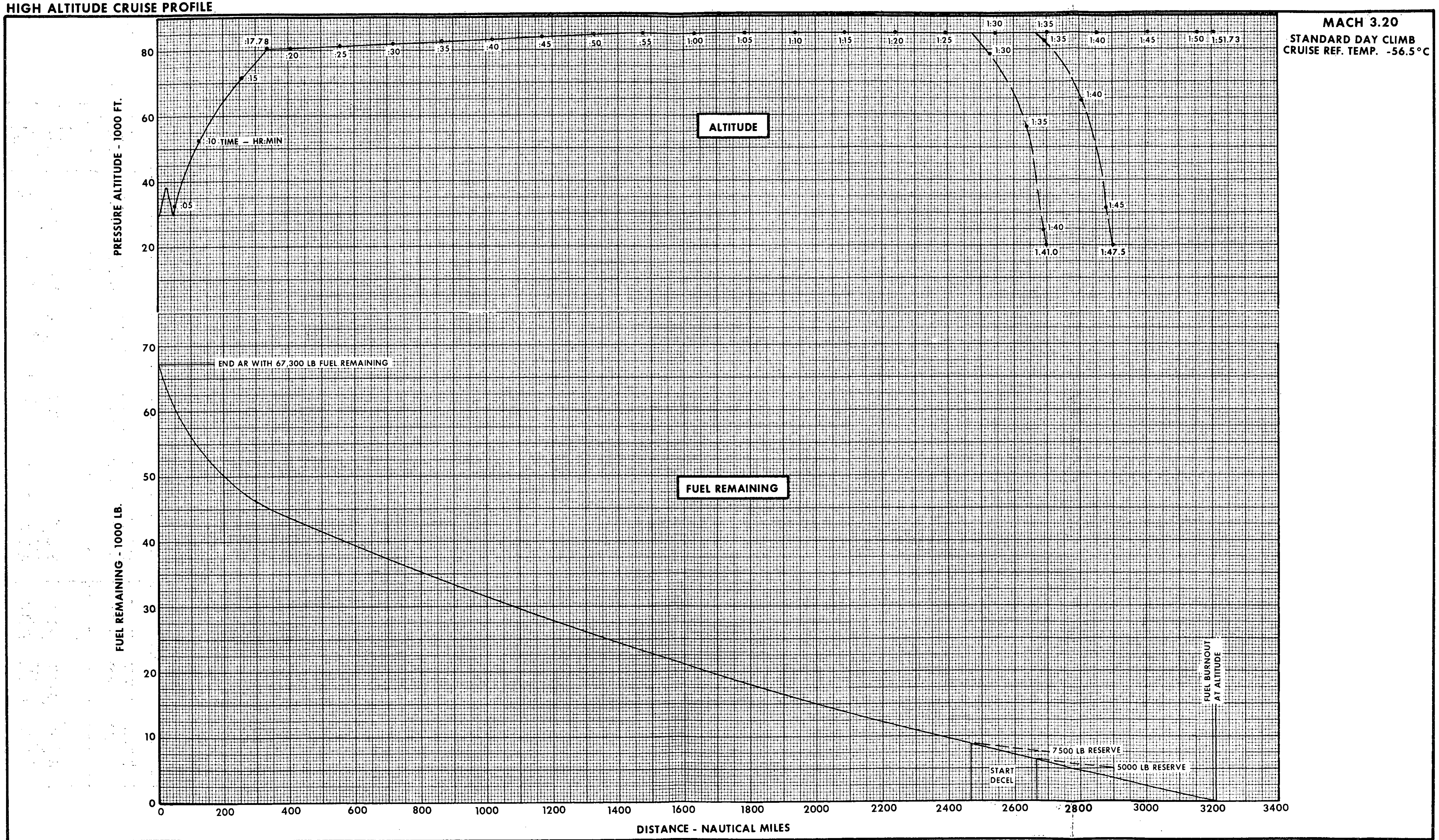


Figure A5-7

(Sheet 1 of 3)

PROFILE CHART: CLIMB - CRUISE INTERCEPT POINTS

1956 ARDC ATMOSPHERE

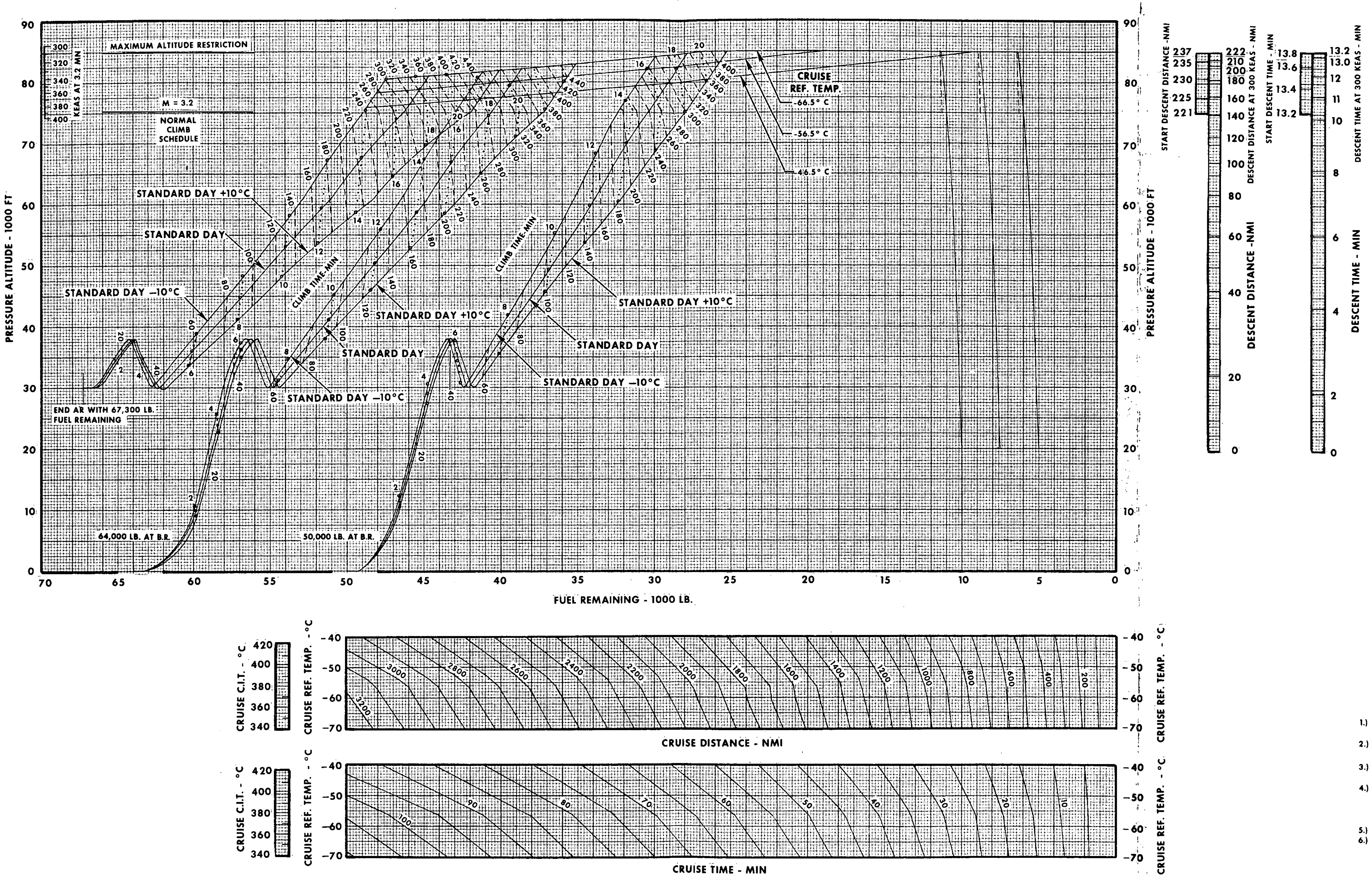
HIGH ALTITUDE CRUISE - MACH 3.20

INITIAL GR. WT. LB.	INITIAL ALTITUDE FT.	CLIMB TEMP. °C	CRUISE TEMP. °C	CLIMB - CRUISE INTERCEPT ALTITUDE FT.	DISTANCE N. MI.	TIME MIN.	FUEL REM. LB.
122,450	30,000	STD -10	-66.5	80,600	301	16.0	47,465
			-56.5	78,400	275	15.1	48,050
			-46.5	76,000	246	14.2	48,690
		STD	-66.5	81,150	369	18.8	44,645
			-56.5	78,900	343	17.9	45,245
			-46.5	76,450	314	17.0	45,900
		STD +10	-66.5	82,000	482	23.5	40,090
			-56.5	79,800	457	22.6	40,675
			-46.5	77,350	428	21.6	41,330
119,150	S.L.	STD -10	-66.5	81,800	310	18.4	41,175
			-56.5	79,600	285	17.5	41,760
			-46.5	77,150	256	16.5	42,410
		STD	-66.5	82,200	369	21.0	38,690
			-56.5	80,100	345	20.1	39,250
			-46.5	77,600	316	19.1	39,915
		STD +10	-66.5	83,050	465	25.0	35,090
			-56.5	80,800	439	24.1	35,690
			-46.5	78,400	411	23.2	36,330
105,150	S.L.	STD -10	-66.5	84,200	300	16.8	29,975
			-56.5	82,000	275	15.9	30,555
			-46.5	79,400	245	14.9	31,250
		STD	-66.5	84,700	348	18.9	27,875
			-56.5	82,450	323	18.0	28,475
			-46.5	79,850	292	16.9	29,080
		STD +10	-66.5	85,000	417	21.8	25,335
			-56.5	84,150	409	21.5	25,560
			-46.5	80,450	365	20.0	26,550

Figure A5-7
(Sheet 2 of 3)

HIGH ALTITUDE CRUISE PERFORMANCE

MACH 3.20
1956 ARDC ATMOSPHERE



1.) Normal Performance Climb Schedule to Mach 3.20
2.) Cruise Performance computed from Flight Test and Operational results.
3.) 300 KEAS Descent Inlet Configuration per Flight Manual.
4.) Cruise Speed (3.20 MN - Zero Wind)
    29.9 NMI/MIN @ -66.5°C
    30.6 NMI/MIN @ -56.5°C
    31.3 NMI/MIN @ -46.5°C
5.) No turns or service allowances included.
6.) Configuration:
    ZFW = 55.150 Lb.
    C.G. = 25%
    Aft Bypass closed during Cruise.
    YJ-1 Engines.

Figure A5-7
(Sheet 3 of 3)

MAXIMUM A/B CEILING CRUISE PROFILE

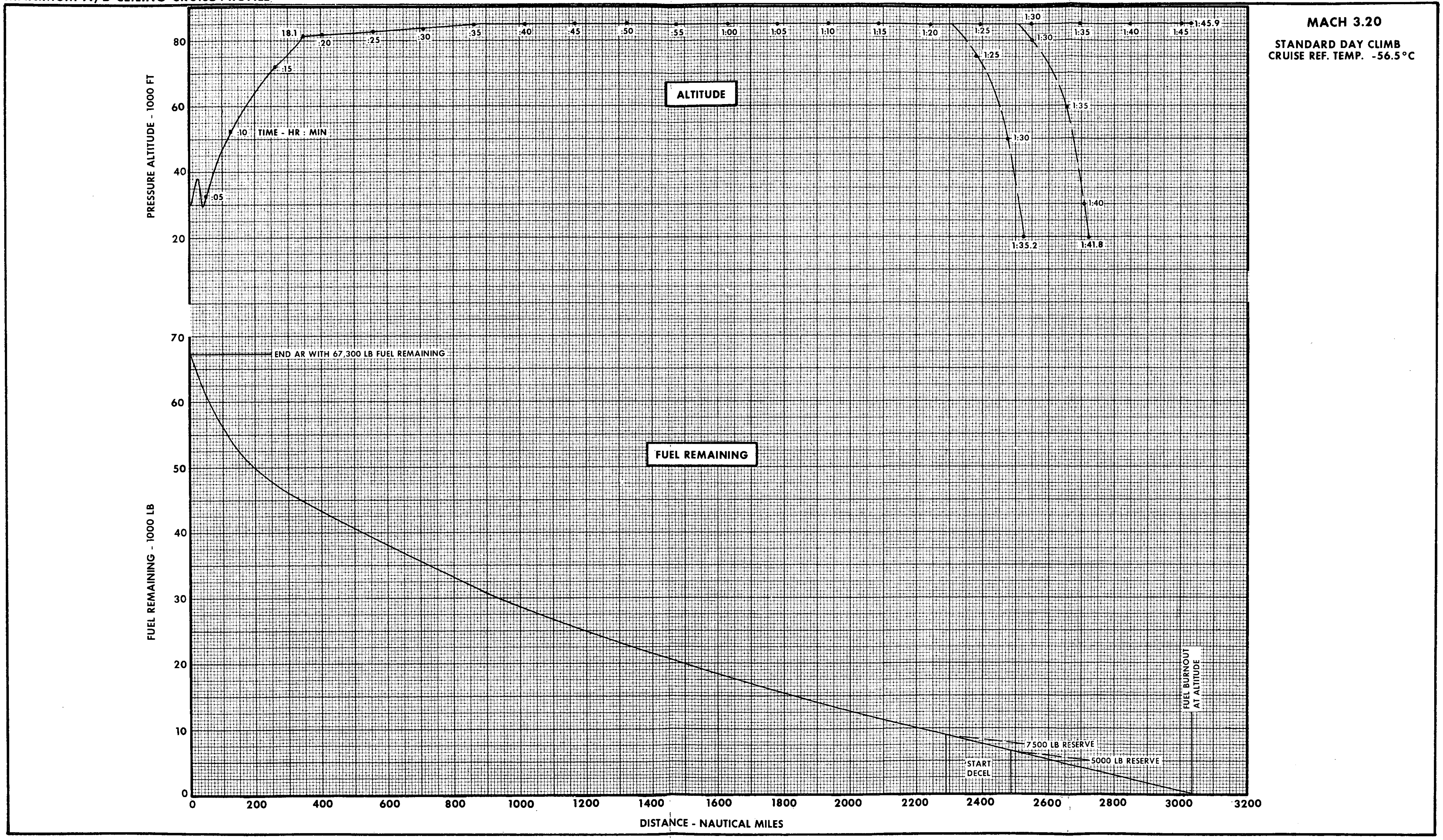


Figure A5-8

(Sheet 1 of 2)

Approved for Release: 2017/07/25 C06535944

MAXIMUM A/B CEILING CRUISE PROFILE

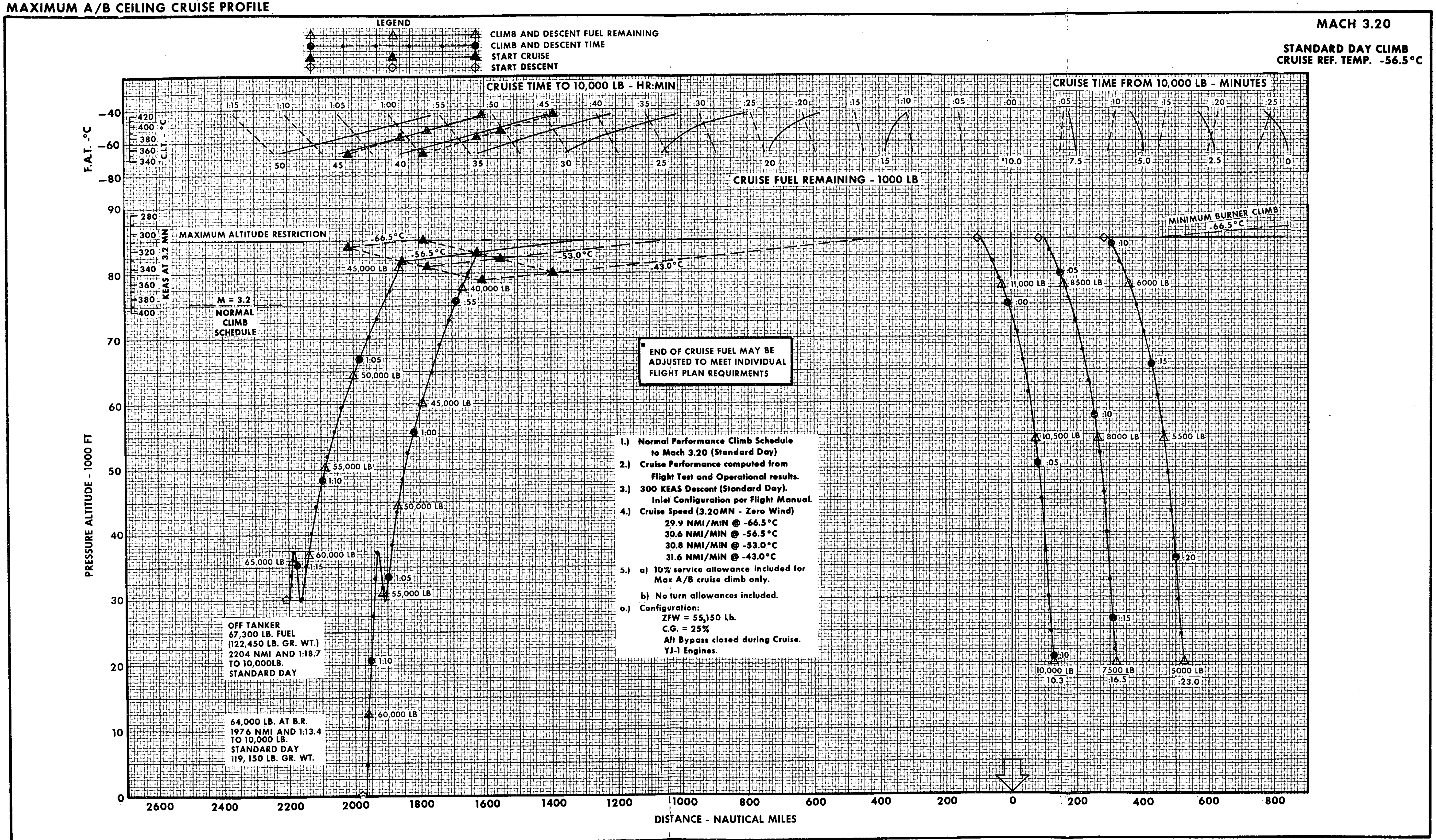


Figure A5-8

(Sheet 2 of 2)

LONG RANGE CRUISE PROFILE

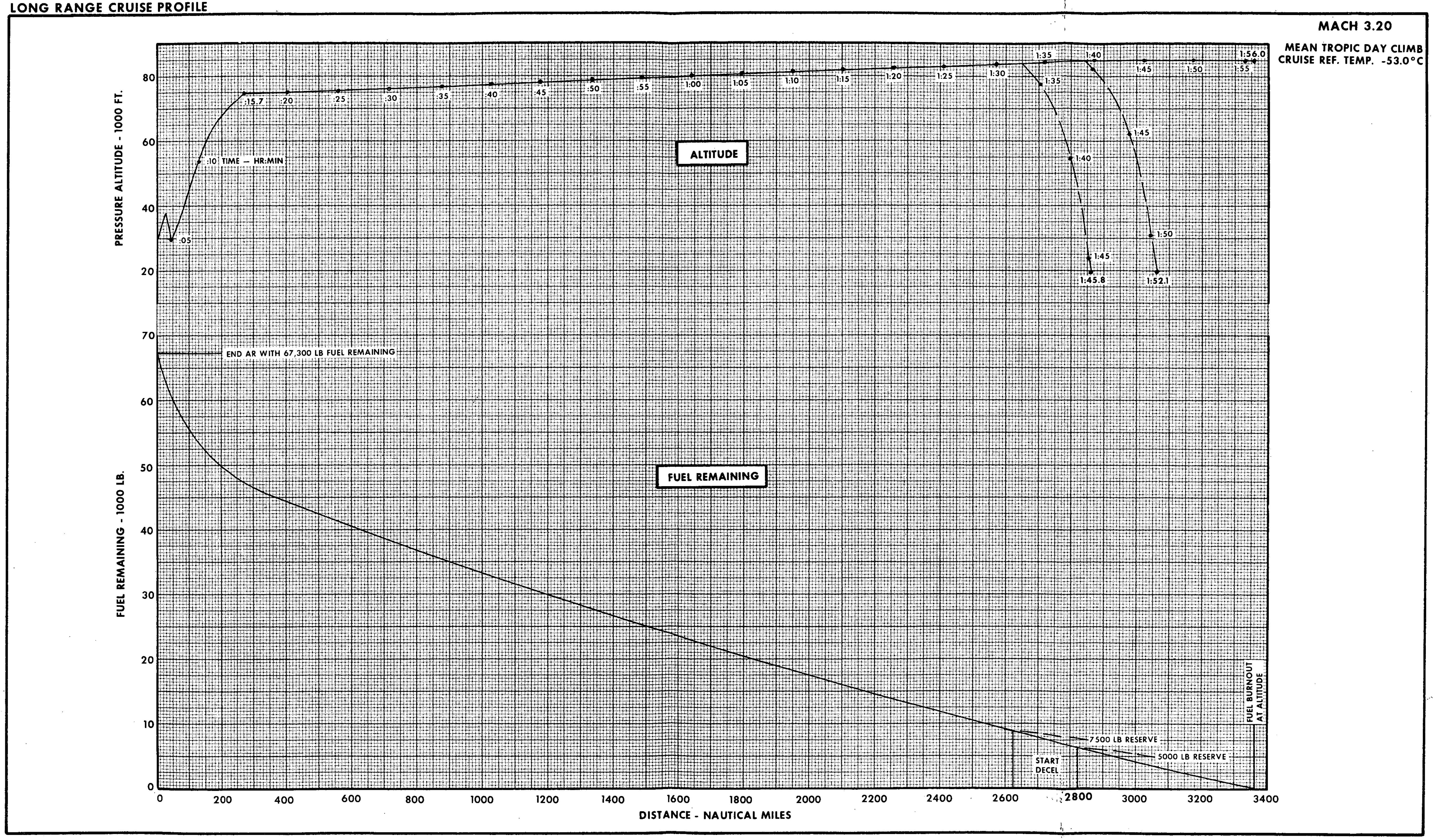


Figure A5-9

(Sheet 1 of 3)

