T.O. 1F-106A-1-1

FLIGHT MANUAL
PERFORMANCE DATA

USAF SE[illegible] F-106A & F-106B AIRCRAFT

[illegible] -456 AND ON

AF SERIAL NO. 57-2508 AND ON

CONTRACTS AF33(600)-30546, [illegible]

SEE NUMERICAL INDEX T.O. 0-1-1-4, FOR CURRENT STATUS OF FLIGHT MANUALS, SAFETY SUPPLEMENTS, OPERATIONAL SUPPLEMENTS AND FLIGHT CREW CHECK-LISTS.

THIS PUBLICATION IS INCOMPLETE WITHOUT T.O. 1F-106A-1.

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USAF

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SECTION I
INTRODUCTION

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SCOPE OF COVERAGE

The charts shown in Appendix I present flight test performance for the F-106A and F-106B airplane with the J75-17 engine. These charts provide flight planning data and sample problems. They are presented in two forms: (1) graphical charts, and (2) profile charts. The profile charts supplement the graphical charts and aid flight planning by reducing the number of charts required and the number of computations which must be made. The profile charts are based on the recommended climb and cruise settings shown on the charts and, in effect, give a profile of the mission or mission phase in terms of fuel and time required to cover a given distance. When cruise conditions other than those shown on the profile charts are desired, the graphical charts should be used for flight planning. More accurate results may be obtained from the graphical charts throughout the entire operating range of the airplane. The term "clean" configuration as applied to these charts implies no optional stores (wing tanks) and no drag producing components extended, such as speed brakes or landing gear. All charts except those presenting takeoff and landing data are based on the ICAO (International Civil Aviation Organization) standard atmosphere. Actual temperature and pressure altitude are used in determining takeoff and landing data.

NOTE

Pressure altitude used in the performance section is based on an altimeter setting of 29.92 in. Hg.

AIRSPEED CORRECTION CHART

No airspeed correction is required for installation error as all airspeeds displayed are calibrated airspeeds.

COMPRESSIBILITY CORRECTION CHART

Equivalent airspeed (EAS) is calibrated airspeed (CAS) corrected for the effects of compressibility. Though the difference between EAS and CAS is negligible at low speeds and low altitudes, impact pressures upon the pitot tube at high speeds cause the airspeed indicator to show values above normal. The correction shown in the compressibility correction chart (figure 1-1) should be subtracted from calibrated airspeed.

MACH NUMBER CORRECTION

No Mach number correction is required for the airplane as the Mach indicator displays true Mach number.

ALTITUDE CORRECTION CHART

Figure 1-3 shown the altitude correction in terms of IAS for those airplanes modified by T.C.T.O. 1F-106-1084, installation of CPU-111 central air data computer and REC Model 855CR compensating pitot-static probe.

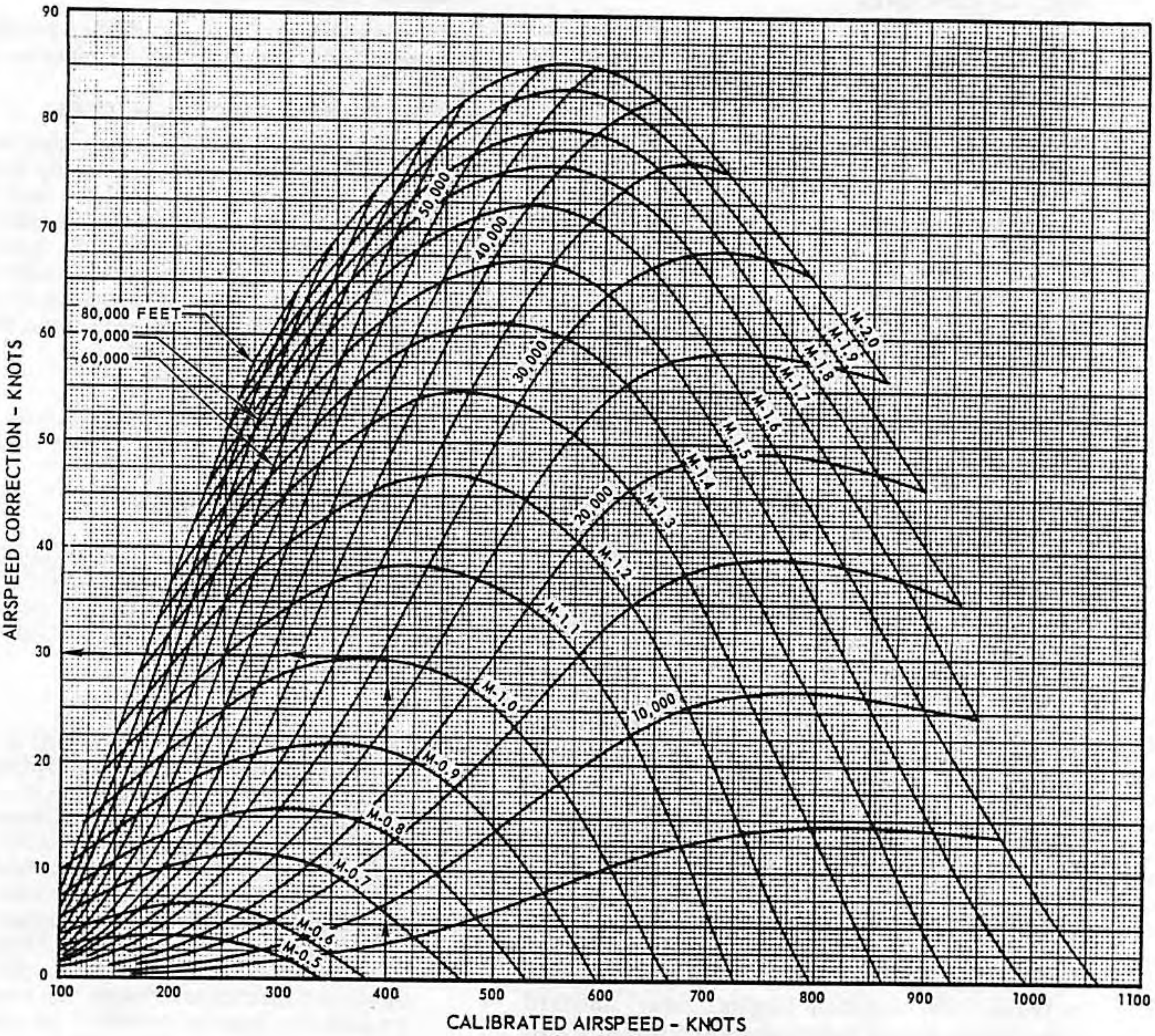
NOTE

On airplanes with the conventional instrument display, the altimeter reading must be corrected for installation error when operating in the pneumatic mode (the STBY flag displayed on the AAU-19/A altimeter) only. When operating in the reset mode (the STBY flag not displayed), this chart is not used because the altitude displayed is corrected for installation error. On airplanes with the integrated instrument system, the standby altimeter must be corrected for installation error whenever it is used.

Indicated altitude is the instrument reading without instrument error considered. True pressure altitude is obtained from reading figure 1-3 by entering the column for IAS and reading down to the line for indicated altitude. The correction is added to the indicated altitude. Example: 500 Knots at an indicated altitude of 40,000 feet gives an increment of 270 feet. True pressure altitude is 40,270 feet.

A B

COMPRESSIBILITY CORRECTION TO CALIBRATED AIRSPEED



NOTE

SUBTRACT CORRECTION FROM CALIBRATED AIRSPEED TO OBTAIN EQUIVALENT AIRSPEED.

22,005B

Figure 1-1

A B

STANDARD ATMOSPHERE TABLE

STANDARD SEA LEVEL AIR:
TEMPERATURE = 15 °C (59 °F)
PRESSURE = 29.921 IN. OF Hg
W = .076475 LB / CU FT

1 IN. OF Hg = 70.732 LB / SQ FT (0.4912 LB / SQ IN.)
a_o = 1116.89 FT / SEC
ρ_o = .0023769 SLUGS / CU FT

BASED ON INTERNATIONAL CIVIL AVIATION ORGANIZATION (ICAO) STANDARD ATMOSPHERE
(NACA TECHNICAL REPORT NO. 1235)

ALTITUDE FEET	DENSITY RATIO ρ / ρ_o	$1/\sqrt{\sigma}$	TEMPERATURE		SPEED OF SOUND RATIO a / a_o	PRESSURE	
			°F	°C		IN. OF Hg	RATIO P/P_o
−2000	1.0598	0.9714	66.132	18.962	1.0064	32.15	1.0294
−1000	1.0296	0.9855	62.566	16.981	1.0030	31.02	1.0147
0	1.0000	1.0000	59.000	15.000	1.0000	29.92	1.0000
1000	.9711	1.0148	55.434	13.019	.9966	28.86	.9644
2000	.9428	1.0299	51.868	11.038	.9931	27.82	.9298
3000	.9151	1.0454	48.302	9.057	.9896	26.82	.8962
4000	.8881	1.0611	44.735	7.075	.9862	25.84	.8637
5000	.8617	1.0773	41.169	5.094	.9827	24.90	.8320
6000	.8359	1.0938	37.603	3.113	.9792	23.98	.8014
7000	.8106	1.1107	34.037	1.132	.9756	23.09	.7716
8000	.7860	1.1279	30.471	−0.849	.9721	22.22	.7428
9000	.7620	1.1456	26.905	−2.831	.9686	21.39	.7148
10,000	.7385	1.1637	23.338	−4.812	.9650	20.58	.6877
11,000	.7156	1.1822	19.772	−6.793	.9614	19.79	.6614
12,000	.6932	1.2011	16.206	−8.774	.9579	19.03	.6360
13,000	.6713	1.2205	12.640	−10.756	.9543	18.29	.6113
14,000	.6500	1.2403	9.074	−12.737	.9507	17.58	.5875
15,000	.6292	1.2606	5.508	−14.718	.9470	16.89	.5643
16,000	.6090	1.2815	1.941	−16.699	.9434	16.22	.5420
17,000	.5892	1.3028	−1.625	−18.681	.9397	15.57	.5203
18,000	.5699	1.3246	−5.191	−20.662	.9361	14.94	.4994
19,000	.5511	1.3470	−8.757	−22.643	.9324	14.34	.4791
20,000	.5328	1.3700	−12.323	−24.624	.9287	13.75	.4595
21,000	.5150	1.3935	−15.889	−26.605	.9250	13.18	.4406
22,000	.4976	1.4176	−19.456	−28.587	.9213	12.64	.4223
23,000	.4807	1.4424	−23.022	−30.568	.9175	12.11	.4046
24,000	.4642	1.4678	−26.588	−32.549	.9138	11.60	.3876
25,000	.4481	1.4938	−30.154	−34.530	.9100	11.10	.3711
26,000	.4325	1.5206	−33.720	−36.511	.9062	10.63	.3552
27,000	.4173	1.5480	−37.286	−38.492	.9024	10.17	.3398
28,000	.4025	1.5762	−40.852	−40.473	.8986	9.725	.3250
29,000	.3881	1.6052	−44.419	−42.455	.8948	9.297	.3107
30,000	.3741	1.6349	−47.985	−44.436	.8909	8.885	.2970
31,000	.3605	1.6654	−51.551	−46.417	.8871	8.488	.2837
32,000	.3473	1.6968	−55.117	−48.398	.8832	8.106	.2709
33,000	.3345	1.7291	−58.683	−50.379	.8793	7.737	.2586
34,000	.3220	1.7623	−62.249	−52.361	.8754	7.382	.2467
35,000	.3099	1.7964	−65.816	−54.342	.8714	7.041	.2353
36,000	.2981	1.8315	−69.382	−56.323	.8675	6.712	.2243
37,000	.2844	1.8753	−69.700	−56.500	.8671	6.397	.2138
38,000	.2710	1.9209	−69.700	−56.500	.8671	6.097	.2038
39,000	.2583	1.9677	−69.700	−56.500	.8671	5.811	.1942
40,000	.2462	2.0155	−69.700	−56.500	.8671	5.538	.1851
41,000	.2346	2.0645	−69.700	−56.500	.8671	5.278	.1764
42,000	.2236	2.1148	−69.700	−56.500	.8671	5.030	.1681
43,000	.2131	2.1662	−69.700	−56.500	.8671	4.794	.1602
44,000	.2031	2.2189	−69.700	−56.500	.8671	4.569	.1527
45,000	.1936	2.2728	−69.700	−56.500	.8671	4.355	.1455
46,000	.1845	2.3281	−69.700	−56.500	.8671	4.151	.1387
47,000	.1758	2.3848	−69.700	−56.500	.8671	3.956	.1322
48,000	.1676	2.4428	−69.700	−56.500	.8671	3.770	.1260
49,000	.1597	2.5022	−69.700	−56.500	.8671	3.593	.1201
50,000	.1522	2.5630	−69.700	−56.500	.8671	3.425	.1145
51,000	.1451	2.6254	−69.700	−56.500	.8671	3.264	.1091
52,000	.1383	2.6892	−69.700	−56.500	.8671	3.111	.1040
53,000	.1318	2.7546	−69.700	−56.500	.8671	2.965	.09909
54,000	.1256	2.8216	−69.700	−56.500	.8671	2.826	.09444
55,000	.1197	2.8903	−69.700	−56.500	.8671	2.693	.09001
56,000	.1141	2.9606	−69.700	−56.500	.8671	2.567	.08578
57,000	.1087	3.0326	−69.700	−56.500	.8671	2.446	.08176
58,000	.1036	3.1063	−69.700	−56.500	.8671	2.331	.07792
59,000	.09877	3.1819	−69.700	−56.500	.8671	2.222	.07426
60,000	.09414	3.2593	−69.700	−56.500	.8671	2.118	.07078
61,000	.08972	3.3386	−69.700	−56.500	.8671	2.018	.06746
62,000	.08551	3.4198	−69.700	−56.500	.8671	1.924	.06429
63,000	.08150	3.5029	−69.700	−56.500	.8671	1.833	.06127
64,000	.07767	3.5881	−69.700	−56.500	.8671	1.747	.05840
65,000	.07403	3.6754	−69.700	−56.500	.8671	1.665	.05566

48,162E

Figure 1-2

ALTITUDE CORRECTION
(INSTALLATION ERROR)

SEA LEVEL TO 60,000 FEET

MODEL: F-106A/B
DATE: 26 JULY 1971
DATA BASIS: FLIGHT TEST

ENGINE J75-17

INDICATED OR PRESSURE ALTITUDE FEET	IAS – KNOTS												
	150	200	250	300	350	400	450	500	550	600	650	700	750
SEA LEVEL	-20	-10	0	10	20	30	50	80	110	140	540	160	190
5,000	-20	-10	10	20	30	50	70	100	130	460	150	190	230
10,000	-20	0	10	20	40	60	90	120	370	150	180	220	270
15,000	-10	10	20	30	50	80	110	280	140	180	220	260	300
20,000	-10	10	20	40	70	100	200	140	170	210	260	300	320
25,000	0	15	30	50	90	140	140	160	210	250	290	310	330
30,000	10	20	40	70	110	160	150	200	250	280	300	320	330
35,000	10	30	60	90	730	140	190	240	270	290	310	320	320
40,000	20	40	80	250	130	180	240	270	290	310	320	320	
45,000	20	60	110	120	170	230	270	290	310	320			
50,000	30	80	450	160	220	270	290	310	320				
55,000	50	110	130	210	260	290	310	330					
60,000	70	200	180	250	290	310	330						

ADD CORRECTION TO OBTAIN TRUE PRESSURE ALTITUDE: SUBTRACT CORRECTION TO OBTAIN INDICATED ALTITUDE

A B

Figure 1-3

SECTION II
TAKEOFF

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TAKEOFF AND LANDING DATA CARD

Prior to each takeoff compute all data contained on the Takeoff and Landing Data Card as shown. Completion of both takeoff and landing data is necessary before takeoff in the event of an emergency landing after takeoff. The data for "Landing Immediately After Takeoff" should be based on the takeoff gross weight. The Takeoff and Landing Data Card nomenclature definitions are as follows:

1. Runway Length. Usable length of runway in feet.
2. Wind. The wind component parallel to the runway.
3. Outside Air Temperature. Runway air temperature in degrees centigrade.
4. Pressure Altitude. Field pressure altitude obtained by setting altimeter to 29.92 inches Hg and reading altimeter dial.
5. Fuel Remaining. Fuel remaining in pounds at start of takeoff roll or at start of final approach, whichever is applicable.

F-106 TAKEOFF AND LANDING DATA CARD

CONDITIONS

	TAKEOFF	LANDING
Runway Length	______	______
Wind	______	______
Outside Air Temp	______	______
Pressure Altitude	______	______
Fuel Remaining	______	______

TAKEOFF

Engine Pressure Ratio	______
Acceleration Check	______Kts. at______Ft.
Takeoff Distance	______Ft.
Takeoff Speed	______Kts.
Refusal Speed & Distance	______Kts. at______Ft.
Max. Abort Speed	______Kts.
Initial Climb Speed	______Kts.

LANDING

	IMMEDIATELY AFTER TAKEOFF	FINAL LANDING
Final Approach Speed	______	______
Prior To Flare Speed	______	______
Touchdown Speed	______	______
Landing Ground Roll:		
Wheel Brakes Only	______	______
Drag Chute Deployed	______	______

Takeoff Data

1. Engine Pressure Ratio. The pressure ratio of pitot pressure and engine turbine discharge pressure. The pressure ratio setting is obtained from the Takeoff Check Chart (refer to BEFORE TAXIING, Section II, T.O. 1F-106A-1).
2. Acceleration Check. Line speed check at specified runway marker in knots (figure 2-1 or 2-2).
3. Takeoff Distance. Ground roll to takeoff speed in feet (figures 2-3 through 2-6).
4. Takeoff Speed. Indicated or calibrated airspeed in knots at which the airplane leaves the ground (figures 2-3 through 2-6).
5. Refusal Speed and Distance. The distance required to accelerate to the refusal speed under normal conditions, and the maximum speed to which the airplane can be accelerated and then stopped on the remaining runway length (figure 2-1 or 2-2).
6. Maximum Abort Speed. Figures 2-7 and 2-8.
7. Initial Climb Speed. Indicated or calibrated airspeed in knots at start of climb for maximum rate-of-climb. (See climb schedule on climb charts, figure 3-1 through 3-12.

Landing Immediately After Takeoff

1. Final Approach Speed. Recommended indicated or calibrated airspeed in knots for final approach (figures 8-1 through 8-4).

2. Prior to Flare Speed. Recommended indicated or calibrated airspeed in knots for the latter portion of final approach just prior to the flare (figures 8-1 through 8-4).
3. Touchdown Speed. Indicated or calibrated airspeed in knots at which the airplane contacts the runway (figures 8-1 through 8-4).
4. Landing Ground Roll:
   a. Wheel Brakes Only. Distance in feet from airplane touchdown to full stop with no drag chute and speed brakes open, using wheel brakes only (figure 8-1 through 8-2).
   b. Drag Chute Deployed. Distance in feet from airplane touchdown to full stop with drag chute (inflated at touchdown), speed brakes open, and using wheel brakes (figure 8-3 or 8-4).

TAKEOFF SPEEDS

Takeoff speeds are shown in figures 2-3 through 2-6 for maximum thrust and military thrust. These charts provide normal takeoff speeds for various gross weights, ambient air temperatures, and pressure altitudes.

Use

Enter the chart with total fuel remaining, then read horizontally to the right to takeoff speed.

CAUTION

Do not attempt to take off when takeoff speed is higher than tire limit speed. See figure 5-3, T.O. 1F-106A-1, for tire limit speeds.

TAKEOFF DISTANCE

Maximum thrust takeoff distances are shown in figures 2-3 and 2-4 and military thrust takeoff distances are shown in figures 2-5 and 2-6. The takeoff distance charts show both ground run distance and total distance over a 50-foot obstacle for takeoff from a hard surface runway. Various conditions of gross weight, ambient air temperature, pressure altitude, and wind are shown. These data are valid for the airplane with or without external fuel tanks within the weight range shown.

Use

Enter the chart with the ambient air temperature and read up to the pressure altitude. Read horizontally to the right to the fuel remaining and then down to the ground run distance with zero wind. Correct ground run for wind and proceed down to appropriate base lines, then read to the left for the total distance to clear 50-foot obstacle.

Sample Problem

Find the maximum thrust takeoff distance for an airplane with 9000 pounds of fuel on a sea level standard day with a 20-knot headwind:

A. Enter figure 2-3 with the standard sea level temperature—59°F or 15°C.

B. Read up to the pressure altitude — sea level.

C. Read horizontally to 9000 pounds fuel remaining.

D. Proceed down to the ground roll wind base line — zero wind.

E. Correct ground run for headwind by following parallel to a wind guide line to 20-knot headwind.

F. Read down to ground run distance for 20-knot headwind — 2450 feet.

G. Read down to baseline for total distance to clear a 50-foot obstacle and interpolate for 20-knot headwind.

H. Read horizontally to the left for total distance to clear a 50-foot obstacle with 20-knot headwind — 4050 feet.

MAXIMUM REFUSAL SPEED AND DISTANCE CHARTS

The maximum refusal speed and distance charts, for maximum and military thrust (figures 2-1 and 2-2), show the highest speed to which the airplane can be accelerated (assuming normal acceleration) and still be stopped in the remaining runway length. The refusal speed and distance charts take into account various gross weights, pressure altitudes, temperatures, and available runway lengths. The charts are presented for dry, hard-surfaced runways with a sub-scale for wet runways. Line check speed is used to allow the takeoff to be monitored at marked runway distances or acceleration line check markers. A decision to continue or abort the takeoff must be made prior to attaining the refusal speed by monitoring the acceleration.

MODEL: F-106A/B
DATE: 21 FEBRUARY 1967
DATA BASIS: FLIGHT TEST

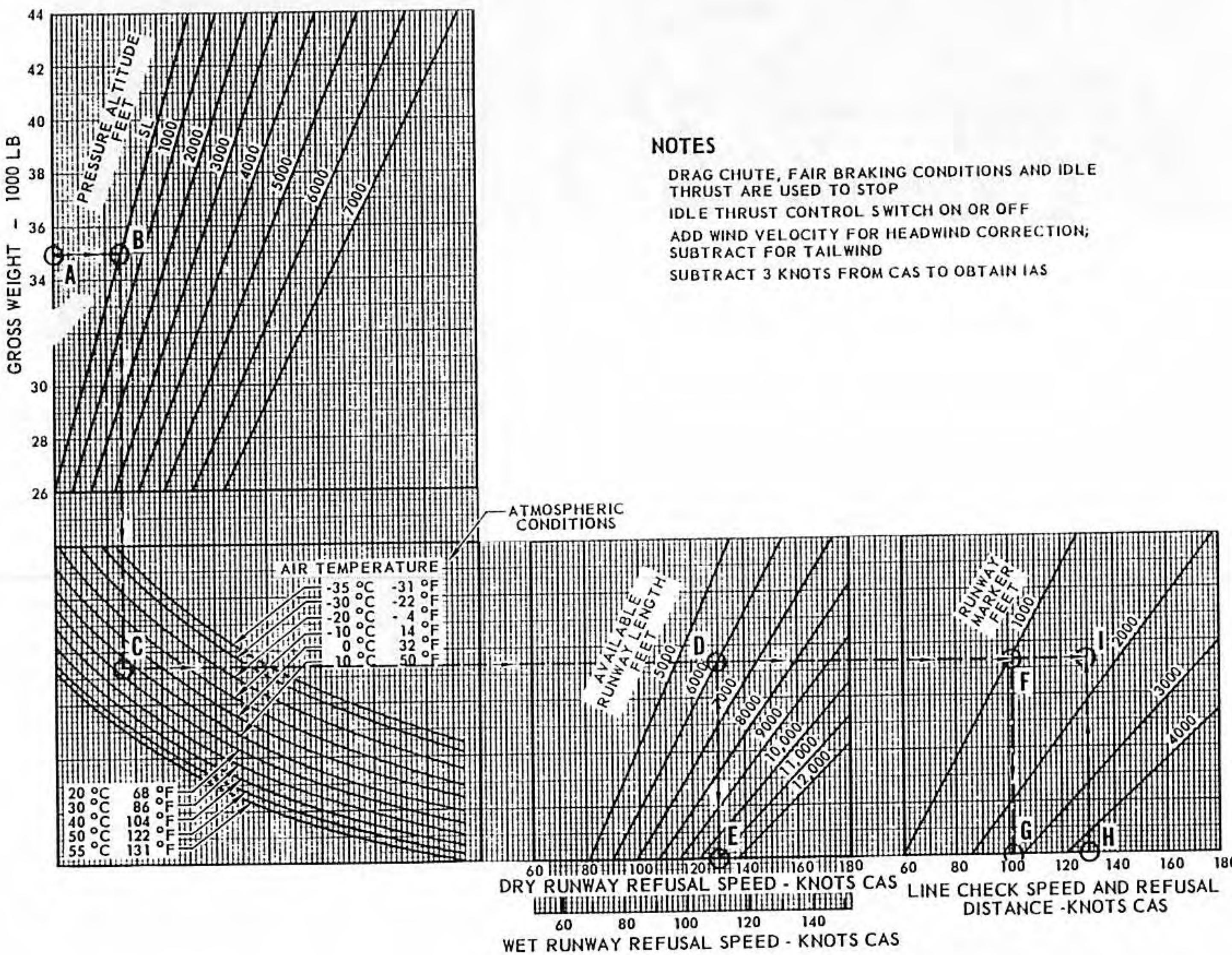
MAXIMUM REFUSAL SPEED AND DISTANCE – MAXIMUM THRUST

ALL CONFIGURATIONS   HARD SURFACE RUNWAY   ZERO WIND

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

NOTES

- DRAG CHUTE, FAIR BRAKING CONDITIONS AND IDLE THRUST ARE USED TO STOP
- IDLE THRUST CONTROL SWITCH ON OR OFF
- ADD WIND VELOCITY FOR HEADWIND CORRECTION; SUBTRACT FOR TAILWIND
- SUBTRACT 3 KNOTS FROM CAS TO OBTAIN IAS