PROFILE CHART: CLIMB - CRUISE INTERCEPT POINTS

MEAN TROPIC ATMOSPHERE

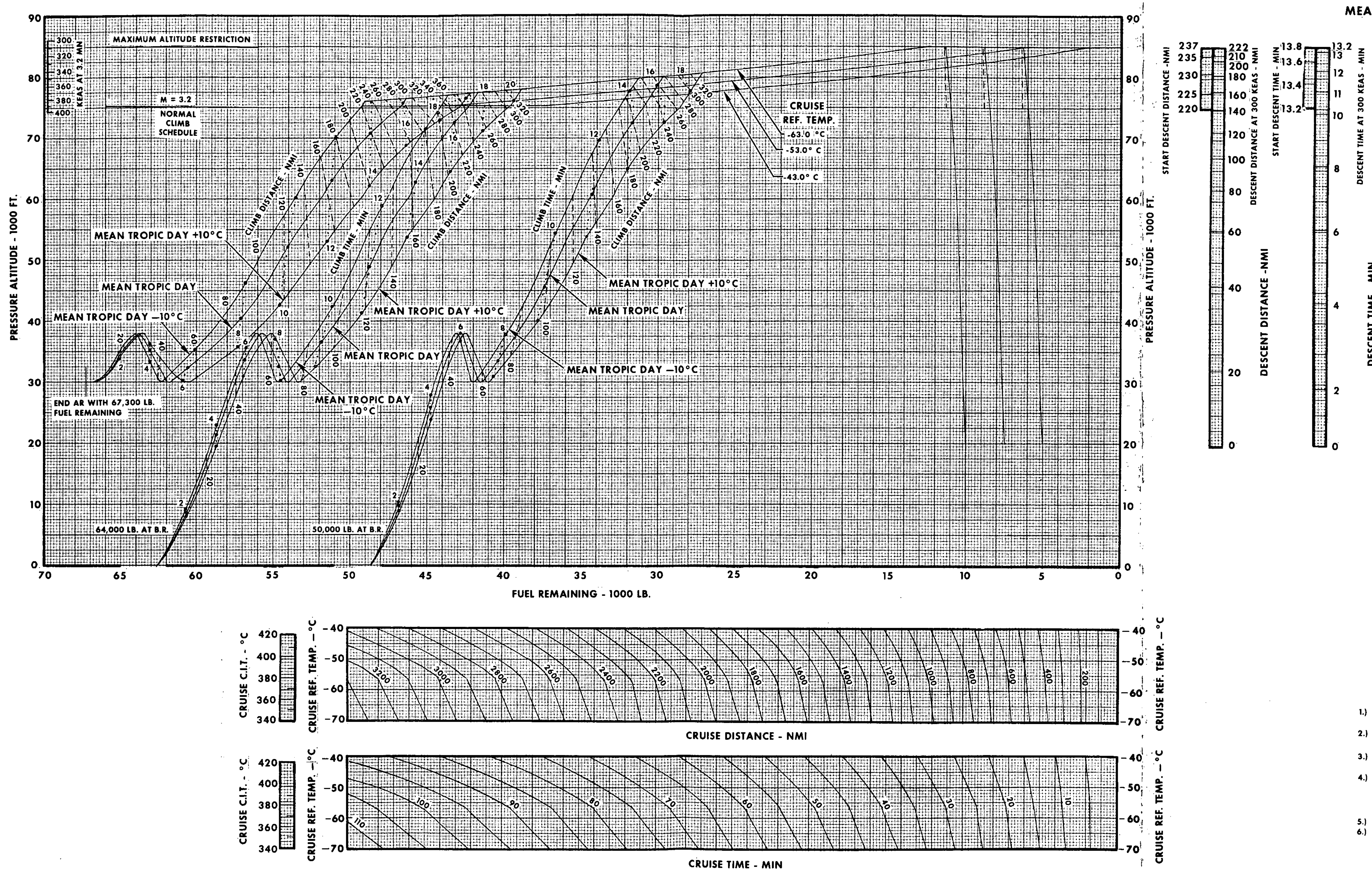
LONG RANGE CRUISE - MACH 3.20

INITIAL GR. WT. LB.	INITIAL ALTITUDE FT.	CLIMB TEMP. °C	CRUISE TEMP. °C	CLIMB - CRUISE INTERCEPT			
				ALTITUDE FT.	DISTANCE N. MI.	TIME MIN.	FUEL REM. LB.
122,450	30,000	M.T. -10	-63.0	76,050	230	13.6	49,025
			-53.0	75,296	221	13.3	49,225
			-43.0	75,296	221	13.3	49,225
		M.T.	-63.0	76,600	290	16.2	46,395
			-53.0	75,296	274	15.7	46,740
			-43.0	75,296	274	15.7	46,740
		M.T. +10	-63.0	77,400	382	20.2	42,290
			-53.0	75,450	359	19.5	42,810
			-43.0	75,296	357	19.4	42,850
119,150	S.L.	M.T. -10	-63.0	77,200	229	15.6	43,645
			-53.0	75,296	206	14.9	44,150
			-43.0	75,296	206	14.9	44,150
		M.T.	-63.0	77,550	274	17.8	41,760
			-53.0	75,600	250	17.0	42,280
			-43.0	75,296	247	16.9	42,360
		M.T. +10	-63.0	78,150	340	20.7	38,860
			-53.0	76,150	316	19.9	39,395
			-43.0	75,296	306	19.5	39,620
105,150	S.L.	M.T. -10	-63.0	79,750	236	14.9	31,285
			-53.0	77,750	223	14.1	31,815
			-43.0	76,350	196	13.5	32,190
		M.T.	-63.0	80,150	277	16.7	29,660
			-53.0	78,150	254	15.9	30,190
			-43.0	76,750	237	15.4	30,565
		M.T. +10	-63.0	80,750	336	19.2	27,100
			-53.0	78,700	312	18.4	27,645
			-43.0	77,300	296	17.9	28,015

Figure A5-9
(Sheet 2 of 3)

LONG RANGE CRUISE PERFORMANCE

MACH 3.20
MEAN TROPIC DAY ATMOSPHERE



1.) Normal Performance Climb Schedule to Mach 3.20
2.) Cruise Performance computed from Flight Test and Operational results.
3.) 300 KEAS Descent Inlet Configuration per Flight Manual.
4.) Cruise Speed (3.20 MN - Zero Wind)
30.1 NMI/MIN @ -63.0°C
30.8 NMI/MIN @ -53.0°C
31.6 NMI/MIN @ -43.0°C
5.) No turns or service allowances included.
6.) Configuration:
ZFW = 55.150 Lb.
C.G. = 25%
Aft Bypass closed during Cruise.
YJ-1 Engines.

Figure A5-9
(Sheet 3 of 3)

HIGH ALTITUDE CRUISE PROFILE

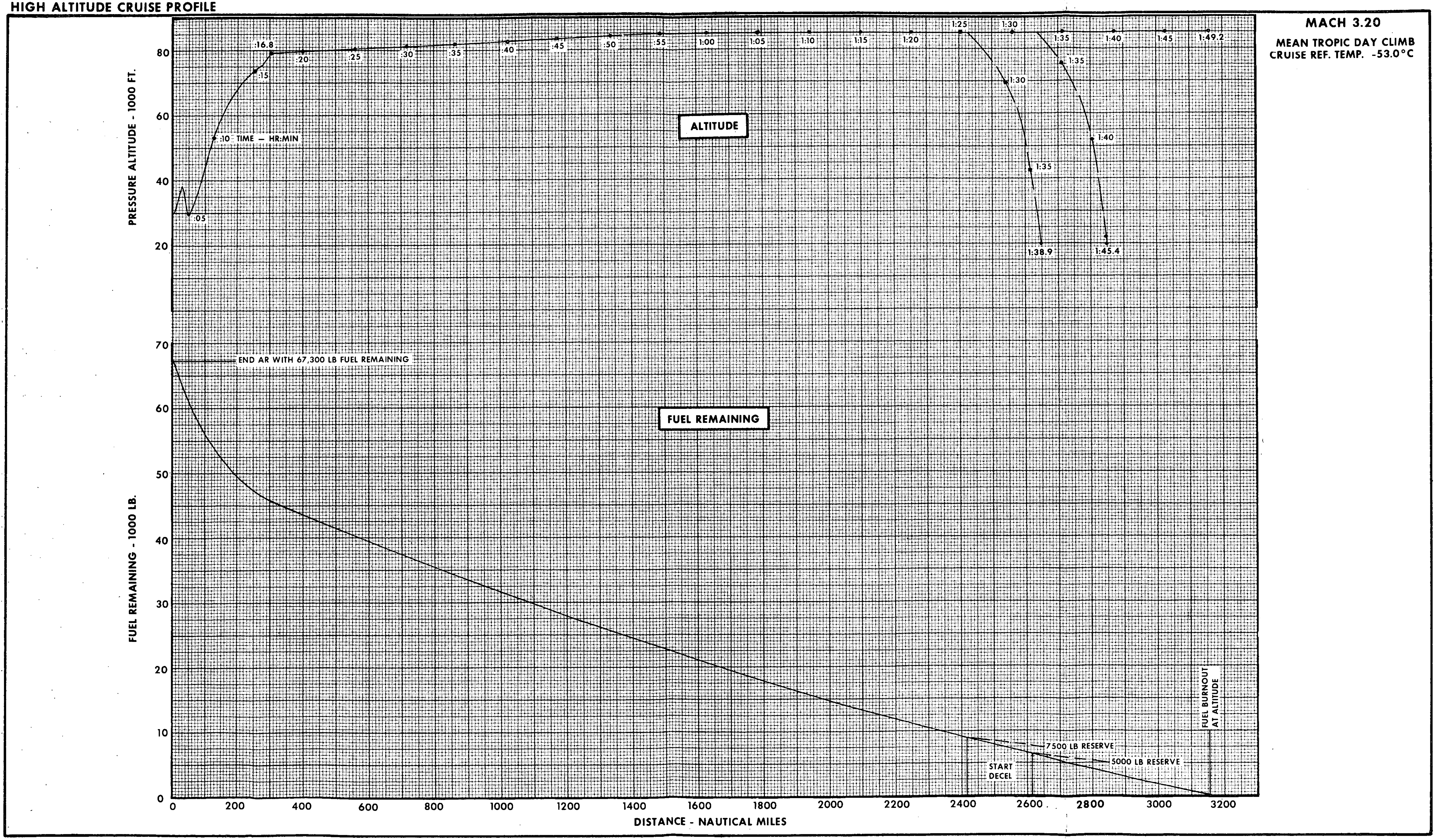


Figure A5-10

(Sheet 1 of 3)

Approved for Release: 2017/07/25 C06535944

PROFILE CHART: CLIMB - CRUISE INTERCEPT POINTS

MEAN TROPIC ATMOSPHERE

HIGH ALTITUDE CRUISE - MACH 3.20

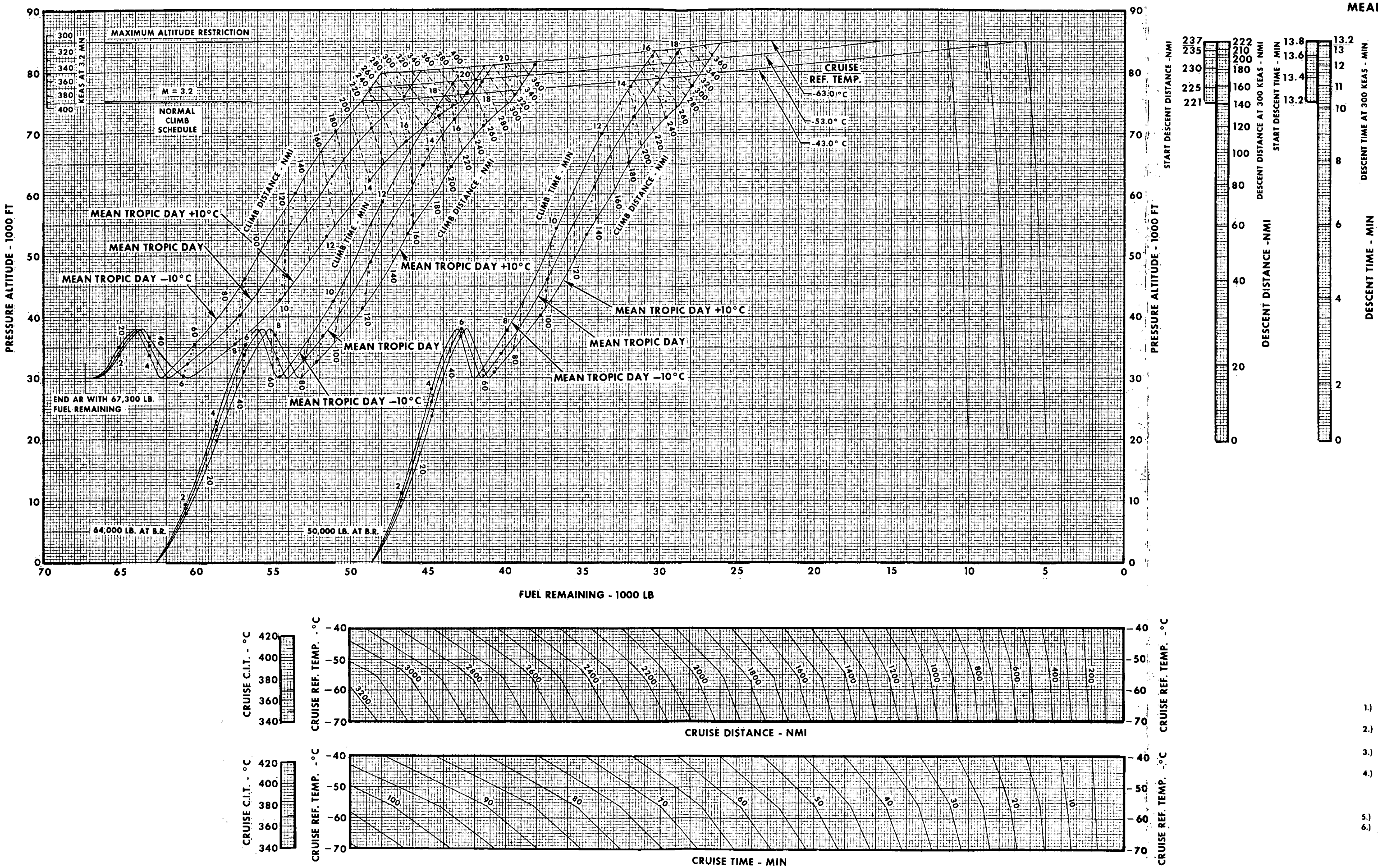
INITIAL GR. WT. LB.	INITIAL ALTITUDE FT.	CLIMB TEMP. °C	CRUISE TEMP. °C	CLIMB - CRUISE INTERCEPT ALTITUDE FT	DISTANCE N. MI.	TIME MIN.	FUEL REM. LB.
122,450	30,000	M.T. -10	-63.0	79,800	276	15.1	48,025
			-53.0	77,500	249	14.2	48,640
			-43.0	75,296	221	13.3	49,225
		M.T.	-63.0	80,250	334	17.7	45,420
			-53.0	78,000	307	16.8	46,020
			-43.0	75,500	277	15.8	46,685
		M.T. +10	-63.0	81,000	426	21.7	41,330
			-53.0	78,750	400	20.8	41,930
			-43.0	76,300	370	19.8	42,585
119,150	S.L.	M.T. -10	-63.0	80,800	272	17.1	42,685
			-53.0	78,500	246	16.2	43,295
			-43.0	76,000	215	15.2	43,965
		M.T.	-63.0	81,150	317	19.2	40,800
			-53.0	78,850	290	18.3	41,425
			-43.0	76,400	260	17.3	42,065
		M.T. +10	-63.0	81,650	381	22.0	37,955
			-53.0	79,400	356	21.2	38,530
			-43.0	77,000	327	20.2	39,165
105,150	S.L.	M.T. -10	-63.0	83,400	280	16.4	30,310
			-53.0	81,000	253	15.4	30,950
			-43.0	78,500	223	14.4	31,615
		M.T.	-63.0	83,800	321	18.2	28,690
			-53.0	81,400	294	17.2	29,325
			-43.0	78,850	264	16.2	30,005
		M.T. +10	-63.0	84,450	378	20.7	26,140
			-53.0	82,000	353	19.7	26,765
			-43.0	79,400	322	18.7	27,460

Figure A5-10
(Sheet 2 of 3)

HIGH ALTITUDE CRUISE PERFORMANCE

MACH 3.20

MEAN TROPIC DAY ATMOSPHERE



1.) Normal Performance Climb Schedule to Mach 3.20
2.) Cruise Performance computed from Flight Test and Operational results.
3.) 300 KEAS Descent Inlet Configuration per Flight Manual.
4.) Cruise Speed (3.20 MN - Zero Wind)
    30.1 NMI/MIN @ -63.0°C
    30.8 NMI/MIN @ -53.0°C
    31.6 NMI/MIN @ -43.0°C
5.) No turns or service allowances included.
6.) Configuration:
    ZFW = 55.150 Lb.
    C.G. = 25%
    Aft Bypass closed during Cruise.
    YJ-1 Engines.

Figure A5-10
(Sheet 3 of 3)

MAXIMUM A/B CEILING CRUISE PROFILE

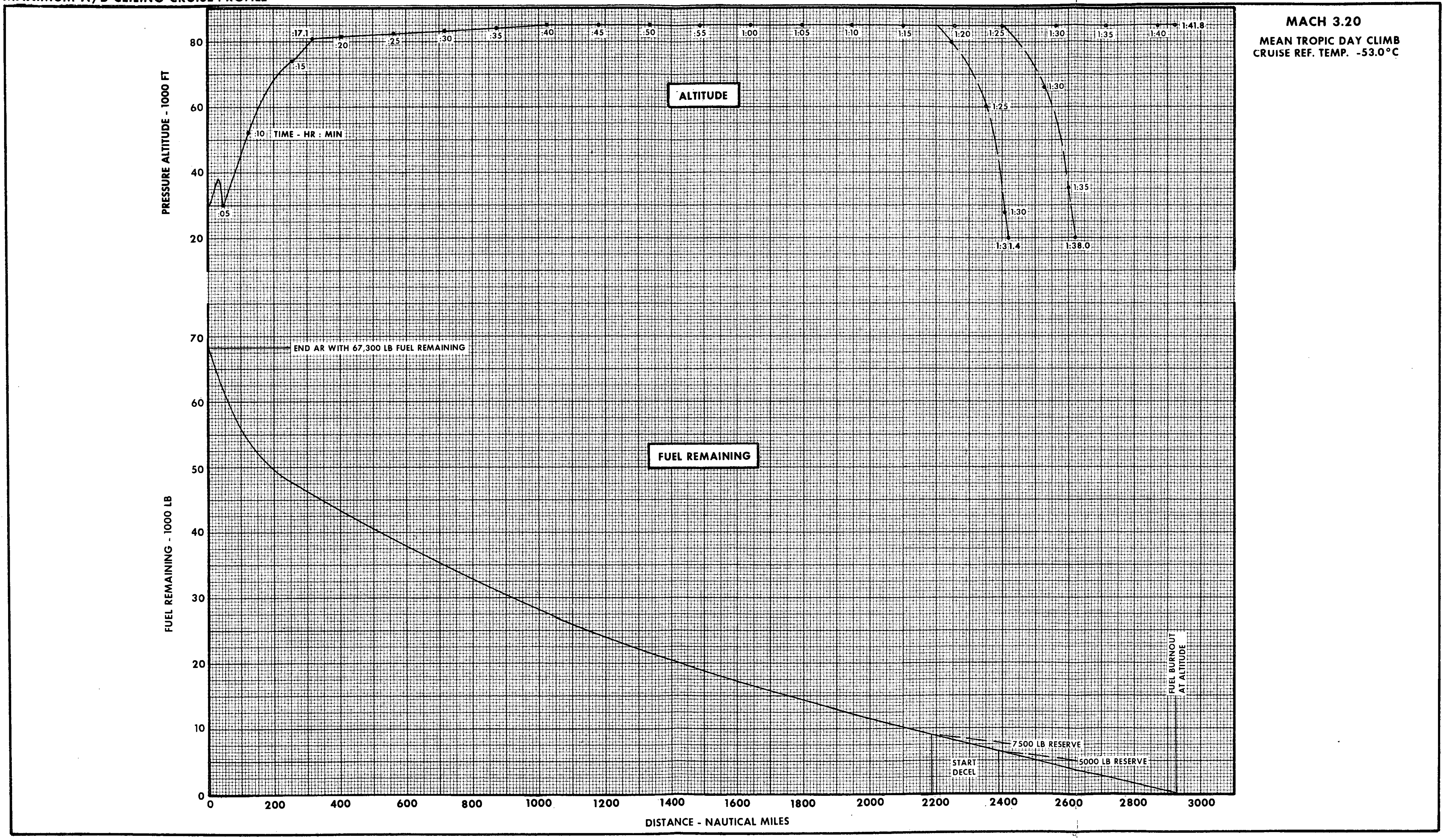


Figure A5-11

(Sheet 1 of 2)

MAXIMUM A/B CEILING CRUISE PROFILE

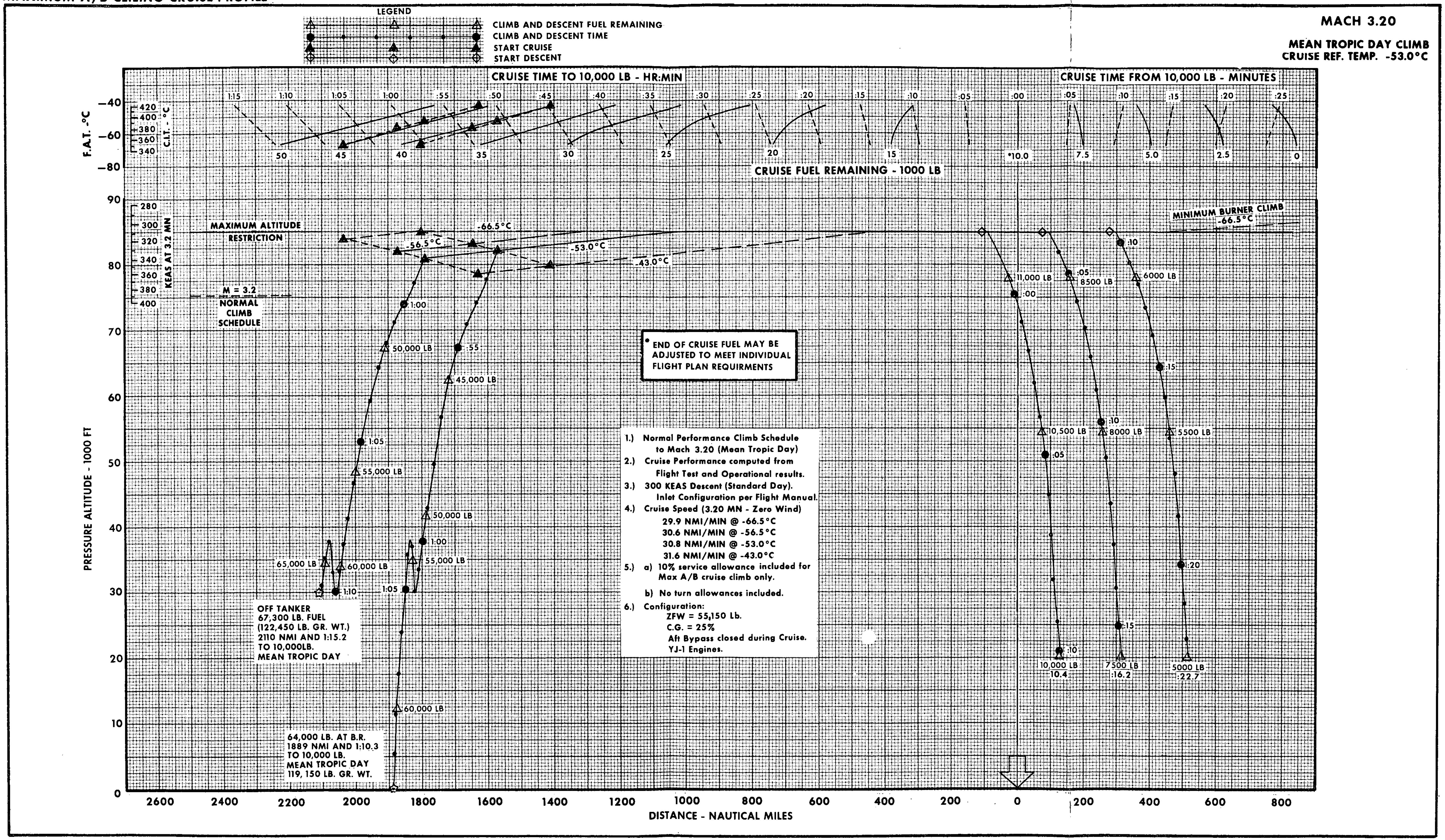


Figure A5-11

(Sheet 2 of 2)

SPECIFIC RANGE AT MACH 3.10

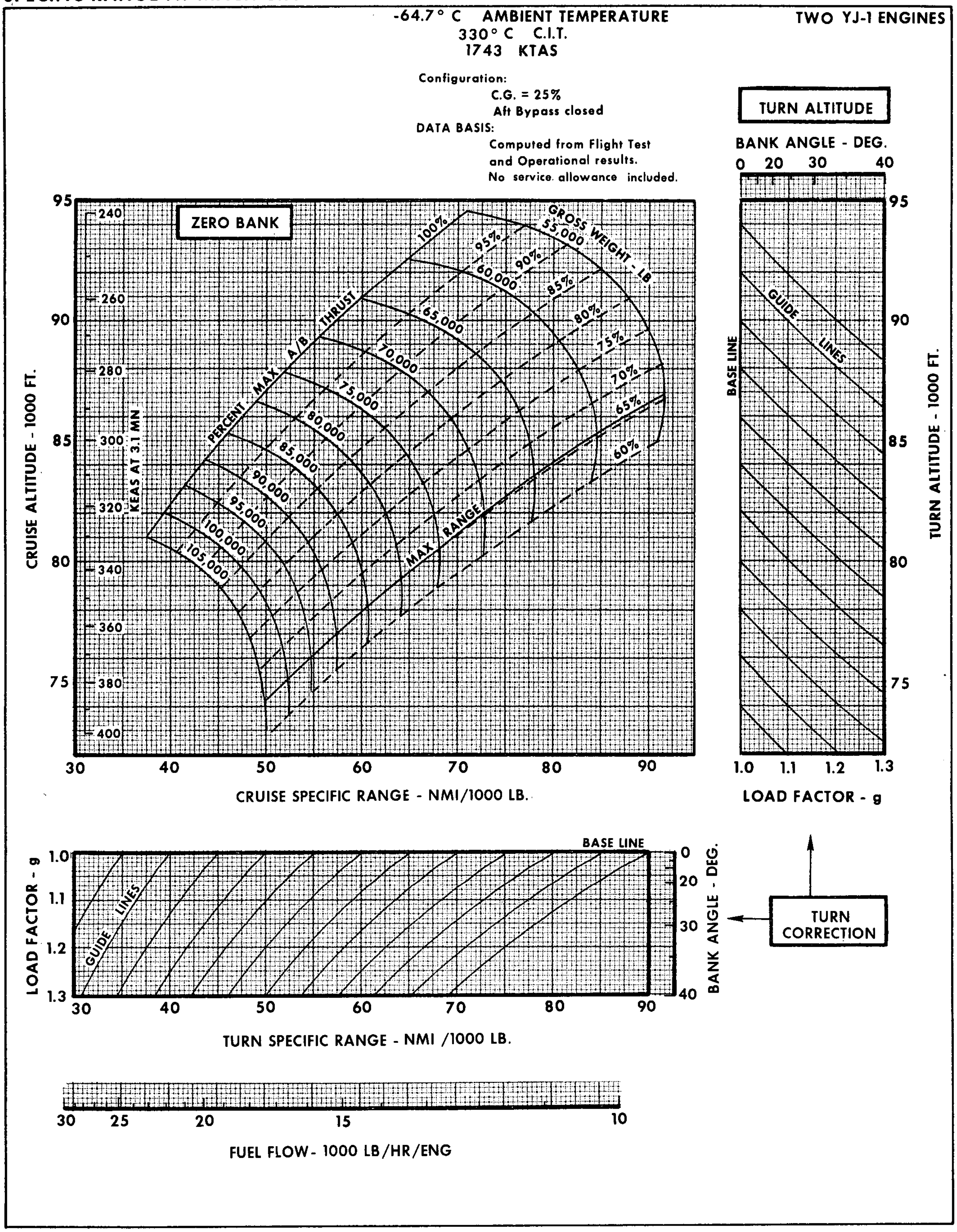


Figure A5-12

SPECIFIC RANGE AT MACH 3.10

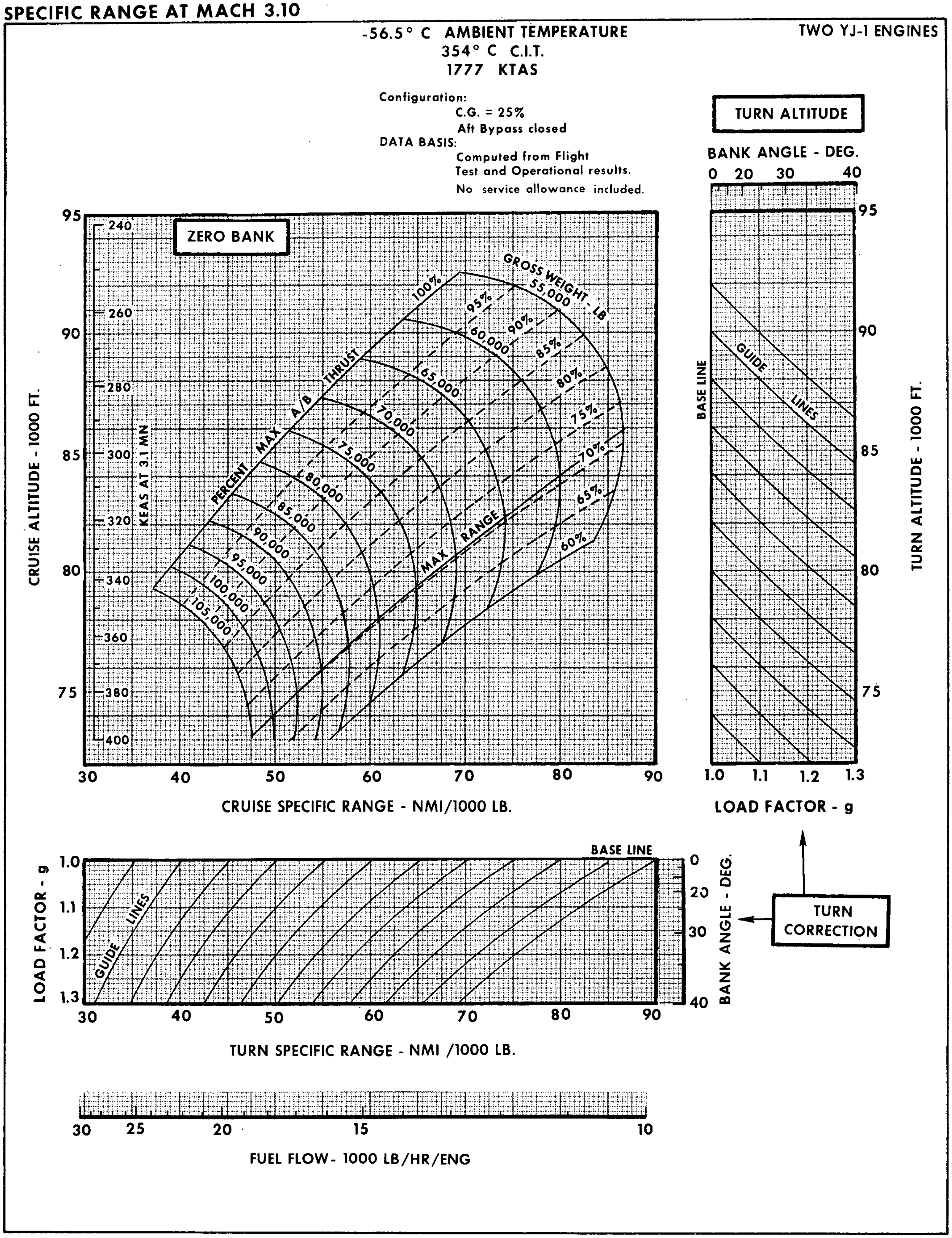


Figure A5-13

SPECIFIC RANGE AT MACH 3.10

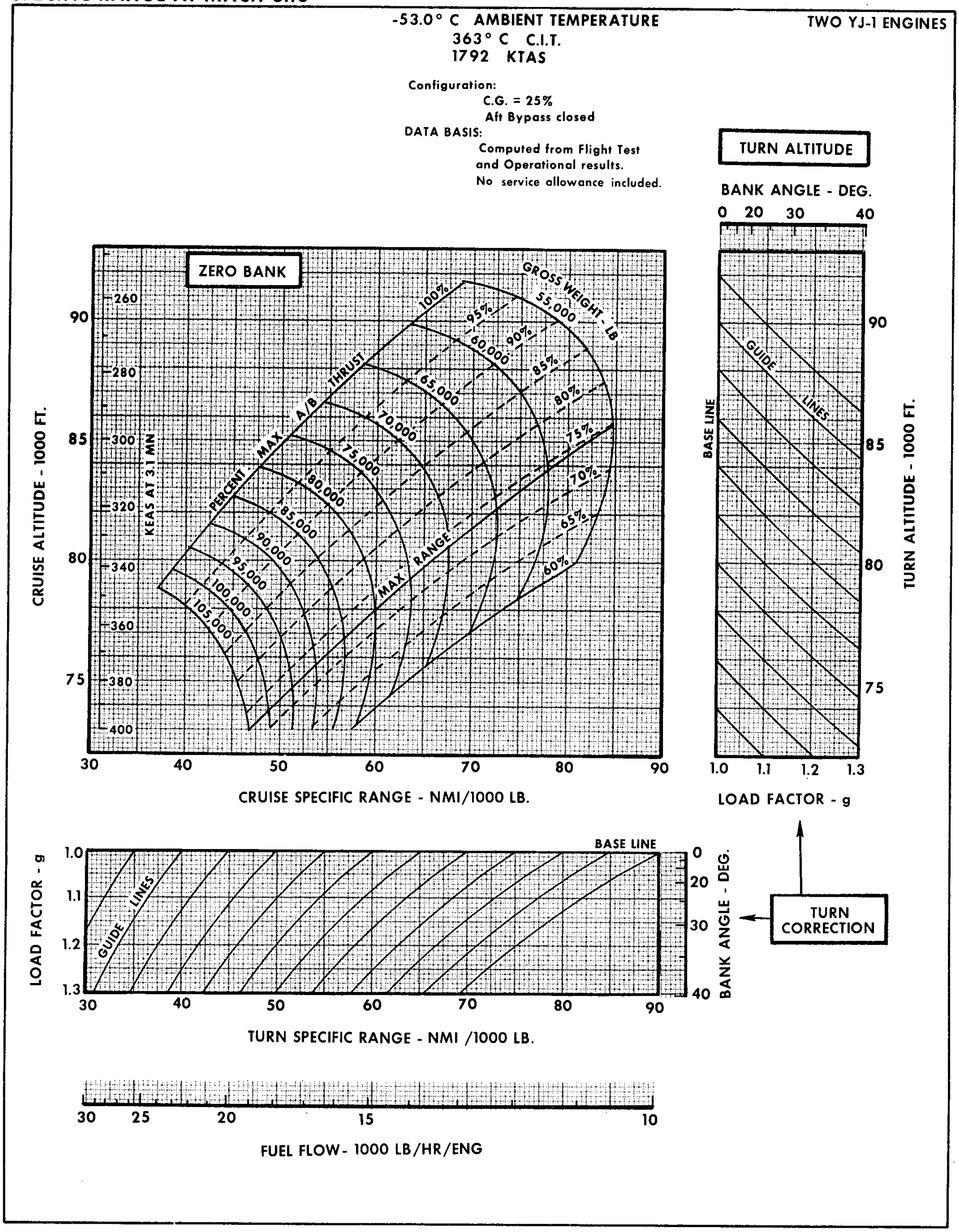


Figure A5-14

SPECIFIC RANGE AT MACH 3.10

-43.5 °C AMBIENT TEMPERATURE
390° C C.I.T.
1832 KTAS

TWO YJ-1 ENGINES

Configuration:
C.G. = 25%
Aft Bypass closed

DATA BASIS:
Computed from Flight Test and Operational results.
No service allowance included.

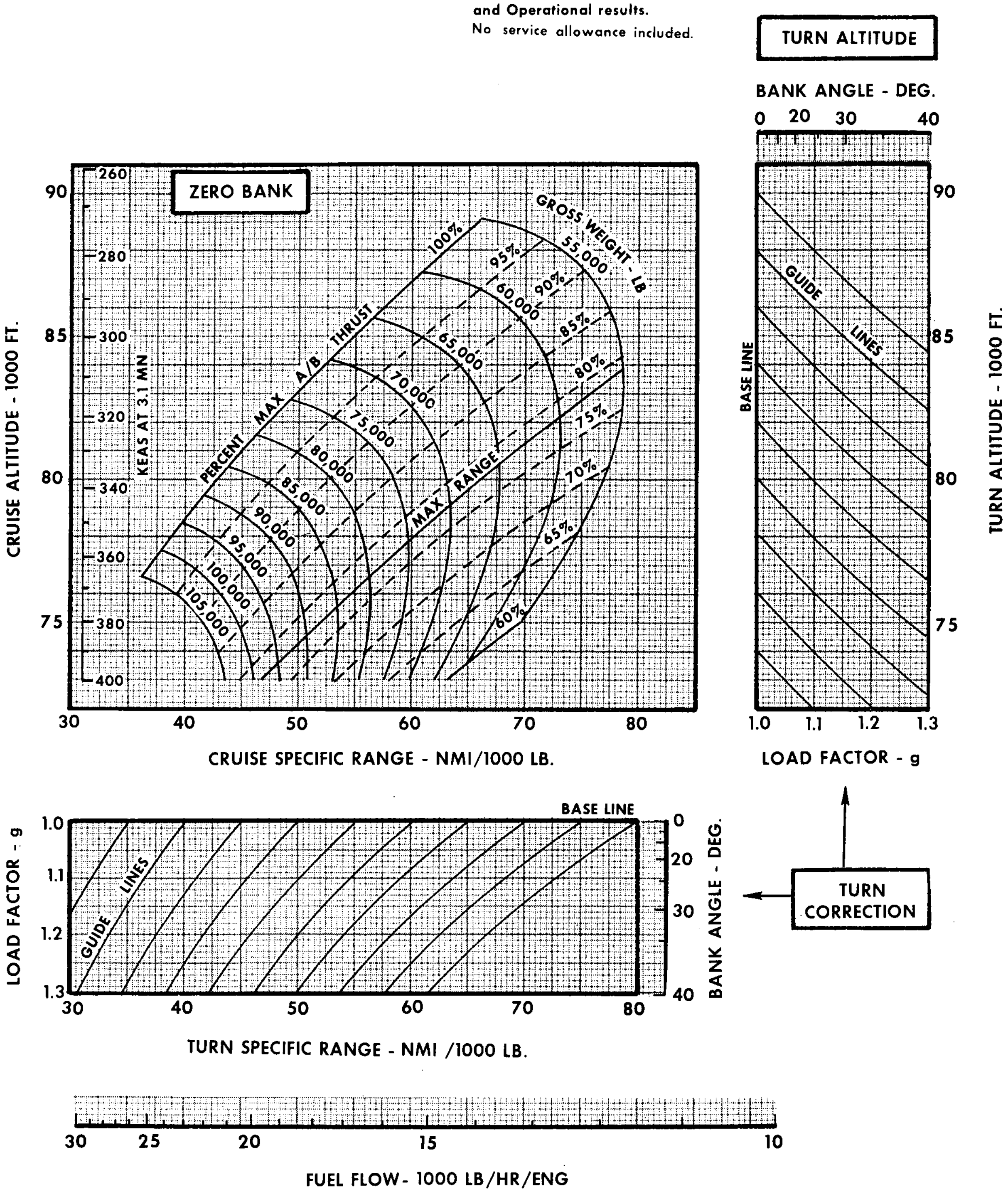


Figure A5-15

LONG RANGE CRUISE PROFILE

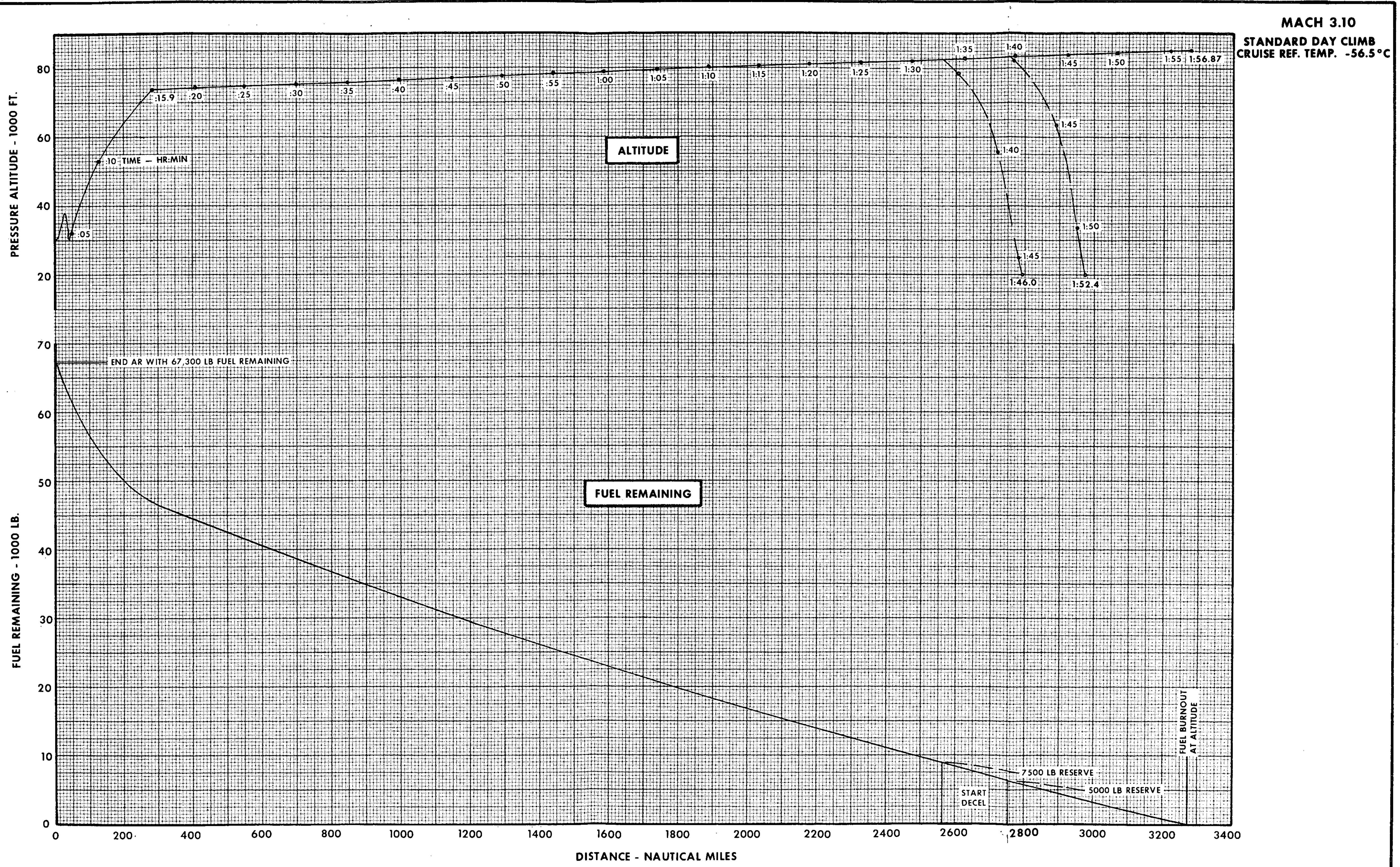


Figure A5-16

(Sheet 1 of 3)

PROFILE CHART: CLIMB - CRUISE INTERCEPT POINTS

1956 ARDC ATMOSPHERE

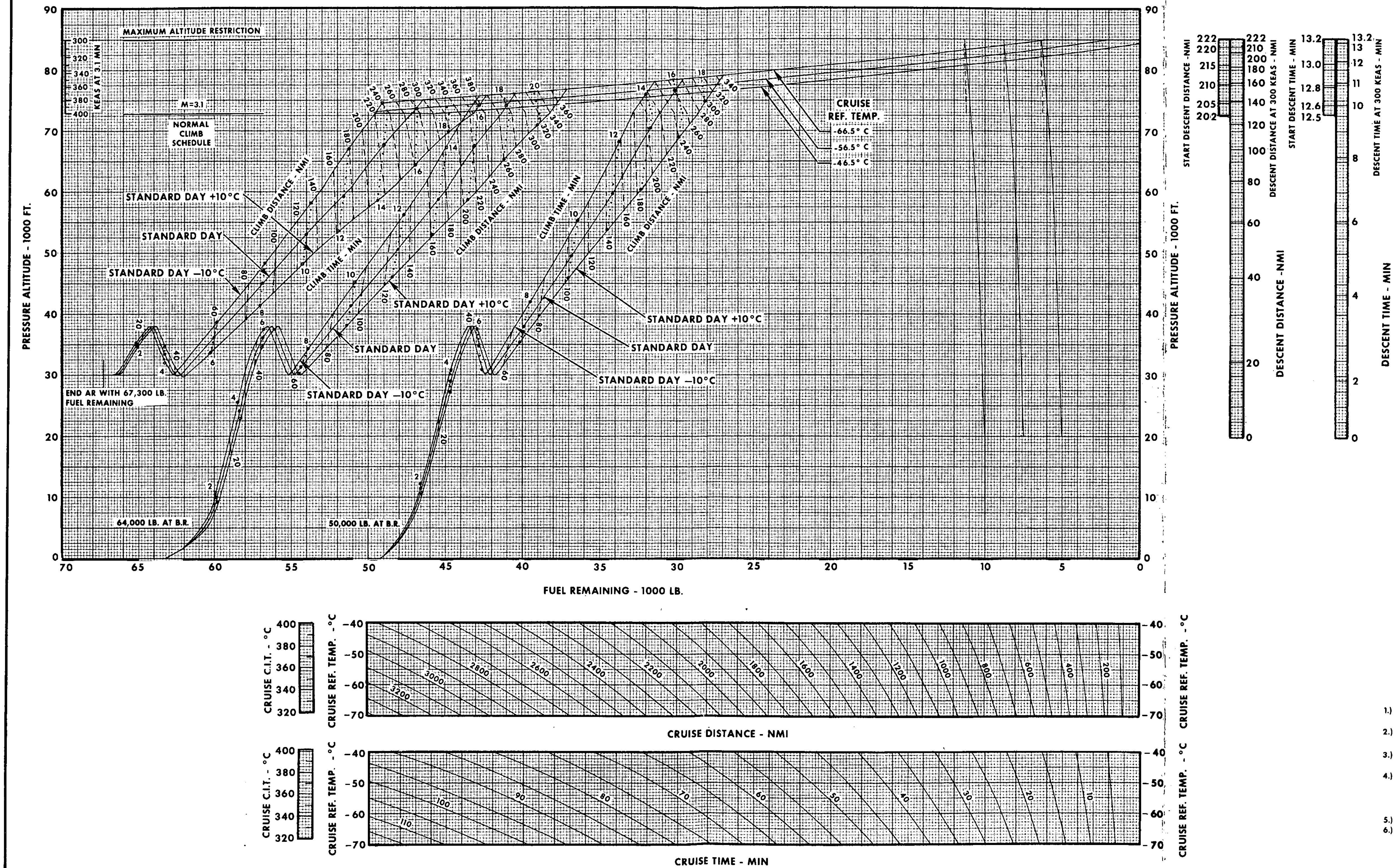
LONG RANGE CRUISE - MACH 3.10

INITIAL GR. WT. LB.	INITIAL ALTITUDE FT.	CLIMB TEMP. °C	CRUISE TEMP. °C	CLIMB - CRUISE INTERCEPT ALTITUDE FT.	DISTANCE N. MI.	TIME MIN.	FUEL REM. LB.
122,450	30,000	STD -10	-66.5	74,600	239	14.0	49,130
			-56.5	73,200	223	13.4	49,500
			-46.5	72,920	219	13.3	49,575
		STD	-66.5	75,050	296	16.4	46,565
			-56.5	73,700	281	15.9	46,900
			-46.5	72,920	272	15.6	47,105
		STD +10	-66.5	75,850	396	20.7	42,395
			-56.5	74,450	380	20.1	42,770
			-46.5	73,400	368	19.7	43,050
119,150	S.L.	STD -10	-66.5	75,800	251	16.4	42,840
			-56.5	74,400	235	15.8	43,210
			-46.5	73,300	222	15.4	43,505
		STD	-66.5	76,200	303	18.7	40,505
			-56.5	74,800	287	18.2	40,880
			-46.5	73,750	275	17.8	41,160
		STD +10	-66.5	76,850	319	22.4	37,160
			-56.5	75,450	303	21.9	37,530
			-46.5	74,350	291	21.4	37,825
105,150	S.L.	STD -10	-66.5	78,050	239	14.8	31,470
			-56.5	76,600	223	14.2	31,860
			-46.5	75,450	210	13.8	32,165
		STD	-66.5	78,450	281	16.7	29,610
			-56.5	77,000	266	16.1	29,990
			-46.5	75,850	253	15.7	30,300
		STD +10	-66.5	79,050	347	19.7	26,990
			-56.5	77,600	332	19.1	27,375
			-46.5	76,400	318	18.6	27,695

Figure A5-16
(Sheet 2 of 3)

LONG RANGE CRUISE PERFORMANCE

MACH 3.10
1956 ARDC ATMOSPHERE



1.) Normal Performance Climb Schedule to Mach 3.10
2.) Cruise Performance computed from Flight Test and Operational results.
3.) 300 KEAS Descent
Inlet Configuration per Flight Manual.
4.) Cruise Speed (3.10 MN - Zero Wind)
29.0 NMI/MIN @ -66.5°C
29.6 NMI/MIN @ -56.5°C
30.3 NMI/MIN @ -46.5°C
5.) No turns or service allowances included.
6.) Configuration:
ZFW = 55.150 Lb.
C.G. = 25%
Aft Bypass closed during Cruise.
YJ-1 Engines.