A B

Figure 2-1

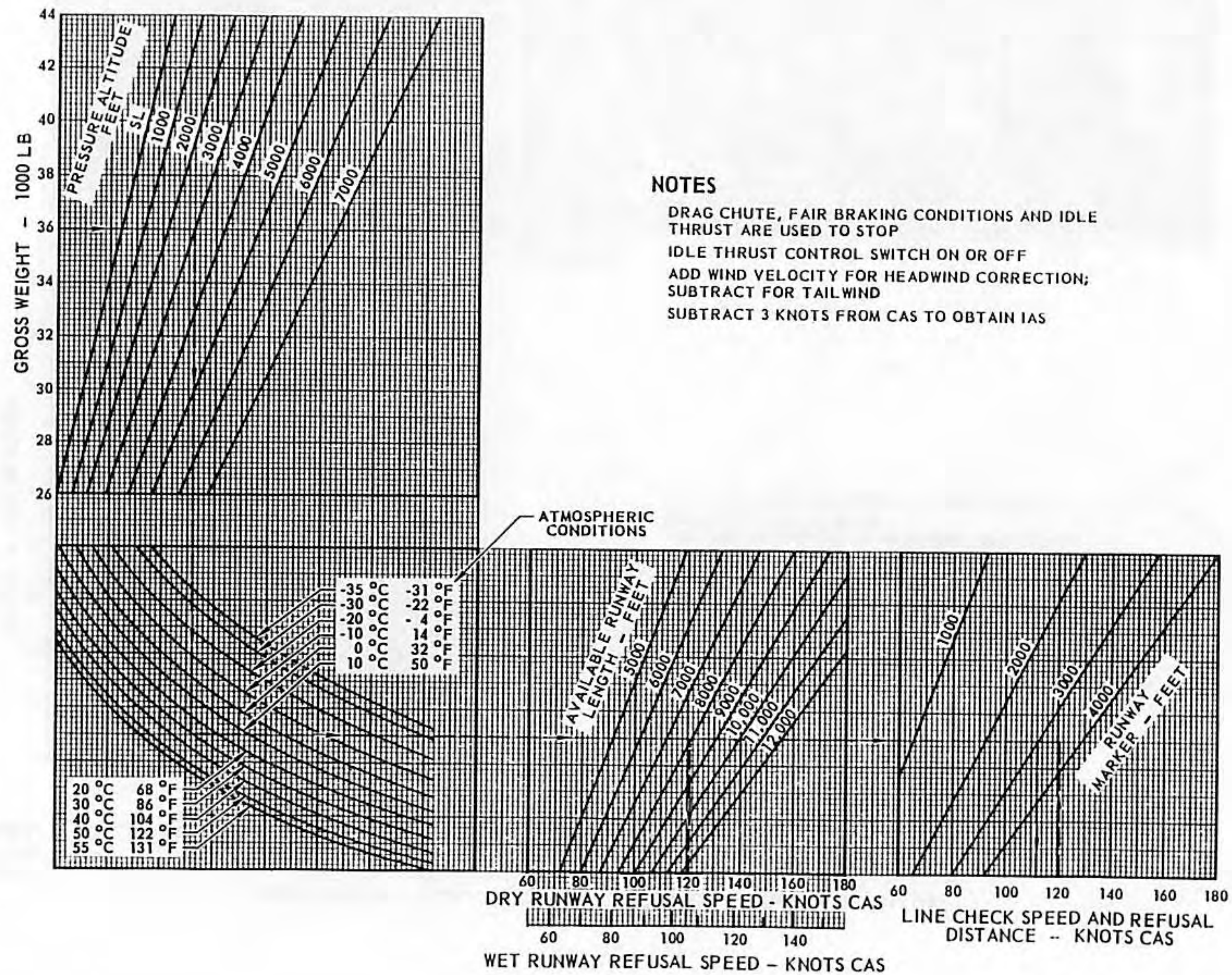
48,120F

MAXIMUM REFUSAL SPEED AND DISTANCE – MILITARY THRUST

ALL CONFIGURATIONS HARD SURFACE RUNWAY ZERO WIND

MODEL: F-106A/B
DATE: 21 FEBRUARY 1967
DATA BASIS: FLIGHT TEST

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL



NOTES

DRAG CHUTE, FAIR BRAKING CONDITIONS AND IDLE THRUST ARE USED TO STOP

IDLE THRUST CONTROL SWITCH ON OR OFF

ADD WIND VELOCITY FOR HEADWIND CORRECTION; SUBTRACT FOR TAILWIND

SUBTRACT 3 KNOTS FROM CAS TO OBTAIN IAS

A **B**

48,121E

Figure 2-2

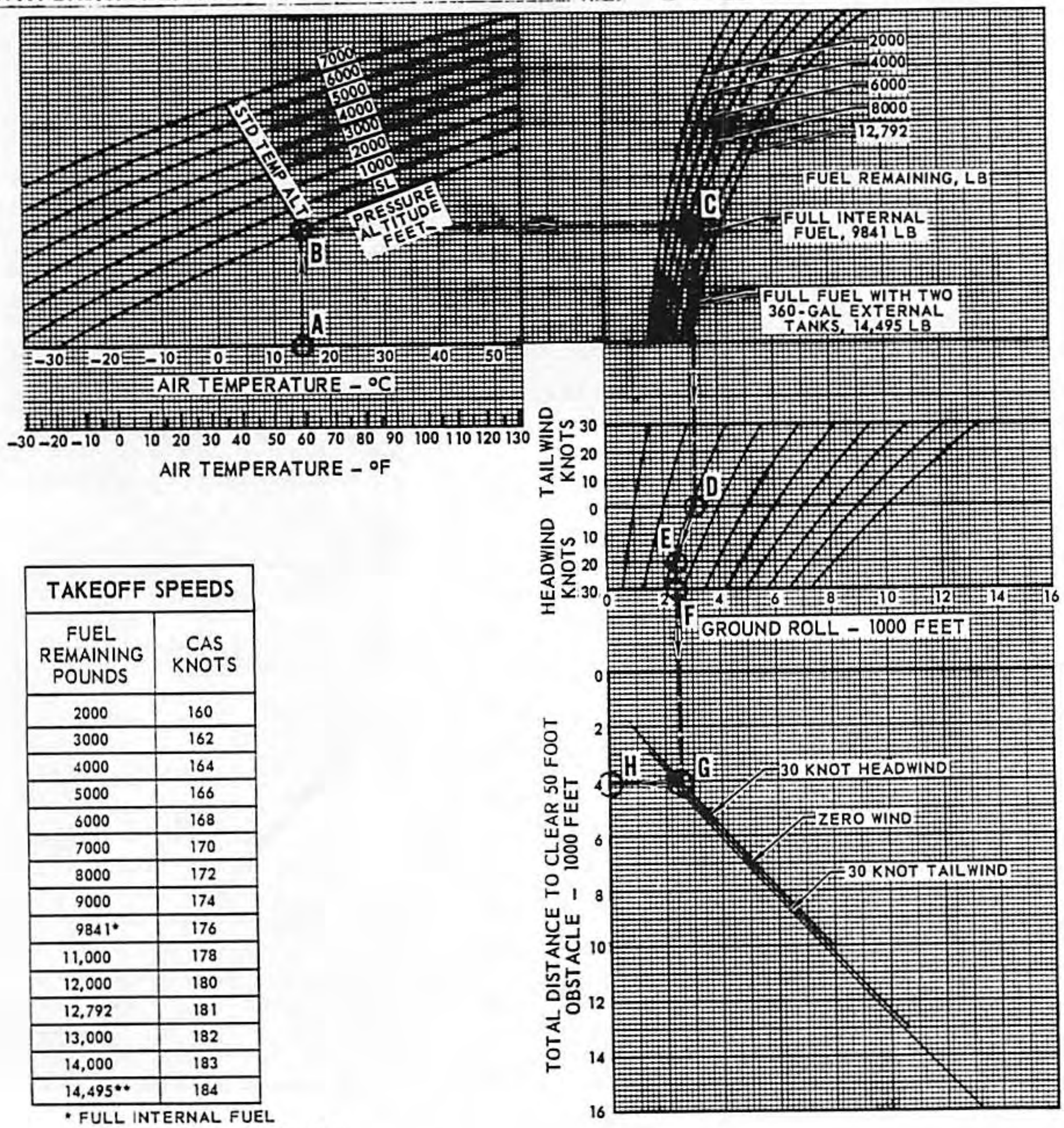
A

TAKEOFF SPEED AND DISTANCE – MAXIMUM THRUST

MODEL: F-106A
DATE: 21 FEBRUARY 1967
DATA BASIS: FLIGHT TEST

HARD SURFACE RUNWAY
ALL CONFIGURATIONS ARMAMENT IN

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL



TAKEOFF SPEEDS	
FUEL REMAINING POUNDS	CAS KNOTS
2000	160
3000	162
4000	164
5000	166
6000	168
7000	170
8000	172
9000	174
9841*	176
11,000	178
12,000	180
12,792	181
13,000	182
14,000	183
14,495**	184

* FULL INTERNAL FUEL
** FULL FUEL WITH TWO 360-GAL EXTERNAL TANKS

NOTES

DATA VALID FOR ALL CONFIGURATIONS EXCEPT ARMAMENT OUT.

FUEL REMAINING CURVES BASED ON A ZERO FUEL WEIGHT OF 27,336 POUNDS (INCLUDING 514 POUNDS FOR EXTERNAL TANKS).

48,118E

Figure 2-3

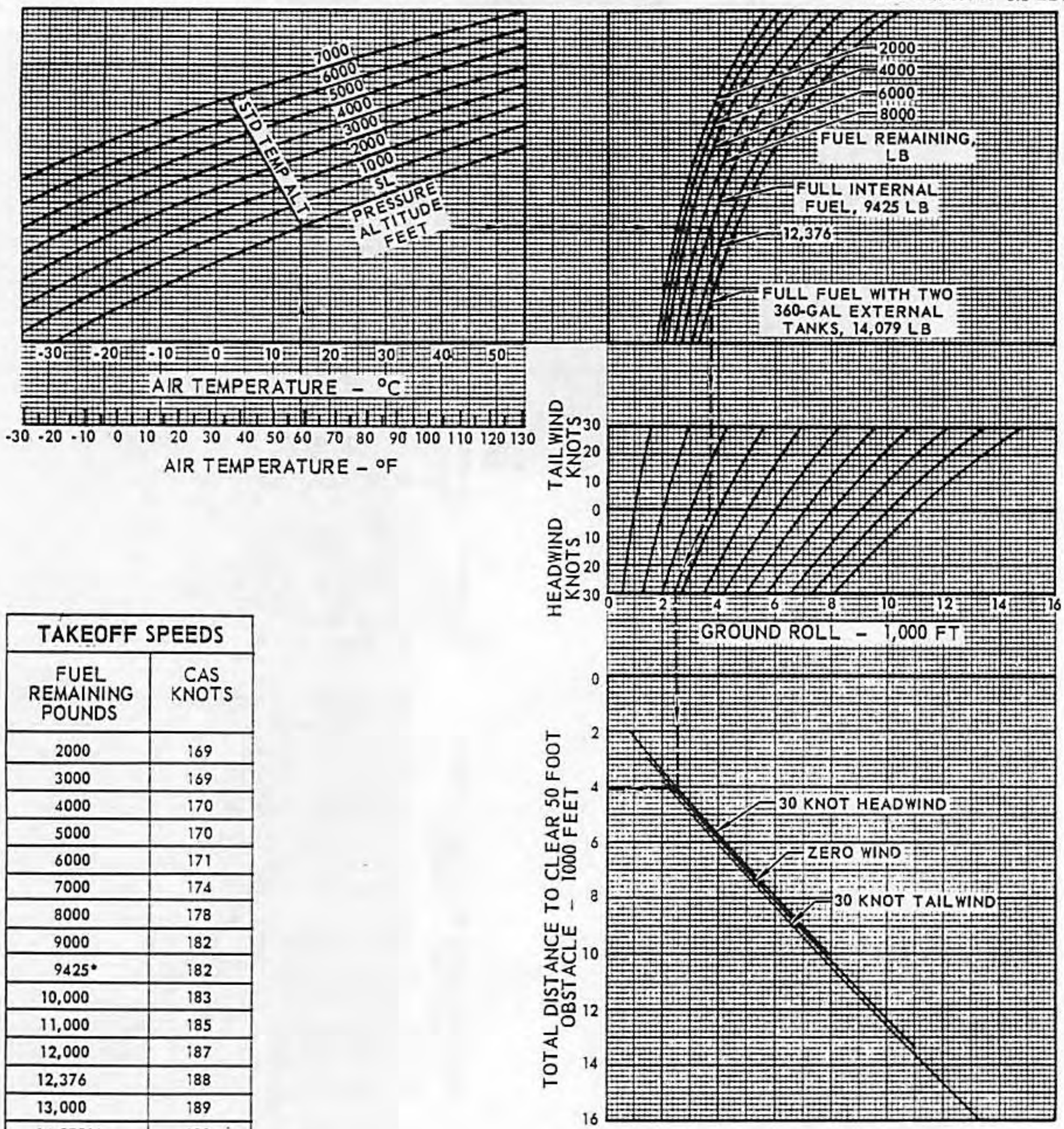
B

TAKEOFF SPEED AND DISTANCE – MAXIMUM THRUST

MODEL: F-106B
DATE: 21 FEBRUARY 1967
DATA BASIS: FLIGHT TEST

HARD SURFACE RUNWAY
ALL CONFIGURATIONS
ARMAMENT IN

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL



TAKEOFF SPEEDS	
FUEL REMAINING POUNDS	CAS KNOTS
2000	169
3000	169
4000	170
5000	170
6000	171
7000	174
8000	178
9000	182
9425*	182
10,000	183
11,000	185
12,000	187
12,376	188
13,000	189
14,079**	190

* FULL INTERNAL FUEL
** FULL FUEL WITH TWO 360-GAL EXTERNAL TANKS

NOTES

DATA VALID FOR ALL CONFIGURATIONS EXCEPT ARMAMENT OUT.
FUEL REMAINING CURVES BASED ON A ZERO FUEL WEIGHT OF 28,641 POUNDS (INCLUDING 514 POUNDS FOR EXTERNAL TANKS).

48,233B

Figure 2-4

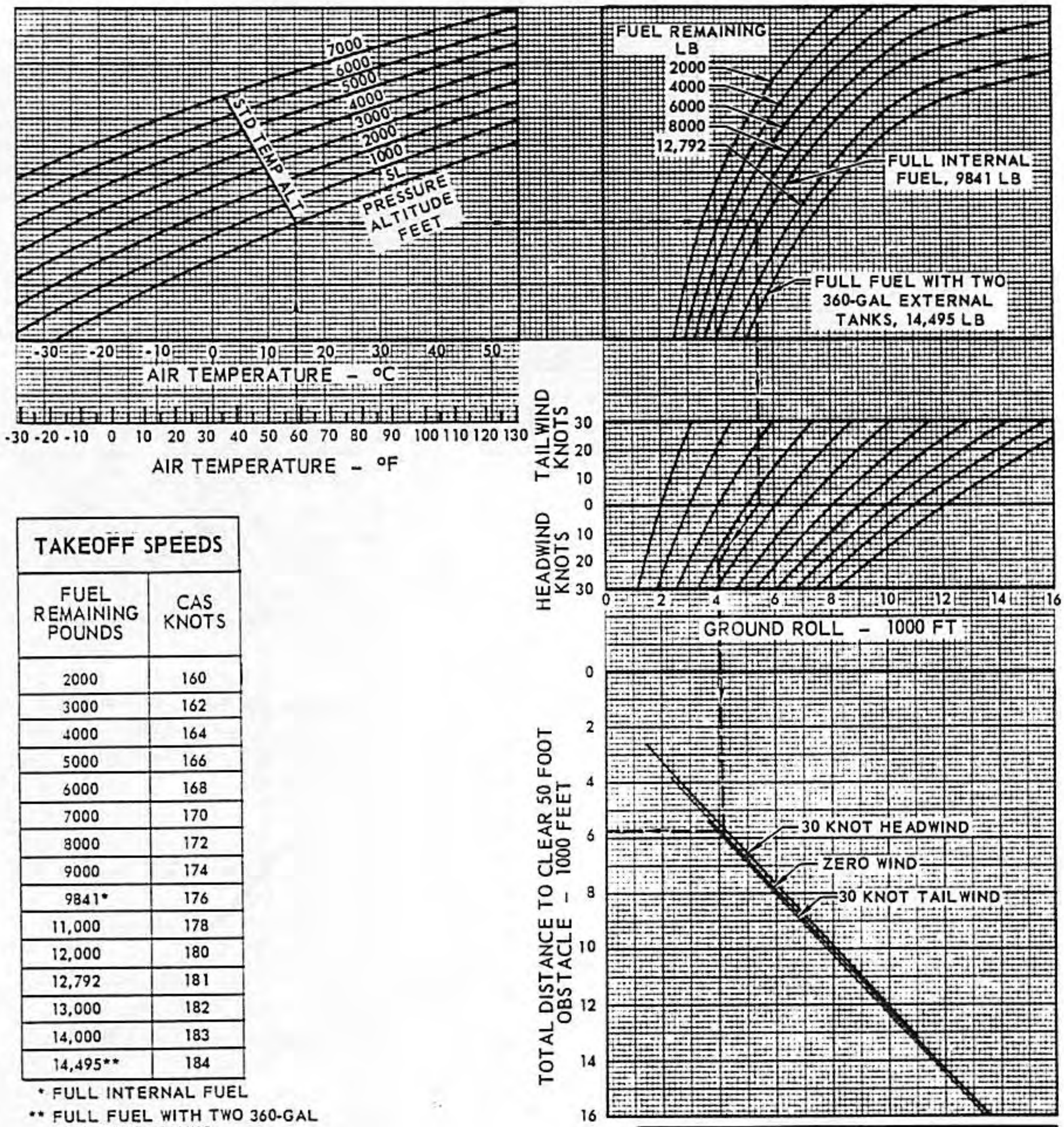
A

TAKEOFF SPEED AND DISTANCE – MILITARY THRUST

MODEL: F-106A
DATE: 21 FEBRUARY 1967
DATA BASIS: FLIGHT TEST

HARD SURFACE RUNWAY
ALL CONFIGURATIONS ARMAMENT IN

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL



TAKEOFF SPEEDS	
FUEL REMAINING POUNDS	CAS KNOTS
2000	160
3000	162
4000	164
5000	166
6000	168
7000	170
8000	172
9000	174
9841*	176
11,000	178
12,000	180
12,792	181
13,000	182
14,000	183
14,495**	184

* FULL INTERNAL FUEL
** FULL FUEL WITH TWO 360-GAL EXTERNAL TANKS

MILITARY THRUST TAKEOFF TEMP LIMITS – °C		
PRESSURE ALTITUDE FEET	NO EXTERNAL TANKS	WITH TWO 360-GAL EXTERNAL TANKS
7000	23	-5
6000	35	6
5000	47	16
4000	-	28
3000	-	39
2000	-	50

NOTES

DATA VALID FOR ALL CONFIGURATIONS EXCEPT ARMAMENT OUT.

FUEL REMAINING CURVES BASED ON A ZERO FUEL WEIGHT OF 27,336 POUNDS (INCLUDING 514 POUNDS FOR EXTERNAL TANKS).

48,119F

Figure 2-5

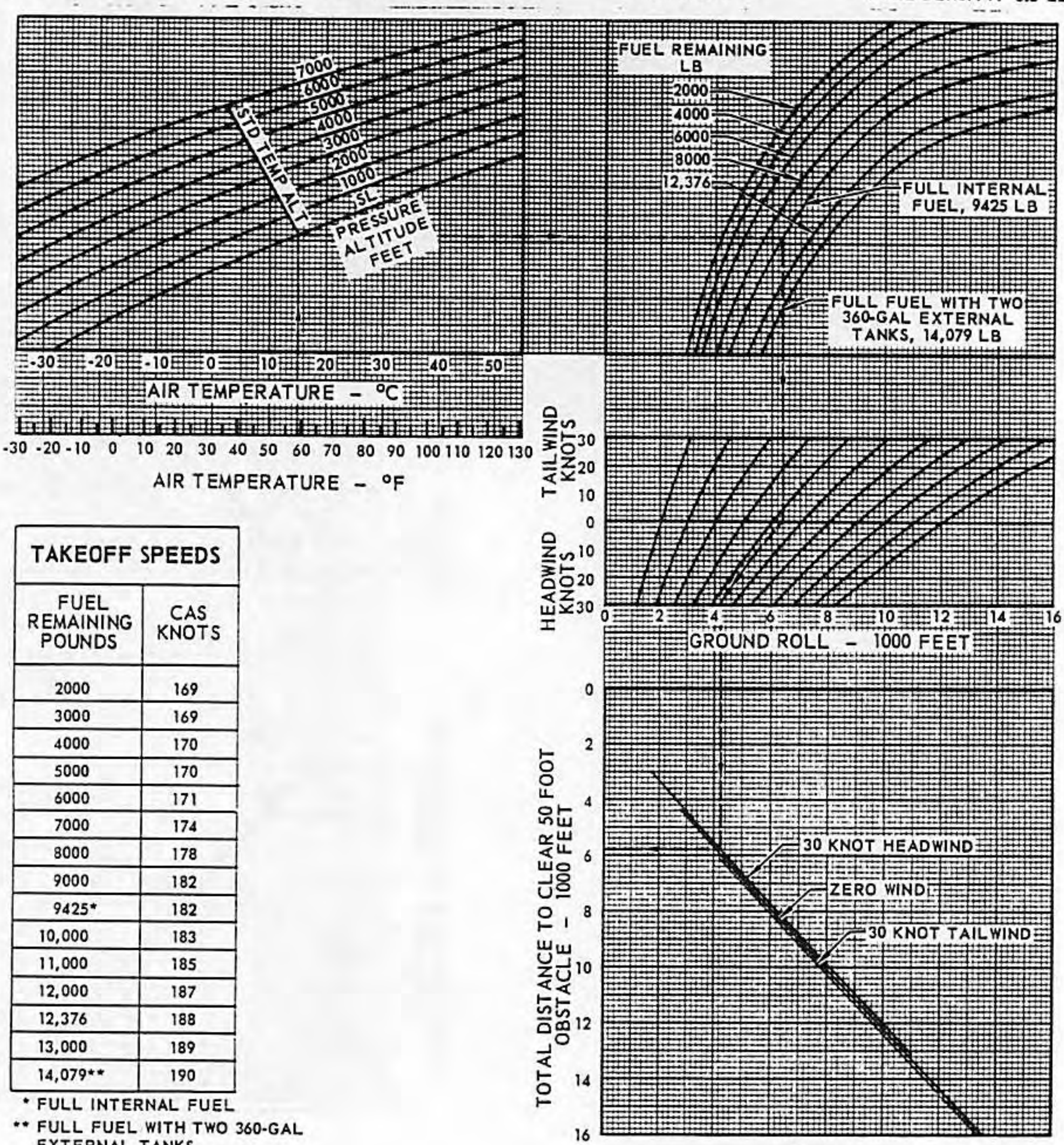
B

TAKEOFF SPEED AND DISTANCE – MILITARY THRUST

MODEL: F-106B
DATE: 21 FEBRUARY 1967
DATA BASIS: FLIGHT TEST

HARD SURFACE RUNWAY
ALL CONFIGURATIONS
ARMAMENT IN

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL



TAKEOFF SPEEDS	
FUEL REMAINING POUNDS	CAS KNOTS
2000	169
3000	169
4000	170
5000	170
6000	171
7000	174
8000	178
9000	182
9425*	182
10,000	183
11,000	185
12,000	187
12,376	188
13,000	189
14,079**	190

* FULL INTERNAL FUEL
** FULL FUEL WITH TWO 360-GAL EXTERNAL TANKS

MILITARY THRUST TAKEOFF TEMP LIMITS – °C		
PRESSURE ALTITUDE FEET	NO EXTERNAL TANKS	WITH TWO 360-GAL EXTERNAL TANKS
7000	9	-15
6000	21	-5
5000	32	5
4000	43	16
3000	55	26
2000	-	38
1000	-	49

NOTES

DATA VALID FOR ALL CONFIGURATIONS EXCEPT ARMAMENT OUT.

FUEL REMAINING CURVES BASED ON A ZERO FUEL WEIGHT OF 28,641 POUNDS (INCLUDING 514 POUNDS FOR EXTERNAL TANKS).

48,234C

Figure 2-6

MAXIMUM ABORT SPEED - MAXIMUM THRUST

MODEL: F-106 A/B
DATE: 9 DECEMBER 1969
DATA BASIS: FLIGHT TEST

ALL CONFIGURATIONS HARD SURFACE RUNWAY ZERO WIND

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

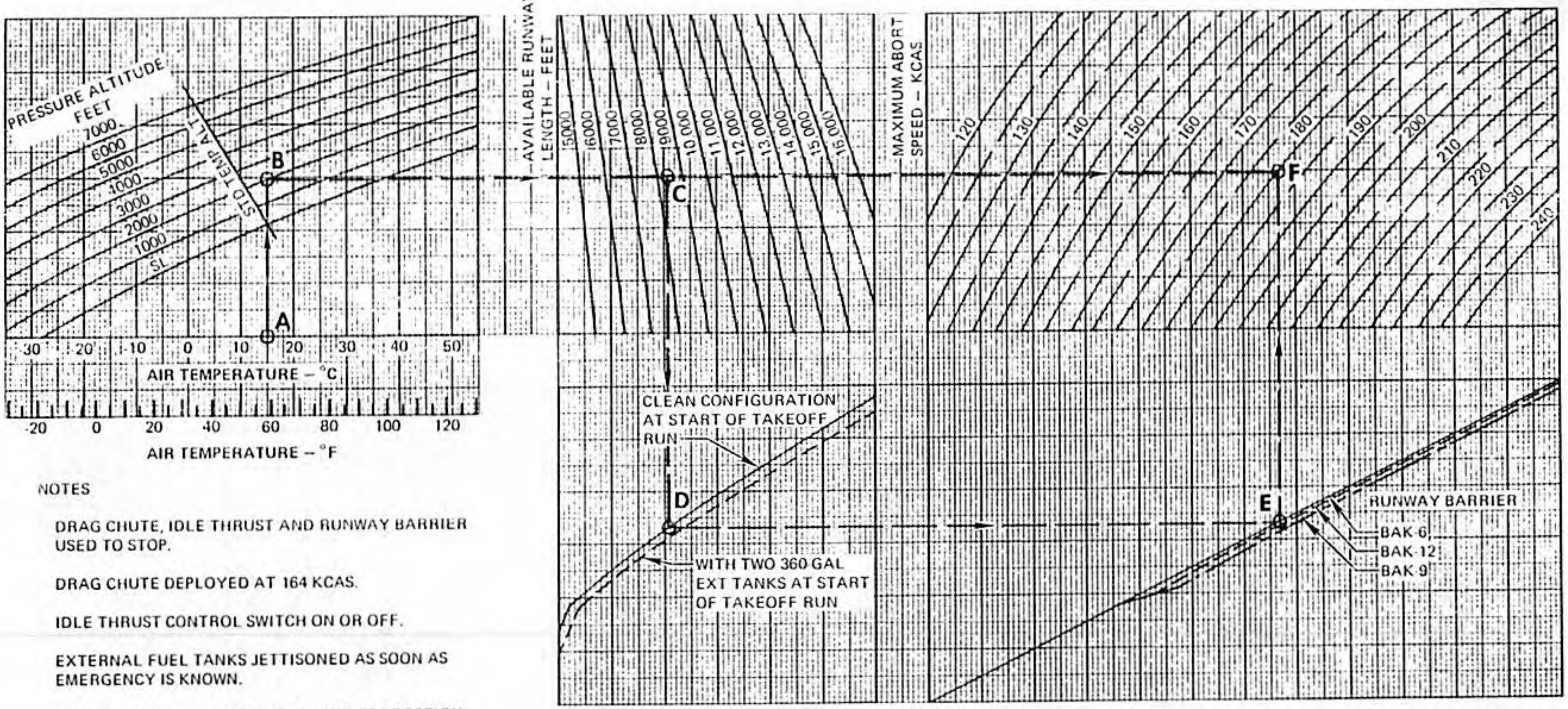


Figure 2-7

NOTES

DRAG CHUTE, IDLE THRUST AND RUNWAY BARRIER USED TO STOP.

DRAG CHUTE DEPLOYED AT 164 KCAS.

IDLE THRUST CONTROL SWITCH ON OR OFF.

EXTERNAL FUEL TANKS JETTISONED AS SOON AS EMERGENCY IS KNOWN.

ADD WIND VELOCITY FOR HEADWIND CORRECTION; SUBTRACT FOR TAILWIND.