Figure A5-16
(Sheet 3 of 3)

HIGH ALTITUDE CRUISE PROFILE

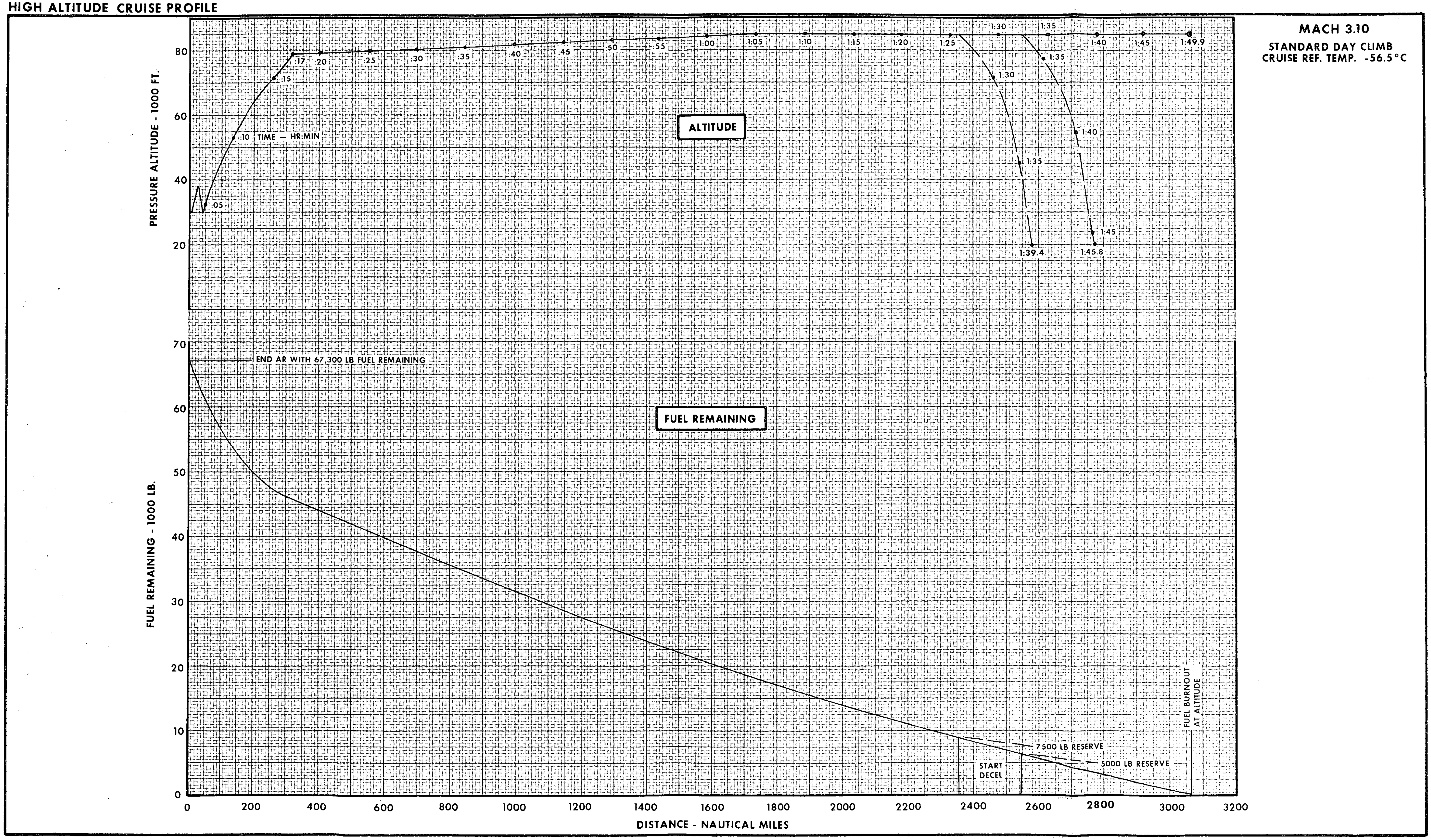


Figure A5-17

(Sheet 1 of 3)

PROFILE CHART: CLIMB - CRUISE INTERCEPT POINTS

1956 ARDC ATMOSPHERE

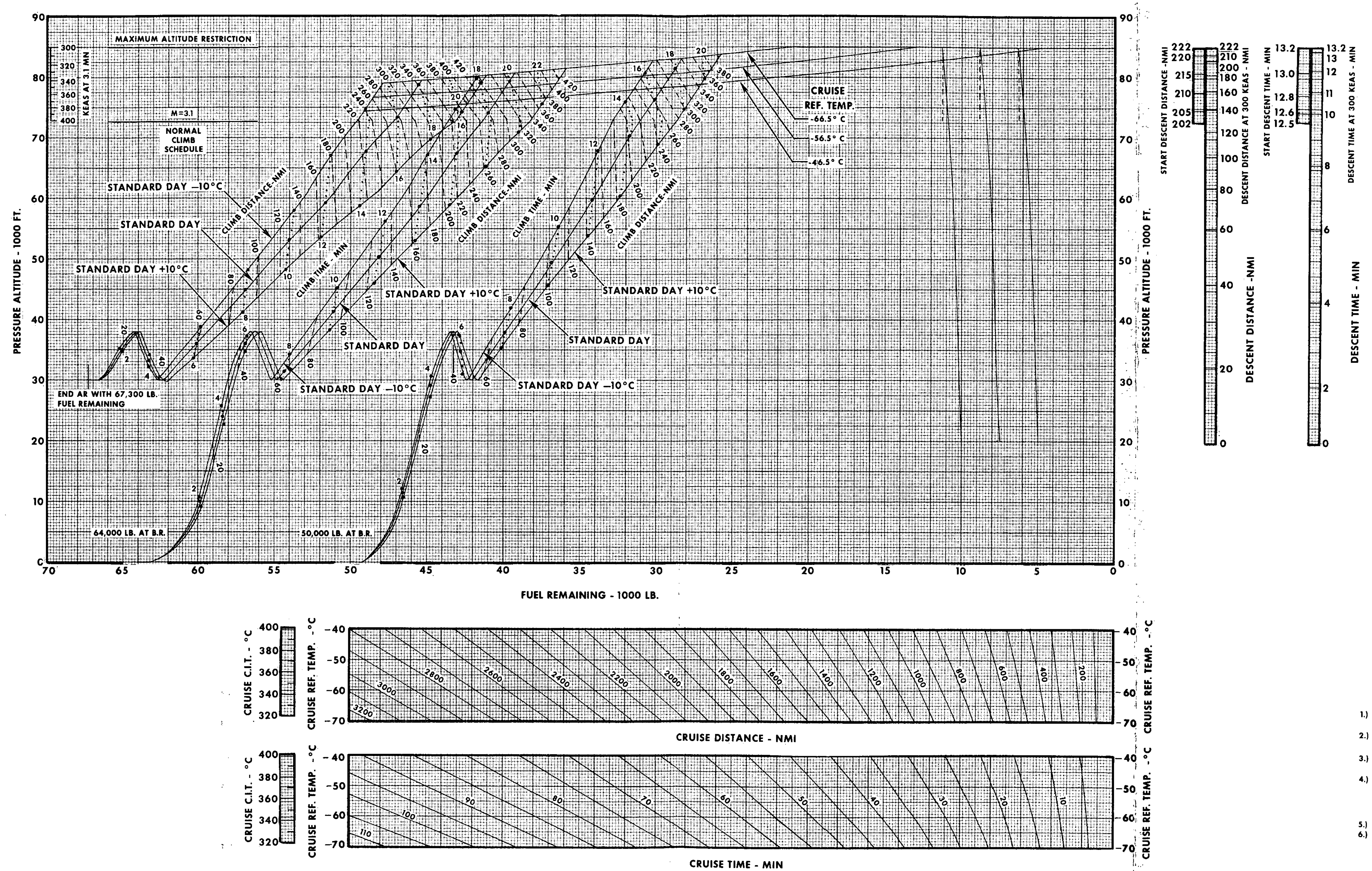
HIGH ALTITUDE CRUISE - MACH 3.10

INITIAL GR. WT. LB.	INITIAL ALTITUDE FT.	CLIMB TEMP. °C	CRUISE TEMP. °C	CLIMB - CRUISE INTERCEPT ALTITUDE FT.	DISTANCE N. MI.	TIME MIN.	FUEL REM LB.
122,450	30,000	STD -10	-66.5	79,000	290	15.7	47,955
			-56.5	76,750	265	14.8	48,555
			-46.5	74,400	237	13.9	49,180
		STD	-66.5	79,550	349	18.3	45,335
			-56.5	77,200	323	17.3	45,965
			-46.5	74,800	295	16.4	46,605
		STD +10	-66.5	80,400	449	22.5	41,185
			-56.5	77,950	422	21.5	41,835
			-46.5	75,600	395	20.6	42,360
119,150	S.L.	STD -10	-66.5	80,250	303	18.2	41,655
			-56.5	77,800	276	17.2	42,305
			-46.5	75,250	246	16.2	42,985
		STD	-66.5	80,750	355	20.6	39,300
			-56.5	78,250	328	19.6	39,960
			-46.5	76,000	302	18.7	40,560
		STD +10	-66.5	81,400	371	24.2	35,945
			-56.5	78,900	344	23.1	36,615
			-46.5	76,600	318	22.3	37,225
105,150	S.L.	STD -10	-66.5	82,650	292	16.7	30,245
			-56.5	80,050	264	15.6	30,940
			-46.5	77,800	238	14.7	31,540
		STD	-66.5	83,100	335	18.6	28,370
			-56.5	80,500	307	17.5	29,060
			-46.5	78,200	281	16.6	29,670
		STD +10	-66.5	83,750	402	21.5	25,735
			-56.5	81,150	374	20.5	26,425
			-46.5	78,800	348	19.6	27,050

Figure A5-17
(Sheet 2 of 3)

HIGH ALTITUDE CRUISE PERFORMANCE

MACH 3.10
1956 ARDC ATMOSPHERE



1.) Normal Performance Climb Schedule to Mach 3.10
2.) Cruise Performance computed from Flight Test and Operational results.
3.) 300 KEAS Descent Inlet Configuration per Flight Manual.
4.) Cruise Speed (3.10 MN - Zero Wind)
29.0 NMI/MIN @ -66.5°C
29.6 NMI/MIN @ -56.5°C
30.3 NMI/MIN @ -46.5°C
5.) No turns or service allowances included.
6.) Configuration:
ZFW = 55.150 Lb.
C.G. = 25%
Aft Bypass closed during Cruise.
YJ-1 Engines.

Figure A5-17
(Sheet 3 of 3)

Approved for Release: 2017/07/25 C06535944

MAXIMUM A/B CEILING CRUISE PROFILE

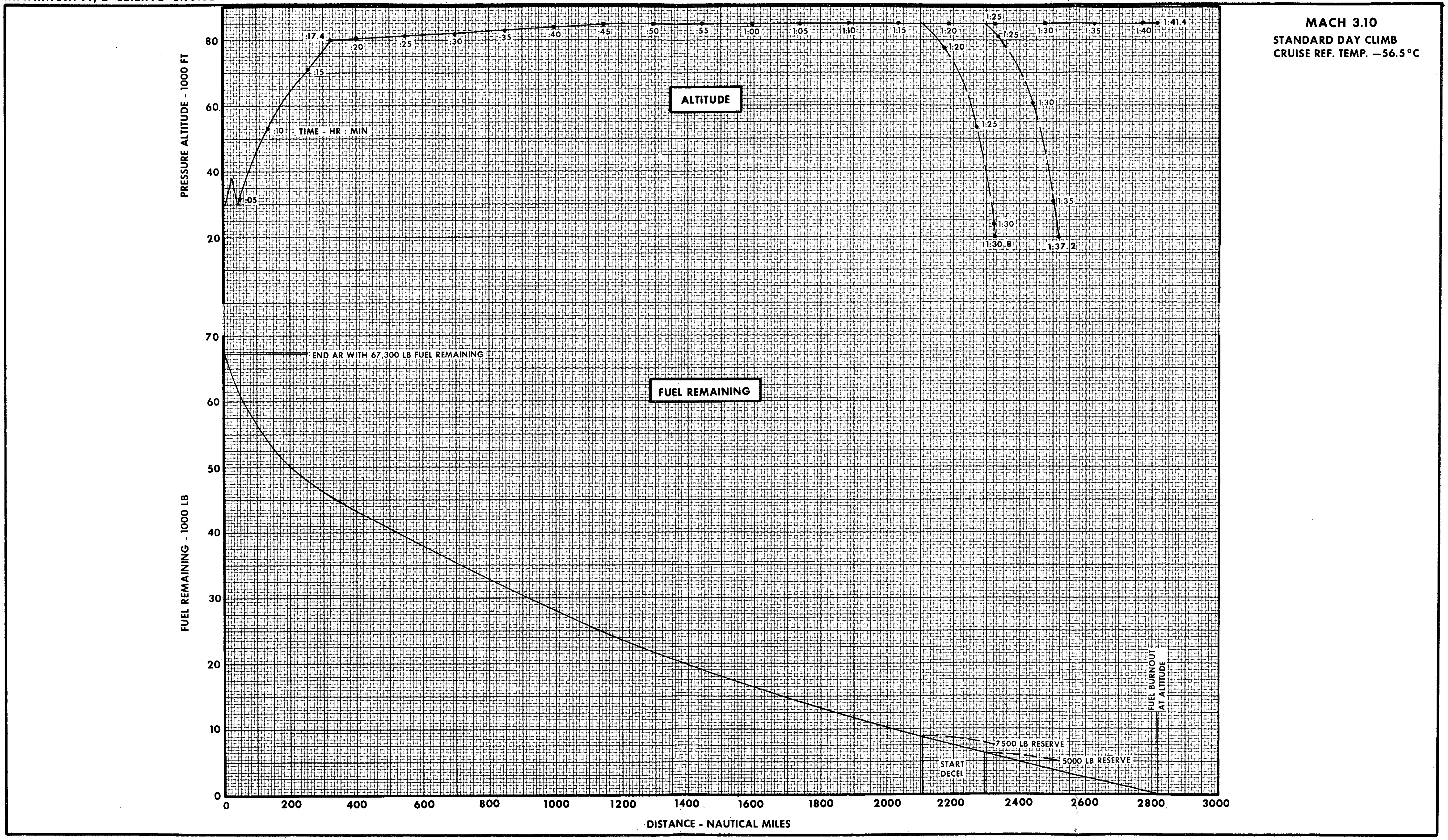


Figure A5-18

(Sheet 1 of 2)

MAXIMUM A/B CEILING CRUISE PROFILE

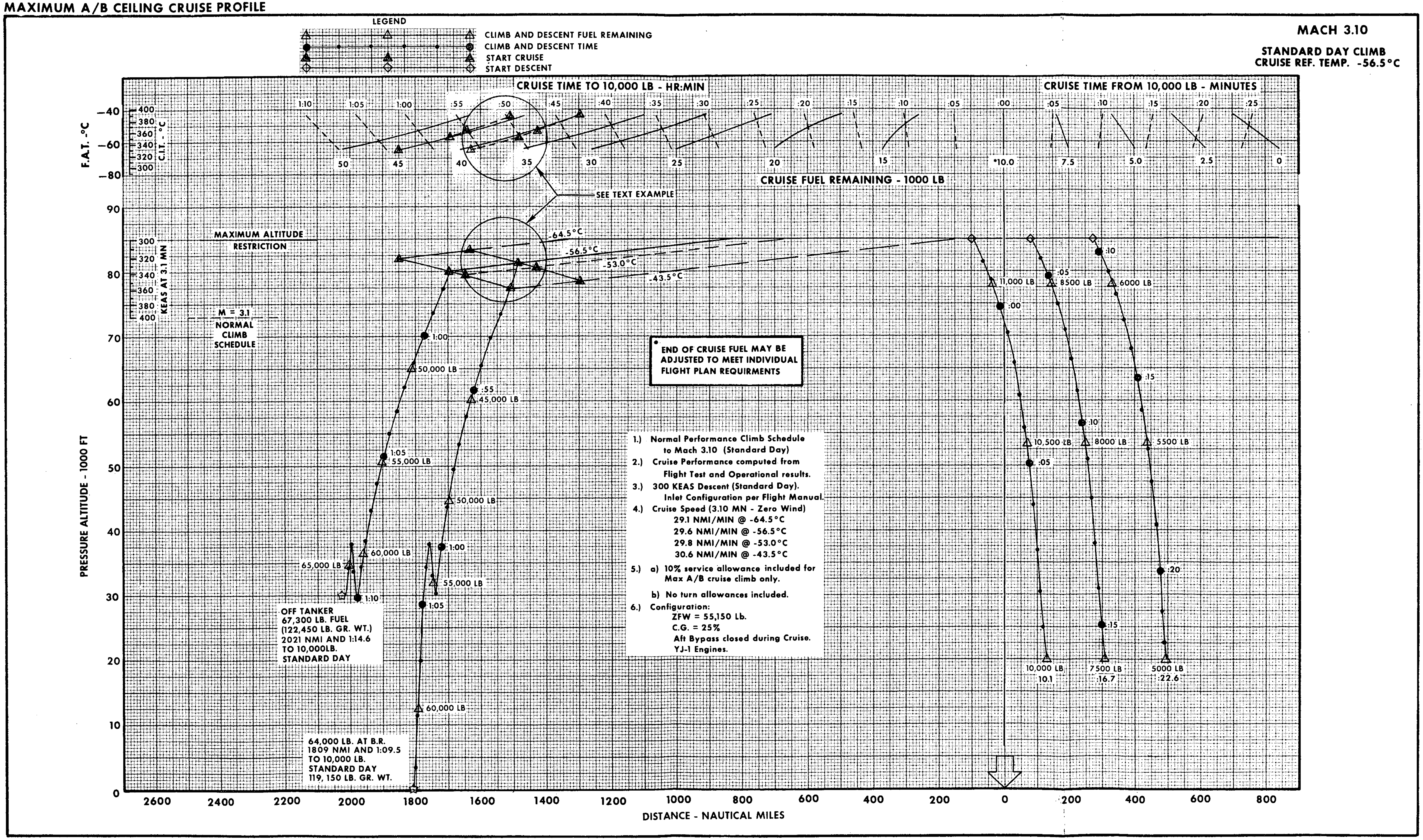


Figure A5-18

(Sheet 2 of 2)

LONG RANGE CRUISE PROFILE

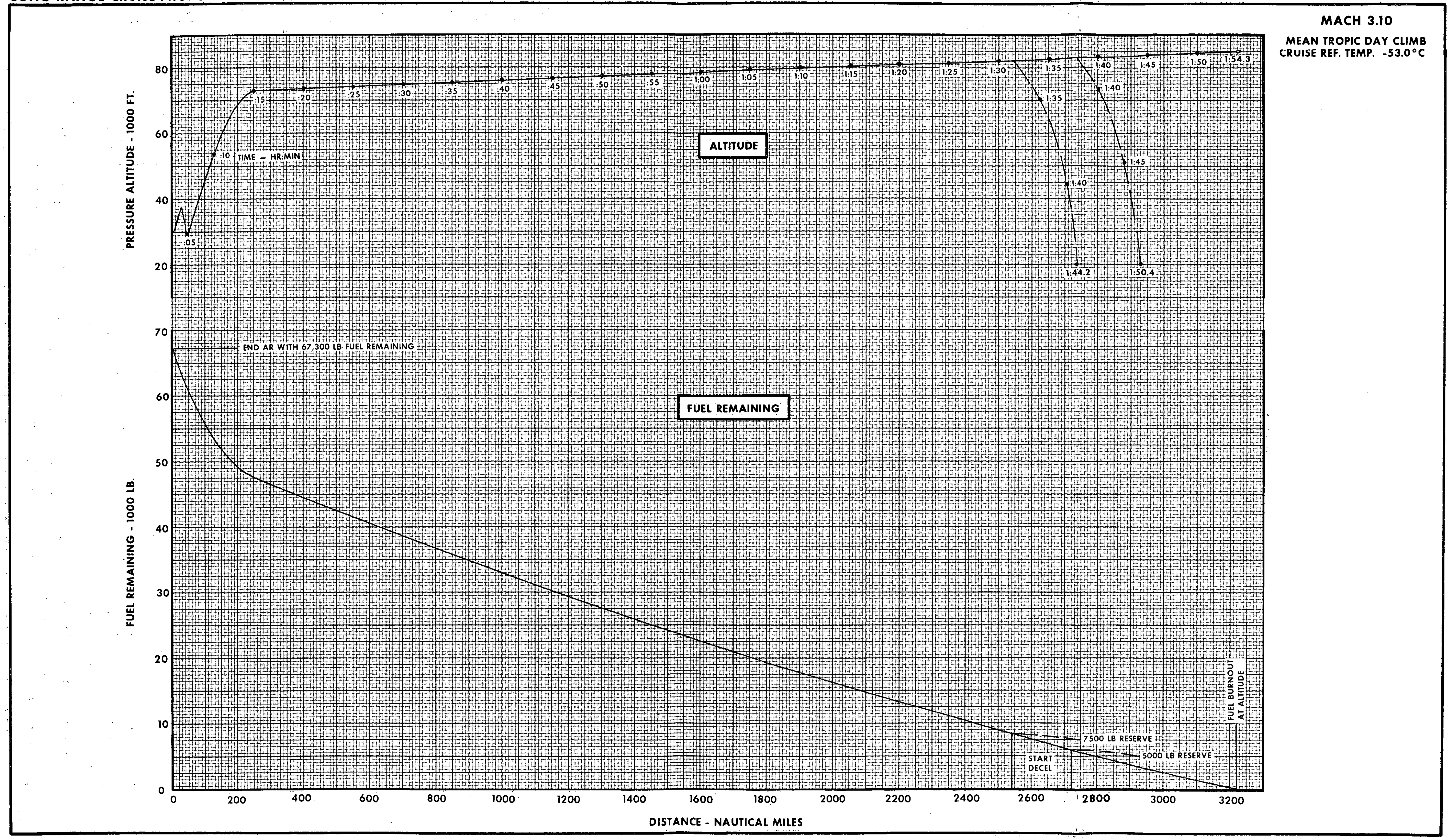


Figure A5-19

(Sheet 1 of 3)

Approved for Release: 2017/07/25 C06535944

PROFILE CHART: CLIMB - CRUISE INTERCEPT POINTS

MEAN TROPIC ATMOSPHERE

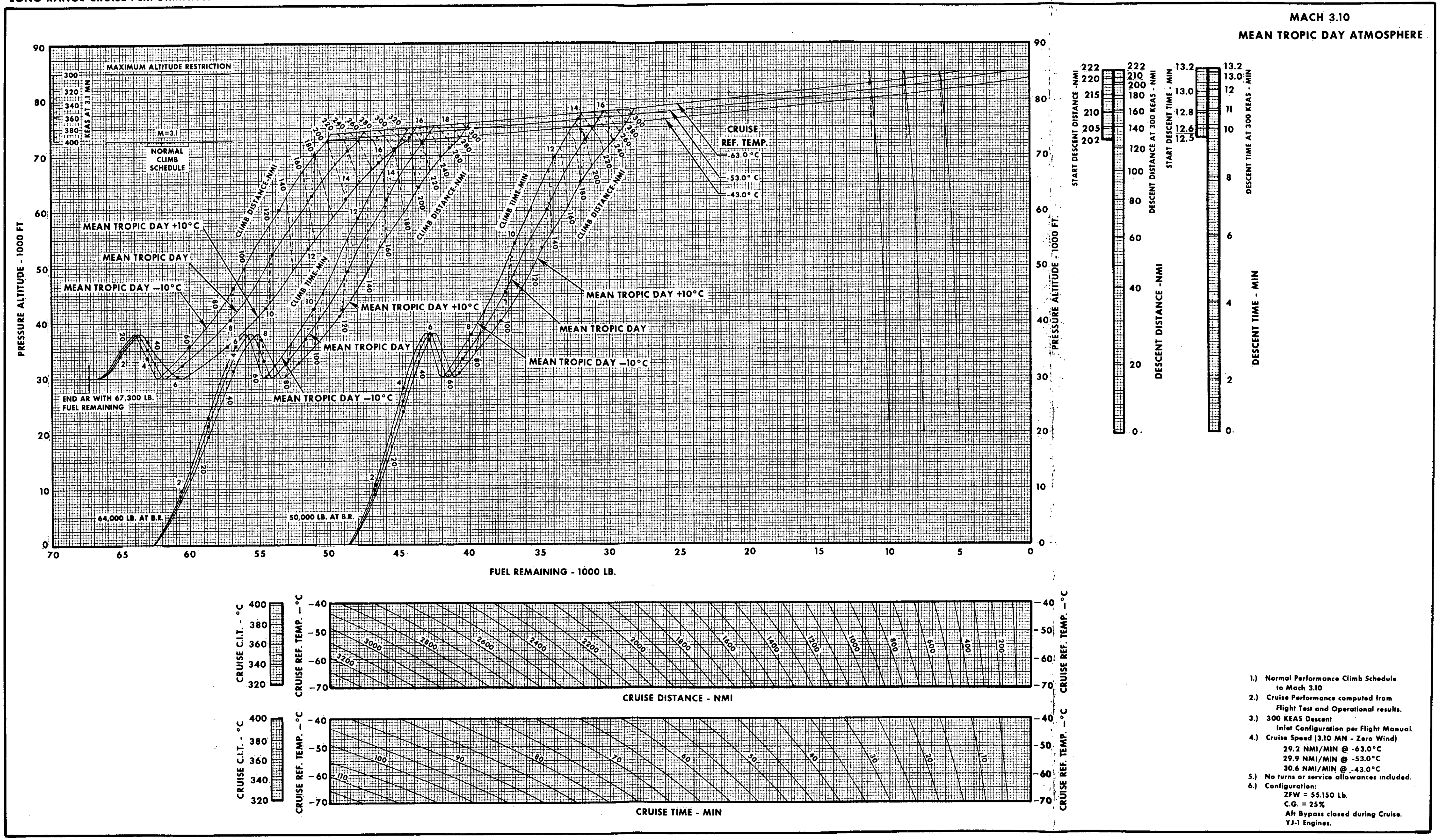
LONG RANGE CRUISE - MACH 3.10

INITIAL GR. WT. LB.	INITIAL ALTITUDE FT.	CLIMB TEMP. °C	CRUISE TEMP. °C	CLIMB - CRUISE INTERCEPT			
				ALTITUDE FT.	DISTANCE N. MI.	TIME MIN.	FUEL REM. LB.
122,450	30,000	M.T. -10	-63.0	73,950	211	13.1	49,845
			-53.0	72,920	199	12.7	50,125
			-43.0	72,920	199	12.7	50,125
		M.T.	-63.0	74,400	261	15.3	47,440
			-53.0	73,300	248	14.9	47,735
			-43.0	72,920	243	14.7	47,840
		M.T. +10	-63.0	75,150	335	18.8	43,750
			-53.0	74,000	322	18.3	44,055
			-43.0	72,920	309	17.9	44,350
119,150	S.L.	M.T. -10	-63.0	75,000	214	15.1	44,270
			-53.0	73,900	202	14.7	44,565
			-43.0	72,920	190	14.3	44,830
		M.T.	-63.0	75,400	253	17.1	42,445
			-53.0	74,250	240	16.6	42,750
			-43.0	72,920	224	16.1	43,110
		M.T. +10	-63.0	75,850	309	19.7	39,935
			-53.0	74,800	298	19.3	40,215
			-43.0	73,400	281	18.7	20,585
105,150	S.L.	M.T. -10	-63.0	77,550	222	14.4	31,880
			-53.0	76,400	210	14.0	32,190
			-43.0	75,000	193	13.4	32,560
		M.T.	-63.0	77,850	256	16.1	30,330
			-53.0	76,750	244	15.6	30,625
			-43.0	75,250	227	15.0	31,025
		M.T. +10	-63.0	78,350	307	18.3	28,100
			-53.0	77,200	294	17.8	28,405
			-43.0	75,800	278	17.3	28,775

Figure A5-19
(Sheet 2 of 3)

Approved for Release: 2017/07/25 C06535944

LONG RANGE CRUISE PERFORMANCE



1.) Normal Performance Climb Schedule to Mach 3.10
2.) Cruise Performance computed from Flight Test and Operational results.
3.) 300 KEAS Descent Inlet Configuration per Flight Manual.
4.) Cruise Speed (3.10 MN - Zero Wind)
29.2 NMI/MIN @ -63.0°C
29.9 NMI/MIN @ -53.0°C
30.6 NMI/MIN @ -43.0°C
5.) No turns or service allowances included.
6.) Configuration:
ZFW = 55,150 Lb.
C.G. = 25%
Aft Bypass closed during Cruise.
YJ-1 Engines.

Figure A5-19
(Sheet 3 of 3)

HIGH ALTITUDE CRUISE PROFILE

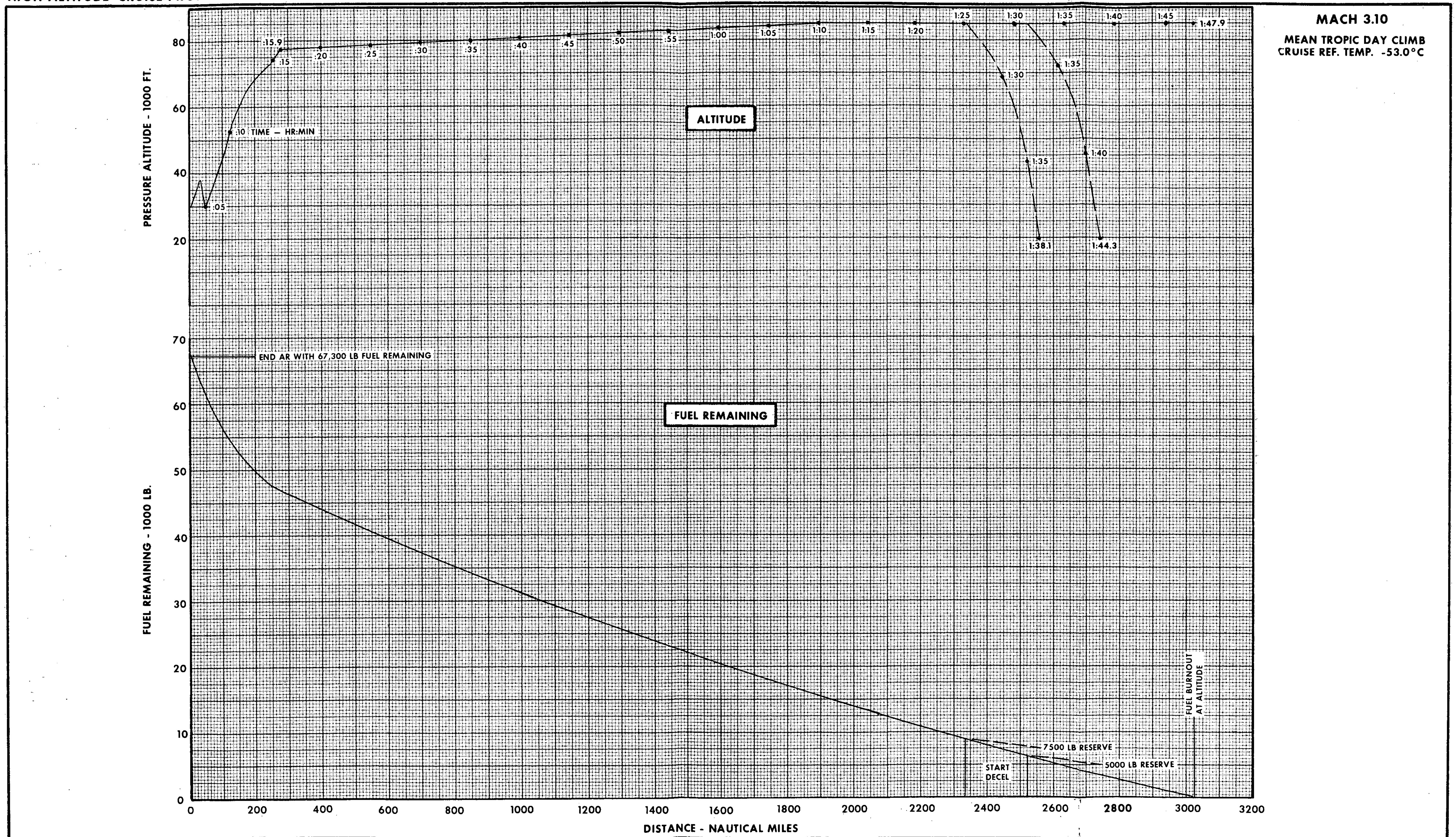


Figure A5-20

(Sheet 1 of 3)

PROFILE CHART: CLIMB - CRUISE INTERCEPT POINTS

MEAN TROPIC ATMOSPHERE

HIGH ALTITUDE CRUISE - MACH 3.10

INITIAL GR. WT. LB.	INITIAL ALTITUDE FT.	CLIMB TEMP. °C	CRUISE TEMP. °C	CLIMB - CRUISE INTERCEPT			
				ALTITUDE FT.	DISTANCE N. MI.	TIME MIN.	FUEL REM. LB.
122,450	30,000	M.T. -10	-63.0	78,000	259	14.7	48,765
			-53.0	75,800	234	13.9	49,350
			-43.0	73,400	205	12.9	49,990
		M.T.	-63.0	78,450	308	16.9	46,360
			-53.0	76,300	266	16.1	46,935
			-43.0	73,850	255	15.1	47,585
		M.T. +10	-63.0	79,200	383	20.4	42,670
			-53.0	77,000	358	19.5	43,260
			-43.0	74,600	330	18.6	43,895
119,150	S.L.	M.T. -10	-63.0	79,100	262	16.8	43,180
			-53.0	76,900	238	15.9	43,750
			-43.0	74,450	209	14.9	44,415
		M.T.	-63.0	79,400	300	18.7	41,380
			-53.0	77,250	276	17.8	41,950
			-43.0	74,800	247	16.9	42,605
		M.T. +10	-63.0	80,000	358	21.3	38,830
			-53.0	77,800	333	20.5	39,415
			-43.0	75,300	304	19.5	40,080
105,150	S.L.	M.T. -10	-63.0	81,700	271	16.1	30,780
			-53.0	79,400	246	15.2	31,390
			-43.0	76,950	217	14.2	32,040
		M.T.	-63.0	82,050	306	17.7	29,210
			-53.0	79,800	281	16.8	29,910
			-43.0	77,200	251	15.8	30,505
		M.T. +10	-63.0	82,600	356	20.0	26,970
			-53.0	80,300	332	19.1	27,580
			-43.0	77,750	302	18.1	28,260

Figure A5-20
(Sheet 2 of 3)

HIGH ALTITUDE CRUISE PERFORMANCE

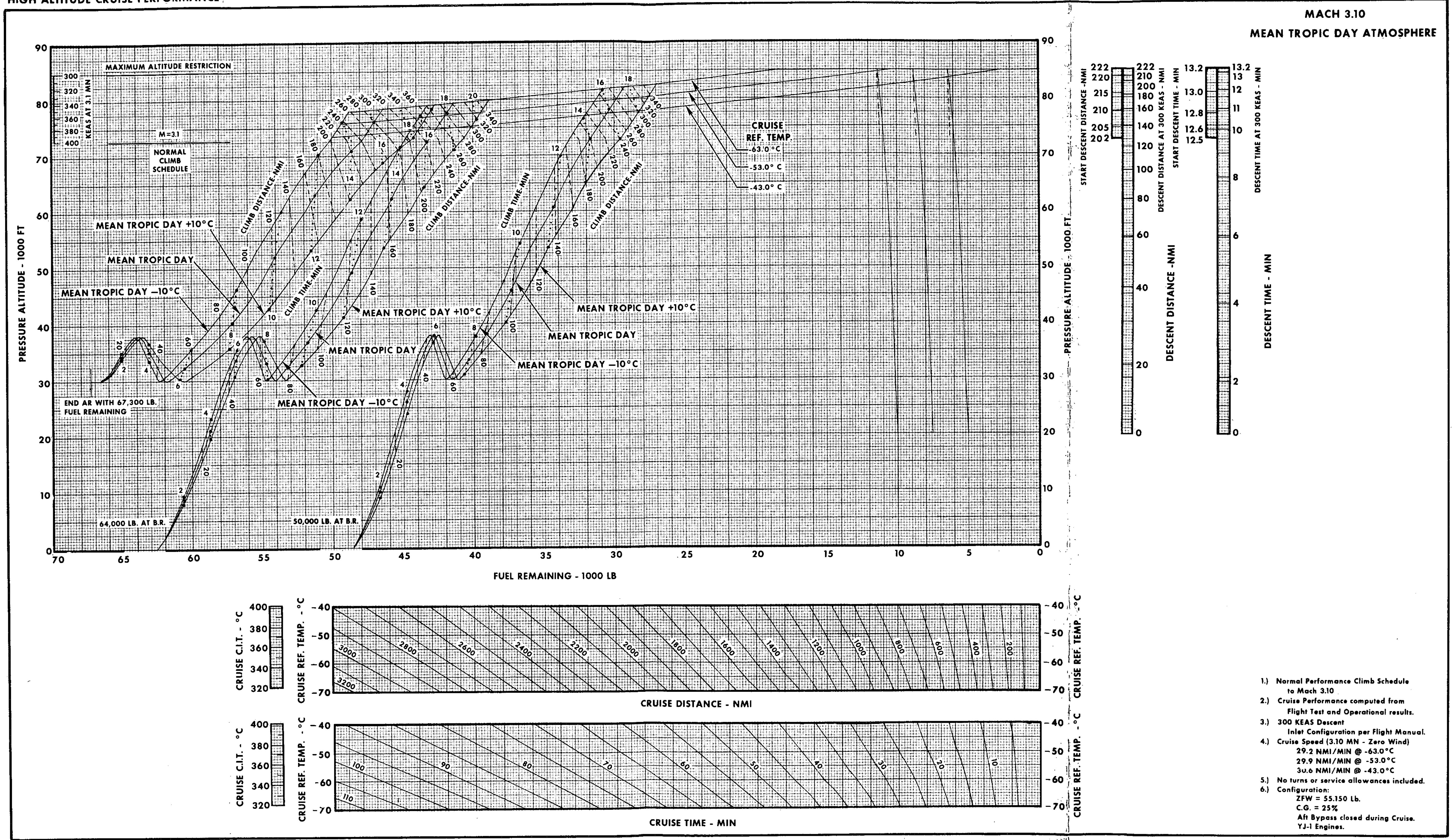


Figure A5-20
(Sheet 3 of 3)

Approved for Release: 2017/07/25 C06535944

MAXIMUM A/B CEILING CRUISE PROFILE

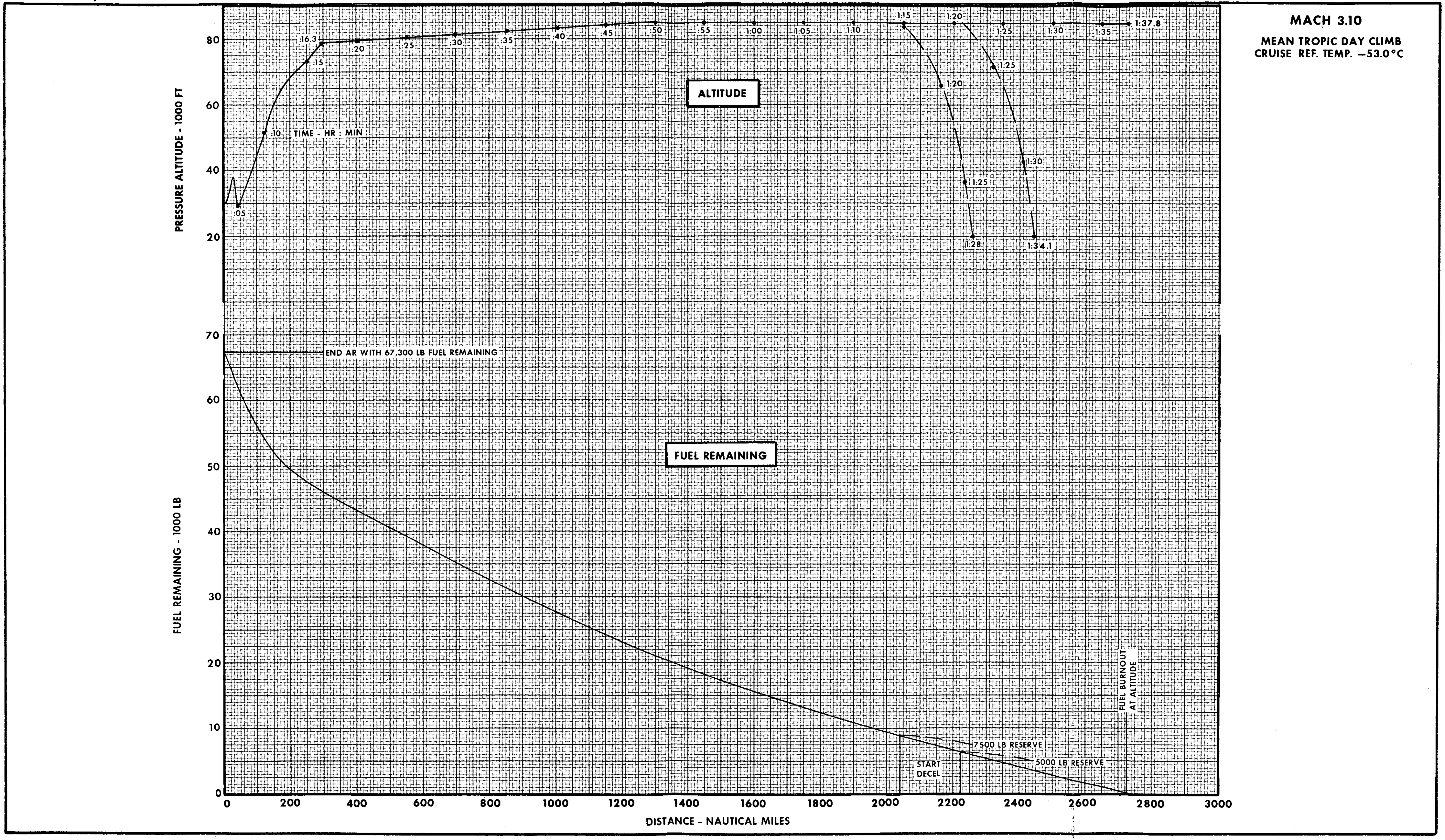


Figure A5-21

(Sheet 1 of 2)

MAXIMUM A/B CEILING CRUISE PROFILE

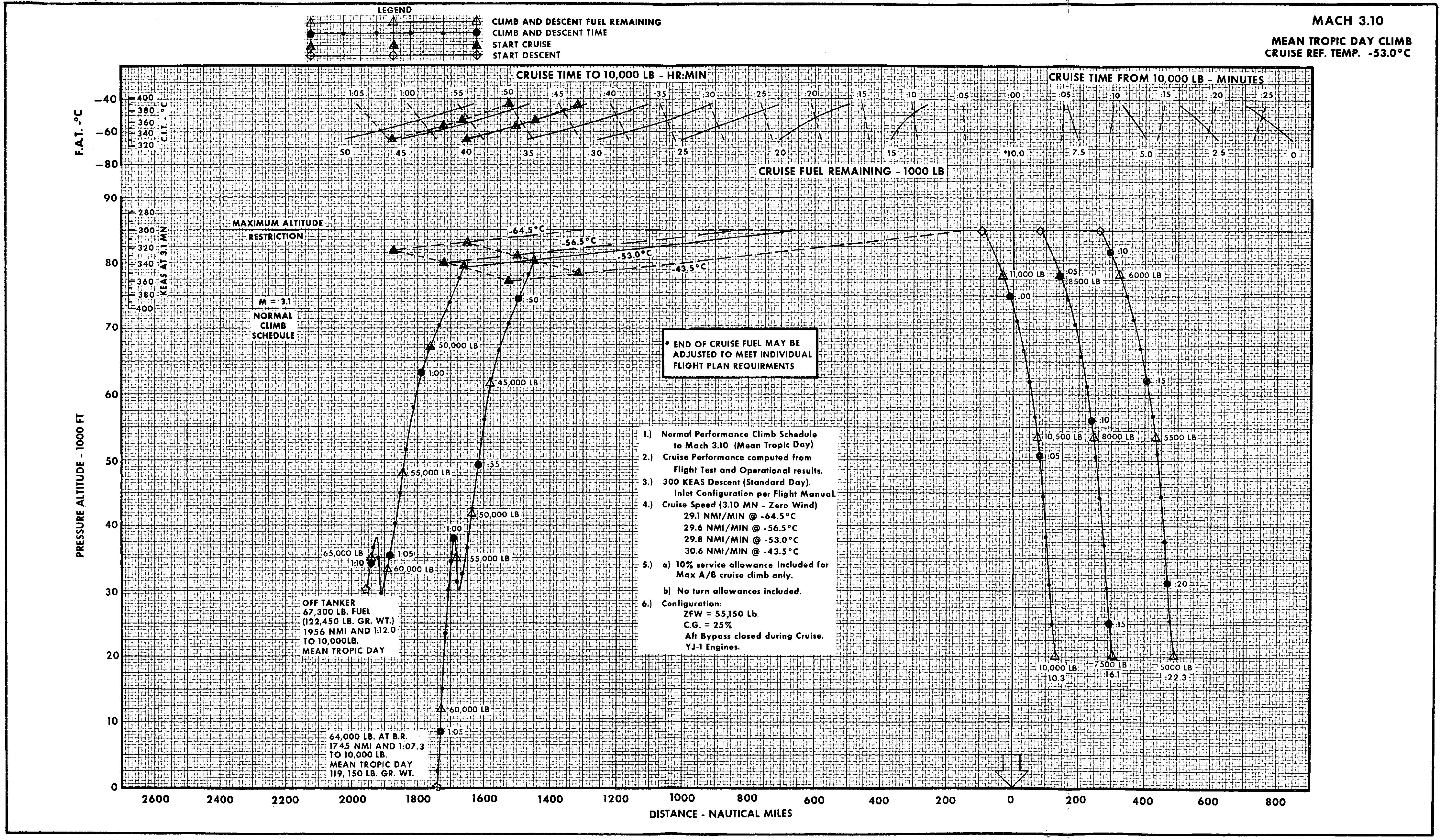


Figure A5-21

(Sheet 2 of 2)