DATA VALID FOR BOTH F-106A AND F-106B, BASED ON GROSS WEIGHTS SHOWN BELOW:

	F-106A	F-106B
FULL INTERNAL FUEL + FULL EXTERNAL FUEL + ARMAMENT	41,831 LB	42,720 LB
FULL INTERNAL FUEL + ARMAMENT	36,663 LB	37,552 LB

48,610

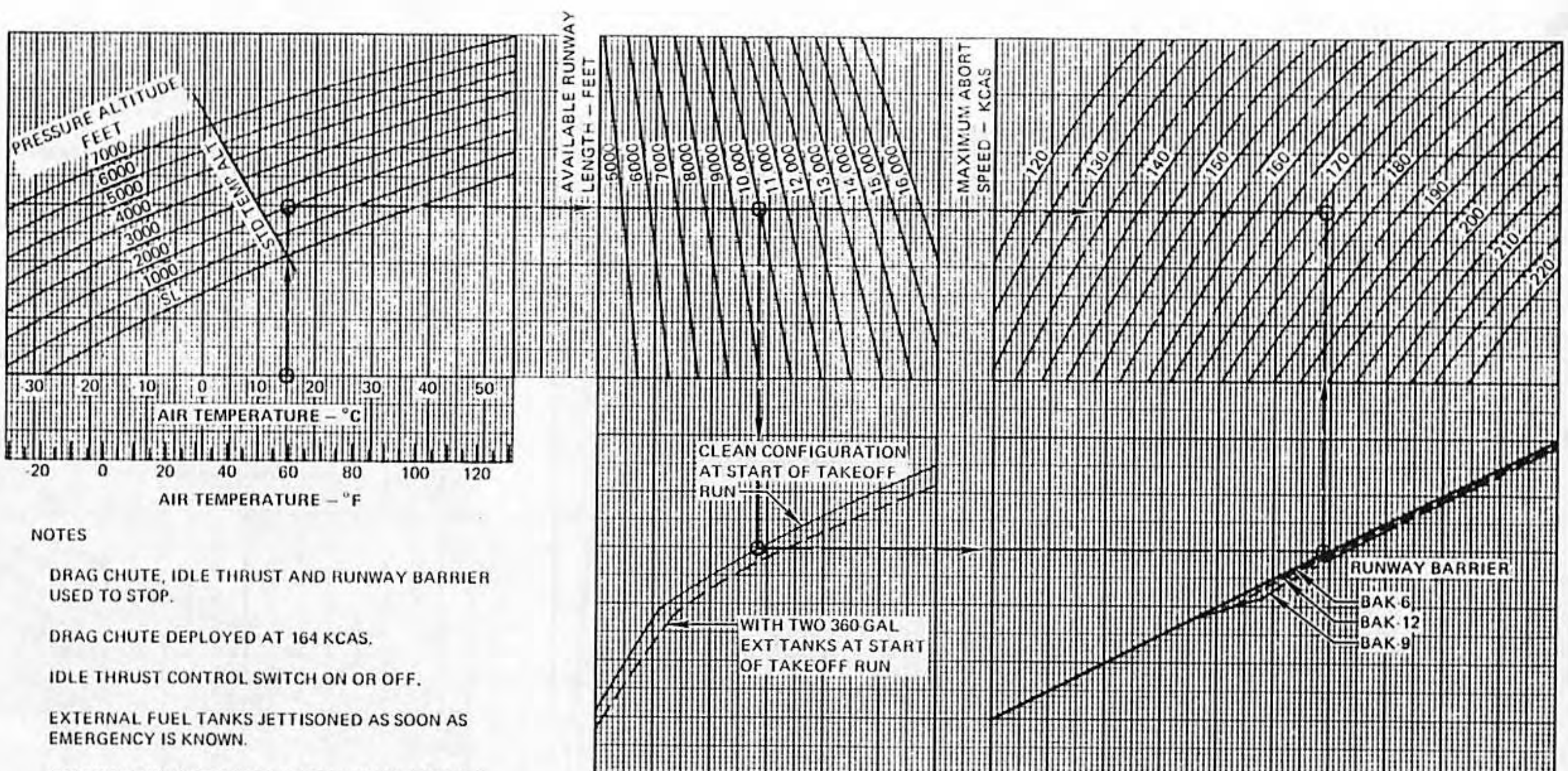
A B

MAXIMUM ABORT SPEED - MILITARY THRUST

MODEL: F-106 A/B
DATE: 9 DECEMBER 1969
DATA BASIS: FLIGHT TEST

ALL CONFIGURATIONS HARD SURFACE RUNWAY ZERO WIND

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL



NOTES

DRAG CHUTE, IDLE THRUST AND RUNWAY BARRIER USED TO STOP.

DRAG CHUTE DEPLOYED AT 164 KCAS.

IDLE THRUST CONTROL SWITCH ON OR OFF.

EXTERNAL FUEL TANKS JETTISONED AS SOON AS EMERGENCY IS KNOWN.

ADD WIND VELOCITY FOR HEADWIND CORRECTION; SUBTRACT FOR TAILWIND.

DATA VALID FOR BOTH F-106A AND F-106B, BASED ON GROSS WEIGHTS SHOWN BELOW:

	F-106A	F-106B
FULL INTERNAL FUEL + FULL EXTERNAL FUEL + ARMAMENT	41,831 LB	42,720 LB
FULL INTERNAL FUEL + ARMAMENT	36,663 LB	37,552 LB

Figure 2-8

48,611

A B

takeoff planning

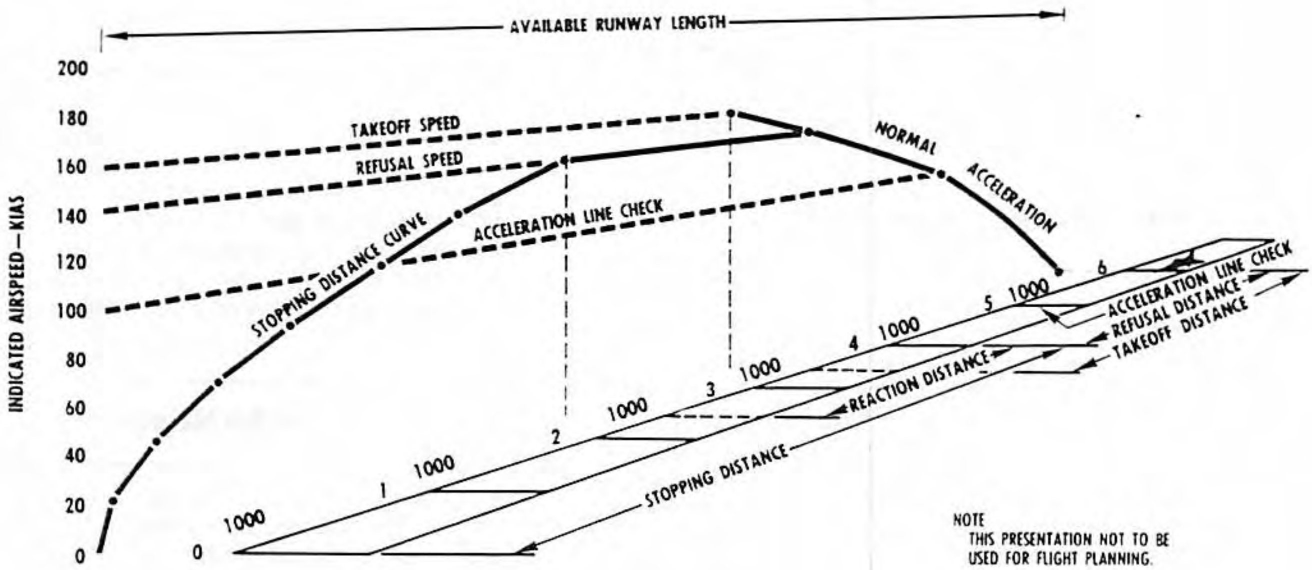


Figure 2-9

Use

To determine the refusal speed, enter the chart at the upper left block with the airplane gross weight and proceed to the right to intersect the pressure altitude line. From this point read down to the ambient temperature line in the block directly below. From this point read to the right along the atmospheric conditions line and intersect the applicable available runway length. At this point read down to the maximum refusal speed. Return to the atmospheric conditions line and continue right to the runway marker line that will be used for an acceleration line check. Read down to the speed that should be attained at this point in the takeoff roll. To determine refusal distance, enter the right block (line check speed) with the refusal speed and read up to a point that intersects the continuation of the atmospheric conditions line. At this point interpolate between the acceleration line check distances for maximum refusal distance.

Sample Problem

Find the maximum refusal speed, the line check speed at the 1000-foot runway marker, and the refusal distance for a 6000-foot runway. Atmospheric conditions are standard at sea level, the airplane gross weight is 35,000 pounds, and the takeoff is to be made with maximum thrust:

A. Enter figure 2-9 with the airplane gross weight—35,000 pounds.

B. Proceed right to intersect the pressure altitude — sea level.

C. Read down to the ambient air temperature — 15°C or 59°F.

D. From the ambient air temperature read right to the available runway length — 6000 feet.
E. Read down to the maximum refusal speed — 130 KCAS.
F. Return to D, then continue right to intersect the desired line check marker — 1000 feet.
G. Read down to the line check speed — 101 KCAS.

To determine the refusal distance:

H. Enter the chart at the line check speed with the refusal speed — 130 KCAS.
I. Read up to the intersection of an extended line from D and F. Interpolate between runway marker lines for refusal distance — 1700 feet.

TAKEOFF PLANNING CHART

The takeoff planning procedures presented in the takeoff speed, takeoff distance, and maximum refusal speed charts are based on runways marked at 1000-foot intervals. The takeoff planning chart (figure 2-9) presents an explanation of the terms used in conjunction with these charts. Acceleration line check speed points are positions along the runway where normal acceleration may be checked. Refusal speed and refusal distance, assuming normal acceleration, are the speeds and distances which can be attained and still stop the airplane in the remaining runway length. All refusal speed and distance data contain reaction time of both the pilot and the applicable airplane systems. Stopping distance is the runway length required to bring the airplane to a safe stop using speed brakes, drag chute, and maximum braking.

TAKEOFF AND LANDING CROSSWIND CHART

The Takeoff and Landing Crosswind Chart (figure 2-10) is used to resolve a surface wind of known velocity and direction into its headwind and crosswind component and to determine the minimum recommended touchdown and the nosewheel liftoff speeds.

1. To resolve a surface wind of known velocity and direction into its headwind and crosswind components, enter the chart on the wind angle line and follow it to the wind velocity circle using maximum gust velocity. Then proceed horizontally to the left scale and read the velocity of the headwind component; then vertically downward and read the velocity of the crosswind component.
2. When the crosswind component falls in the green area of the chart, use the recommended touchdown speeds corrected for gusts (figures 8-1 through 8-4) or the recommended takeoff speeds (figures 2-3 through 2-6).
3. When crosswind component falls in the yellow or light red area of the chart, the minimum nose wheel liftoff speed during takeoff is determined from the table on the chart.

NOTE

- Added caution must be taken in the yellow area due to possible restricted lateral stick movement.
- Operation in the light red area is marginal and not recommended for normal operations.

Compare this minimum speed with the recommended touchdown speeds (figures 8-1 through 8-4; add gust factor if gusts are present) or recommended takeoff speeds (figures 2-3 through 2-6). Use the highest value obtained from this comparison.

WARNING

- If the nose wheel liftoff speed is increased over the recommended takeoff speed, the takeoff distance will be increased over those distances shown in the charts in figures 2-3 through 2-6. Do not exceed tire limit speed (figure 5-3, T.O. 1F-106A-1).
- If the landing touchdown speed is increased over the recommended touchdown speed, the landing distance will be increased over those distances shown in figures 8-1 through 8-4. Do not exceed tire limit speed (figure 5-3, T.O. 1F-106A-1).

4. If the crosswind component falls in the dark red area of the chart, takeoff and landing is not recommended.

WARNING

Takeoffs and landings are not recommended in the dark red area because adequate rudder and elevon control is not available.

Sample Problem

Given: A wind of 25 knots, 45° relative to runway heading.

Determine: The headwind and crosswind components.

A. Enter figure 2-10 on the wind angle line—45°.

B. Proceed to the wind velocity circle—25 knots. Determine that takeoff is recommended.

C. Move horizontally to the left and read the headwind component—18 knots.

D. Move vertically downward and read the crosswind component—18 knots.

Crosswind Takeoff

The minimum nose gear liftoff speed for a given crosswind condition is determined from the Takeoff and Landing Crosswind Chart (figure 2-10).

Sample Problem

Given: A wind of 25 knots, 45° relative to runway heading.

Determine: The headwind and crosswind components and the minimum nose wheel liftoff speed for a maximum internal fuel condition.

A. Enter figure 2-10 on the wind angle line—45°.

B. Proceed to the wind velocity circle—25 knots.

C. Move horizontally to the left and read the headwind component—18 knots (used to obtain takeoff distance from takeoff charts).

D. Move vertically downward to the crosswind component—18 knots.

E. Enter table with crosswind component and read the minimum nose wheel liftoff speed—163 KCAS.

The recommended takeoff speed at sea level, 15°C with maximum thrust at a maximum internal fuel condition is 176 KCAS (figure 2-3). Since the speed found from the takeoff speeds chart is higher, it should be used.

NOTE

If the nose wheel liftoff speed is increased over the recommended takeoff speed, the takeoff distance will be increased over those distances shown in the charts in figures 2-3 through 2-6.

MAXIMUM ABORT SPEED CHARTS

The maximum abort speed charts, for maximum and military thrust are shown in figures 2-7 and 2-8. These charts show the highest speed to which the airplane can be accelerated on a hard-surface runway (or attained in an airborne condition just above the runway following a normal takeoff) and still be stopped in the remaining runway length by engaging a BAK-6, -9, or -12 barrier at the maximum engaging speed. The charts assume normal acceleration and take into account various air temperatures, pressure altitudes and available runway lengths. Two initial loadings are considered: (1) airplane with full internal and external fuel and armament and (2) airplane without external tanks but with full internal fuel and armament. Corrections for wet or icy runway conditions are not required since very little wheel braking is available at speeds equal to or greater than the maximum barrier engagement speeds.

Use

Enter the chart with the ambient air temperature and read up to the pressure altitude. Read horizontally to the right to the available runway length (note the location of the point for later use). Read down to the applicable configuration reference line and proceed horizontally to the right to the applicable runway barrier reference line. Read up to the intersection with a line extended horizontally to the right from the available runway point previously noted. Interpolate between the lines of constant KCAS to obtain the maximum abort speed.

Sample Problem

Find the maximum abort speed for engagement with a BAK-6 barrier located 930 feet from the end of a 9500 foot runway. The airplane has full internal fuel and armament at start of takeoff ground roll and external tanks are not carried. The takeoff roll is started 300 feet from the end of the runway. The pressure altitude is 2000 feet and the ambient air temperature is 15°C. The takeoff is to be made into a ten-knot headwind with the engine operating at maximum thrust.

A. Enter figure 2-7 with the ambient air temperature—15°C.

B. Read up to intersect the pressure altitude—2,000 feet.

C. Proceed right to the available runway length —8,270 feet (mark this point for future use).

The available runway is determined by subtracting the brake release point and the barrier location point from the runway length.

9500 feet - 300 feet - 930 feet = 8270 feet.

D. Read down to the applicable takeoff configuration—clean configuration at start of takeoff run.

E. Proceed right to the applicable runway barrier—BAK-6.

F. Read up to intersection with line extended horizontally from point C and interpolate for maximum abort speed—180 KCAS.

G. Add ten knots for headwind correction.

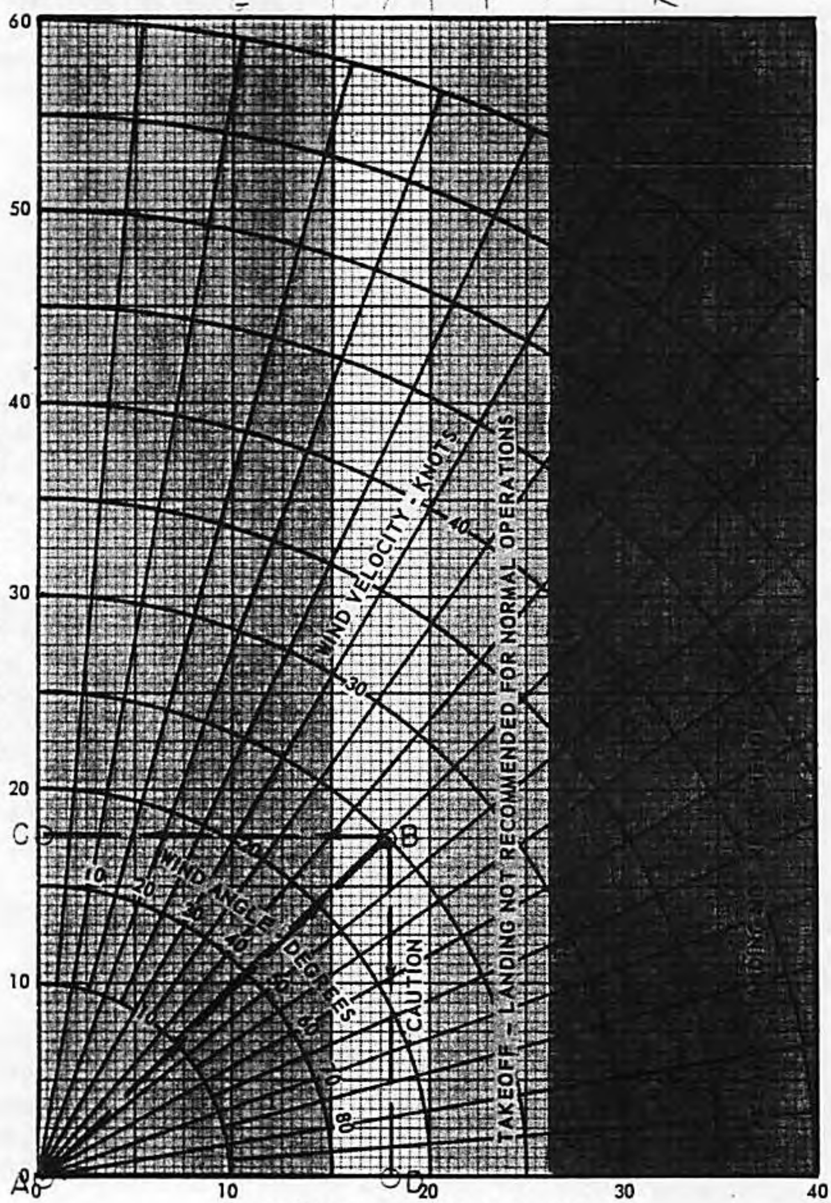
A B

TAKEOFF AND LANDING CROSSWIND CHART

MODEL: F-106A/B
DATE: 27 JUNE 1962
DATA BASIS: ESTIMATED

STANDARD ATMOSPHERE

ENGINE: J75-17



MINIMUM TOUCHDOWN OR NOSEWHEEL LIFTOFF SPEED

CROSSWIND COMPONENT KNOTS	MINIMUM TOUCHDOWN OR NOSEWHEEL LIFTOFF SPEED KNOTS CAS
15	160
16	161
17	162
18	163
19	164
20	165
21	168
22	172
23	177
24	183
25	189
26	195

- USE MINIMUM RECOMMENDED TOUCHDOWN SPEEDS (CORRECTED FOR GUSTS) FOR THE QUANTITY OF FUEL REMAINING.
- COMPARE THE MINIMUM RECOMMENDED TOUCHDOWN SPEED (CORRECTED FOR GUSTS) FOR THE QUANTITY OF FUEL REMAINING, WITH THE TOUCHDOWN SPEED FOR THE CROSSWIND COMPONENT AND USE THE HIGHER SPEED.
- NOT RECOMMENDED FOR NORMAL OPERATIONS.
- NOT RECOMMENDED.

NOTES

- ENTER CHART WITH MAXIMUM GUST VELOCITY.
- REFER TO SECTION V FOR TIRE LIMIT SPEEDS.

WARNING

- ANTICIPATE RESTRICTED LATERAL CONTROL STICK MOVEMENT.
- LANDING WITH A CROSSWIND COMPONENT OF 15 KNOTS, OR ABOVE, IS NOT RECOMMENDED WHEN WEARING A FULL PRESSURE SUIT, ANTI-EXPOSURE SUIT, OR HEAVY WINTER FLYING CLOTHES.

48.237C

Figure 2-10

SECTION III
CLIMB

TABLE OF CONTENTS

CLIMB

Figures 3-1 through 3-4 present the subsonic climb performance of the clean airplane using maximum thrust and military thrust respectively. Figures 3-5 through 3-8 show climb performance with 360-gallon external tanks installed. These charts show time to climb and distance to climb as a function of gross weight. Gross weight-guide lines represent the weight reduction as fuel is used in the climb. The recommended climb schedule is shown in table form on each chart. This climb schedule allows a constant altitude acceleration from takeoff to 400 KCAS; climb at 400 KCAS until reaching the 0.92 Mach number; then climb to altitude at constant 0.92 Mach number.

NOTE

The acceleration from takeoff to 400 KCAS may be a climbing acceleration for terrain clearance. For good acceleration characteristics, the airplane attitude angle should not exceed 15° with maximum thrust and 10° with military thrust after accelerating in level flight to a speed at which the airplane attitude may be sustained without sinking.

Use

To obtain time, distance, and fuel to climb: enter the chart with the gross weight and altitude at the start of the climb. Follow parallel to the nearest gross weight guide line up to the altitude at end of the climb. Then read directly down to the gross weight scale for the gross weight at end of climb, to the left for distance in climb, and to the right for time to climb. The difference between the initial gross weight and the gross weight at end of climb is the fuel used. The figures obtained must then be corrected for temperature variation if a difference exists between actual and standard day conditions. Multiply each percent correction per degree (found in table on the chart) by the number of degrees variation from standard to obtain the percentage correction. Then multiply the percentage correction by the value for time, distance, or fuel to obtain the correction factor. Add or subtract (as applicable) the correction factor to the value for time, distance, or fuel.

NOTE

Add the correction factor when the temperature is above standard, and subtract one-half the correction factor when temperature is below standard.

Sample Problem

Find the time, distance, and fuel used for a maximum thrust climb to an altitude of 35,000 feet immediately after takeoff at 250 KCAS. A temperature variation of -20°C from standard exists.

A. Enter figure 3-1 with initial gross weight—33,325 pounds.
B. Is initial altitude—sea level.
C. Is initial distance—0.5 nautical miles.
D. Is initial time—0.2 minutes.
E. Is final altitude—35,000 feet.
F. Is final gross weight—31,850 pounds.
G. Is final distance—17.0 nautical miles.
H. Is final time—2.4 minutes.

A-F. Total fuel used (standard day) (33,325 −31,850) =1475 pounds. Total fuel used (standard day −20°C) =1475 pounds minus (.0059 × 20°C × 1475 lbs ÷ 2) = 1388 pounds.

G-C. Total distance traveled (standard day) (17.0 −0.5) = 16.5 nautical miles. Total distance traveled (standard day −20°C) = 16.5 nautical miles minus (.013 × 20°C × 16.5 n.mi. ÷ 2) = 14.4 nautical miles.

H-D. Total time to climb (standard day) (2.4 −0.2) = 2.2 minutes. Total time to climb (standard day −20°C) = 2.2 minutes minus (.009 × 20°C × 2.2 min. ÷ 2) = 2.0 minutes.

MODEL: F-106A
DATE: 17 DECEMBER 1962
DATA BASIS: FLIGHT TEST

CLIMB - MAXIMUM THRUST

CONFIGURATION: CLEAN   STANDARD ATMOSPHERE

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

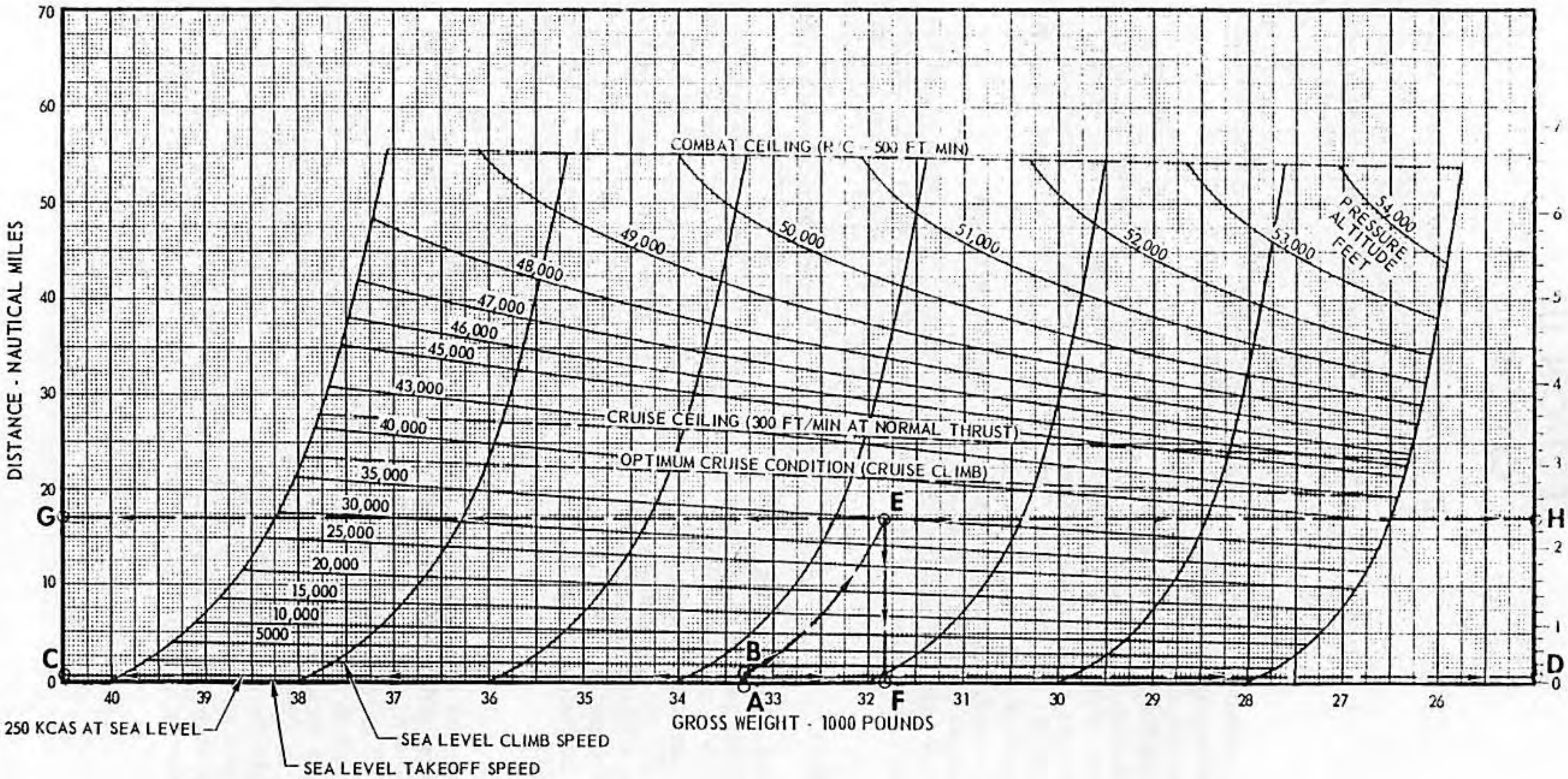


Figure 3-1

CLIMB SCHEDULE			
PRESSURE ALTITUDE FEET	TRUE MACH NUMBER	TAS KNOTS	CAS KNOTS
55,000	0.92	528	201
50,000	0.92	528	225
45,000	0.92	528	253
40,000	0.92	528	284
35,000	0.92	530	318
30,000	0.92	542	352
25,000	0.92	554	392
20,000	0.85	522	400
15,000	0.78	488	400
10,000	0.71	456	400
5000	0.66	426	400
SL	0.61	401	400

PERCENT CORRECTION PER DEGREE TEMPERATURE VARIATION, ABOVE STANDARD TEMPERATURE		
	°F	°C
TIME	0.50	0.90
DISTANCE	0.72	1.30
FUEL	0.33	0.59

NOTE

ADD THE INDICATED CORRECTION WHEN TEMPERATURE IS ABOVE STANDARD, AND SUBTRACT ONE-HALF OF THE INDICATED CORRECTION WHEN TEMPERATURE IS BELOW STANDARD.