SPECIFIC RANGE AT MACH 2.90

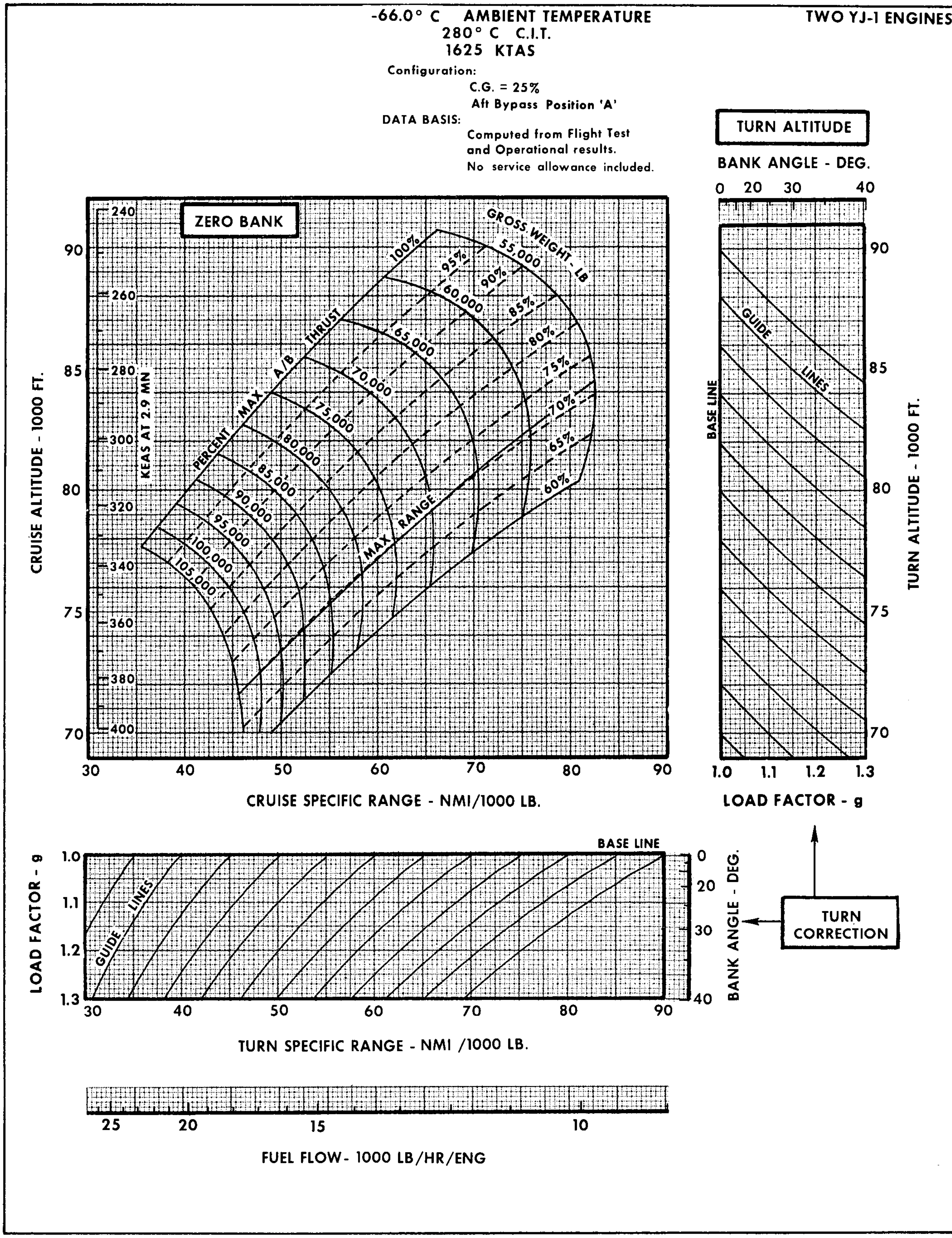


Figure A5-22

SPECIFIC RANGE AT MACH 2.90

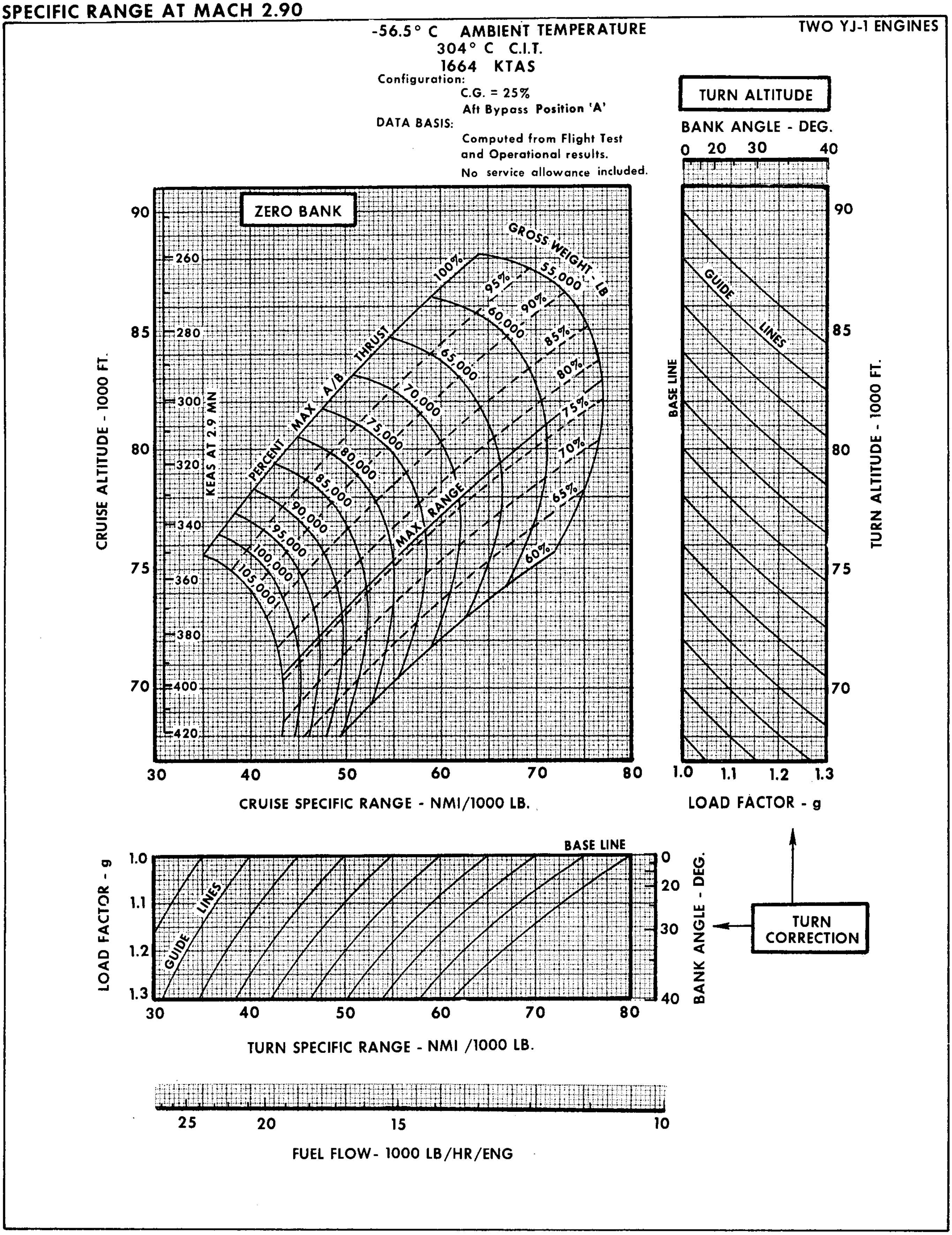


Figure A5-23

SPECIFIC RANGE AT MACH 2.90

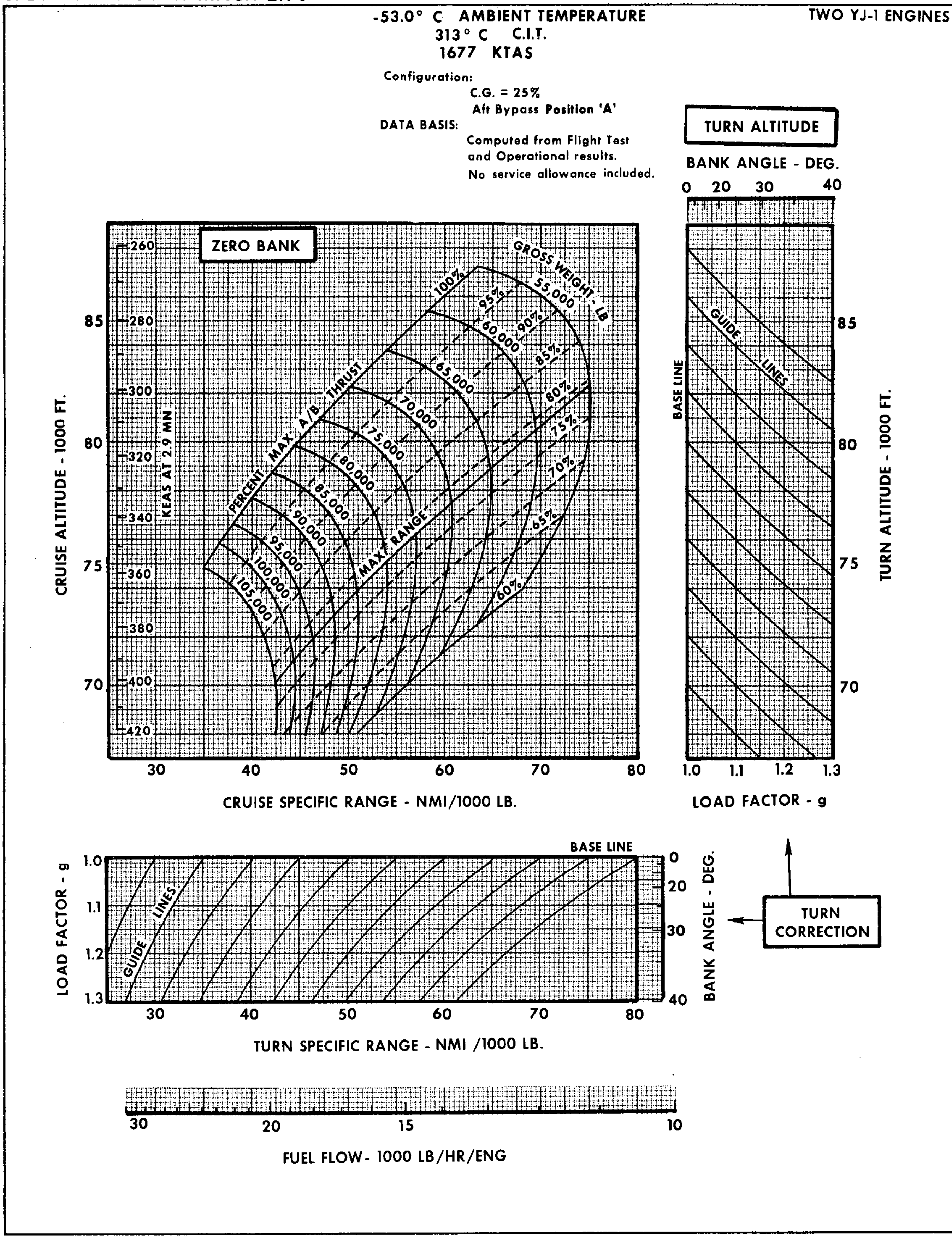


Figure A5-24

SPECIFIC RANGE AT MACH 2.90

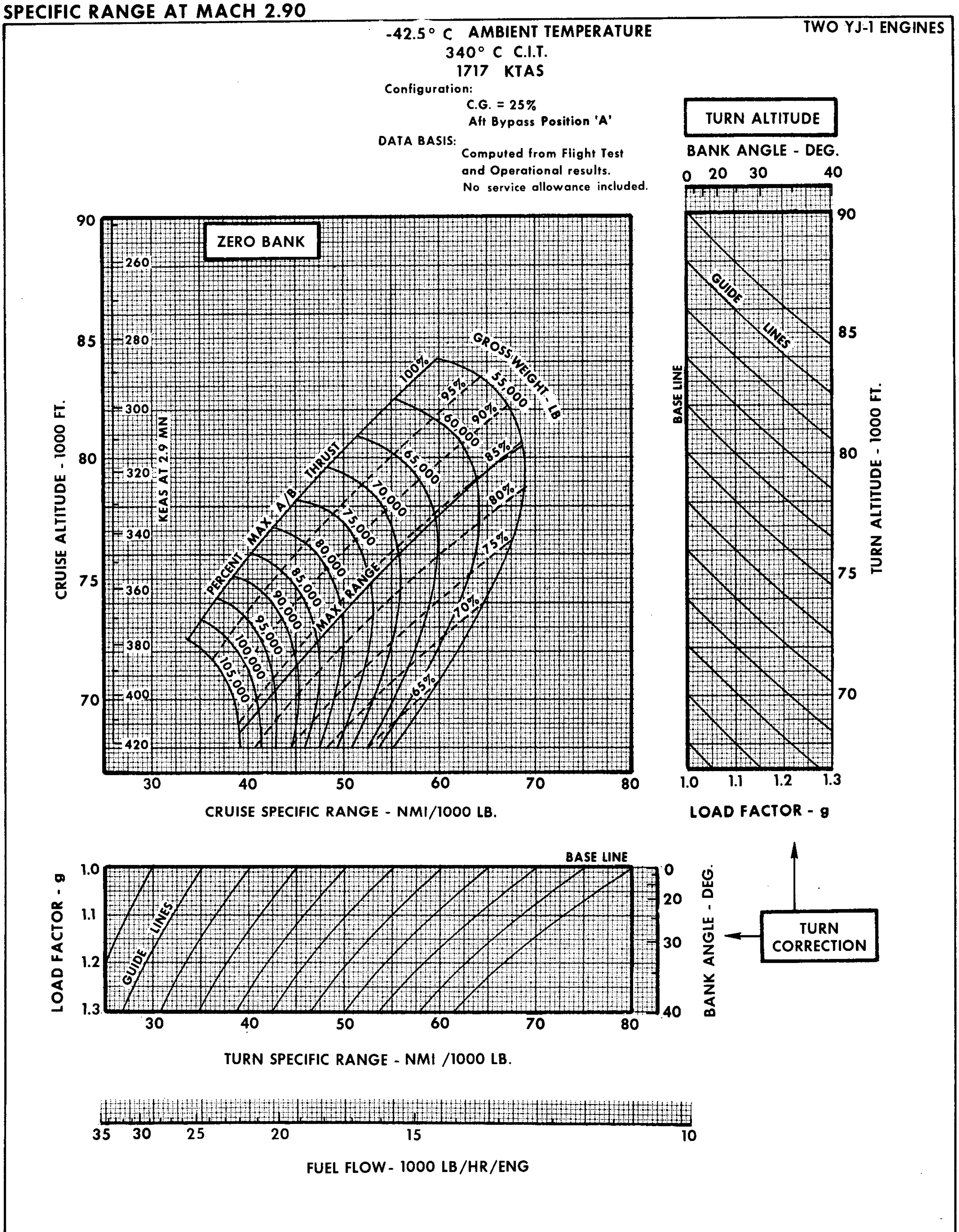


Figure A5-25

LONG RANGE CRUISE PROFILE

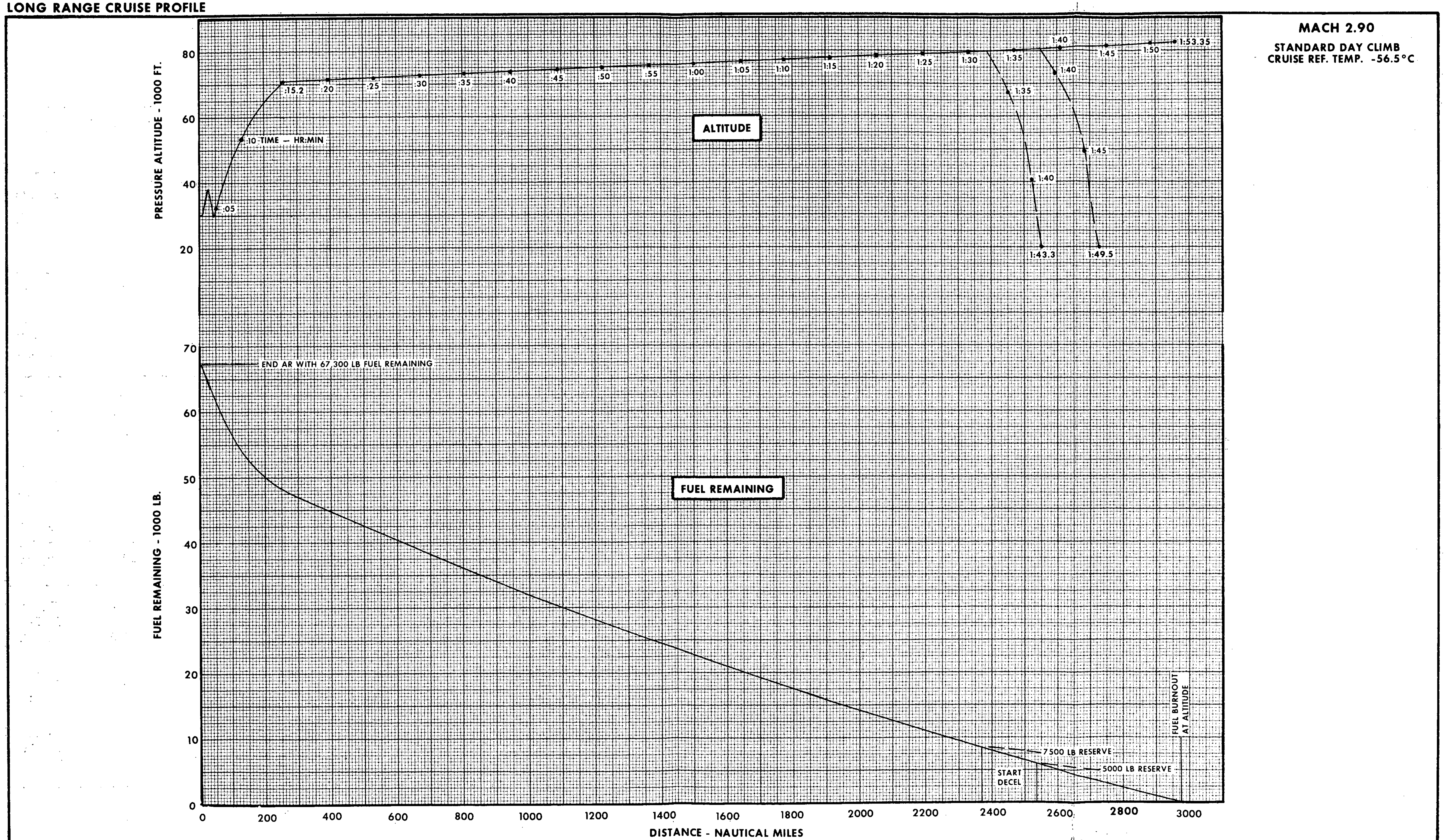


Figure A5-26

(Sheet 1 of 3)

PROFILE CHART: CLIMB - CRUISE INTERCEPT POINTS

1956 ARDC ATMOSPHERE

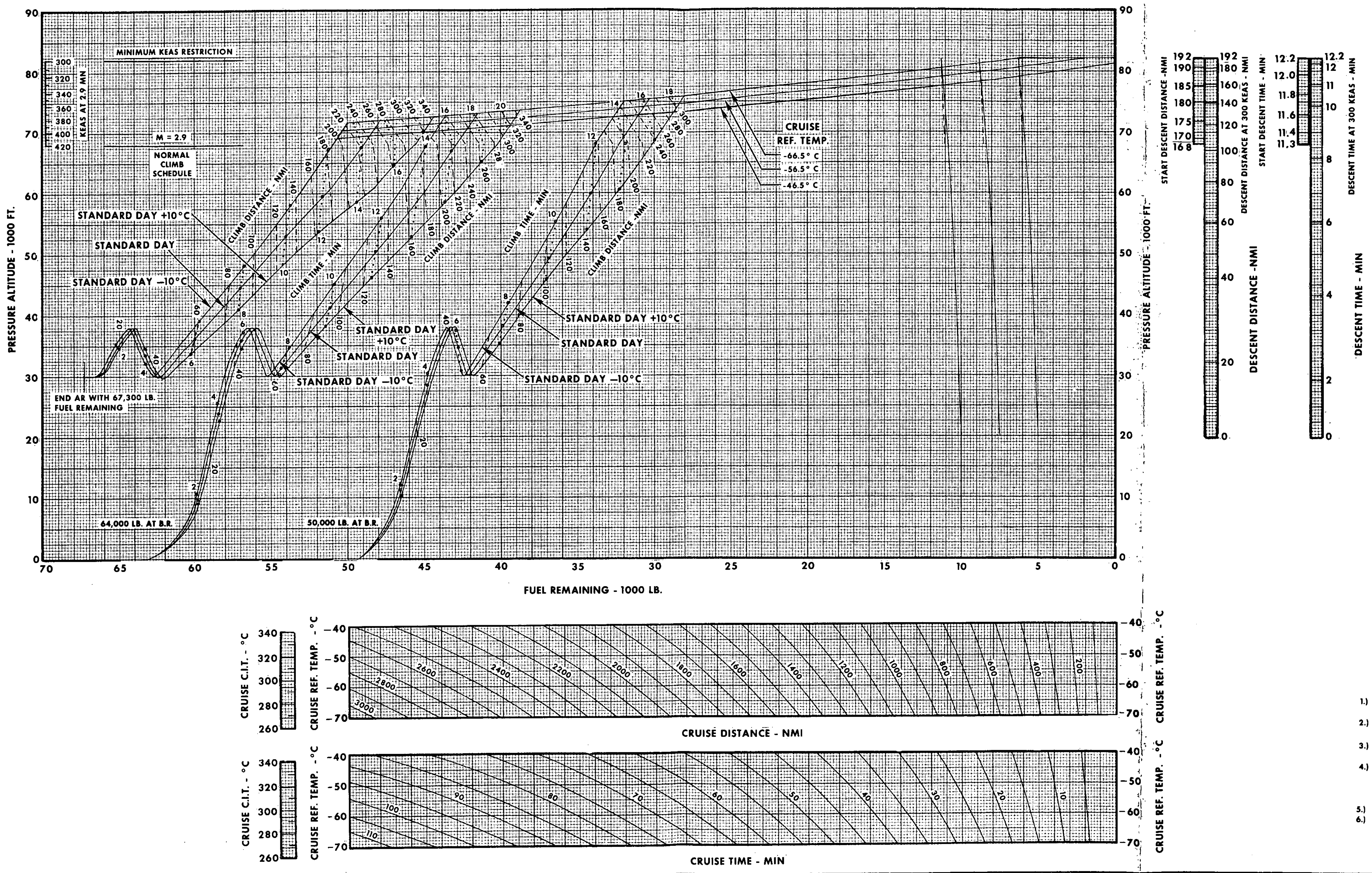
LONG RANGE CRUISE - MACH 2.90

INITIAL GR. WT. LB.	INITIAL ALTITUDE FT.	CLIMB TEMP. °C	CRUISE TEMP. °C	CLIMB - CRUISE INTERCEPT ALTITUDE FT.	DISTANCE N. MI.	TIME MIN.	FUEL REM LB.
122,450	30,000	STD -10	-66.5	71,700	224	13.6	50,020
			-56.5	70,450	211	13.1	50,355
			-46.5	69,150	197	12.6	50,700
		STD	-66.5	72,050	272	15.7	47,855
			-56.5	70,800	259	15.2	48,190
			-46.5	69,500	245	14.7	48,540
		STD +10	-66.5	72,600	344	19.0	44,385
			-56.5	71,400	332	18.5	44,700
			-46.5	70,050	317	18.0	45,060
119,150	S.L.	STD -10	-66.5	72,800	238	16.1	43,560
			-56.5	71,550	226	15.6	43,890
			-46.5	70,250	212	15.1	44,240
		STD	-66.5	73,150	281	18.2	41,470
			-56.5	71,950	269	17.7	41,860
			-46.5	70,600	255	17.2	42,220
		STD +10	-66.5	73,650	344	21.1	38,735
			-56.5	72,400	332	20.6	39,065
			-46.5	71,200	320	20.1	39,385
105,150	S.L.	STD -10	-66.5	75,050	231	14.8	31,945
			-56.5	73,800	219	14.3	32,280
			-46.5	72,550	207	13.8	32,610
		STD	-66.5	75,400	266	16.4	30,340
			-56.5	74,200	255	15.9	30,660
			-46.5	72,850	241	15.4	31,020
		STD +10	-66.5	75,950	318	18.9	28,040
			-56.5	74,650	306	18.4	28,380
			-46.5	73,350	293	17.8	28,730

Figure A5-26
(Sheet 2 of 3)

LONG RANGE CRUISE PERFORMANCE

MACH 2.90
1956 ARDC ATMOSPHERE



1.) Normal Performance Climb Schedule to Mach 2.90
2.) Cruise Performance computed from Flight Test and Operational results.
3.) 300 KEAS Descent Inlet Configuration per Flight Manual.
4.) Cruise Speed (2.90 MN - Zero Wind)
   27.1 NMI/MIN @ -66.5°C
   27.7 NMI/MIN @ -56.5°C
   28.4 NMI/MIN @ -46.5°C
5.) No turns or service allowances included.
6.) Configuration:
   ZFW = 55.150 Lb.
   C.G. = 25%
   Aft Bypass Position 'A' during Cruise.
   YJ-1 Engines.

Figure A5-26
(Sheet 3 of 3)

LONG RANGE CRUISE PROFILE

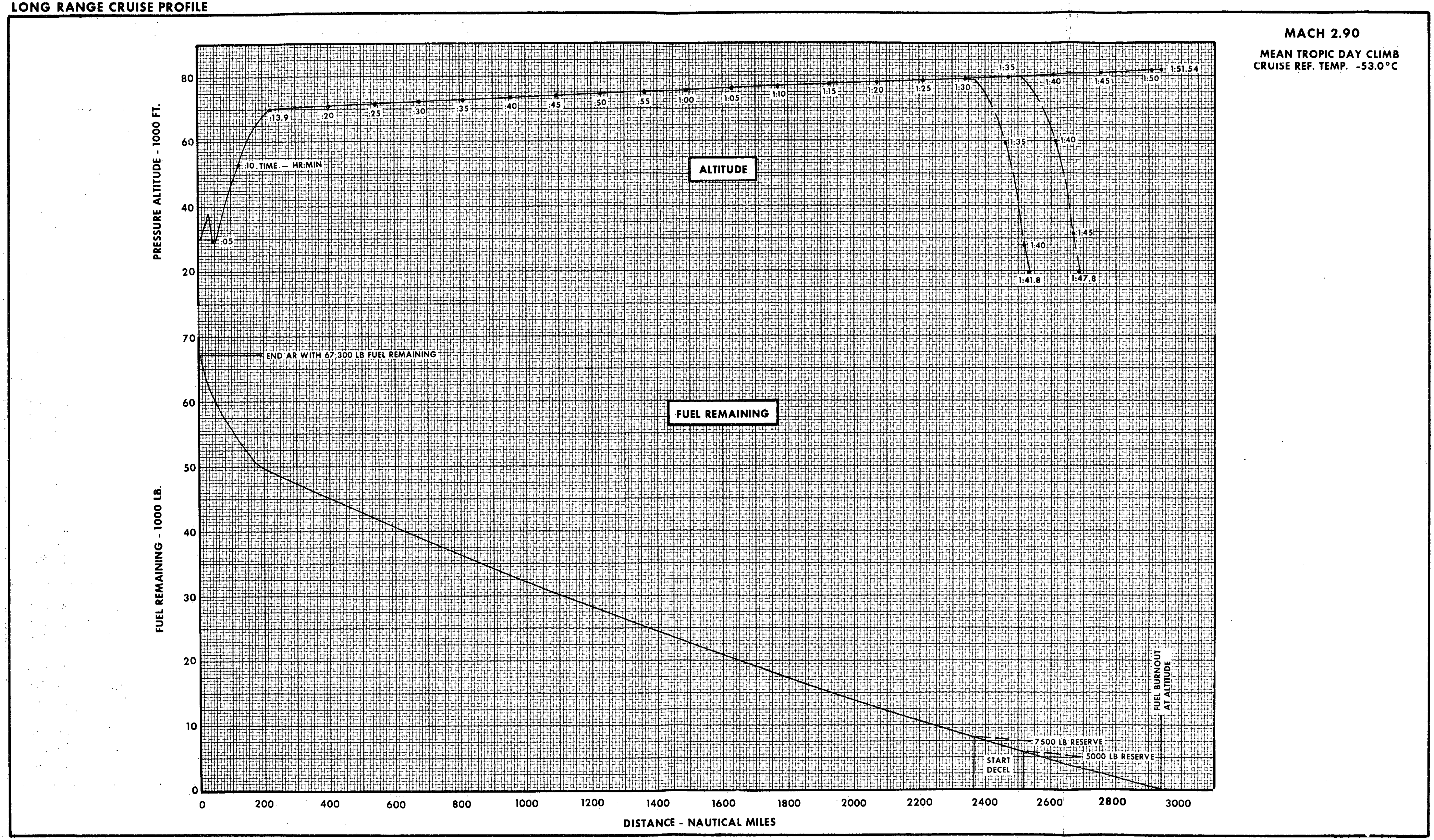


Figure A5-27

(Sheet 1 of 3)

PROFILE CHART: CLIMB - CRUISE INTERCEPT POINTS

MEAN TROPIC ATMOSPHERE

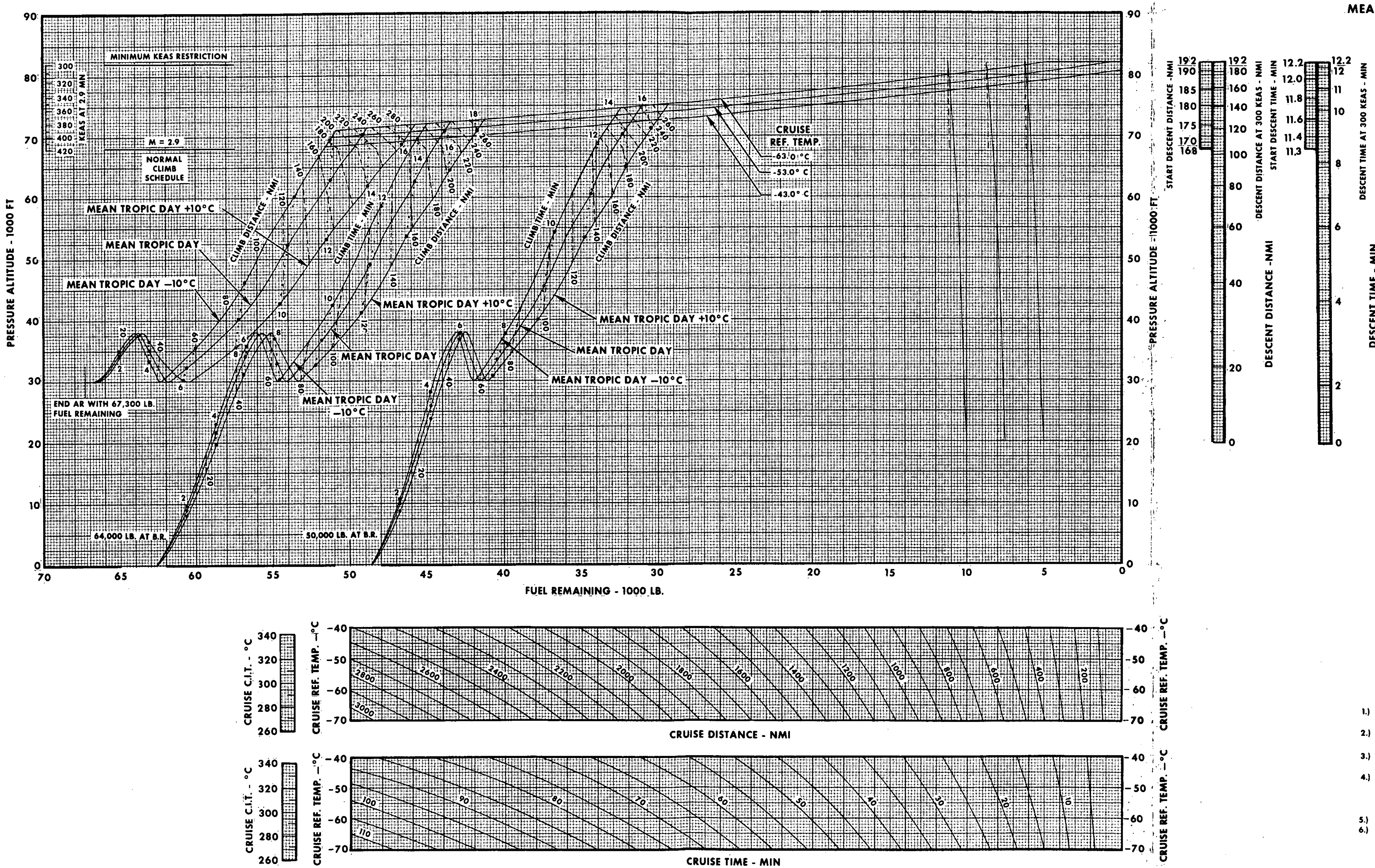
LONG RANGE CRUISE - MACH 2.90

INITIAL GR. WT. LB.	INITIAL ALTITUDE FT.	CLIMB TEMP. °C	CRUISE TEMP. °C	CLIMB - CRUISE INTERCEPT			
				ALTITUDE FT.	DISTANCE N. MI.	TIME MIN	FUEL REM. LB.
122,450	30,000	M.T. -10	-63.0	71,150	199	12.6	50,810
			-53.0	69,900	185	12.1	51,145
			-43.0	68,350	168	11.5	51,560
		M.T.	-63.0	71,450	234	14.4	48,800
			-53.0	70,200	220	13.9	49,130
			-43.0	68,750	204	13.4	49,415
		M.T. +10	-63.0	72,000	288	17.3	45,710
			-53.0	70,800	275	16.8	46,030
			-43.0	69,350	259	16.2	46,415
119,150	S.L.	M.T. -10	-63.0	72,150	207	15.0	44,920
			-53.0	70,950	195	14.5	45,240
			-43.0	69,500	179	13.9	45,620
		M.T.	-63.0	72,400	256	16.6	43,415
			-53.0	71,200	224	16.1	43,735
			-43.0	69,750	208	15.5	44,120
		M.T. +10	-63.0	72,800	277	18.7	41,220
			-53.0	71,600	265	18.2	41,535
			-43.0	70,200	250	17.6	41,910
105,150	S.L.	M.T. -10	-63.0	74,500	214	14.3	32,415
			-53.0	73,300	202	13.8	32,735
			-43.0	71,900	187	13.2	33,110
		M.T.	-63.0	74,800	239	15.7	31,065
			-53.0	73,600	228	15.2	31,395
			-43.0	72,200	213	14.6	31,760
		M.T. +10	-63.0	75,150	276	17.5	29,370
			-53.0	73,950	264	17.0	29,690
			-43.0	72,550	250	16.4	30,065

Figure A5-27
(Sheet 2 of 3)

LONG RANGE CRUISE PERFORMANCE

MACH 2.90
MEAN TROPIC DAY ATMOSPHERE



1.) Normal Performance Climb Schedule to Mach 2.90
2.) Cruise Performance computed from Flight Test and Operational results.
3.) 300 KEAS Descent Inlet Configuration per Flight Manual.
4.) Cruise Speed (2.90 MN - Zero Wind)
27.3 NMI/MIN @ -63.0°C
28.0 NMI/MIN @ -53.0°C
28.6 NMI/MIN @ -43.0°C
5.) No turns or service allowances included.
6.) Configuration:
ZFW = 55.150 Lb.
C.G. = 25%
Aft Bypass Position 'A' during Cruise.
YJ-1 Engines.

Figure A5-27
(Sheet 3 of 3)

Approved for Release: 2017/07/25 C06535944

PERFORMANCE MISSION PLANNING FACTORS FOR SUPERSONIC CRUISE

T.O. FUEL WT. (MAX. G.W.) = 64,000 LB
T.O. FUEL WT. (LIGHT G.W.) = 50,000 LB
END A/R FUEL WT. = 67,300 LB

DATA BASIS:
1.) COMPUTED FROM FLT TEST AND OPERATIONAL RESULTS.
2.) CRUISE DISTANCE BASED ON 7500 LB FUEL RESERVE AT 20,000 FT.
3.) ZFW = 55,150 LB.

	MACH 3.2 -56.5°C					
	FUEL USED	TIME	ALT.	DIST.	AVG. MACH	AVG. KTAS
CLIMB FROM:						
S.L. MAX. G.W. T.O. TO LONG RANGE CRUISE	23,750	18.8	76,800	305	1.70	975
S.L. MAX. G.W. T.O. TO HIGH ALTITUDE CRUISE	24,870	19.8	81,600	335	1.77	1017
S.L. LIGHT G.W. T.O. TO LONG RANGE CRUISE	20,650	16.6	79,100	282	1.78	1020
4500 MAX. G.W. T.O. TO LONG RANGE CRUISE	23,450	18.5	76,450	300	1.70	974
4500 MAX. G.W. T.O. TO HIGH ALTITUDE CRUISE	24,450	19.5	81,450	333	1.79	1025
4500 LIGHT G.W. T.O. TO LONG RANGE CRUISE	20,250	16.3	79,000	280	1.80	1032
30,000 1 A/B A/R TO LONG RANGE CRUISE	20,950	16.5	75,550	302	1.91	1098
30,000 1A/B A/R TO HIGH ALTITUDE CRUISE	22,200	17.8	80,400	338	1.99	1140
CRUISE AT:						
LONG RANGE (S.L. - MAX. G.W. T.O.)	31,350	66.7	85,000	2040	3.2	1836
HIGH ALTITUDE (S.L. - MAX. G.W. T.O.)	30,230	60.7	85,000	1858	3.2	1836
LONG RANGE (S.L. - LIGHT G.W. T.O.)	20,450	46.0	85,000	1404	3.2	1836
LONG RANGE (4500 FT - MAX. G.W. T.O.)	31,650	67.3	85,000	2056	3.2	1836
HIGH ALTITUDE (4500 FT - MAX. G.W. T.O.)	30,650	61.2	85,000	1870	3.2	1836
LONG RANGE (4500 FT - LIGHT G.W. T.O.)	20,850	47.0	85,000	1435	3.2	1836
LONG RANGE (30,000 FT. A/R)	37,450	77.3	85,000	2364	3.2	1836
HIGH ALTITUDE (30,000 FT. A/R)	36,200	69.5	85,000	2124	3.2	1836
DESCENT FROM:						
LONG RANGE CRUISE TO 29,000 FT.	1240	11.8	85,000	221	1.96	1124
HIGH ALTITUDE CRUISE TO 29,000 FT.	1240	11.8	85,000	221	1.96	1124
LONG RANGE CRUISE TO HIGH CONE	1400	13.7	85,000	237	1.81	1038
HIGH ALTITUDE CRUISE TO HIGH CONE	1400	13.7	85,000	237	1.81	1038
HIGH CONE TO 4500 FT.	900	6.0	20,000	34	-	340
HIGH CONE TO S.L.	1050	7.0	20,000	40	-	345

	MACH 3.2 -53.0°C					
	FUEL USED	TIME	ALT.	DIST.	AVG. MACH	AVG. KTAS
CLIMB FROM:						
S.L. MAX. G.W. T.O. TO LONG RANGE CRUISE	23,050	17.9	75,850	273	1.55	916
S.L. MAX. G.W. T.O. TO HIGH ALTITUDE CRUISE	24,190	19.1	80,800	309	1.64	970
S.L. LIGHT G.W. T.O. TO LONG RANGE CRUISE	19,500	16.0	78,000	252	1.60	945
4500 MAX. G.W. T.O. TO LONG RANGE CRUISE	22,700	17.7	75,700	272	1.56	922
4500 MAX. G.W. T.O. TO HIGH ALTITUDE CRUISE	23,850	18.9	80,700	309	1.66	981
4500 LIGHT G.W. T.O. TO LONG RANGE CRUISE	19,350	15.6	77,950	252	1.64	970
30,000 1 A/B A/R TO LONG RANGE CRUISE	20,600	15.7	75,300	274	1.77	1047
30,000 1A/B A/R TO HIGH ALTITUDE CRUISE	21,450	16.8	79,550	307	1.85	1097
CRUISE AT:						
LONG RANGE (S.L. - MAX. G.W. T.O.)	32,060	66.5	84,000	2049	3.2	1850
HIGH ALTITUDE (S.L. - MAX. G.W. T.O.)	30,900	59.1	85,000	1832	3.2	1850
LONG RANGE (S.L. - LIGHT G.W. T.O.)	21,610	47.4	84,000	1460	3.2	1850
LONG RANGE (4500 FT - MAX. G.W. T.O.)	32,410	67.3	84,000	2063	3.2	1850
HIGH ALTITUDE (4500 FT - MAX. G.W. T.O.)	31,260	60.4	85,000	1848	3.2	1850
LONG RANGE (4500 FT - LIGHT G.W. T.O.)	21,760	47.7	84,000	1469	3.2	1850
LONG RANGE (30,000 FT. A/R)	37,810	76.2	84,000	2348	3.2	1850
HIGH ALTITUDE (30,000 FT. A/R)	36,950	68.4	85,000	2106	3.2	1850
DESCENT FROM:						
LONG RANGE CRUISE TO 29,000 FT.	1230	11.8	84,000	219	1.88	1115
HIGH ALTITUDE CRUISE TO 29,000 FT.	1240	11.8	85,000	221	1.90	1124
LONG RANGE CRUISE TO HIGH CONE	1390	13.7	84,000	235	1.74	1030
HIGH ALTITUDE CRUISE TO HIGH CONE	1400	13.7	85,000	237	1.75	1038
HIGH CONE TO 4500 FT.	900	6.0	20,000	34	-	340
HIGH CONE TO S.L.	1050	7.0	20,000	40	-	345

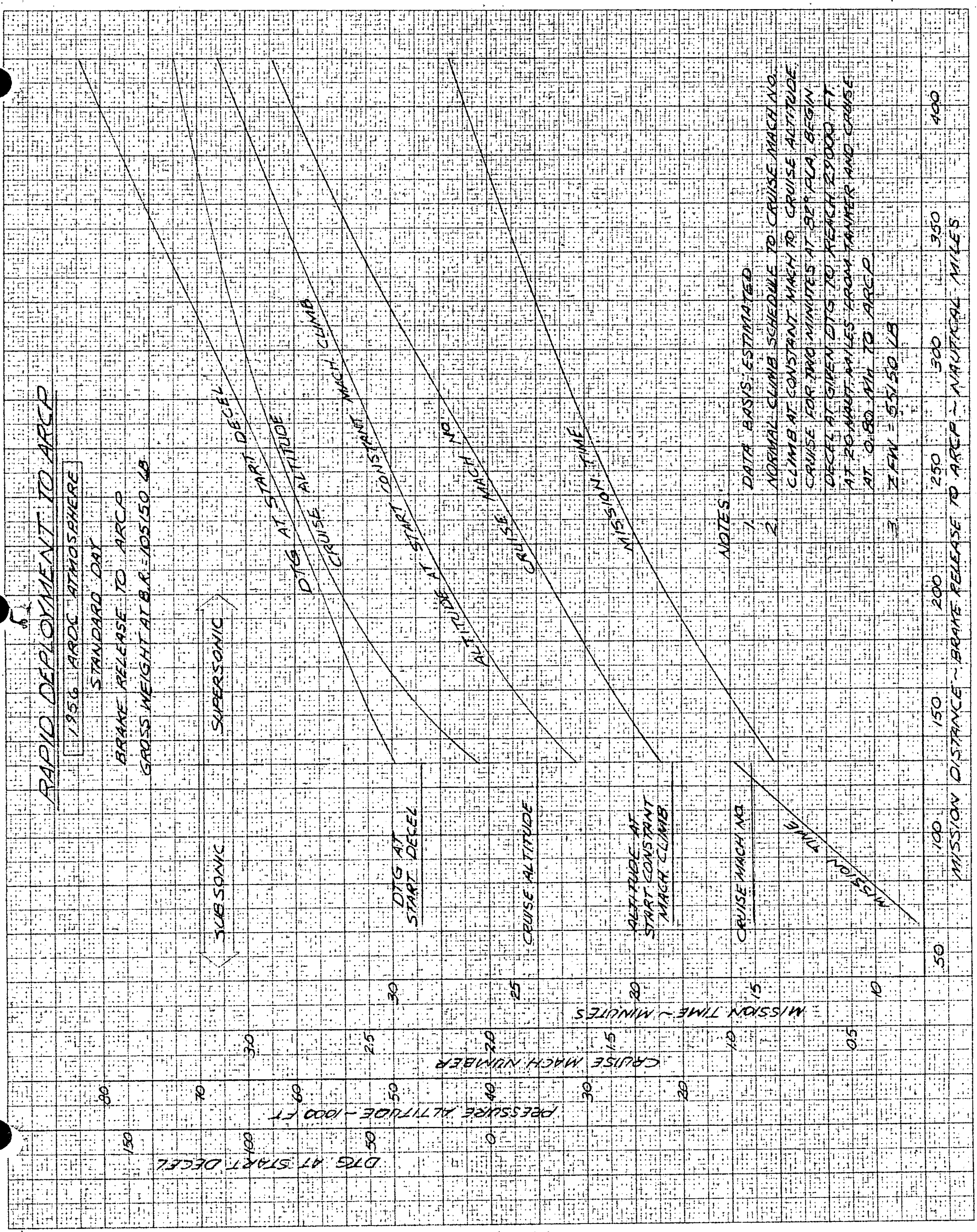
	MACH 3.1 -56.5°C					
	FUEL USED	TIME	ALT.	DIST.	AVG. MACH	AVG. KTAS
CLIMB FROM:						
S.L. MAX. G.W. T.O. TO LONG RANGE CRUISE	23,350	18.2	74,800	288	1.66	950
S.L. MAX. G.W. T.O. TO HIGH ALTITUDE CRUISE	24,150	19.1	79,800	316	1.73	995
S.L. LIGHT G.W. T.O. TO LONG RANGE CRUISE	20,150	16.1	77,000	266	1.73	992
4500 MAX. G.W. T.O. TO LONG RANGE CRUISE	22,720	18.0	74,700	286	1.66	954
4500 MAX. G.W. T.O. TO HIGH ALTITUDE CRUISE	23,770	19.0	79,700	315	1.73	995
4500 LIGHT G.W. T.O. TO LONG RANGE CRUISE	19,600	15.9	76,900	265	1.74	1000
30,000 1 A/B A/R TO LONG RANGE CRUISE	20,450	15.9	73,700	282	1.89	1083
30,000 1A/B A/R TO HIGH ALTITUDE CRUISE	21,400	17.0	78,600	314	1.94	1110
CRUISE AT:						
LONG RANGE (S.L. - MAX. G.W. T.O.)	31,890	66.6	82,500	1972	3.1	1777
HIGH ALTITUDE (S.L. - MAX. G.W. T.O.)	31,570	59.6	85,000	1770	3.1	1777
LONG RANGE (S.L. - LIGHT G.W. T.O.)	21,040	46.6	82,500	1380	3.1	1777
LONG RANGE (4500 FT - MAX. G.W. T.O.)	32,440	67.5	82,500	2000	3.1	1777
HIGH ALTITUDE (4500 FT - MAX. G.W. T.O.)	31,970	61.2	85,000	1815	3.1	1777
LONG RANGE (4500 FT - LIGHT G.W. T.O.)	21,590	47.7	82,500	1412	3.1	1777
LONG RANGE (30,000 FT. A/R)	38,040	77.0	82,500	2282	3.1	1777
HIGH ALTITUDE (30,000 FT. A/R)	37,070	69.1	85,000	2045	3.1	1777
DESCENT FROM:						
LONG RANGE CRUISE TO 29,000 FT.	1150	11.3	82,500	202	1.87	1073
HIGH ALTITUDE CRUISE TO 29,000 FT.	1170	11.5	85,000	204	1.85	1065
LONG RANGE CRUISE TO HIGH CONE	1310	13.2	82,500	218	1.73	991
HIGH ALTITUDE CRUISE TO HIGH CONE	1330	13.4	85,000	220	1.72	985
HIGH CONE TO 4500 FT.	900	6.0	20,000	34	-	340
HIGH CONE TO S.L.	1050	7.0	20,000	40	-	345

	MACH 3.1 -53.0°C					
	FUEL USED	TIME	ALT.	DIST.	AVG. MACH	AVG. KTAS
CLIMB FROM:						
S.L. MAX. G.W. T.O. TO LONG RANGE CRUISE	22,550	17.5	74,400	259	1.52	898
S.L. MAX. G.W. T.O. TO HIGH ALTITUDE CRUISE	23,450	18.4	78,900	286	1.57	933
S.L. LIGHT G.W. T.O. TO LONG RANGE CRUISE	19,350	15.7	76,650	243	1.57	929
4500 MAX. G.W. T.O. TO LONG RANGE CRUISE	22,000	17.3	74,400	259	1.52	899
4500 MAX. G.W. T.O. TO HIGH ALTITUDE CRUISE	23,000	18.2	78,800	285	1.59	940
4500 LIGHT G.W. T.O. TO LONG RANGE CRUISE	18,750	15.3	76,450	241	1.60	945
30,000 1 A/B A/R TO LONG RANGE CRUISE	19,600	14.8	73,350	249	1.71	1010
30,000 1A/B A/R TO HIGH ALTITUDE CRUISE	20,450	15.9	77,700	279	1.78	1053
CRUISE AT:						
LONG RANGE (S.L. - MAX. G.W. T.O.)	32,640	66.1	82,400	1970	3.1	1792
HIGH ALTITUDE (S.L. - MAX. G.W. T.O.)	31,720	59.3	85,000	1775	3.1	1792
LONG RANGE (S.L. - LIGHT G.W. T.O.)	21,840	46.8	82,400	1399	3.1	1792
LONG RANGE (4500 FT - MAX. G.W. T.O.)	33,190	67.0	82,400	1997	3.1	1792
HIGH ALTITUDE (4500 FT - MAX. G.W. T.O.)	32,170	60.1	85,000	1795	3.1	1792
LONG RANGE (4500 FT - LIGHT G.W. T.O.)	22,440	48.0	82,400	1428	3.1	1792
LONG RANGE (30,000 FT. A/R)	38,890	76.4	82,400	2276	3.1	1792
HIGH ALTITUDE (30,000 FT. A/R)	38,000	68.9	85,000	2056	3.1	1792
DESCENT FROM:						
LONG RANGE CRUISE TO 29,000 FT.	1150	11.2	82,400	202	1.83	1083
HIGH ALTITUDE CRUISE TO 29,000 FT.	1170	11.4	85,000	204	1.81	1073
LONG RANGE CRUISE TO HIGH CONE	1310	13.1	82,400	218	1.69	999
HIGH ALTITUDE CRUISE TO HIGH CONE	1330	13.3	85,000	222	1.69	1002
HIGH CONE TO 4500 FT.	900	6.0	20,000	34	-	340
HIGH CONE TO S.L.	1050	7.0	20,000	40	-	345