A

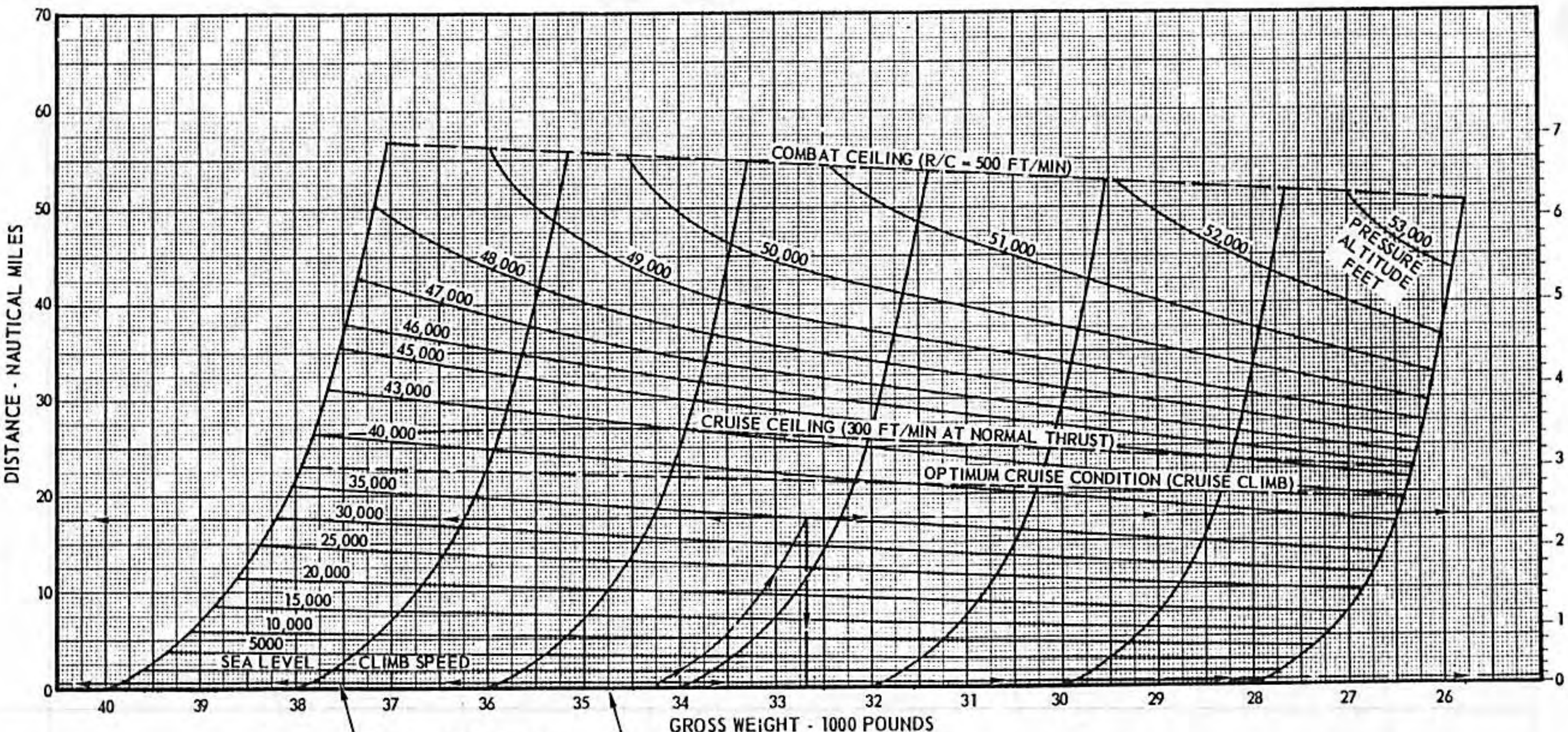
48,122G

CLIMB - MAXIMUM THRUST

MODEL: F-106B
DATE: 17 DECEMBER 1962
DATA BASIS: FLIGHT TEST

CONFIGURATION: CLEAN   STANDARD ATMOSPHERE

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL



CLIMB SCHEDULE			
PRESSURE ALTITUDE FEET	TRUE MACH NUMBER	TAS KNOTS	CAS KNOTS
55,000	0.92	528	201
50,000	0.92	528	225
45,000	0.92	528	253
40,000	0.92	528	284
35,000	0.92	530	318
30,000	0.92	542	352
25,000	0.92	554	392
20,000	0.85	522	400
15,000	0.78	488	400
10,000	0.71	456	400
5000	0.66	426	400
SL	0.61	401	400

PERCENT CORRECTION PER DEGREE TEMPERATURE VARIATION, ABOVE STANDARD TEMPERATURE		
	°F	°C
TIME	0.50	0.90
DISTANCE	0.72	1.30
FUEL	0.33	0.59

NOTE

ADD THE INDICATED CORRECTION WHEN TEMPERATURE IS ABOVE STANDARD, AND SUBTRACT ONE-HALF OF THE INDICATED CORRECTION WHEN TEMPERATURE IS BELOW STANDARD.

48,239A

Figure 3-2

B

MODEL: F-106A
DATE: 17 DECEMBER 1962
DATA BASIS: FLIGHT TEST

CLIMB - MILITARY THRUST

CONFIGURATION: CLEAN   STANDARD ATMOSPHERE

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

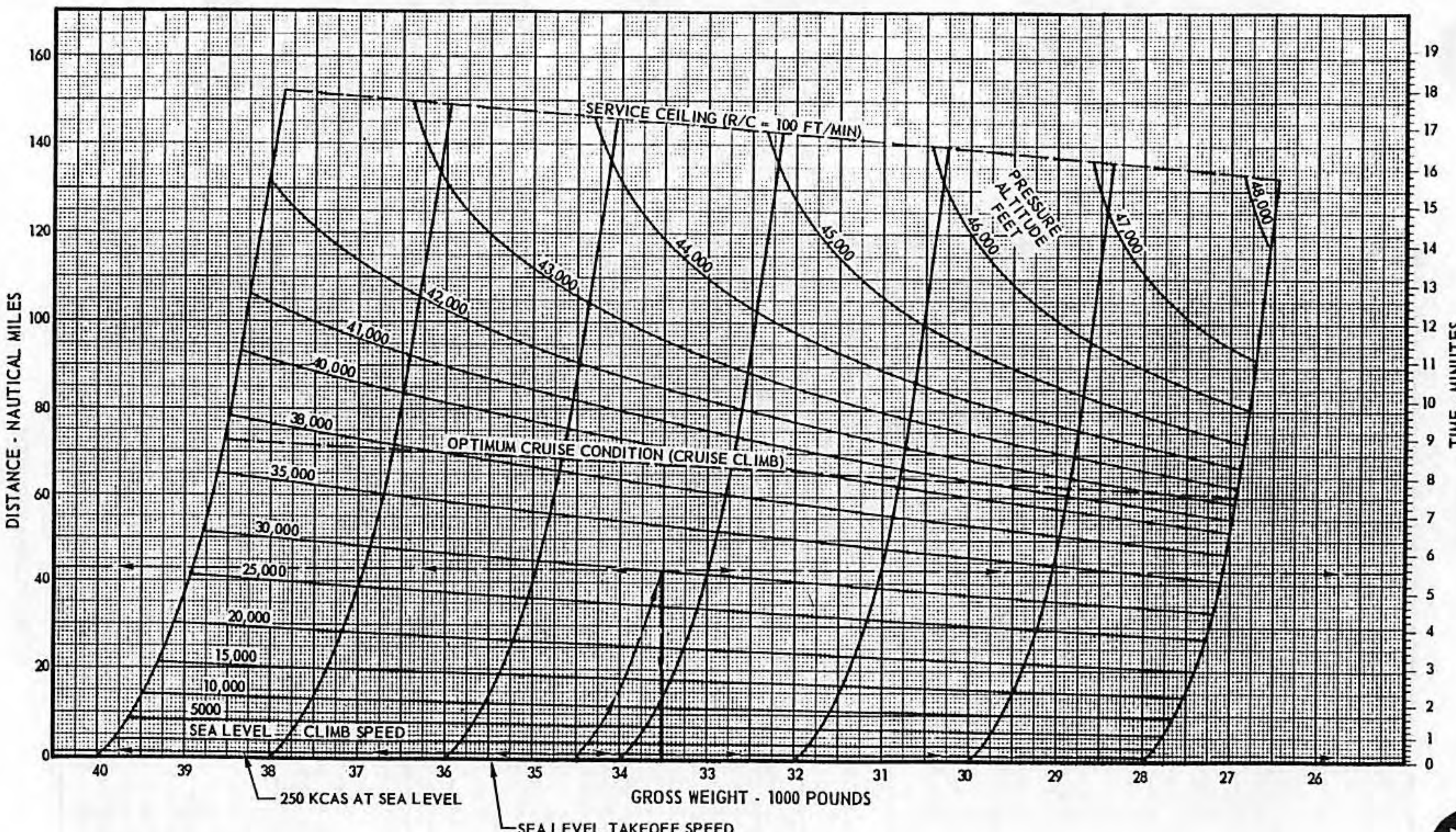


Figure 3-3

CLIMB SCHEDULE			
PRESSURE ALTITUDE FEET	TRUE MACH NUMBER	TAS KNOTS	CAS KNOTS
55,000	0.92	528	201
50,000	0.92	528	225
45,000	0.92	528	253
40,000	0.92	528	284
35,000	0.92	530	318
30,000	0.92	542	352

CLIMB SCHEDULE			
PRESSURE ALTITUDE FEET	TRUE MACH NUMBER	TAS KNOTS	CAS KNOTS
25,000	0.92	554	392
20,000	0.85	522	400
15,000	0.78	488	400
10,000	0.71	456	400
5000	0.66	426	400
SL	0.61	401	400

PERCENT CORRECTION PER DEGREE TEMPERATURE VARIATION, ABOVE STANDARD TEMPERATURE		
	°F	°C
TIME	1.06	1.91
DISTANCE	1.17	2.10
FUEL	0.75	1.35

NOTE

ADD THE INDICATED CORRECTION WHEN TEMPERATURE IS ABOVE STANDARD, AND SUBTRACT ONE-HALF OF THE INDICATED CORRECTION WHEN TEMPERATURE IS BELOW STANDARD.

A

48,123F

CLIMB - MILITARY THRUST

MODEL: F-106B
DATE: 17 DECEMBER 1962
DATA BASIS: FLIGHT TEST

CONFIGURATION: CLEAN   STANDARD ATMOSPHERE

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

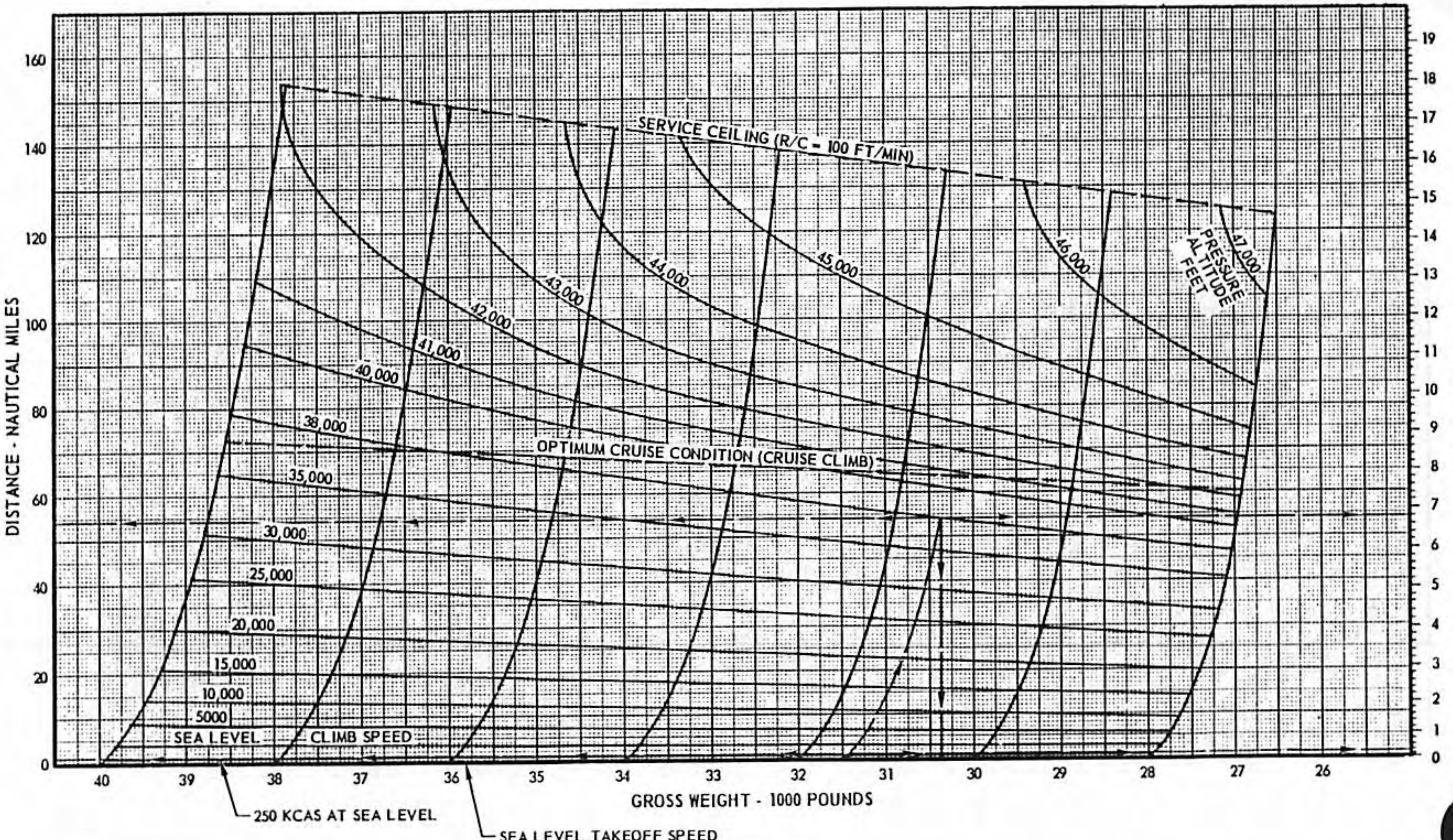


Figure 3-4

CLIMB SCHEDULE			
PRESSURE ALTITUDE FEET	TRUE MACH NUMBER	TAS KNOTS	CAS KNOTS
55,000	0.92	528	201
50,000	0.92	528	225
45,000	0.92	528	253
40,000	0.92	528	284
35,000	0.92	530	318
30,000	0.92	542	352

CLIMB SCHEDULE			
PRESSURE ALTITUDE FEET	TRUE MACH NUMBER	TAS KNOTS	CAS KNOTS
25,000	0.92	554	392
20,000	0.85	522	400
15,000	0.78	488	400
10,000	0.71	456	400
5000	0.66	426	400
SL	0.61	401	400

PERCENT CORRECTION PER DEGREE TEMPERATURE VARIATION, ABOVE STANDARD TEMPERATURE		
	°F	°C
TIME	1.06	1.91
DISTANCE	1.17	2.10
FUEL	0.75	1.35

NOTE

ADD THE INDICATED CORRECTION WHEN TEMPERATURE IS ABOVE STANDARD, AND SUBTRACT ONE-HALF OF THE INDICATED CORRECTION WHEN TEMPERATURE IS BELOW STANDARD.

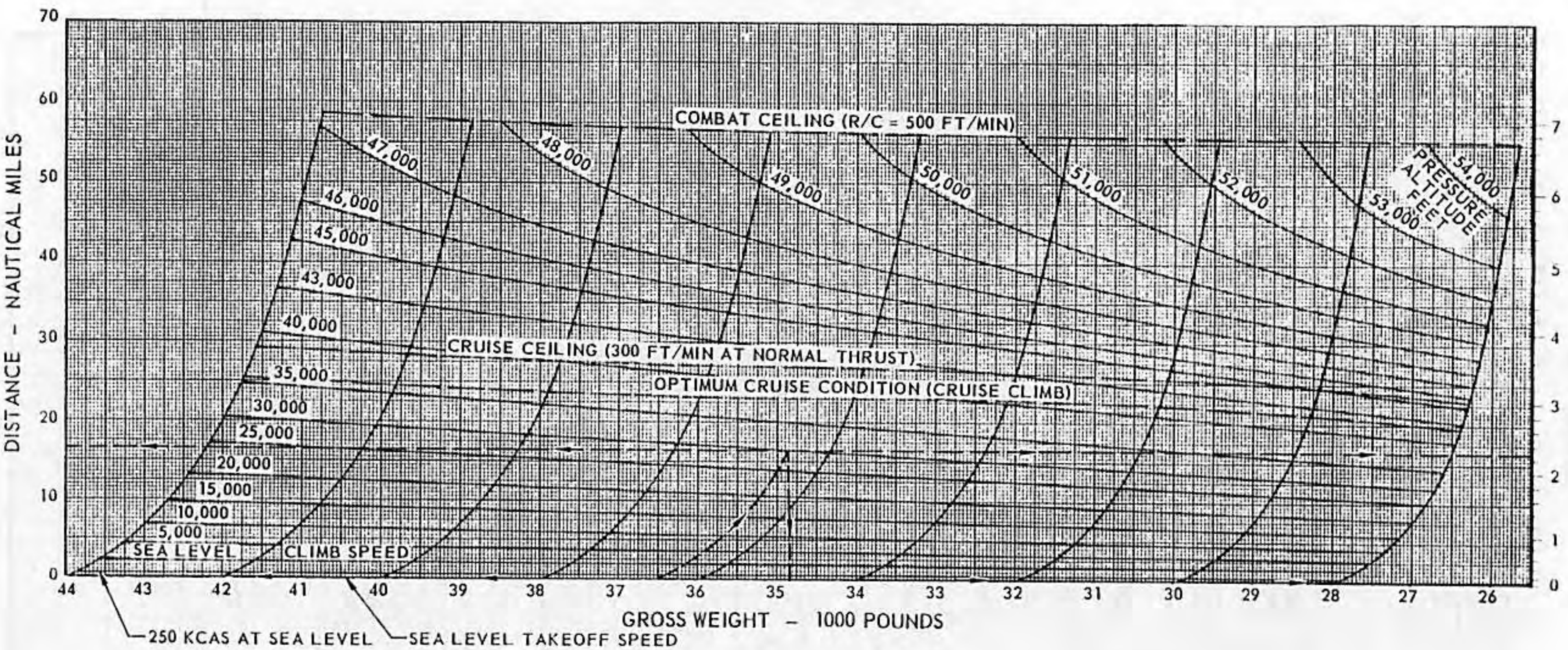
48,240 A

MODEL: F-106A
DATE: 21 FEBRUARY 1967
DATA BASIS: FLIGHT TEST

CLIMB – MAXIMUM THRUST

CONFIGURATION: TWO 360-GALLON EXTERNAL TANKS
STANDARD ATMOSPHERE

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL



CLIMB SCHEDULE			
PRESSURE ALTITUDE FEET	TRUE MACH NUMBER	TAS KNOTS	CAS KNOTS
55,000	0.92	528	201
50,000	0.92	528	225
45,000	0.92	528	253
40,000	0.92	528	284
35,000	0.92	530	318
30,000	0.92	542	352
25,000	0.92	554	392
20,000	0.85	522	400
15,000	0.78	488	400
10,000	0.71	456	400
5,000	0.66	426	400
SL	0.61	400	400

PERCENT CORRECTION PER DEGREE TEMPERATURE VARIATION, ABOVE STANDARD TEMPERATURE	°F	°C
TIME	0.50	0.90
DISTANCE	0.72	1.30
FUEL	0.33	0.59

NOTE

ADD THE INDICATED CORRECTION WHEN TEMPERATURE IS ABOVE STANDARD, AND SUBTRACT ONE-HALF OF THE INDICATED CORRECTION WHEN TEMPERATURE IS BELOW STANDARD.

A

48,534

Figure 3-5

CLIMB – MAXIMUM THRUST

CONFIGURATION: TWO 360-GALLON EXTERNAL TANKS

STANDARD ATMOSPHERE

MODEL: F-106B
DATE: 21 FEBRUARY 1967
DATA BASIS: FLIGHT TEST

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

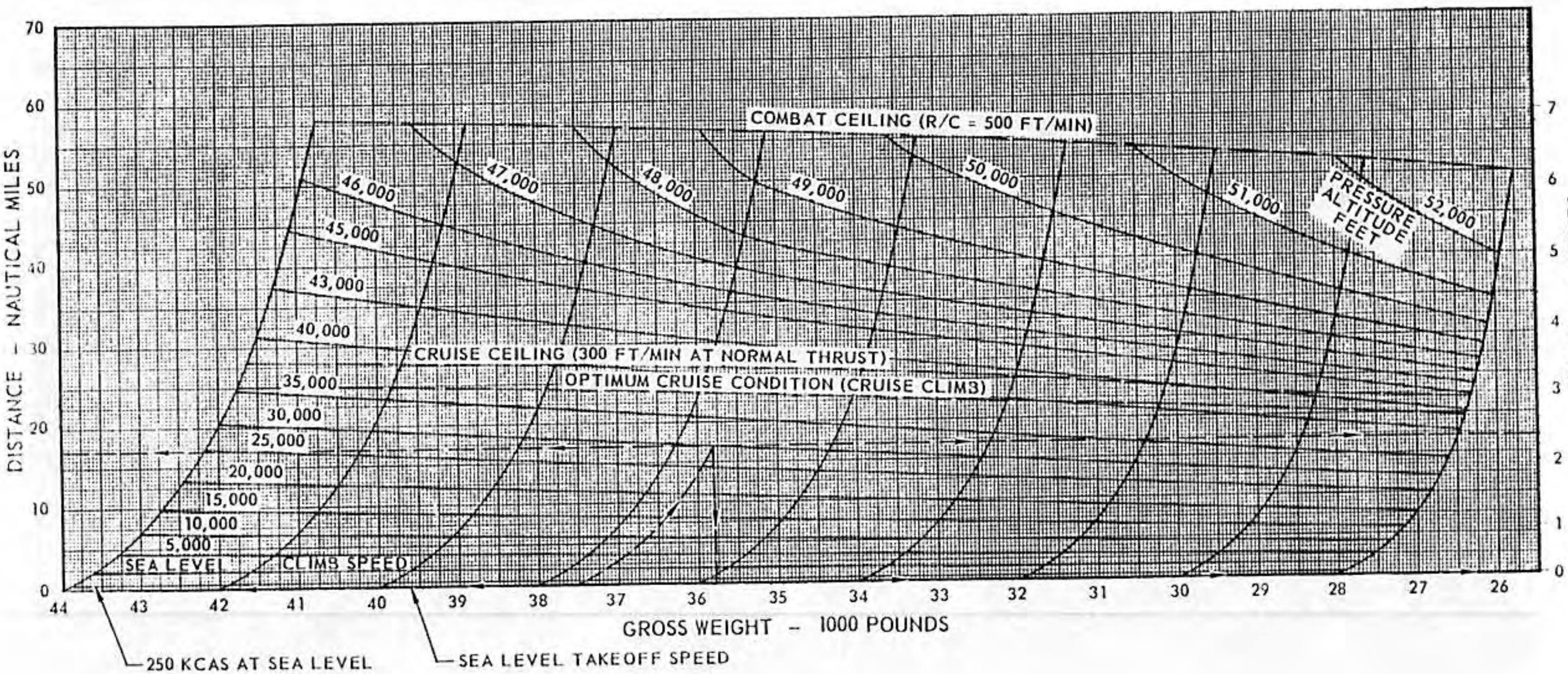


Figure 3-6

CLIMB SCHEDULE			
PRESSURE ALTITUDE FEET	TRUE MACH NUMBER	TAS KNOTS	CAS KNOTS
55,000	0.92	528	201
50,000	0.92	528	225
45,000	0.92	528	253
40,000	0.92	528	284
35,000	0.92	530	318
30,000	0.92	542	352
25,000	0.92	554	392
20,000	0.85	522	400
15,000	0.78	488	400
10,000	0.71	456	400
5,000	0.66	426	400
SL	0.61	400	400

PERCENT CORRECTION PER DEGREE TEMPERATURE VARIATION, ABOVE STANDARD TEMPERATURE		
	°F	°C
TIME	0.50	0.90
DISTANCE	0.72	1.30
FUEL	0.33	0.59

NOTE

ADD THE INDICATED CORRECTION WHEN TEMPERATURE IS ABOVE STANDARD, AND SUBTRACT ONE-HALF OF THE INDICATED CORRECTION WHEN TEMPERATURE IS BELOW STANDARD.

B

48,535

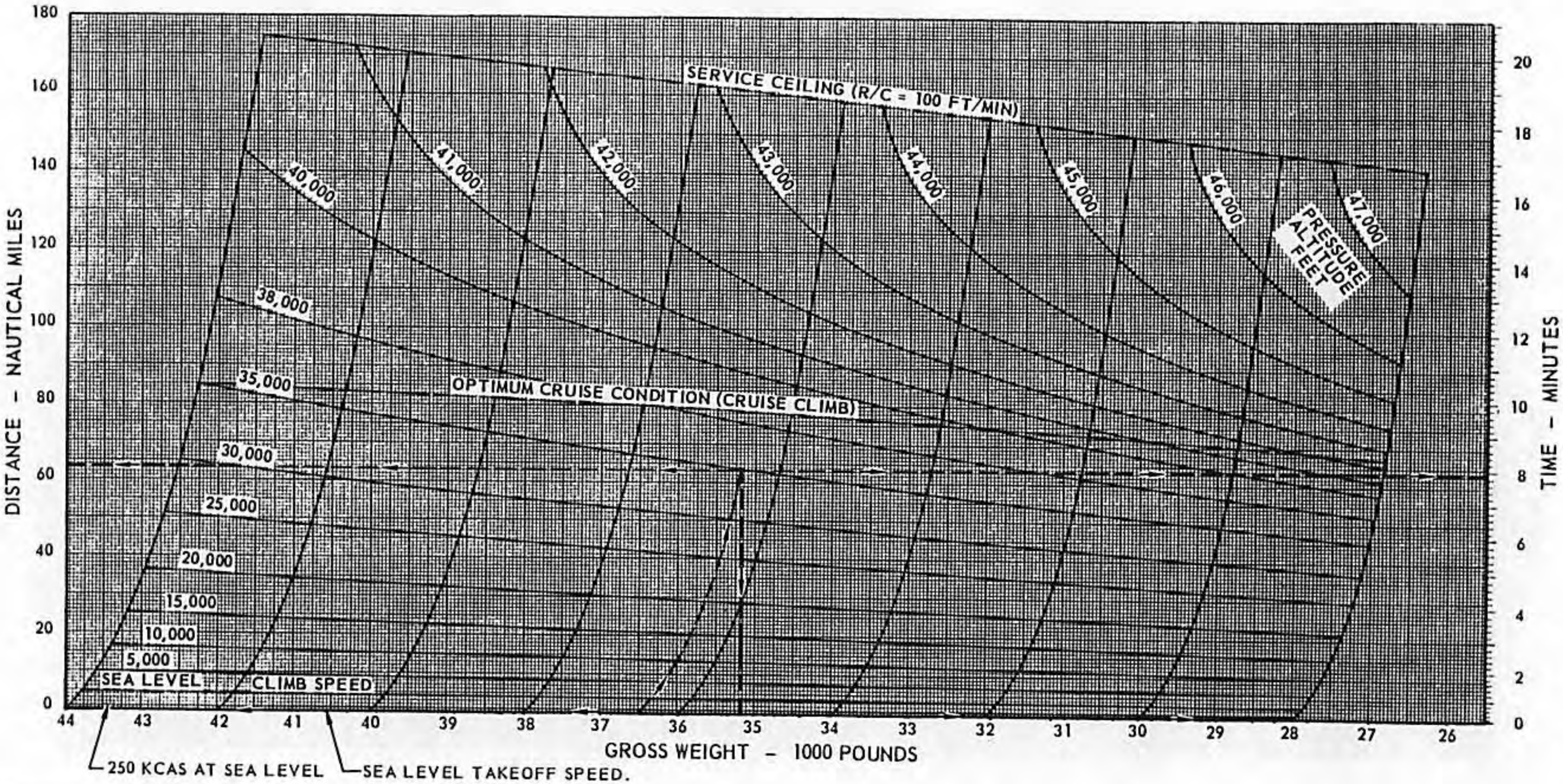
CLIMB – MILITARY THRUST

CONFIGURATION: TWO 360-GALLON EXTERNAL TANKS

STANDARD ATMOSPHERE

MODEL: F-106A
DATE: 21 FEBRUARY 1967
DATA BASIS: FLIGHT TEST

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL



CLIMB SCHEDULE			
PRESSURE ALTITUDE FEET	TRUE MACH NUMBER	TAS KNOTS	CAS KNOTS
55,000	0.92	528	201
50,000	0.92	528	225
45,000	0.92	528	253
40,000	0.92	528	284
35,000	0.92	530	318
30,000	0.92	542	352

CLIMB SCHEDULE			
PRESSURE ALTITUDE FEET	TRUE MACH NUMBER	TAS KNOTS	CAS KNOTS
25,000	0.92	554	392
20,000	0.85	522	400
15,000	0.78	488	400
10,000	0.71	456	400
5,000	0.66	426	400
SL	0.61	400	400

PERCENT CORRECTION PER DEGREE TEMPERATURE VARIATION, ABOVE STANDARD TEMPERATURE		
	°F	°C
TIME	1.06	1.91
DISTANCE	1.17	2.10
FUEL	0.75	1.35

NOTE

ADD THE INDICATED CORRECTION WHEN TEMPERATURE IS ABOVE STANDARD, AND SUBTRACT ONE-HALF OF THE INDICATED CORRECTION WHEN TEMPERATURE IS BELOW STANDARD.

A

48,536

Figure 3-7

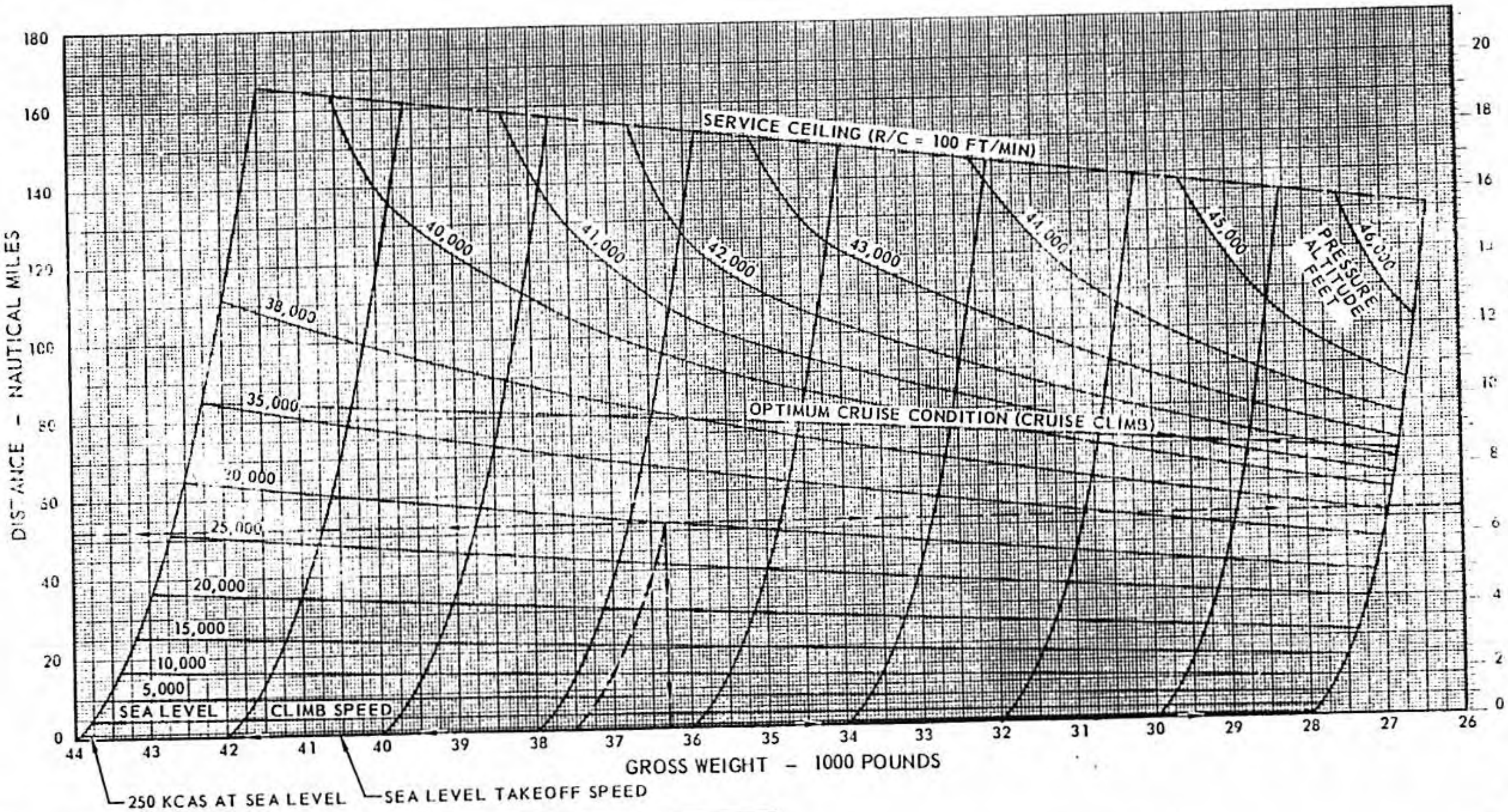
CLIMB – MILITARY THRUST

CONFIGURATION: TWO 360-GALLON EXTERNAL TANKS

STANDARD ATMOSPHERE

MODEL: F-106B
DATE: 21 FEBRUARY 1967
DATA BASIS: FLIGHT TEST

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL



CLIMB SCHEDULE			
PRESSURE ALTITUDE FEET	TRUE MACH NUMBER	TAS KNOTS	CAS KNOTS
55,000	0.92	528	201
50,000	0.92	528	225
45,000	0.92	528	253
40,000	0.92	528	284
35,000	0.92	530	318
30,000	0.92	542	352

CLIMB SCHEDULE			
PRESSURE ALTITUDE FEET	TRUE MACH NUMBER	TAS KNOTS	CAS KNOTS
25,000	0.92	554	392
20,000	0.85	522	400
15,000	0.78	488	400
10,000	0.71	456	400
5,000	0.66	426	400
SL	0.61	400	400

PERCENT CORRECTION PER DEGREE TEMPERATURE VARIATION, ABOVE STANDARD TEMPERATURE		
	°F	°C
TIME	1.06	1.91
DISTANCE	1.17	2.10
FUEL	0.75	1.35

NOTE

ADD THE INDICATED CORRECTION WHEN TEMPERATURE IS ABOVE STANDARD, AND SUBTRACT ONE-HALF OF THE INDICATED CORRECTION WHEN TEMPERATURE IS BELOW STANDARD.

48,537

Figure 3-8

B

SECTION IV
RANGE

TABLE OF CONTENTS

MISSION PROFILE

Mission profile charts are shown for the clean airplane in figures 4-1 and 4-2, for the airplane carrying external fuel tanks in figures 4-3 and 4-4, and for the airplane with the external fuel tanks dropped when empty in figures 4-5 and 4-6. These charts give the time and fuel required to fly a given air distance or, conversely, for a given fuel the distance that could be covered at any cruising altitude from sea level to the optimum cruise (cruise-climb) altitude. The flight sequence of the mission profile consists of takeoff, climb to cruise altitude with military thrust, and cruise at maximum range cruise conditions. The fuel reference lines include a fuel allowance adequate for normal ground operation, takeoff and acceleration to 400 KCAS. No distance or time credit is given to this phase of the mission. The time ticks on the climb path show the time to climb to any altitude. Each profile chart includes tabulated data concerning recommended speeds for both climb and cruise. To further aid in cruise control, approximate initial and final values of cruise fuel flow are tabulated along with the cruise speeds. The performance shown in these charts is based on standard atmospheric conditions with no wind effects. Wind effects may be applied to the profile to obtain the approximate fuel and time required to fly a given ground distance.

Use

The fuel and time required to fly a given air distance at a specified altitude are determined by entering the chart with the desired air distance, reading up to the specified altitude, and interpolating (if necessary) between reference lines for fuel and time. Given a specific fuel quantity, the reverse procedure may be used to determine the air distance. For a given fuel quantity the maximum available range is obtained by locating the fuel quantity available for the flight (total fuel quantity less desired fuel reserve for loiter, descent and landing) on the fuel reference lines (interpolating if necessary), then following the fuel reference line to the altitude at which the air distance is a maximum. The reverse procedure is used to find the minimum fuel required to fly a given air distance. To obtain the fuel and time required to fly a given ground distance with head or tail winds, correct the ground distance to an equivalent air distance and use this distance in the chart. The recommended procedure for wind correction is as follows:

1. Compute average true airspeed (distance ÷ time with zero wind conditions).
2. Apply wind to obtain ground speed (subtract headwind; add tailwind).
3. Compute time with wind effect (ground distance ÷ ground speed with wind).
4. Compute the equivalent air distance (multiply the time with wind effect by the average true airspeed).
5. Enter the profile at the cruise altitude and equivalent air distance and interpolate for fuel required.

Sample Problem

Find the minimum fuel and the time required to fly a distance of 850 nautical miles with no wind. The airplane is loaded with full internal fuel plus 360-gallon external tanks, making a total fuel load of 14,495 pounds. (Takeoff gross weight is 41,831 pounds.) The external fuel tanks are to be dropped when empty:

A. Enter figure 4-5 with the air distance—850 nautical miles.

B. Read up to the altitude desired for cruise, interpolate for fuel required (8375 pounds), and for elapsed time from start of climb (1 hours:48 minutes).

To obtain this range, the mission profile would be flown with a military thrust climb to the desired cruise altitude (26,750 feet) following takeoff. Cruise out interpolating between speeds indicated in cruise table for two 360-gallon external fuel tanks. When the external fuel tanks are empty and dropped at approximately 260 nautical miles, the cruise is set up according to the table for cruise with the clean configuration.

INTERCEPT PROFILE CHART

The intercept profile chart for the clean airplane is shown in figures 4-7 and 4-8, and for the airplane carrying external tanks in figures 4-9 and 4-10. This profile is similar to the mission profile with the exception that maximum thrust is used for the climb and military thrust is used for the cruise. Whereas the mission profile is used for missions requiring maximum range, the intercept profile should be restricted to missions that require minimum time.

Use

Mission planning with the intercept profile is the same as with the mission profile.

OPTIMUM RETURN PROFILE

The optimum return profiles are shown in figures 4-11 and 4-12 for the clean airplane or with external tanks dropped when empty and in figures 4-13 and 4-14 for the airplane carrying two external fuel tanks. These profiles indicate the minimum fuel required to fly a given air distance; or conversely, the maximum distance that can be flown with a given amount of fuel remaining at any given altitude. The return flight path requires a military thrust climb, from lower altitudes, to the optimum return altitude and either a cruise-climb or a constant altitude cruise as required. For short range returns or low fuel quantities, the return is made at the intial altitude. The recommended return flight paths are indicated on the charts by different shaded areas and notes. Operating conditions for climb and cruise are shown in the tables along with the profile.

NOTE

Fuel required for loiter, descent or landing is not included in these profiles.

Use

To use the charts, enter the respective chart at the desired return distance, read up to the initial airplane altitude and interpolate for the fuel required to return. The desired fuel reserves must be added to the fuel required. If the chart is entered with the fuel available for return at the initial airplane altitude, read down for the return distance. In this case, the fuel reserve must be subtracted from the total fuel available before entering the chart. Wind effects are computed in the same manner as discussed under the mission profiles.

Sample Problem

Find the fuel required to return a distance of 825 nautical miles. The airplane is carrying 360-gallon external fuel tanks and is initially at an altitude of 13,300 feet. It is desired that 1000 pounds of fuel be retained for descent to the base and landing:

A. Enter figure 4-13 at the return distance—825 nautical miles.
B. Read up to the initial altitude—13,300 feet.
C. Read the fuel required for return (interpolate if necessary)—5350 pounds. Add required reserve fuel to the return fuel to get total fuel required (example: 1000 pounds reserve = 6350 pounds).

The flight path would be as follows:

1. Climb with military thrust to cruise altitude (approximately 40,000 feet)—use schedule as indicated in the climb table.
2. Cruise-climb to destination—use cruise table.
3. Descend to base and land.

OPTIMUM RETURN TABULAR DATA

Optimum return data are shown in tabular form in figures 4-15 and 4-16 for clean airplanes and figures 4-17 and 4-18 for airplanes with external tanks. These tables indicate the minimum fuel required to fly a given air distance or, conversely, the maximum distance that can be flown with a given amount of fuel remaining at any given altitude. Operating conditions for climb and cruise are shown in notes and tables on these figures.

NOTE

Fuel reserves for loiter, descent, and landing are not included in these tables. The data are based on zero fuel over the landing base.

Use

Entering the charts at the initial altitude, read across to the column which corresponds to the distance to be flown. Read the appropriate blocks to determine fuel required for return with or without climb and the optimum altitude for return.

Sample Problem

Find the fuel required to return a distance of 200 nautical miles. The airplane is an F-106B with 360-gallon external tanks and is initially at an altitude of 20,000 feet. A fuel reserve of 1000 pounds is desired for descent and landing.

A. Enter figure 4-18 at 20,000 feet initial altitude.

B. Read across to the 200 NM column.

C. Read fuel required for optimum return with climb = 1460 pounds (minimum). Adding fuel reserve of 1000 pounds = 2460 pounds (minimum) fuel required. Note that, without climb, fuel required for return would be 1720 + 1000 (reserve) = 2720 pounds (minimum).

D. Read optimum altitude = 37,500 feet.

Flight path would be military thrust climb (400 KCAS to Mach .92—then Mach .92) to 37,500 feet. Establish cruise at approximately Mach .87 (see cruise table) and cruise to destination.

NAUTICAL MILES PER 1000 POUNDS OF FUEL

Charts of nautical miles per 1000 pounds of fuel are provided in figures 4-19 through 4-42. These charts present the constant altitude cruise specifics as a function of Mach number at 5000-foot altitude intervals from sea level to 45,000 feet. Various gross weights covering the weight range of the airplane have been considered. Recommended cruise speeds for maximum range cruise and for maximum endurance are shown for the instantaneous weights. Engine fuel flow and pressure ratio covering the full range of operation are included on the charts. Corrections to the nautical miles per pound of fuel under wind conditions may be made as indicated on the charts. The nautical miles per 1000 pounds of fuel with afterburner charts (figures 4-19 and 4-20) are an extension of the nautical miles per 1000 pounds of fuel without afterburner curves. See figure 4-43 for the extension of these data curves from the non-afterburner to the afterburner charts.

Use

To find the nautical miles per 1000 pounds of fuel for a given cruise speed and gross weight, enter the chart with the desired cruise speed, read up to the gross weight, and then to the left for the nautical miles per 1000 pounds of fuel. Fuel flow and pressure ratio may be determined by interpolation.

Sample Problem

Find the distance that can be flown with 1000 pounds of fuel at an altitude of 30,000 feet and at 0.8 Mach number. The airplane is in the clean configuration and the average gross weight is 33,000 pounds:

A. Enter figure 4-35 (Nautical Miles Per 1000 Pounds 30,000 Feet—Clean) with the cruise speed—Mach 0.8.

B. Read up to the average gross weight — 33,000 pounds. (Also note that at this point the fuel flow — 3170 lb/hr. and pressure ratio — 1.87 can be interpolated.)

C. Read to the left for the nautical miles per 1000 pounds — 149 nautical miles.

mission profile

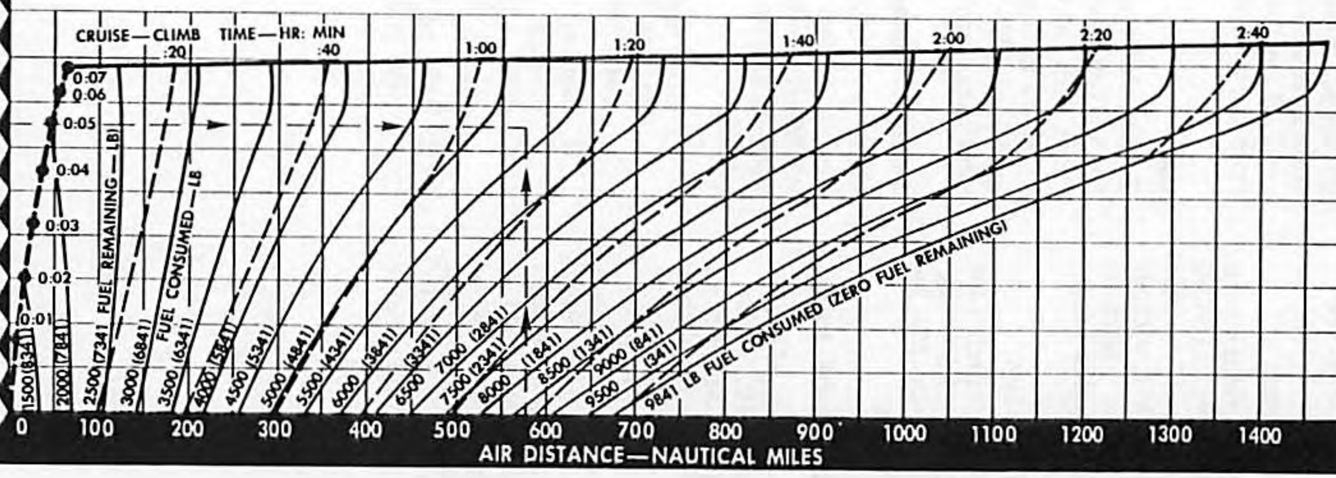
MODEL: F-106A
DATE: 1 SEPTEMBER 1961
DATA BASIS: FLIGHT TEST

CONFIGURATION: CLEAN
STANDARD ATMOSPHERE
TAKEOFF GROSS WEIGHT = 35,875 LB.
EMPTY GROSS WEIGHT = 26,034 LB.

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

A

MILITARY THRUST CLIMB			
CAS KNOTS	TAS KNOTS	TRUE MACH NO.	TRUE ALT 1,000 FT
255	531	.925	45
285	531	.925	40
320	533	.925	35
354	545	.925	30
394	557	.925	25
436	568	.925	20
459	556	.890	15
459	521	.820	10
459	489	.750	5
459	459	.690	0



CRUISE CLEAN CONFIGURATION					
TRUE ALTITUDE 1,000 FT	TRUE MACH NO	CAS KNOTS	TAS KNOTS	FUEL FLOW LB/HR	ENGINE PRESSURE RATIO
CRUISE-CLIMB	.90	282-259	516	3110-2510	2.24-2.16
35	.86	296	496	3120-2540	2.05-1.87
30	.81	305	475	3310-2730	1.91-1.74
25	.73	303	437	3490-2810	1.78-1.63
20	.65	298	398	3650-2820	1.68-1.54
15	.58	296	366	3780-2930	1.58-1.45
10	.53	296	339	3930-3060	1.49-1.37
5	.48	293	314	4080-3220	1.40-1.30
SEA LEVEL	.44	291	291	4210-3420	1.31-1.23

——— FUEL CONSUMED
——— CRUISE-CLIMB FLIGHT PATH
– – – – TIME (START, TAXI, TAKEOFF & ACCELERATE TO CLIMB NOT INCLUDED)
— — — MILITARY THRUST CLIMB

NOTE
- FUEL ALLOWANCE INCLUDED FOR START, TAXI, TAKEOFF & ACCELERATE TO CLIMB SPEED = 1070 LB.
- NO ALLOWANCE OR RESERVES MADE FOR LOITER, DESCENT OR LANDING.
- USE MILITARY THRUST FOR CLIMB.
- CRUISE AT RECOMMENDED MACH NO.

481268

Figure 4-1

mission profile

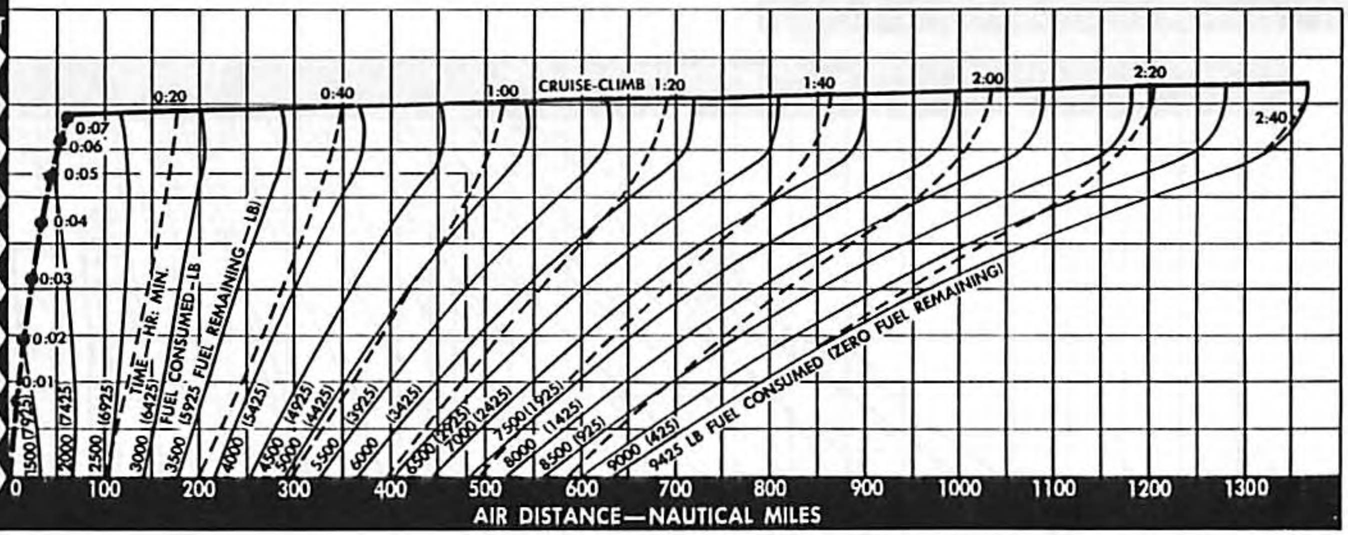
MODEL: F-106B
DATE: 1 SEPTEMBER 1961
DATA BASIS: FLIGHT TEST

CONFIGURATION: CLEAN
STANDARD ATMOSPHERE
TAKEOFF GROSS WEIGHT = 36,300 LB
EMPTY GROSS WEIGHT = 26,875 LB

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

B

MILITARY THRUST CLIMB			
CAS KNOTS	TAS KNOTS	TRUE MACH NO.	TRUE ALT 1,000 FT
255	531	.925	45
285	531	.925	40
320	533	.925	35
354	545	.925	30
394	557	.925	25
436	568	.925	20
459	556	.890	15
459	521	.820	10
459	489	.750	5
459	459	.690	0



CRUISE: CLEAN CONFIGURATION					
TRUE ALTITUDE 1,000 FT	TRUE MACH NO.	CAS KNOTS	TAS KNOTS	FUEL FLOW LB/HR	ENGINE PRESSURE RATIO
CRUISE-CLIMB	.90	284-263	516	3160-2580	2.22-2.20
35	.86	298	498	3160-2610	2.06-1.89
30	.81	307	477	3350-2800	1.91-1.76
25	.73	306	439	3520-2890	1.79-1.65
20	.66	302	403	3690-2910	1.68-1.55
15	.59	299	370	3820-3020	1.58-1.46
10	.54	298	343	3970-3150	1.49-1.38
5	.49	295	318	4110-3310	1.40-1.31
SEA LEVEL	.44	294	294	4240-3480	1.31-1.24

——— FUEL CONSUMED
——— CRUISE-CLIMB FLIGHT PATH
- - - - TIME (START, TAXI, TAKEOFF & ACCELERATE TO CLIMB NOT INCLUDED)
— — — MILITARY THRUST CLIMB

NOTE
- FUEL ALLOWANCE INCLUDED FOR START, TAXI, TAKE-OFF & ACCELERATE TO CLIMB = 1070 LB.
- NO ALLOWANCE OR RESERVES MADE FOR LOITER, DESCENT OR LANDING.
- USE MILITARY THRUST FOR CLIMB.
- CRUISE AT RECOMMENDED MACH NO.

Figure 4-2

48247A

mission profile

MODEL: F-106A
DATE: 21 FEBRUARY 1967
DATE BASIS: FLIGHT TEST

CONFIGURATION: TWO-360 GAL EXTERNAL TANKS (RETAINED WHEN EMPTY)
STANDARD ATMOSPHERE
TAKEOFF GROSS WEIGHT = 41,831 LB
EMPTY GROSS WEIGHT = 27,336 LB

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

A

MILITARY THRUST CLIMB			
CAS KNOTS	TAS KNOTS	TRUE MACH NO.	TRUE ALT 1,000 FT
253	528	.92	45
284	528	.92	40
318	530	.92	35
352	542	.92	30
392	554	.92	25
400	522	.85	20
400	488	.78	15
400	456	.71	10
400	426	.66	5
400	400	.61	0

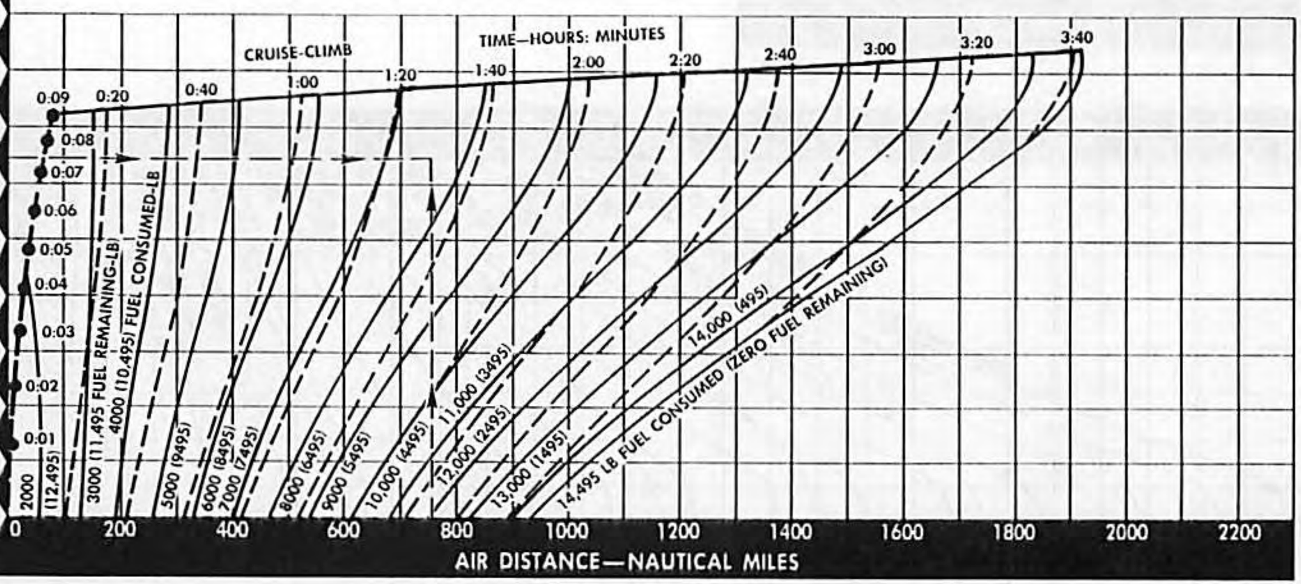


Figure 4-3

———	FUEL CONSUMED
———	CRUISE-CLIMB FLIGHT PATH
– – –	TIME (START, TAXI, TAKEOFF, AND ACCELERATE TO CLIMB NOT INCLUDED)
—— —	MILITARY THRUST CLIMB

NOTE
- FUEL ALLOWANCE INCLUDED FOR START, TAXI, TAKEOFF AND ACCELERATE TO CLIMB SPEED = 1070 LB.
- NO ALLOWANCE OR RESERVES MADE FOR LOITER, DESCENT, OR LANDING.
- USE MILITARY THRUST FOR CLIMB.
- CRUISE AT RECOMMENDED MACH NO.