	MACH 2.9 -56.5°C					
	FUEL USED	TIME	ALT.	DIST.	AVG. MACH	AVG. KTAS
CLIMB FROM:						
S.L. MAX. G.W. T.O. TO LONG RANGE CRUISE	22,350	17.7	72,000	270	1.60	916
S.L. MAX. G.W. T.O. TO HIGH ALTITUDE CRUISE						
S.L. LIGHT G.W. T.O. TO LONG RANGE CRUISE	19,350	15.9	74,200	253	1.67	955
4500 MAX. G.W. T.O. TO LONG RANGE CRUISE	21,070	17.3	71,850	268	1.62	931
4500 MAX. G.W. T.O. TO HIGH ALTITUDE CRUISE						
4500 LIGHT G.W. T.O. TO LONG RANGE CRUISE	18,950	15.7	74,000	253	1.69	967
30,000 1 A/B A/R TO LONG RANGE CRUISE	19,250	15.2	70,800	259	1.78	1023
30,000 1A/B A/R TO HIGH ALTITUDE CRUISE						
CRUISE AT:						
LONG RANGE (S.L. - MAX. G.W. T.O.)	33,011	66.0	79,700	1834	2.9	1664
HIGH ALTITUDE (S.L. - MAX. G.W. T.O.)						
LONG RANGE (S.L. - LIGHT G.W. T.O.)	22,011	46.7	79,700	1294	2.9	1664
LONG RANGE (4500 FT - MAX. G.W. T.O.)	33,611	67.1	79,700	1858	2.9	1664
HIGH ALTITUDE (4500 FT - MAX. G.W. T.O.)						
LONG RANGE (4500 FT - LIGHT G.W. T.O.)	22,410	47.5	79,700	1314	2.9	1664
LONG RANGE (30,000 FT. A/R)	39,410	76.4	79,700	2116	2.9	1664
HIGH ALTITUDE (30,000 FT. A/R)						
DESCENT FROM:						
LONG RANGE CRUISE TO 29,000 FT.	979	11.1	79,700	170	1.85	1063
HIGH ALTITUDE CRUISE TO 29,000 FT.						
LONG RANGE CRUISE TO HIGH CONE	1139	12.0	79,700	186	1.69	970
HIGH ALTITUDE CRUISE TO HIGH CONE						
HIGH CONE TO 4500 FT.	900	6.0	20,000	34	-	340
HIGH CONE TO S.L.	1050	7.0	20,000	40	-	345

Figure A5-28

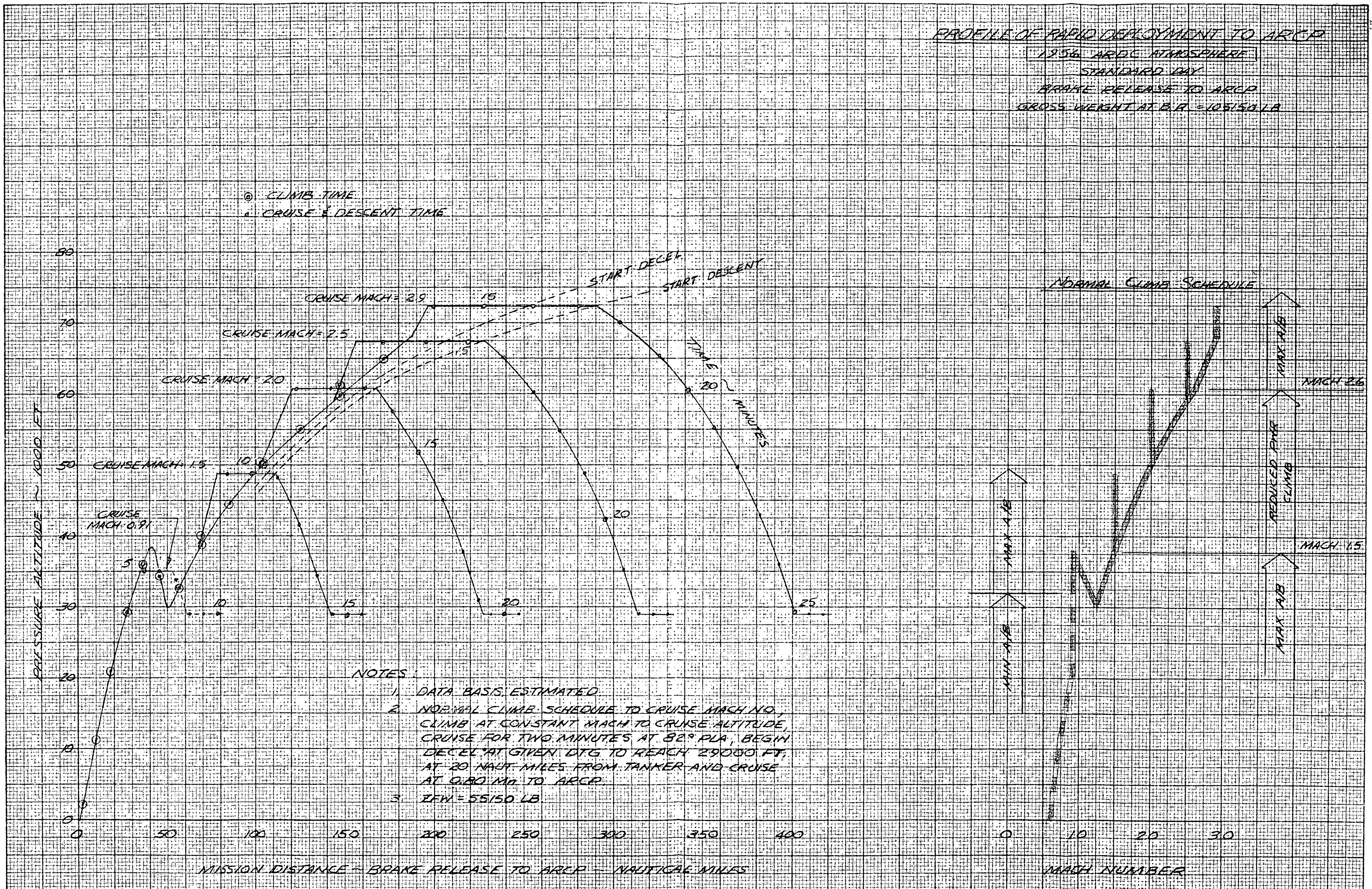
Approved for Release: 2017/07/25 C06535944



FORM 5278A

Changed 15 June 1968

Figure A5-29


PROFILE OF RAPID DEPLOYMENT TO ARCP
1956 ARDC ATMOSPHERE
STANDARD DAY
BRAKE RELEASE TO ARCP
GROSS WEIGHT AT B.R. = 105150 LB
⊙ CLIMB TIME
• CRUISE & DESCENT TIME
CRUISE MACH = 2.9
CRUISE MACH = 2.5
CRUISE MACH = 2.0
CRUISE MACH = 1.5
CRUISE MACH 0.91
START DECEL
START DESCENT
TIME ~ MINUTES
NORMAL CLIMB SCHEDULE
MAX A/B
REDUCED PWR CLIMB
MIN A/B
MACH 2.6
MACH 1.5
PRESSURE ALTITUDE ~ 1000 FT
MISSION DISTANCE ~ BRAKE RELEASE TO ARCP ~ NAUTICAL MILES
MACH NUMBER
NOTES:
1. DATA BASIS: ESTIMATED
2. NORMAL CLIMB SCHEDULE TO CRUISE MACH NO., CLIMB AT CONSTANT MACH TO CRUISE ALTITUDE, CRUISE FOR TWO MINUTES AT 82° PLA, BEGIN DECEL AT GIVEN DTG TO REACH 29000 FT. AT 20 NAUT. MILES FROM TANKER AND CRUISE AT 0.80 Mn TO ARCP.
3. ZFW = 55150 LB

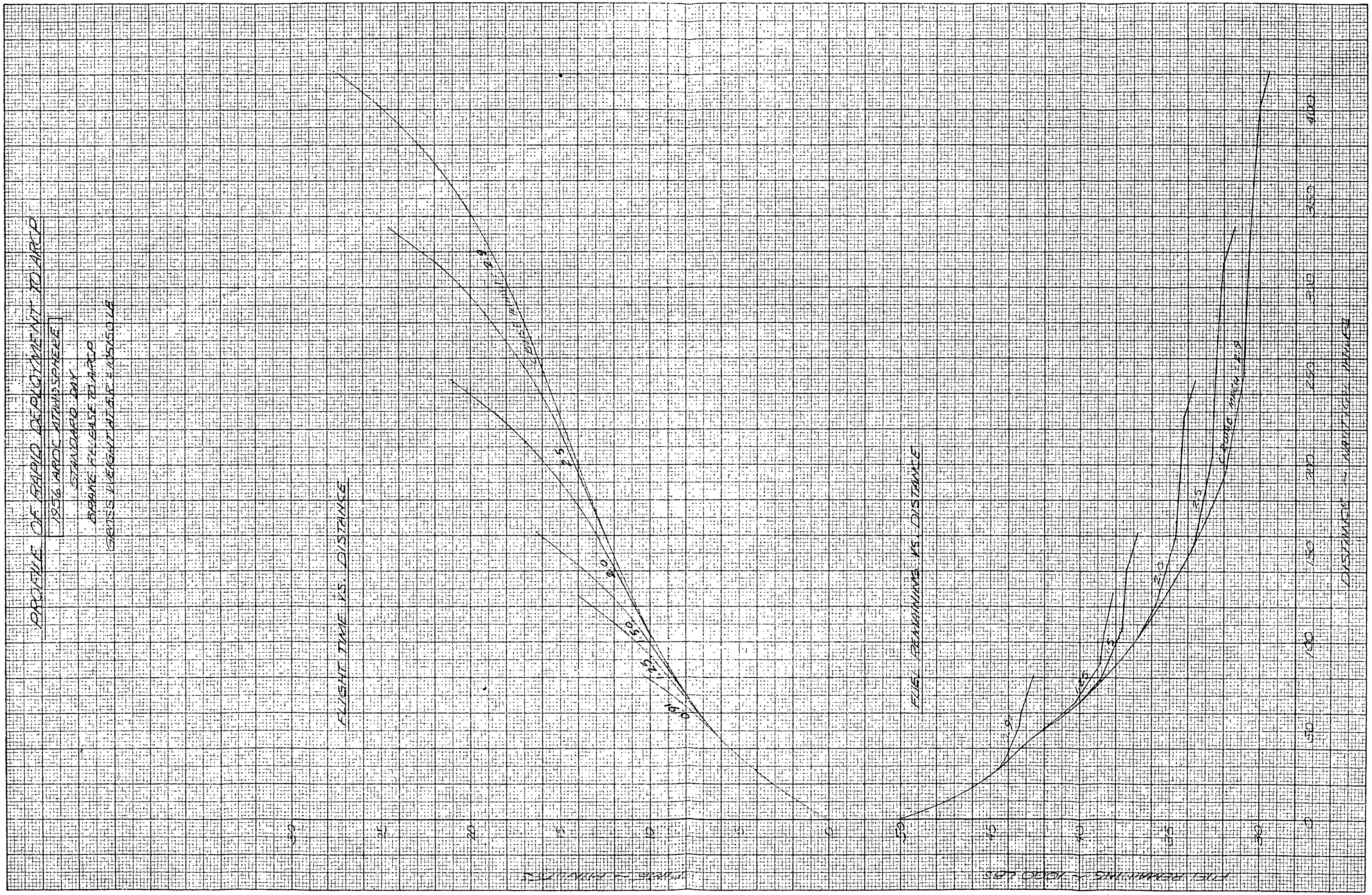
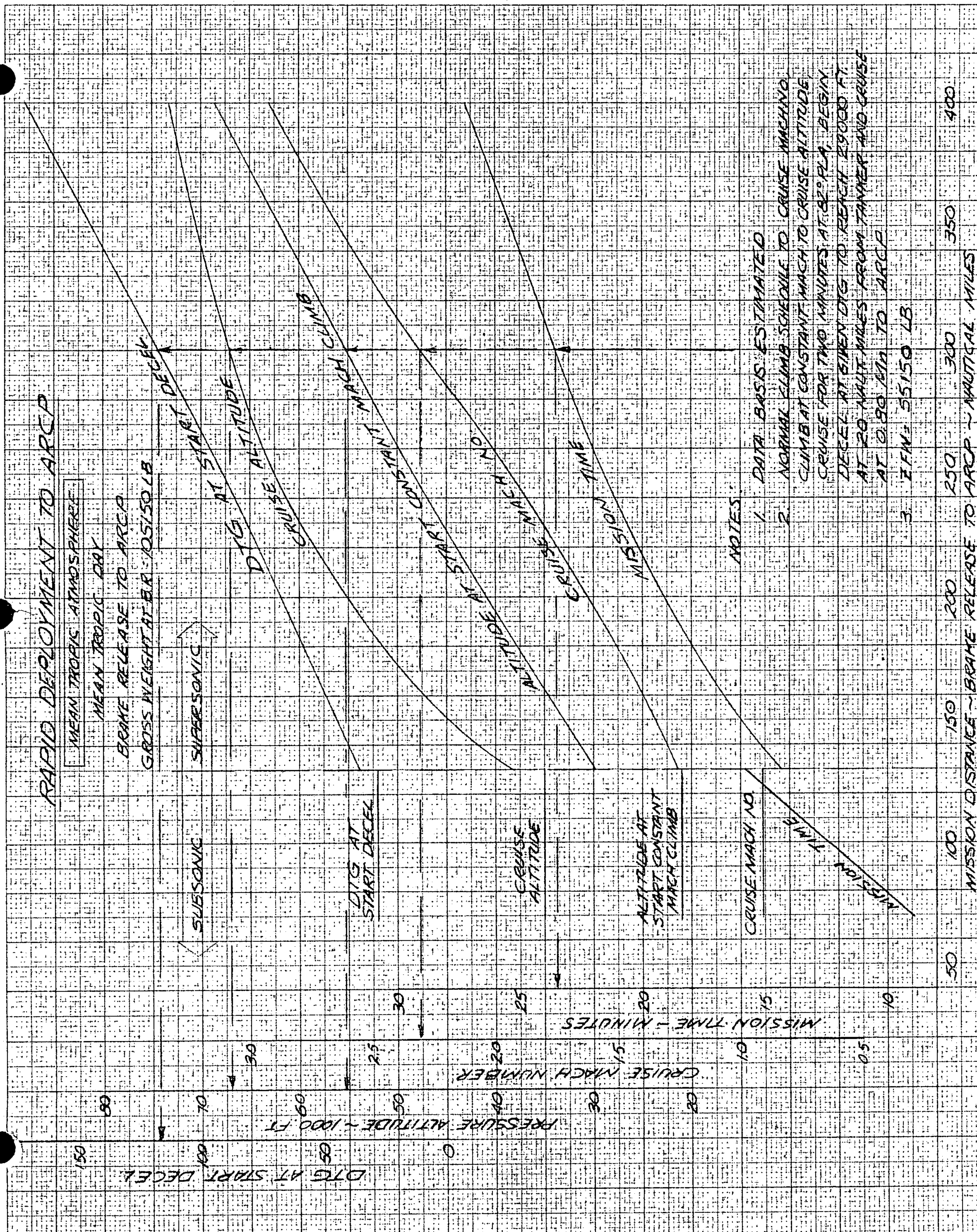


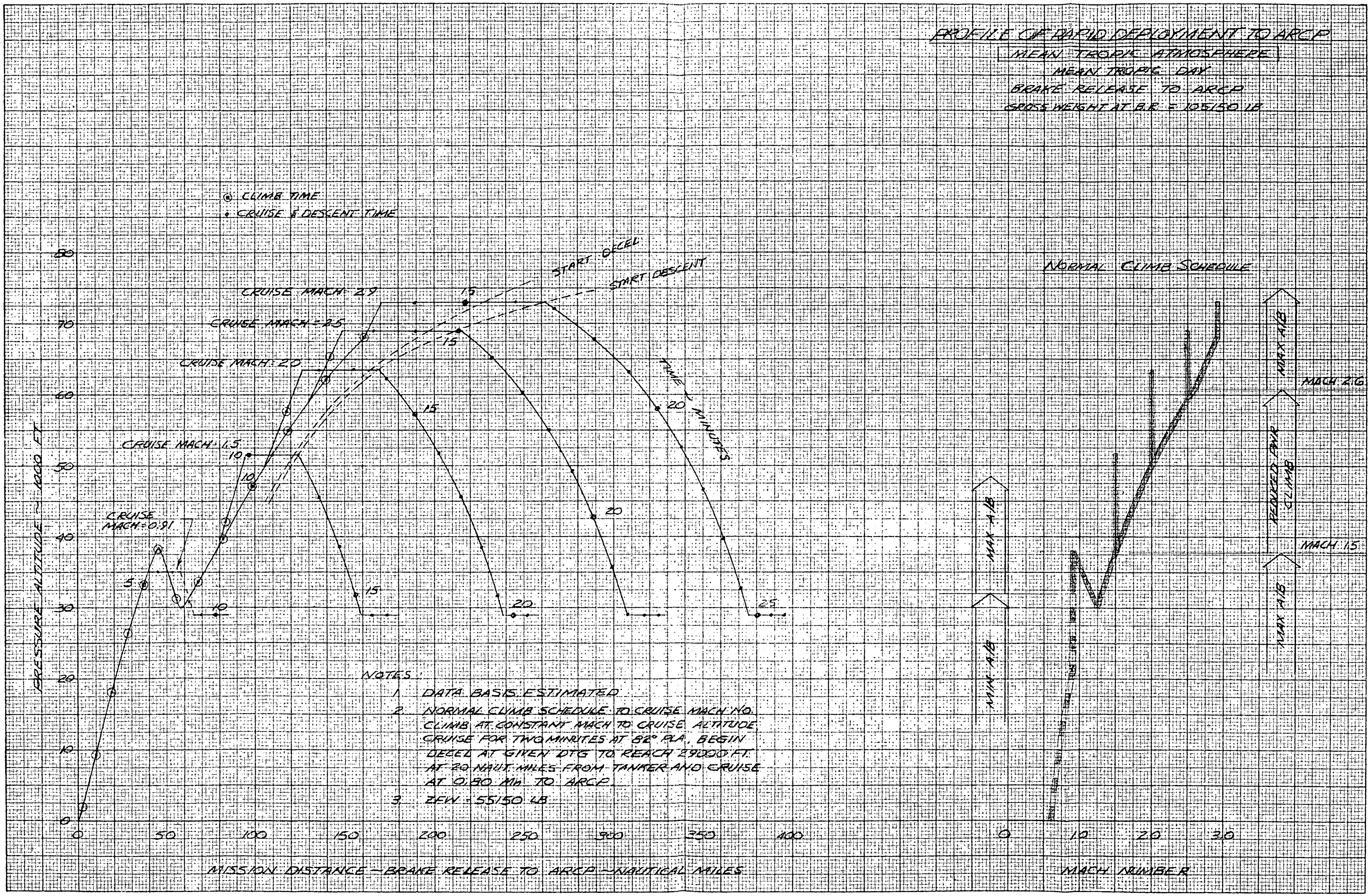
Figure A5-30
(Sheet 2 of 2)

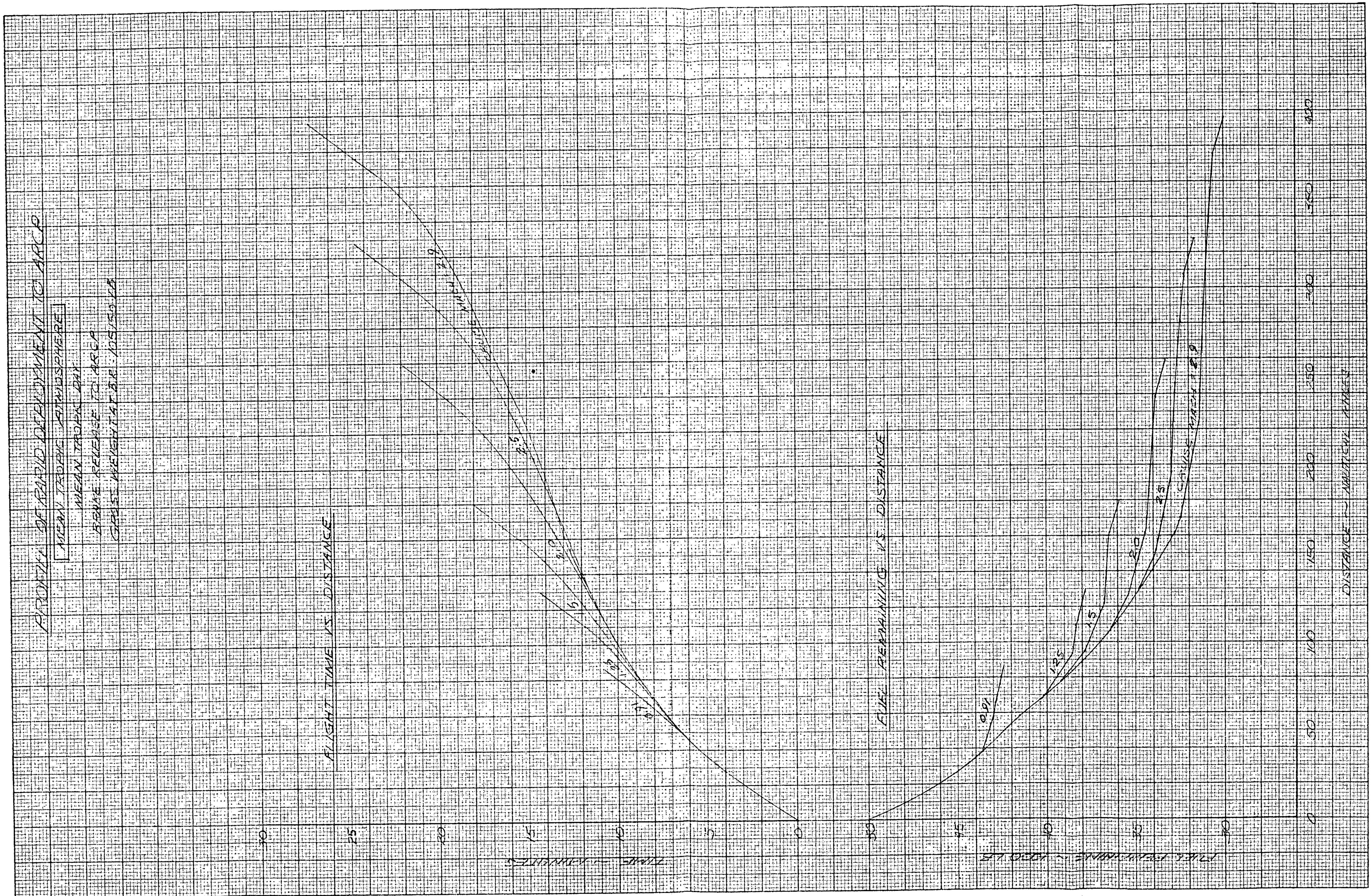


FORM 5278A

Figure A5-31

Approved for Release: 2017/07/25 C06535944


PROFILE OF RAPID DEPLOYMENT TO ARCP
MEAN TROPIC ATMOSPHERE
MEAN TROPIC DAY
BRAKE RELEASE TO ARCP
GROSS WEIGHT AT B.R. = 105150 LB
⊙ CLIMB TIME
• CRUISE & DESCENT TIME
START DECEL
START DESCENT
CRUISE MACH 2.9
CRUISE MACH = 2.5
CRUISE MACH 2.0
CRUISE MACH 1.5
CRUISE MACH = 0.91
TIME ~ MINUTES
NORMAL CLIMB SCHEDULE
MAX A/B
MACH 2.6
REDUCED PWR CLIMB
MACH 1.5
MIN A/B
PRESSURE ALTITUDE ~ 1000 FT
NOTES:
1 DATA BASIS: ESTIMATED
2 NORMAL CLIMB SCHEDULE TO CRUISE MACH NO. CLIMB AT CONSTANT MACH TO CRUISE ALTITUDE. CRUISE FOR TWO MINUTES AT 82° PLA, BEGIN DECEL AT GIVEN DTG TO REACH 29000 FT. AT 20 NAUT. MILES FROM TANKER AND CRUISE AT 0.80 Mh TO ARCP.
3 ZFW = 55150 LB
MISSION DISTANCE ~ BRAKE RELEASE TO ARCP ~ NAUTICAL MILES
MACH NUMBER



Approved for Release: 2017/07/25 C06535944

ALPHABETICAL INDEX

Page Numbers With Asterisks Denote Illustrations

Page Numbers With Asterisks Denote Illustrations

Page Numbers With Asterisks Denote Illustrations

G

Page Numbers With Asterisks Denote Illustrations

Page Numbers With Asterisks Denote Illustrations

M

N

Page Numbers With Asterisks Denote Illustrations

Page Numbers With Asterisks Denote Illustrations

Page Numbers With Asterisks Denote Illustrations

Page Numbers With Asterisks Denote Illustrations

X

Y

Page Numbers With Asterisks Denote Illustrations