CRUISE: TWO 360-GAL EXTERNAL TANKS					
TRUE ALTITUDE 1,000 FT	TRUE MACH NO	CAS KNOTS	TAS KNOTS	FUEL FLOW LB/HR	ENGINE PRESSURE RATIO
CRUISE-CLIMB	.90	312-263	516	4010-2840	2.35-2.28
35	.87	297	500	4050-2870	2.28-2.00
30	.81	309	478	4170-3030	2.08-1.86
25	.75	313	449	4370-3100	1.94-1.73
20	.68	316	420	4560-3220	1.83-1.61
15	.62	313	387	4690-3300	1.71-1.51
10	.56	308	354	4860-3370	1.62-1.41
5	.50	303	325	4960-3450	1.51-1.33
SEA LEVEL	.45	297	297	4990-3630	1.42-1.27

48538

mission profile

MODEL: F-106B
DATE: 21 FEBRUARY 1967
DATE BASIS: FLIGHT TEST

CONFIGURATION: TWO 360-GAL EXTERNAL TANKS (RETAINED WHEN EMPTY)
STANDARD ATMOSPHERE
TAKEOFF GROSS WEIGHT = 42,740 LB
EMPTY GROSS WEIGHT = 28,641 LB

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

B

MILITARY THRUST CLIMB			
CAS KNOTS	TAS KNOTS	TRUE MACH NO.	TRUE ALT 1,000 FT
253	528	.92	45
284	528	.92	40
318	530	.92	35
352	542	.92	30
392	554	.92	25
400	522	.85	20
400	488	.78	15
400	456	.71	10
400	426	.66	5
400	400	.61	0

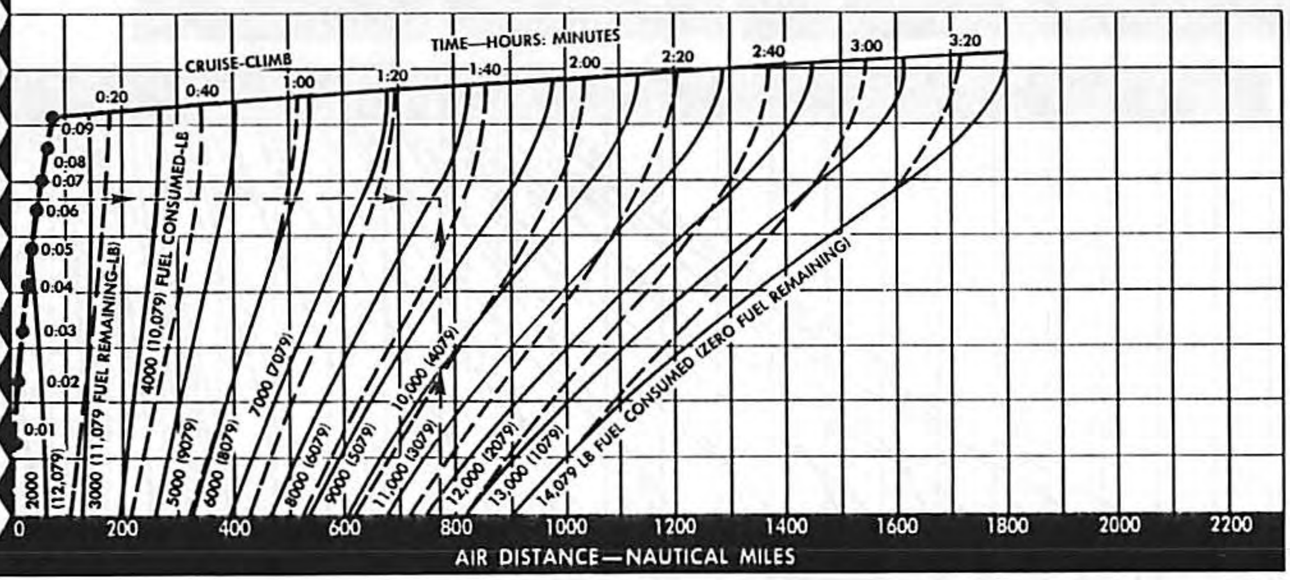


Figure 4-4

——— FUEL CONSUMED
——— CRUISE-CLIMB FLIGHT PATH
– – – TIME (START, TAXI, TAKEOFF AND ACCELERATE TO CLIMB NOT INCLUDED)
— — MILITARY THRUST CLIMB

NOTE
- FUEL ALLOWANCE INCLUDED FOR START, TAXI, TAKEOFF AND ACCELERATE TO CLIMB SPEED = 1070 LB.
- NO ALLOWANCE OR RESERVES MADE FOR LOITER, DESCENT, OR LANDING.
- USE MILITARY THRUST FOR CLIMB.
- CRUISE AT RECOMMENDED MACH NO.

CRUISE: TWO 360-GAL EXTERNAL TANKS					
TRUE ALTITUDE 1,000 FT	TRUE MACH NO	CAS KNOTS	TAS KNOTS	FUEL FLOW LB/HR	ENGINE PRESSURE RATIO
CRUISE-CLIMB	.90	303-268	516	4090-2970	2.35-2.30
35	.87	300	503	4120-2980	2.30-2.03
30	.82	312	483	4250-3140	2.10-1.89
25	.76	317	455	4460-3230	1.96-1.76
20	.70	320	426	4660-3350	1.84-1.64
15	.63	318	393	4790-3430	1.72-1.53
10	.56	313	360	4960-3520	1.63-1.44
5	.51	309	331	5050-3600	1.52-1.35
SEA LEVEL	.46	303	303	5090-3710	1.43-1.28

48539

mission profile

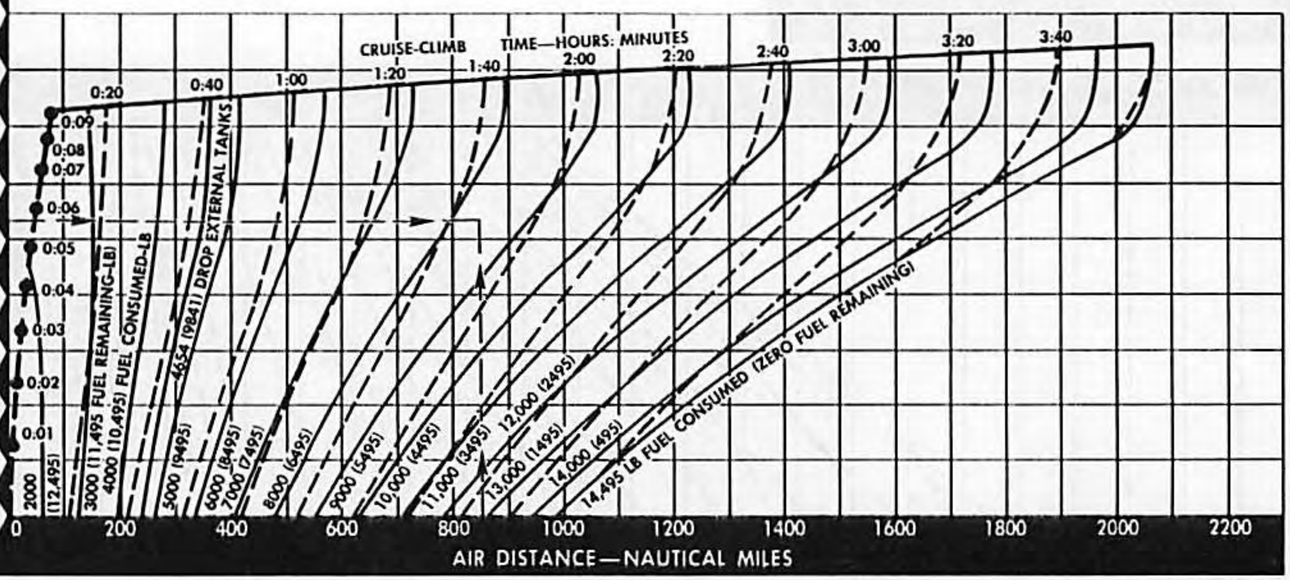
MODEL: F-106A
DATE: 21 FEBRUARY 1967
DATE BASIS: FLIGHT TEST

CONFIGURATION: TWO 360-GAL EXTERNAL TANKS (DROPPED WHEN EMPTY)
STANDARD ATMOSPHERE
TAKEOFF GROSS WEIGHT = 41,831 LB
EMPTY GROSS WEIGHT = 26,822 LB

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

A

MILITARY THRUST CLIMB			
CAS KNOTS	TAS KNOTS	TRUE MACH NO.	TRUE ALT 1,000 FT
253	528	.92	45
284	528	.92	40
318	530	.92	35
352	542	.92	30
392	554	.92	25
400	522	.85	20
400	488	.78	15
400	456	.71	10
400	426	.66	5
400	400	.61	0



CRUISE: TWO 360-GAL EXTERNAL TANKS					
TRUE ALTITUDE 1,000 FT	TRUE MACH NO	CAS KNOTS	TAS KNOTS	FUEL FLOW LB/HR	ENGINE PRESSURE RATIO
CRUISE-CLIMB	.90	293-300	516	4010-3760	2.35-2.34
35	.90	309	517	4050-3800	2.28-2.23
30	.85	325	501	4170-3910	2.08-2.04
25	.79	334	476	4370-4070	1.94-1.90
20	.73	339	449	4560-4230	1.83-1.78
15	.67	340	419	4690-4340	1.71-1.66
10	.60	332	381	4860-4460	1.62-1.57
5	.54	327	351	4960-4540	1.51-1.46
SEA LEVEL	.48	319	319	4990-4610	1.42-1.38

CRUISE CLEAN CONFIGURATION					
TRUE ALTITUDE 1,000 FT	TRUE MACH NO	CAS KNOTS	TAS KNOTS	FUEL FLOW LB/HR	ENGINE PRESSURE RATIO
CRUISE-CLIMB	.90	262-292	516	3440-2610	2.25-2.20
35	.87	297	500	3410-2600	2.13-1.89
30	.81	310	480	3570-2800	1.95-1.76
25	.74	319	443	3730-2900	1.82-1.65
20	.66	306	408	3890-2910	1.71-1.55
15	.60	303	375	4010-3010	1.59-1.43
10	.54	302	347	4130-3140	1.51-1.38
5	.49	300	321	4240-3300	1.42-1.30
SEA LEVEL	.45	296	296	4360-3480	1.33-1.24

——— FUEL CONSUMED
——— CRUISE-CLIMB FLIGHT PATH
– – – TIME (START, TAXI, TAKEOFF, AND ACCELERATE TO CLIMB NOT INCLUDED)
— — MILITARY THRUST CLIMB

NOTE
- FUEL ALLOWANCE INCLUDED FOR START, TAXI, TAKEOFF AND ACCELERATE TO CLIMB SPEED = 1070 LB.
- NO ALLOWANCE OR RESERVES MADE FOR LOITER, DESCENT, OR LANDING.
- USE MILITARY THRUST FOR CLIMB.
- CRUISE AT RECOMMENDED MACH NO.

48540

Figure 4-5

mission profile

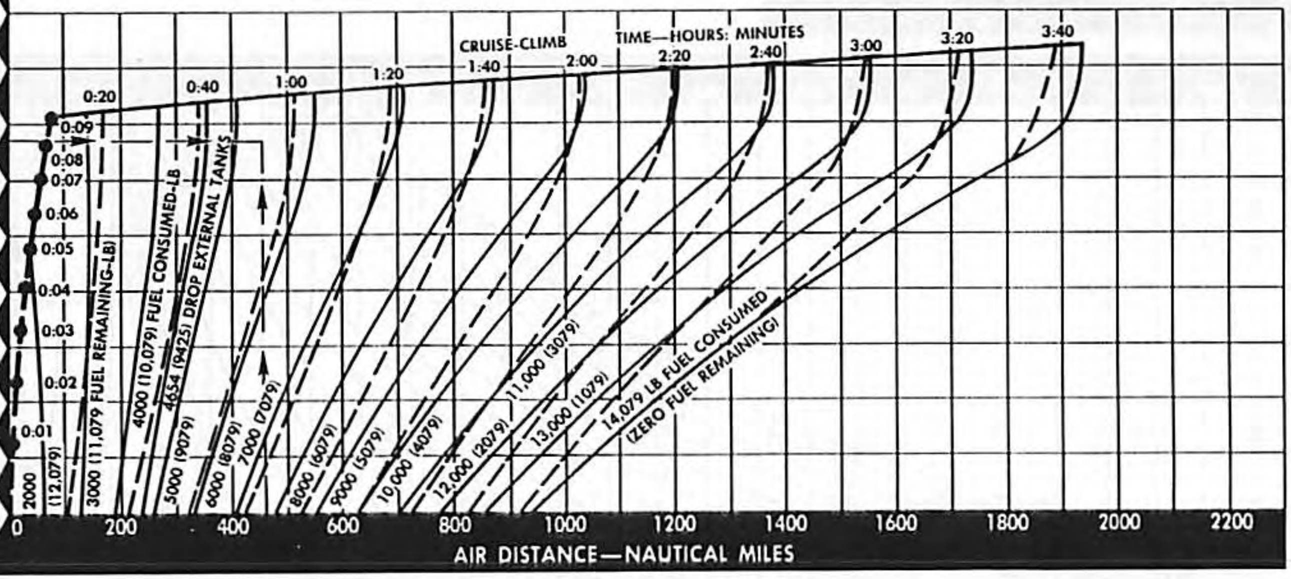
MODEL: F-106B
DATE: 21 FEBRUARY 1967
DATE BASIS: FLIGHT TEST

CONFIGURATION: TWO 360-GAL EXTERNAL TANKS (DROPPED WHEN EMPTY)
STANDARD ATMOSPHERE
TAKEOFF GROSS WEIGHT = 42,720 LB
EMPTY GROSS WEIGHT = 28,127 LB

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

B

MILITARY THRUST CLIMB			
CAS KNOTS	TAS KNOTS	TRUE MACH NO.	TRUE ALT 1,000 FT
253	528	.92	45
284	528	.92	40
318	530	.92	35
352	542	.92	30
392	554	.92	25
400	522	.85	20
400	488	.78	15
400	456	.71	10
400	426	.66	5
400	400	.61	0



CRUISE: TWO 360-GAL EXTERNAL TANKS					
TRUE ALTITUDE 1,000 FT	TRUE MACH NO	CAS KNOTS	TAS KNOTS	FUEL FLOW LB/HR	ENGINE PRESSURE RATIO
CRUISE-CLIMB	.90	303-297	516	4090-3890	2.35
35	.90	310	519	4120-3910	2.30-2.25
30	.86	328	505	4250-4010	2.10-2.06
25	.80	337	481	4460-4170	1.96-1.91
20	.74	343	454	4660-4340	1.84-1.80
15	.68	344	424	4790-4450	1.72-1.68
10	.60	335	385	4960-4570	1.63-1.59
5	.55	331	355	5050-4650	1.52-1.48
SEA LEVEL	.49	323	323	5090-4700	1.43-1.39

CRUISE: CLEAN CONFIGURATION					
TRUE ALTITUDE 1,000 FT	TRUE MACH NO	CAS KNOTS	TAS KNOTS	FUEL FLOW LB/HR	ENGINE PRESSURE RATIO
CRUISE-CLIMB	.90	295-266	516	3550-2730	2.27-2.22
35	.87	299	502	3530-2700	2.16-1.92
30	.82	312	483	3700-2890	1.97-1.79
25	.74	313	448	3820-3000	1.84-1.68
20	.68	312	415	3980-3040	1.72-1.58
15	.61	309	382	4100-3140	1.60-1.48
10	.55	308	354	4220-3270	1.52-1.40
5	.50	305	327	4330-3420	1.44-1.32
SEA LEVEL	.45	299	299	4440-3590	1.35-1.25

——— FUEL CONSUMED
——— CRUISE-CLIMB FLIGHT PATH
— — — TIME (START, TAXI, TAKEOFF, AND ACCELERATE TO CLIMB NOT INCLUDED)
▬ — MILITARY THRUST CLIMB

NOTE
- FUEL ALLOWANCE INCLUDED FOR START, TAXI, TAKEOFF AND ACCELERATE TO CLIMB SPEED = 1070 LB.
- NO ALLOWANCE OR RESERVES MADE FOR LOITER, DESCENT, OR LANDING.
- USE MILITARY THRUST FOR CLIMB.
- CRUISE AT RECOMMENDED MACH NO.

Figure 4-6

48541

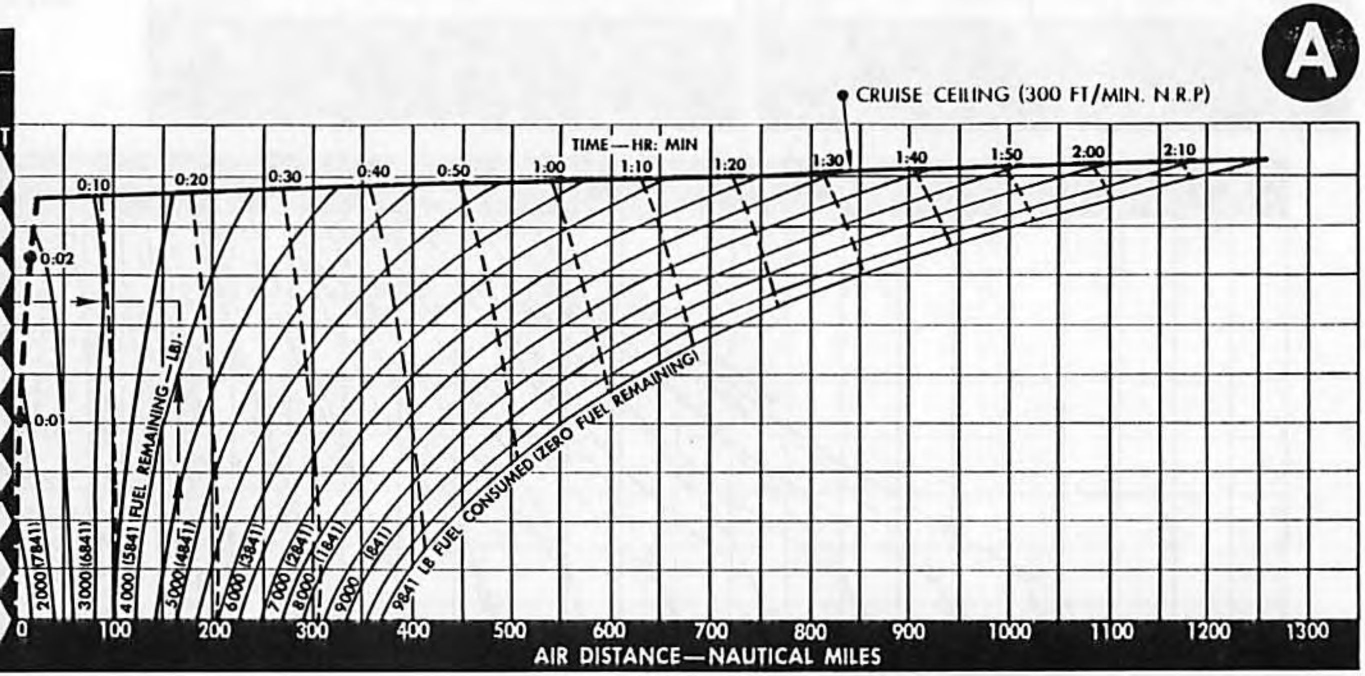
intercept profile

MODEL: F-106A
DATE: 1 SEPTEMBER 1961
DATA BASIS: FLIGHT TEST

CONFIGURATION: CLEAN
STANDARD ATMOSPHERE
TAKEOFF GROSS WEIGHT=35,875 LB

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

MAXIMUM THRUST CLIMB			
CAS KNOTS	TAS KNOTS	TRUE MACH NO.	TRUE ALT 1,000 FT
260	539	.940	45
291	539	.940	40
326	542	.940	35
360	554	.940	30
402	566	.940	25
444	577	.940	20
459	556	.890	15
459	521	.820	10
459	489	.750	5
459	459	.690	0



CRUISE CLEAN CONFIGURATION					
TRUE ALTITUDE 1,000 FT	TRUE MACH NO	CAS KNOTS	TAS KNOTS	FUEL FLOW LB/HR	ENGINE PRESSURE RATIO
CRUISE-CEILING	.94	273-258	541	3,450-2,880	2.51-2.50
40	.98	303	560	4,150	2.44
35	.99	347	571	5,150	2.42
30	.99	386	583	6,270	2.35
25	.99	424	594	7,500	2.30
20	.98	467	603	8,860	2.23
15	.98	505	612	10,350	2.15
10	.97	544	617	11,800	2.09
5	.95	582	617	13,420	2.00
SEA LEVEL	.92	609	609	14,500	1.92

———— FUEL CONSUMED
— — — — MAXIMUM THRUST CLIMB
– – – – – TIME (START, TAXI, TAKEOFF AND ACCELERATE TO CLIMB NOT INCLUDED)

NOTE
- FUEL ALLOWANCE INCLUDED FOR START, TAXI, TAKEOFF AND ACCELERATION TO CLIMB = 1070 LB.
- NO ALLOWANCE MADE FOR LOITER, DESCENT, OR LANDING.
- MAXIMUM THRUST USED FOR CLIMB.
- NORMAL THRUST USED FOR CRUISE.

481508

Figure 4-7

intercept profile

MODEL: F-106B
DATE: 1 SEPTEMBER 1961
DATA BASIS: FLIGHT TEST

CONFIGURATION: CLEAN
STANDARD ATMOSPHERE
TAKEOFF GROSS WEIGHT = 36,300 LB

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

MAXIMUM THRUST CLIMB			
CAS KNOTS	TAS KNOTS	TRUE MACH NO.	TRUE ALT 1,000 FT
260	539	.940	45
291	539	.940	40
326	542	.940	35
360	554	.940	30
402	566	.940	25
444	577	.940	20
459	556	.890	15
459	521	.820	10
459	489	.750	5
459	459	.690	0

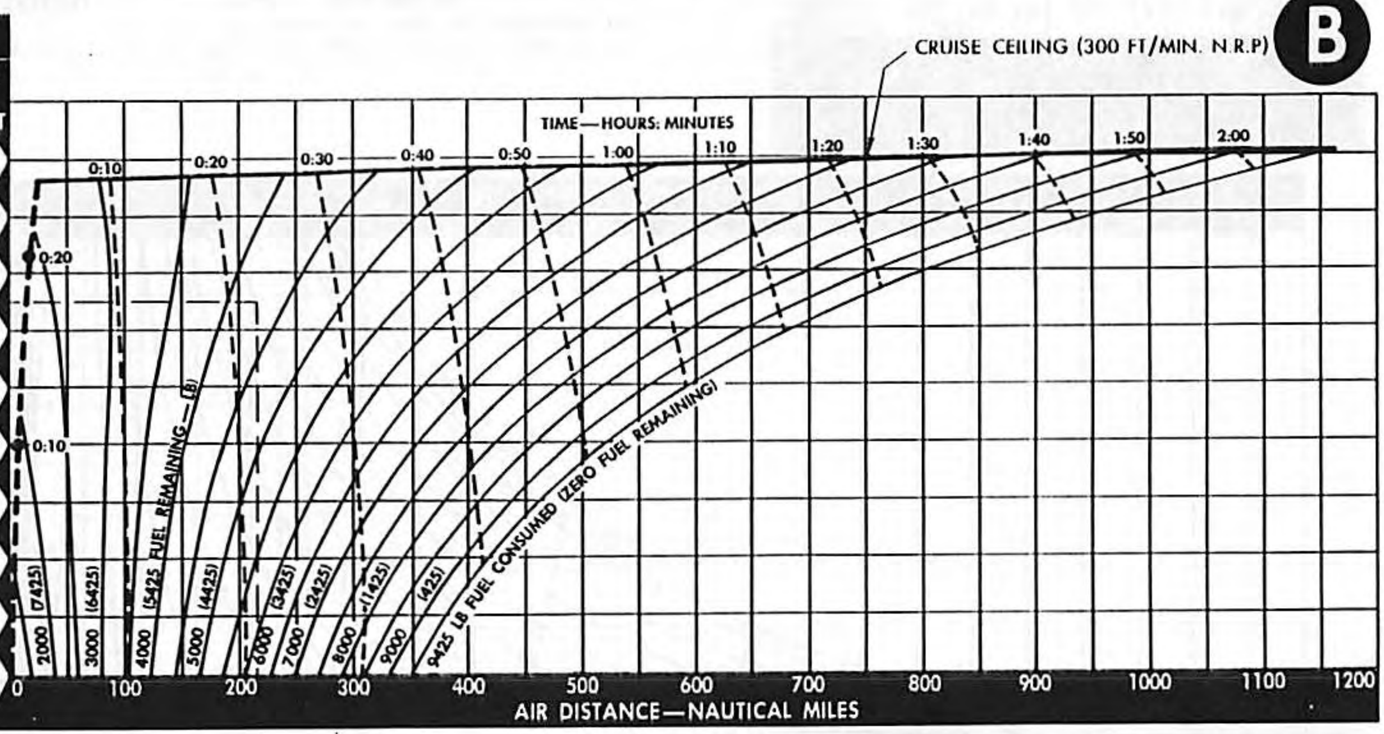


Figure 4-8

CRUISE CLEAN CONFIGURATION					
TRUE ALTITUDE 1,000 FT	TRUE MACH NO	CAS KNOTS	TAS KNOTS	FUEL FLOW LB/HR	ENGINE PRESSURE RATIO
CRUISE-CEILING	.94	273-258	541	3,410-3,040	2.51-2.50
40	.98	303	560	4,150	2.44
35	.99	347	571	5,150	2.42
30	.99	386	583	6,270	2.35
25	.99	424	594	7,500	2.30
20	.98	467	603	8,860	2.23
15	.98	505	612	10,350	2.15
10	.97	544	617	11,800	2.09
5	.95	582	617	13,420	2.00
SEA LEVEL	.92	609	609	14,500	1.92

———— FUEL CONSUMED
– – – – MAXIMUM THRUST CLIMB
— — — TIME (START, TAXI, TAKEOFF AND ACCELERATE TO CLIMB NOT INCLUDED)

NOTE
- FUEL ALLOWANCE INCLUDED FOR START, TAXI, TAKEOFF AND ACCELERATION TO CLIMB = 1070 LB.
- NO ALLOWANCE MADE FOR LOITER, DESCENT, OR LANDING.
- MAXIMUM THRUST USED FOR CLIMB.
- NORMAL THRUST USED FOR CRUISE.

48250A

intercept profile

MODEL: F-106A
DATE: 21 FEBRUARY 1967
DATE BASIS: FLIGHT TEST

CONFIGURATION: TWO 360-GAL EXTERNAL TANKS
STANDARD ATMOSPHERE
TAKEOFF GROSS WEIGHT = 41,831 LB

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

A

MILITARY THRUST CLIMB			
CAS KNOTS	TAS KNOTS	TRUE MACH NO.	TRUE ALT 1,000 FT
253	528	.92	45
284	528	.92	40
318	530	.92	35
352	542	.92	30
392	554	.92	25
400	522	.85	20
400	488	.78	15
400	456	.71	10
400	426	.66	5
400	400	.61	0

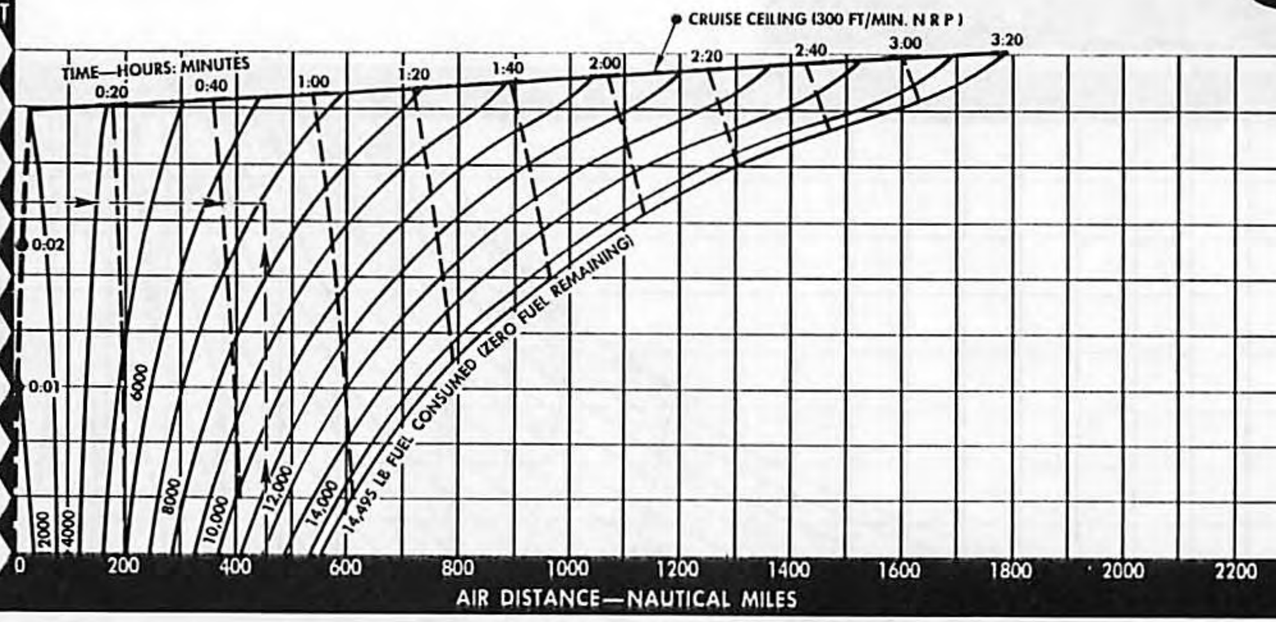


Figure 4-9

— — MAXIMUM THRUST CLIMB
——— FUEL CONSUMED
— — — TIME (START, TAXI, TAKEOFF AND ACCELERATION TO CLIMB SPEED NOT INCLUDED)

NOTE
- FUEL ALLOWANCE INCLUDED FOR START, TAXI, TAKEOFF AND ACCELERATION TO CLIMB SPEED = 1070 LB.
- NO ALLOWANCE MADE FOR LOITER, DESCENT, OR LANDING.
- MAXIMUM THRUST USED FOR CLIMB.
- NORMAL THRUST USED FOR CRUISE.

CRUISE: TWO 360-GAL EXTERNAL TANKS					
TRUE ALTITUDE 1,000 FT	TRUE MACH NO	CAS KNOTS	TAS KNOTS	FUEL FLOW LB/HR	ENGINE PRESSURE RATIO
CRUISE CEILING	.93	290-256	536	4,000-3,100	2.50-2.49
40	.96	298	550	4,170	2.48
35	.97	338	559	5,110	2.45
30	.97	377	572	6,310	2.37
25	.97	417	584	7,440	2.31
20	.96	455	589	8,690	2.24
15	.96	498	601	10,270	2.17
10	.95	537	606	11,680	2.09
5	.95	582	617	13,420	2.00
SEA LEVEL	.90	595	595	14,340	1.94

48542

intercept profile

MODEL: F-106B
DATE: 21 FEBRUARY 1967
DATE BASIS: FLIGHT TEST

CONF'GURATION: TWO 360-GAL EXTERNAL TANKS
STANDARD ATMOSPHERE
TAKEOFF GROSS WEIGHT = 42,720 LB

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

B

MILITARY THRUST CLIMB			
CAS KNOTS	TAS KNOTS	TRUE MACH NO.	TRUE ALT 1,000 FT
253	528	.92	45
284	528	.92	40
318	530	.92	35
352	542	.92	30
392	554	.92	25
400	522	.85	20
400	488	.78	15
400	456	.71	10
400	426	.66	5
400	400	.61	0

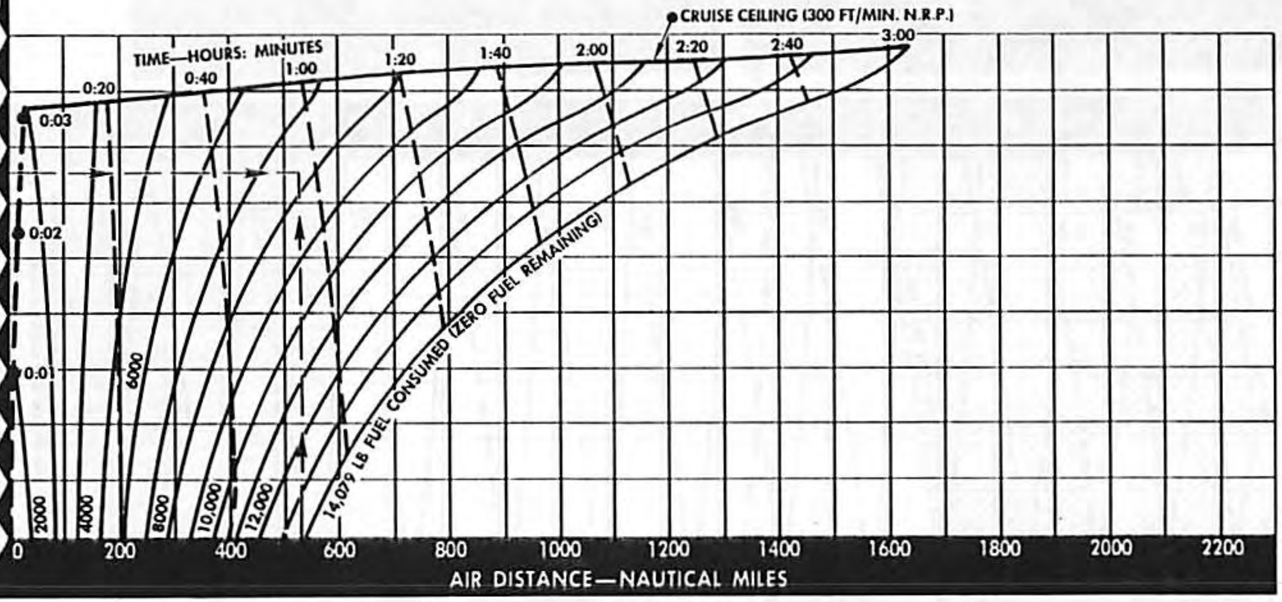


Figure 4-10

CRUISE: TWO 360-GAL EXTERNAL TANKS					
TRUE ALTITUDE 1,000 FT	TRUE MACH NO	CAS KNOTS	TAS KNOTS	FUEL FLOW LB/HR	ENGINE PRESSURE RATIO
CRUISE CEILING	.93	298-265	536	4,320-3,310	2.50-2.49
40	.96	298	550	4,170	2.48
35	.97	338	559	5,110	2.45
30	.97	377	572	6,310	2.37
25	.97	417	584	7,440	2.31
20	.96	455	589	8,690	2.24
15	.96	498	601	10,270	2.17
10	.95	537	606	11,680	2.09
5	.95	582	617	13,420	2.00
SEA LEVEL	.90	595	595	14,340	1.94

— — MAXIMUM THRUST CLIMB
——— FUEL CONSUMED
– – – TIME (START, TAXI, TAKEOFF AND ACCELERATION TO CLIMB SPEED NOT INCLUDED)

NOTE
- FUEL ALLOWANCE INCLUDED FOR START, TAXI, TAKEOFF AND ACCELERATION TO CLIMB SPEED = 1070 LB.
- NO ALLOWANCE MADE FOR LOITER, DESCENT, OR LANDING.
- MAXIMUM THRUST USED FOR CLIMB.
- NORMAL THRUST USED FOR CRUISE.

48543

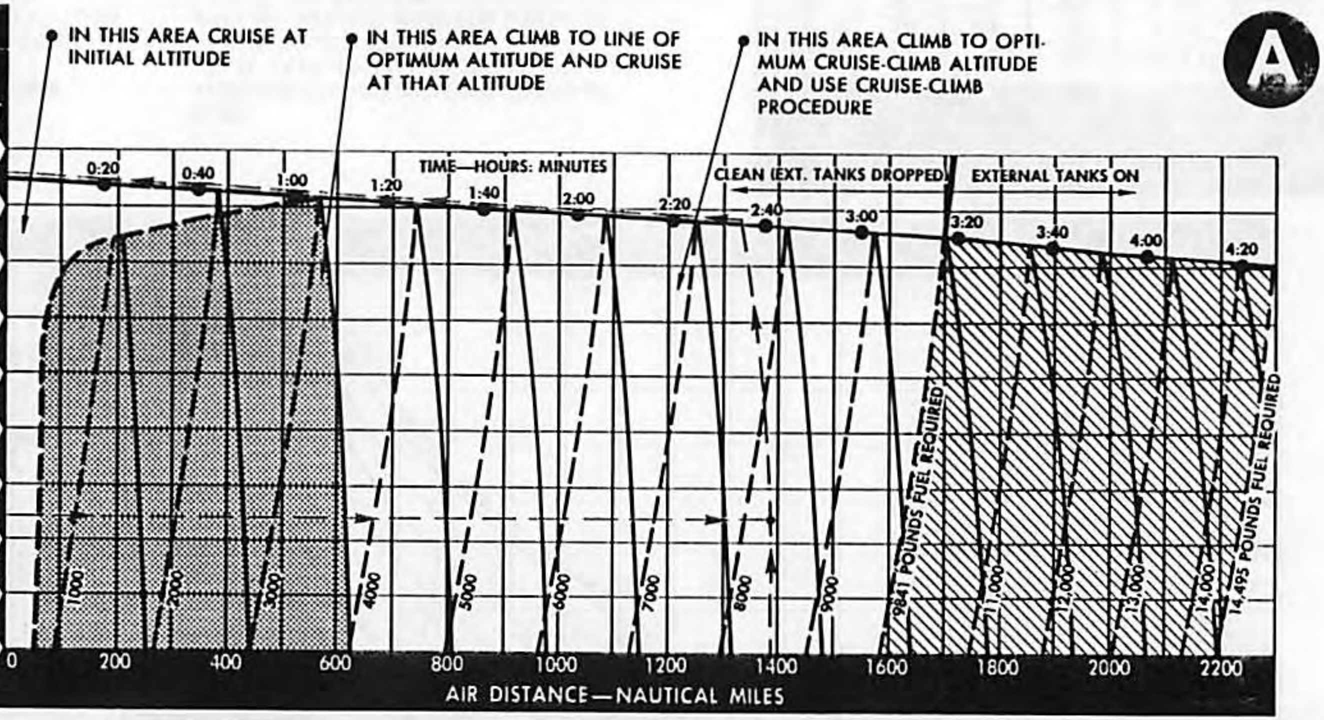
optimum return profile

MODEL: F-106A
DATE: 21 FEBRUARY 1967
DATE BASIS: FLIGHT TEST

CONFIGURATION: CLEAN AND TWO-360 GAL EXTERNAL TANKS (DROPPED WHEN EMPTY)
STANDARD ATMOSPHERE
TAKEOFF GROSS WEIGHT WITH EXTERNAL TANKS = 41,831 LB • WITHOUT EXTERNAL TANKS = 36,663 LB
EMPTY GROSS WEIGHT = 26,822 LB

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

MILITARY THRUST CLIMB			
CAS KNOTS	TAS KNOTS	TRUE MACH NO.	TRUE ALT 1,000 FT
253	528	.92	45
284	528	.92	40
318	530	.92	35
352	542	.92	30
392	554	.92	25
400	522	.85	20
400	488	.78	15
400	456	.71	10
400	426	.66	5
400	400	.61	0



CRUISE: TWO 360-GAL EXTERNAL TANKS					
TRUE ALTITUDE 1,000 FT	TRUE MACH NO	CAS KNOTS	TAS KNOTS	FUEL FLOW LB/HR	ENGINE PRESSURE RATIO
CRUISE-CLIMB	.90	309-293	516	4240-3760	2.35-2.34

CRUISE CLEAN CONFIGURATION					
TRUE ALTITUDE 1,000 FT	TRUE MACH NO	CAS KNOTS	TAS KNOTS	FUEL FLOW LB/HR	ENGINE PRESSURE RATIO
CRUISE-CLIMB	.90	291-262	516	3440-2610	2.26-2.20
40	.89	273	510	2620	2.08
35	.85	291	490	2650	1.89
30	.79	301	467	2850	1.78
25	.71	296	427	2950	1.68
20	.62	286	382	2980	1.57
15	.56	282	350	3100	1.48
10	.51	282	325	3240	1.39
5	.47	284	304	3410	1.32
SEALEVEL	.43	284	284	3570	1.27

— — — FUEL REQUIRED
—— —— LINE OF BEST RANGE FOR CONSTANT ALTITUDE
———— LINE OF BEST RANGI FOR CRUISE-CLIMB ALTITUDE
———— CLIMB PATH GUIDE LINES

NOTE

- FUEL REQUIRED AT ANY POINT INCLUDES MILITARY THRUST CLIMB TO CRUISE ALTITUDE.
- BEST CRUISE CONDITION IS DETERMINED BY INTERSECTION OF CLIMB PATH GUIDE LINE AND LINES OF BEST RANGE.
- CRUISE AT RECOMMENDED MACH NUMBER.
- NO ALLOWANCE MADE FOR LOITER, DESCENT, OR LANDING.

48544

Figure 4-11

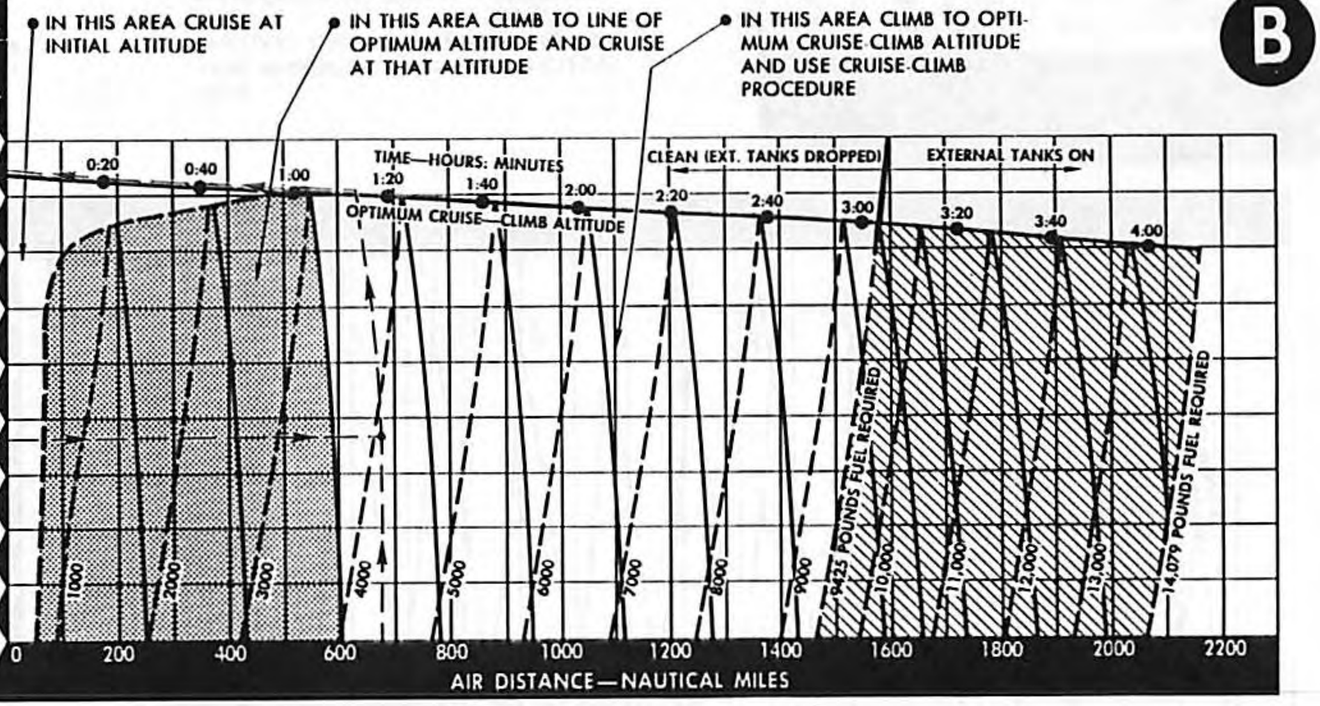
optimum return profile

MODEL: F-106B
DATE: 21 FEBRUARY 1967
DATE BASIS: FLIGHT TEST

CONFIGURATION: CLEAN AND TWO-360 GAL EXTERNAL TANKS (DROPPED WHEN EMPTY)
STANDARD ATMOSPHERE
TAKEOFF GROSS WEIGHT WITH EXTERNAL TANKS = 42,720 LB • WITHOUT EXTERNAL TANKS = 37,552 LB
EMPTY GROSS WEIGHT = 28,127 LB

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

MILITARY THRUST CLIMB			
CAS KNOTS	TAS KNOTS	TRUE MACH NO.	TRUE ALT 1,000 FT
253	528	.92	45
284	528	.92	40
318	530	.92	35
352	542	.92	30
392	554	.92	25
400	522	.85	20
400	488	.78	15
400	456	.71	10
400	426	.66	5
400	400	.61	0



CRUISE: TWO 360-GAL EXTERNAL TANKS					
TRUE ALTITUDE 1,000 FT	TRUE MACH NO	CAS KNOTS	TAS KNOTS	FUEL FLOW LB/HR	ENGINE PRESSURE RATIO
CRUISE-CLIMB	.90	312-297	516	4330-3890	2.36-2.35

- - - FUEL REQUIRED
— — LINE OF BEST RANGE FOR CONSTANT ALTITUDE
—— LINE OF BEST RANGE FOR CRUISE-CLIMB ALTITUDE
—— CLIMB PATH GUIDE LINES

NOTE
- FUEL REQUIRED AT ANY POINT INCLUDES MILITARY THRUST CLIMB TO CRUISE ALTITUDE.
- BEST CRUISE CONDITION IS DETERMINED BY INTERSECTION OF CLIMB PATH GUIDE LINE AND LINES OF BEST RANGE.
- CRUISE AT RECOMMENDED MACH NUMBER.
- NO ALLOWANCE MADE FOR LOITER, DESCENT, OR LANDING.

CRUISE CLEAN CONFIGURATION					
TRUE ALTITUDE 1,000 FT	TRUE MACH NO	CAS KNOTS	TAS KNOTS	FUEL FLOW LB/HR	ENGINE PRESSURE RATIO
CRUISE-CLIMB	.90	295-266	516	3550-2730	2.27-2.21
40	.90	275	514	2790	2.15
35	.86	294	494	2740	1.93
30	.80	304	472	2960	1.81
25	.72	307	433	3070	1.70
20	.64	294	392	3130	1.59
15	.58	290	360	3250	1.50
10	.52	289	333	3370	1.41
5	.48	289	310	3530	1.33
SEA LEVEL	.44	289	289	3710	1.28

48545

Figure 4-12

optimum return profile

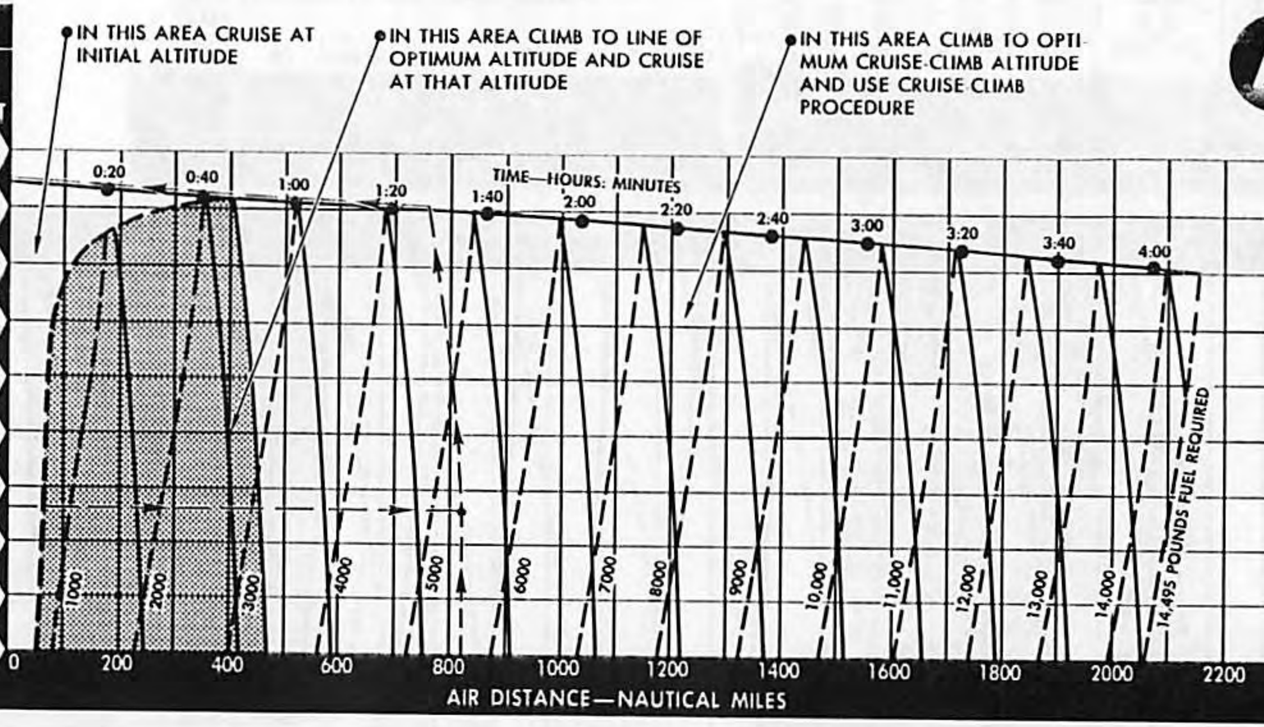
MODEL: F-106A
DATE: 21 FEBRUARY 1967
DATE BASIS: FLIGHT TEST

CONFIGURATION: TWO 360-GAL EXTERNAL TANKS
STANDARD ATMOSPHERE
TAKEOFF GROSS WEIGHT = 41,831 LB
EMPTY GROSS WEIGHT = 27,336 LB

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

A

MILITARY THRUST CLIMB			
CAS KNOTS	TAS KNOTS	TRUE MACH NO.	TRUE ALT 1,000 FT
253	528	.92	45
284	528	.92	40
318	530	.92	35
352	542	.92	30
392	554	.92	25
400	522	.85	20
400	488	.78	15
400	456	.71	10
400	426	.66	5
400	400	.61	0



- — — FUEL REQUIRED
- — — LINE OF BEST RANGE FOR CONSTANT ALTITUDE
- ——— LINE OF BEST RANGE FOR CRUISE-CLIMB ALTITUDE
- ——— CLIMB PATH GUIDE LINES

NOTE
- FUEL REQUIRED AT ANY POINT INCLUDES MILITARY THRUST CLIMB TO CRUISE ALTITUDE.
- BEST CRUISE CONDITION IS DETERMINED BY INTERSECTION OF CLIMB PATH GUIDE LINE AND LINES OF BEST RANGE.
- CRUISE AT RECOMMENDED MACH NUMBER.
- NO ALLOWANCE MADE FOR LOITER, DESCENT, OR LANDING.

CRUISE: TWO 360-GAL EXTERNAL TANKS					
TRUE ALTITUDE 1,000 FT	TRUE MACH NO	CAS KNOTS	TAS KNOTS	FUEL FLOW LB/HR	ENGINE PRESSURE RATIO
CRUISE-CLIMB	.90	309-263	516	4240-2840	2.35-2.28
40	.89	273	511	2890	2.19
35	.84	286	483	2880	2.00
30	.77	292	454	3080	1.88
25	.70	292	421	3170	1.75
20	.64	293	391	3300	1.63
15	.57	290	360	3420	1.53
10	.51	285	328	3490	1.44
5	.46	280	300	3560	1.34
SEA LEVEL	.42	279	279	3770	1.29

48546

Figure 4-13

optimum return profile

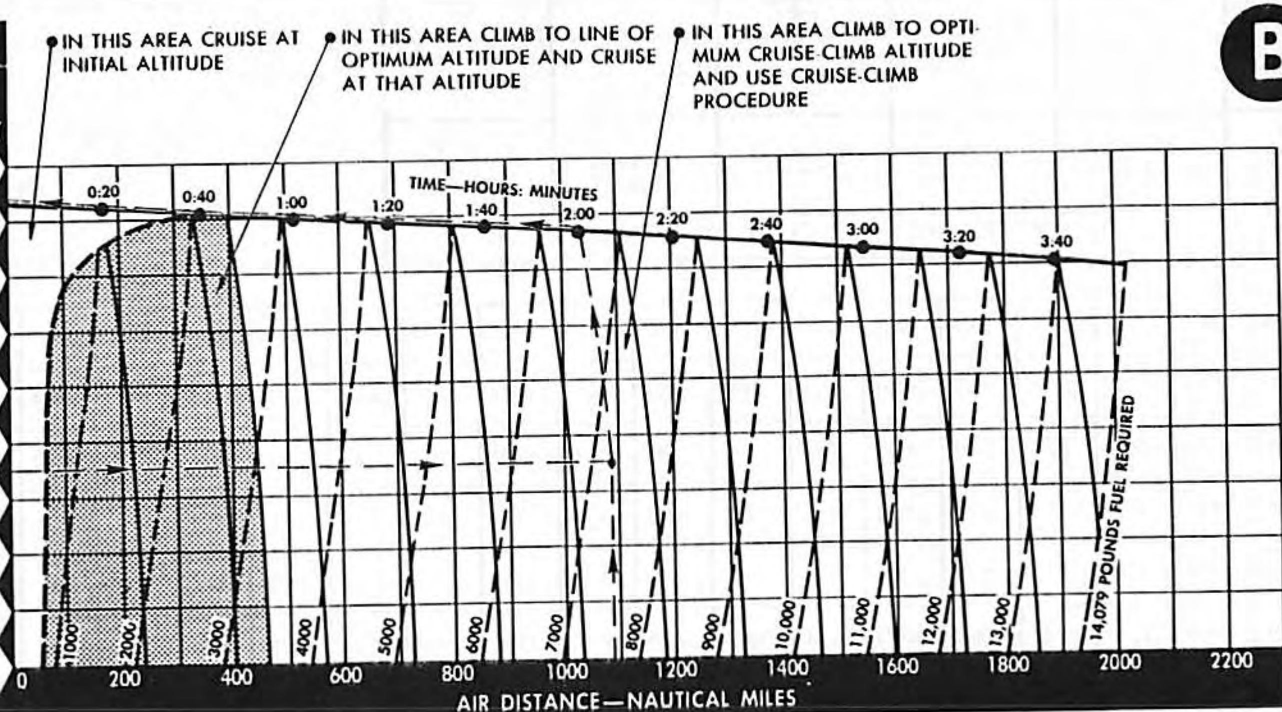
MODEL: F-106B
DATE: 21 FEBRUARY 1967
DATE BASIS: FLIGHT TEST

CONFIGURATION: TWO 360-GAL EXTERNAL TANKS
STANDARD ATMOSPHERE
TAKEOFF GROSS WEIGHT = 42,720 LB
EMPTY GROSS WEIGHT = 28,641 LB

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

B

MILITARY THRUST CLIMB			
CAS KNOTS	TAS KNOTS	TRUE MACH NO.	TRUE ALT 1,000 FT
253	528	.92	45
284	528	.92	40
318	530	.92	35
352	542	.92	30
392	554	.92	25
400	522	.85	20
400	488	.78	15
400	456	.71	10
400	426	.66	5
400	400	.61	0



CRUISE: TWO 360-GAL EXTERNAL TANKS					
TRUE ALTITUDE 1,000 FT	TRUE MACH NO	CAS KNOTS	TAS KNOTS	FUEL FLOW LB/HR	ENGINE PRESSURE RATIO
CRUISE-CLIMB	.90	312-268	516	4330-2970	2.36-2.30
40	.89	274	512	3010	2.23
35	.85	289	488	3040	2.04
30	.78	296	461	3200	1.90
25	.71	298	429	3310	1.78
20	.65	299	399	3440	1.66
15	.58	295	365	3540	1.55
10	.53	291	335	3640	1.47
5	.47	286	307	3720	1.36
SEA LEVEL	.43	284	284	3910	1.31

- - - FUEL REQUIRED
— - — LINE OF BEST RANGE FOR CONSTANT ALTITUDE
——— LINE OF BEST RANGE FOR CRUISE-CLIMB ALTITUDE
——— CLIMB PATH GUIDE LINES

NOTE
- FUEL REQUIRED AT ANY POINT INCLUDES MILITARY THRUST CLIMB TO CRUISE ALTITUDE.
- BEST CRUISE CONDITION IS DETERMINED BY INTERSECTION OF CLIMB PATH GUIDE LINE AND LINES OF BEST RANGE.
- CRUISE AT RECOMMENDED MACH NUMBER.
- NO ALLOWANCE MADE FOR LOITER, DESCENT, OR LANDING.

Figure 4-14

48547

OPTIMUM RETURN CLEAN

MODEL: F-106A

DATA BASIS: FLIGHT TEST

CONDITIONS: STANDARD DAY – NO WIND

INITIAL ALTITUDE 1000 FT	60 NM			100 NM			150 NM			200 NM			250 NM			300 NM			350 NM		
	FUEL W/O CLIMB	1000 FT OPT ALT	FUEL WITH CLIMB	FUEL W/O CLIMB	1000 FT OPT ALT	FUEL WITH CLIMB	FUEL W/O CLIMB	1000 FT OPT ALT	FUEL WITH CLIMB	FUEL W/O CLIMB	1000 FT OPT ALT	FUEL WITH CLIMB	FUEL W/O CLIMB	1000 FT OPT ALT	FUEL WITH CLIMB	FUEL W/O CLIMB	1000 FT OPT ALT	FUEL WITH CLIMB	FUEL W/O CLIMB	1000 FT OPT ALT	FUEL WITH CLIMB
40	310	40.0	310	520	40.0	520	770	40.0	770	1030	40.0	1030	1290	40.0	1290	1540	40.0	1540	1800	40.0	1800
35	330	35.0	330	540	35.0	540	810	36.5	810	1080	37.5	1080	1350	38.0	1340	1620	38.5	1610	1890	39.0	1880
30	370	30.0	370	610	34.0	590	920	36.5	860	1220	37.5	1130	1530	38.0	1400	1830	38.5	1660	2140	39.0	1930
25	420	25.0	420	690	33.5	650	1040	36.0	920	1380	37.0	1180	1730	38.0	1460	2080	38.0	1730	2420	39.0	2000
20	470	20.0	470	780	33.0	740	1170	36.0	1000	1570	37.0	1270	1960	37.5	1540	2350	38.0	1810	2740	38.5	2080
15	530	15.0	530	890	32.0	820	1330	35.5	1091	1770	37.0	1370	2220	37.5	1640	2660	38.0	1900	3100	38.5	2180
10	600	12.0	600	1000	31.5	910	1500	35.5	1190	2000	37.0	1460	2500	37.5	1730	3000	38.0	2000	3500	38.5	2270
5	680	12.0	680	1120	31.0	990	1690	35.0	1280	2250	37.0	1550	2810	37.5	1820	3370	38.0	2100	3930	38.5	2370
SEA LEVEL	760	12.0	770	1260	30.0	1090	1890	35.0	1370	2520	37.0	1640	3150	37.5	1920	3780	38.0	2190	4400	38.5	2470

INSTRUCTIONS AND NOTES

- FUEL REQUIRED WITH CLIMB INCLUDES MILITARY THRUST CLIMB TO CRUISE ALTITUDE.
- CLIMB AT 400 KCAS UNTIL REACHING 0.92 M; THEN CLIMB CONSTANT MACH TO ALTITUDE.
- CRUISE AT RECOMMENDED MACH NO.
- AT DISTANCES LESS THAN 60 NM MINIMUM ALTITUDE 12,000 FEET.
- ZERO FUEL OVER LANDING BASE.

CRUISE: CLEAN CONFIGURATION

TRUE ALTITUDE 1000 FT	TRUE MACH NO.	CAS KNOTS	TAS KNOTS	FUEL FLOW LB/HR	ENGINE PRESSURE RATIO
40	.89	273	510	2620	2.08
35	.85	291	490	2650	1.89
30	.79	301	467	2850	1.78
25	.71	296	427	2950	1.68
20	.62	286	382	2980	1.57
15	.56	282	350	3100	1.48
10	.51	282	325	3240	1.39
5	.47	284	304	3410	1.32
SEA LEVEL	.43	284	284	3570	1.27

48,520

Figure 4-15

A

MODEL: F-106B
DATA BASIS: FLIGHT TEST

OPTIMUM RETURN CLEAN

CONDITIONS: STANDARD DAY – NO WIND

INITIAL ALTITUDE 1000 FT	60 NM			100 NM			150 NM			200 NM			250 NM			300 NM			350 NM		
	FUEL W/O CLIMB	1000 FT OPT ALT	FUEL WITH CLIMB	FUEL W/O CLIMB	1000 FT OPT ALT	FUEL WITH CLIMB	FUEL W/O CLIMB	1000 FT OPT ALT	FUEL WITH CLIMB	FUEL W/O CLIMB	1000 FT OPT ALT	FUEL WITH CLIMB	FUEL W/O CLIMB	1000 FT OPT ALT	FUEL WITH CLIMB	FUEL W/O CLIMB	1000 FT OPT ALT	FUEL WITH CLIMB	FUEL W/O CLIMB	1000 FT OPT ALT	FUEL WITH CLIMB
40	330	40.0	330	550	40.0	550	820	40.0	820	1090	40.0	1090	1360	40.0	1360	1640	40.0	1640	1910	40.0	1910
35	340	35.0	340	560	35.0	560	840	36.5	840	1110	37.5	1110	1390	38.0	1390	1670	38.5	1670	1950	39.0	1950
30	380	30.0	380	630	34.0	620	950	36.5	890	1260	37.5	1170	1570	38.0	1450	1890	38.5	1720	2210	39.0	2000
25	430	25.0	430	710	33.5	670	1070	36.0	950	1420	37.0	1230	1780	38.0	1510	2130	38.0	1780	2490	39.0	2070
20	480	20.0	480	800	33.0	760	1200	36.0	1040	1600	37.0	1320	2000	37.5	1600	2400	38.0	1880	2800	38.5	2180
15	550	15.0	550	910	32.0	850	1360	35.5	1140	1810	37.0	1420	2260	37.5	1700	2710	38.0	1980	3170	38.5	2260
10	610	12.0	610	1020	31.5	940	1520	35.5	1230	2030	37.0	1510	2530	37.5	1800	3040	38.0	2070	3550	38.5	2360
5	690	12.0	680	1140	31.0	1030	1710	35.0	1330	2280	37.0	1600	2850	37.5	1890	3420	38.0	2170	3990	38.5	2460
SEA LEVEL	770	12.0	780	1290	30.0	1130	1930	35.0	1430	2570	37.0	1700	3210	37.5	1990	3850	38.0	2270	4490	38.5	2560

INSTRUCTIONS AND NOTES

- FUEL REQUIRED WITH CLIMB INCLUDES MILITARY THRUST CLIMB TO CRUISE ALTITUDE.
- CLIMB AT 400 KCAS UNTIL REACHING 0.92 M; THEN CLIMB CONSTANT MACH TO ALTITUDE.
- CRUISE AT RECOMMENDED MACH NO.
- AT DISTANCES LESS THAN 60 NM MINIMUM ALTITUDE 12,000 FEET.
- ZERO FUEL OVER LANDING BASE.

48,521

CRUISE: CLEAN CONFIGURATION

TRUE ALTITUDE 1000 FT	TRUE MACH NO.	CAS KNOTS	TAS KNOTS	FUEL FLOW LB/HR	ENGINE PRESSURE RATIO
40	.90	275	514	2790	2.15
35	.86	294	494	2740	1.93
30	.80	304	472	2960	1.81
25	.72	307	433	3070	1.70
20	.64	294	392	3130	1.59
15	.58	290	360	3250	1.50
10	.52	289	333	3370	1.41
5	.48	289	310	3530	1.33
SEA LEVEL	.44	289	289	3710	1.28

Figure 4-16

OPTIMUM RETURN WITH 360-GALLON EXTERNAL TANKS

MODEL: F-106A
DATA BASIS: FLIGHT TEST

CONDITIONS: STANDARD DAY – NO WIND

INITIAL ALTITUDE 1000 FT	60 NM			100 NM			150 NM			200 NM			250 NM			300 NM			350 NM		
	FUEL W/O CLIMB	1000 FT OPT ALT	FUEL WITH CLIMB	FUEL W/O CLIMB	1000 FT OPT ALT	FUEL WITH CLIMB	FUEL W/O CLIMB	1000 FT OPT ALT	FUEL WITH CLIMB	FUEL W/O CLIMB	1000 FT OPT ALT	FUEL WITH CLIMB	FUEL W/O CLIMB	1000 FT OPT ALT	FUEL WITH CLIMB	FUEL W/O CLIMB	1000 FT OPT ALT	FUEL WITH CLIMB	FUEL W/O CLIMB	1000 FT OPT ALT	FUEL WITH CLIMB
40	340	40.0	340	570	40.0	570	850	40.0	850	1130	40.0	1130	1420	40.0	1420	1700	40.0	1700	1990	40.0	1990
35	360	35.0	360	600	35.0	600	900	36.5	900	1190	38.5	1190	1490	39.5	1480	1790	40.0	1790	2090	40.0	2070
30	410	30.0	410	680	33.5	660	1020	36.5	950	1360	38.0	1240	1700	39.5	1540	2040	40.0	1830	2380	40.0	2130
25	450	25.0	450	760	32.5	720	1130	36.0	1010	1510	38.0	1300	1880	39.0	1600	2260	40.0	1890	2640	40.0	2190
20	510	20.0	510	850	31.5	810	1270	35.5	1110	1690	37.5	1400	2110	39.0	1700	2530	40.0	2000	2950	40.0	2290
15	570	15.0	570	950	30.5	910	1430	35.5	1210	1900	37.5	1500	2370	38.5	1800	2850	39.5	2100	3320	40.0	2400
10	640	12.0	640	1070	29.5	1000	1600	35.5	1310	2130	37.0	1600	2660	38.5	1900	3200	39.5	2200	3730	40.0	2500
5	710	12.0	710	1190	28.5	1100	1780	35.0	1400	2380	37.0	1700	2970	38.5	2000	3560	39.5	2300	4160	40.0	2600
SEA LEVEL	800	12.0	790	1350	27.5	1190	2030	35.0	1500	2710	37.0	1810	3380	38.5	2110	4060	39.5	2410	4730	40.0	2710

INSTRUCTIONS AND NOTES

- FUEL REQUIRED WITH CLIMB INCLUDES MILITARY THRUST CLIMB TO CRUISE ALTITUDE.
- CLIMB AT 400 KCAS UNTIL REACHING 0.92 M; THEN CLIMB CONSTANT MACH TO ALTITUDE.
- CRUISE AT RECOMMENDED MACH NO.
- AT DISTANCES LESS THAN 60 NM MINIMUM ALTITUDE 12,000 FEET.
- ZERO FUEL OVER LANDING BASE.

CRUISE: TWO 360-GAL EXTERNAL TANKS					
TRUE ALTITUDE 1000 FT	TRUE MACH NO.	CAS KNOTS	TAS KNOTS	FUEL FLOW LB/HR	ENGINE PRESSURE RATIO
40	.89	273	511	2890	2.19
35	.84	286	483	2880	2.00
30	.77	292	454	3080	1.88
25	.70	292	421	3170	1.75
20	.64	293	391	3300	1.63
15	.57	290	360	3420	1.53
10	.51	285	328	3490	1.44
5	.46	280	300	3560	1.34
SEA LEVEL	.42	279	279	3770	1.29

48,548 A

A

Figure 4-17

OPTIMUM RETURN WITH 360-GALLON EXTERNAL TANKS

MODEL: F-106B

DATA BASIS: FLIGHT TEST

CONDITIONS: STANDARD DAY – NO WIND

INITIAL ALTITUDE 1000 FT	60 NM			100 NM			150 NM			200 NM			250 NM			300 NM			350 NM		
	FUEL W/O CLIMB	1000 FT OPT ALT	FUEL WITH CLIMB	FUEL W/O CLIMB	1000 FT OPT ALT	FUEL WITH CLIMB	FUEL W/O CLIMB	1000 FT OPT ALT	FUEL WITH CLIMB	FUEL W/O CLIMB	1000 FT OPT ALT	FUEL WITH CLIMB	FUEL W/O CLIMB	1000 FT OPT ALT	FUEL WITH CLIMB	FUEL W/O CLIMB	1000 FT OPT ALT	FUEL WITH CLIMB	FUEL W/O CLIMB	1000 FT OPT ALT	FUEL WITH CLIMB
40	360	40.0	360	590	40.0	590	880	40.0	880	1180	40.0	1180	1470	40.0	1470	1770	40.0	1770	2070	40.0	2070
35	380	35.0	380	630	35.0	630	940	36.5	940	1250	38.5	1240	1560	39.5	1540	1870	40.0	1840	2180	40.0	2150
30	420	30.0	420	690	33.5	670	1040	36.5	980	1390	38.0	1290	1740	39.5	1600	2090	40.0	1900	2430	40.0	2210
25	470	25.0	470	770	32.5	740	1160	36.0	1050	1540	38.0	1360	1930	39.0	1670	2310	40.0	1970	2700	40.0	2280
20	520	20.0	520	860	31.5	830	1290	35.5	1150	1720	37.5	1460	2150	39.0	1760	2580	40.0	2070	3020	40.0	2380
15	580	15.0	580	970	30.5	930	1460	35.5	1250	1940	37.5	1560	2420	38.5	1870	2910	39.5	2180	3390	40.0	2490
10	650	12.0	650	1090	29.5	1030	1630	35.5	1350	2170	37.0	1660	2710	38.5	1980	3260	39.5	2280	3800	40.0	2590
5	730	12.0	730	1210	28.5	1130	1820	35.0	1440	2420	37.0	1760	3030	38.5	2080	3640	39.5	2390	4240	40.0	2700
SEA LEVEL	830	12.0	820	1380	27.5	1220	2070	35.5	1550	2750	37.0	1870	3440	38.5	2190	4130	39.5	2500	4820	40.0	2810

INSTRUCTIONS AND NOTES

- FUEL REQUIRED WITH CLIMB INCLUDES MILITARY THRUST CLIMB TO CRUISE ALTITUDE.
- CLIMB AT 400 KCAS UNTIL REACHING 0.92 M; THEN CLIMB CONSTANT MACH TO ALTITUDE.
- CRUISE AT RECOMMENDED MACH NO.
- AT DISTANCES LESS THAN 60 NM MINIMUM ALTITUDE 12,000 FEET.
- ZERO FUEL OVER LANDING BASE.

CRUISE: TWO 360-GAL. EXTERNAL TANKS					
TRUE ALTITUDE 1000 FT	TRUE MACH NO.	CAS KNOTS	TAS KNOTS	FUEL FLOW LB/HR	ENGINE PRESSURE RATIO
40	.89	274	512	3010	2.23
35	.85	289	488	3040	2.04
30	.78	296	461	3200	1.90
25	.71	298	429	3310	1.78
20	.65	299	399	3440	1.66
15	.58	295	365	3540	1.55
10	.53	291	335	3640	1.47
5	.47	286	307	3720	1.36
SEA LEVEL	.43	284	284	3910	1.31

48,549A

Figure 4-18

B

A

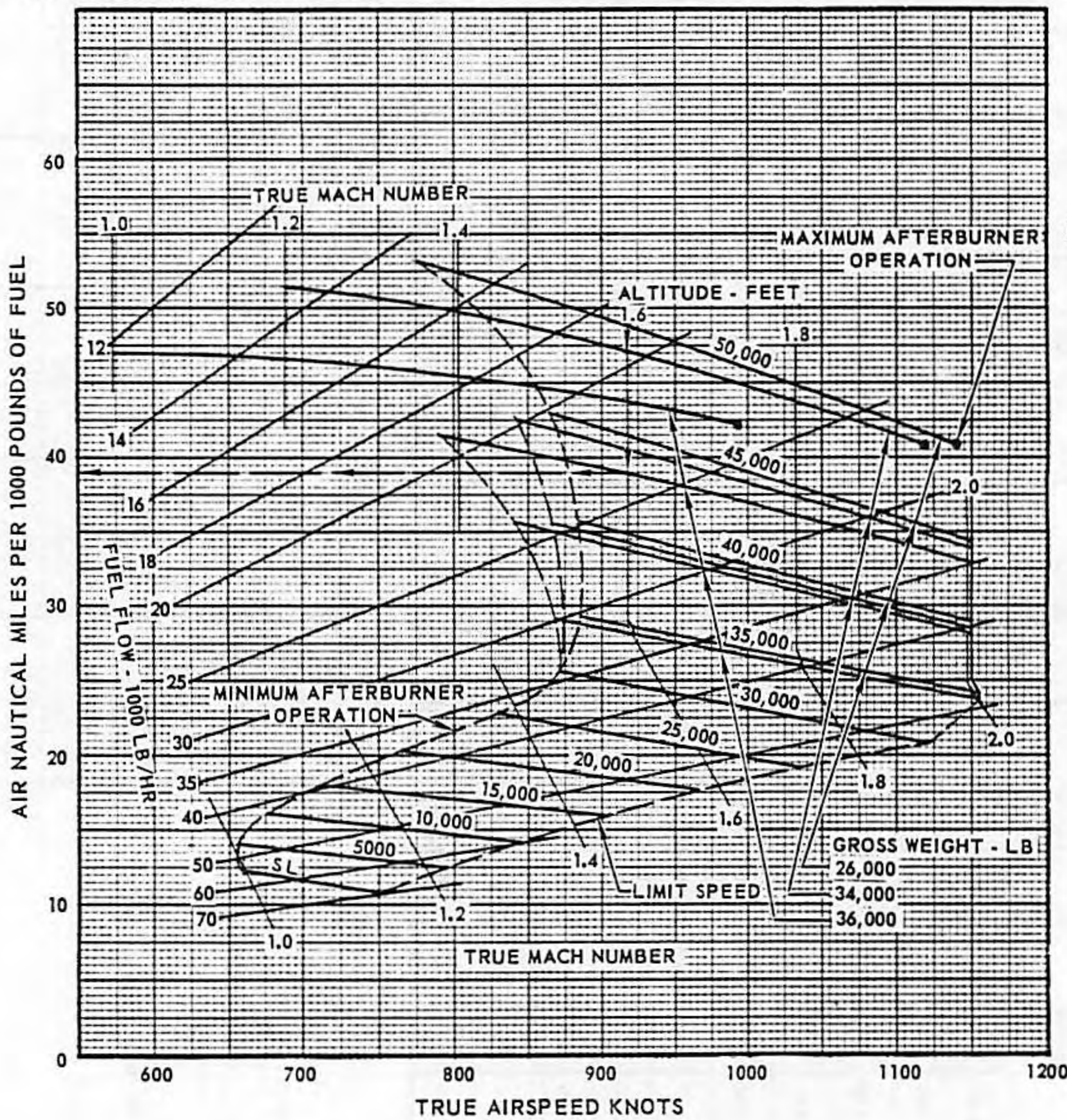
NAUTICAL MILES PER 1000 POUNDS - AFTERBURNER

MODEL: F-106A
DATE: 1 SEPTEMBER 1961
DATA BASIS: FLIGHT TEST

CONFIGURATION: CLEAN
ARMAMENT IN

STANDARD ATMOSPHERE

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL



NOTES

WIND CORRECTION TO N. MI / LB

$$\text{GROUND N. MI / LB} = \text{AIR N. MI / LB} \times \frac{V_{GROUND}}{V_{AIR}}$$

WHERE V_{AIR} IS TRUE AIRSPEED AND V_{GROUND} IS GROUND SPEED.

DATA VALID FOR ALL GROSS WEIGHTS BETWEEN ALTITUDES OF SEA LEVEL AND 30,000 FEET.

48, 212A

Figure 4-19

NAUTICAL MILES PER 1000 POUNDS - AFTERBURNER

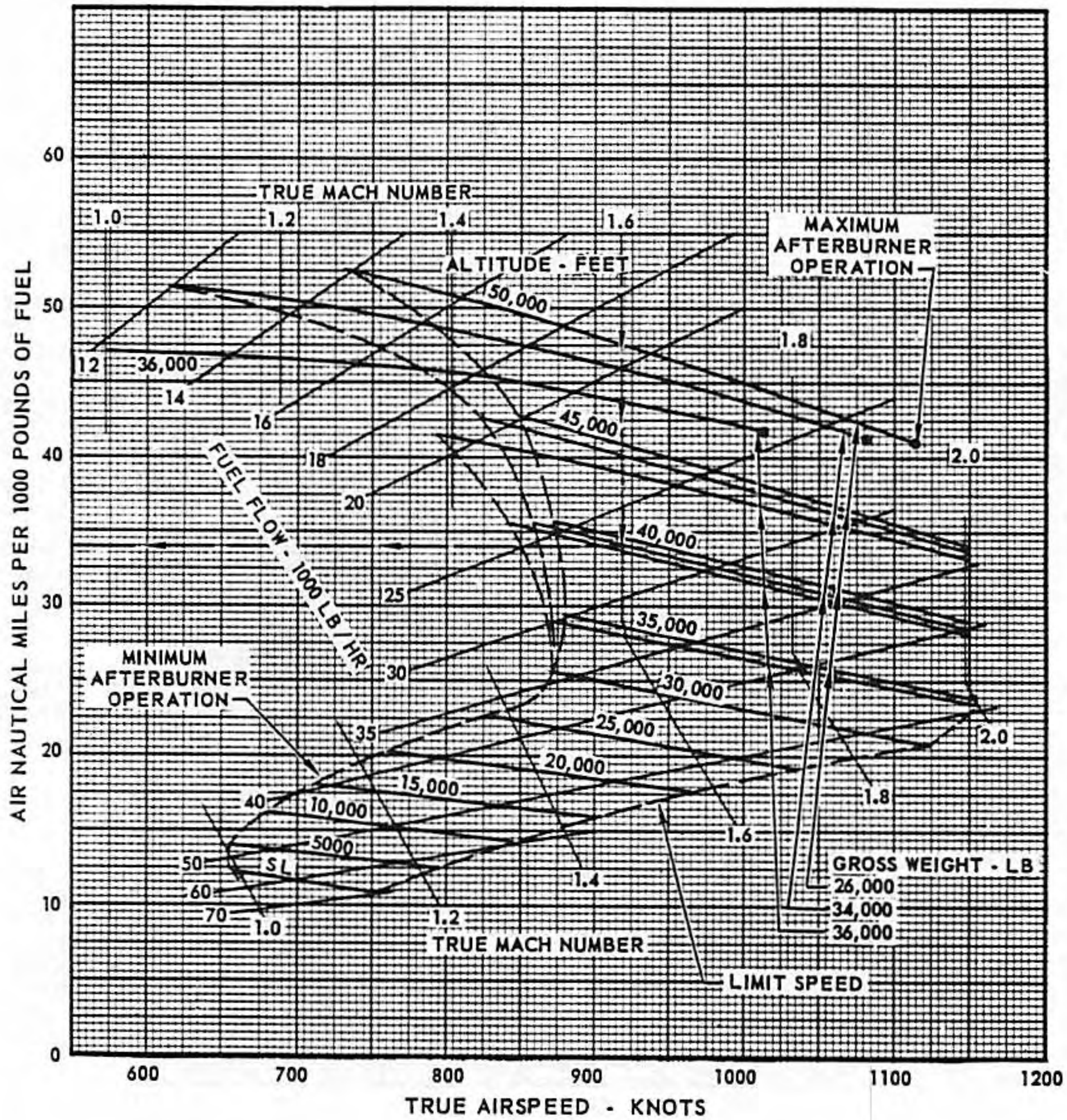
B

MODEL: F-106B
DATE: 1 SEPTEMBER 1961
DATA BASIS: FLIGHT TEST

CONFIGURATION: CLEAN
ARMAMENT IN

STANDARD ATMOSPHERE

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL



NOTES

WIND CORRECTION TO N. MI/LB

GROUND N. MI/LB = AIR N. MI/LB $\times \frac{V_{GROUND}}{V_{AIR}}$

WHERE V_{AIR} IS TRUE AIRSPEED AND V_{GROUND} IS GROUND SPEED.

DATA VALID FOR ALL GROSS WEIGHTS BETWEEN ALTITUDES OF SEA LEVEL AND 30,000 FEET.

48,254

Figure 4-20

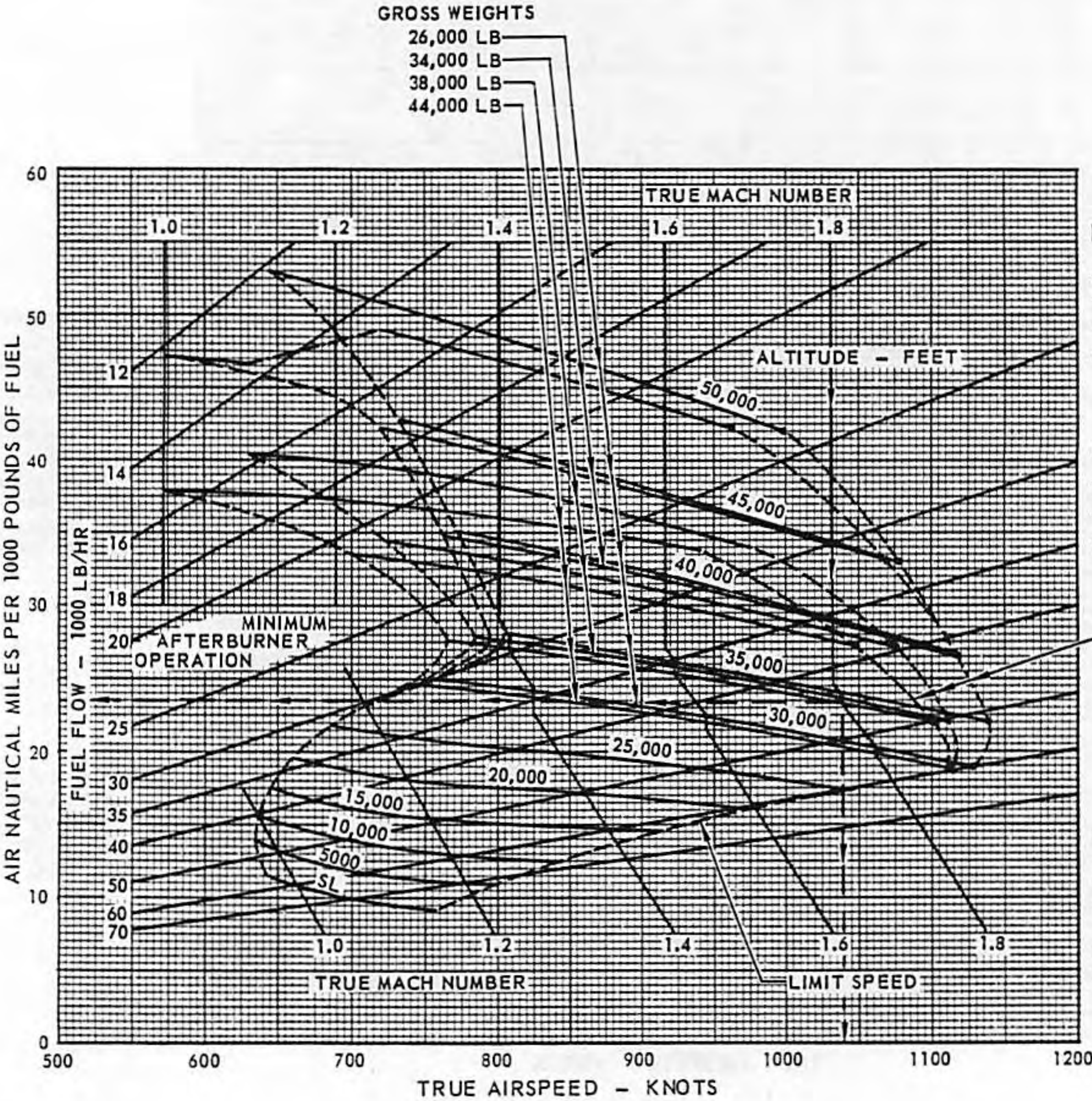
A

NAUTICAL MILES PER 1000 POUNDS – AFTERBURNER

MODEL: F-106A
DATE: 21 FEBRUARY 1967
DATA BASIS: FLIGHT TEST

CONFIGURATION: TWO 360-GALLON EXTERNAL TANKS
STANDARD ATMOSPHERE ARMAMENT IN

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL



NOTES

WIND CORRECTION TO N. MI/LB
GROUND N. MI/LB = AIR N. MI/LB $\times \frac{V_{GROUND}}{V_{AIR}}$
WHERE V_{AIR} IS TRUE AIRSPEED AND V_{GROUND} IS GROUND SPEED.

DATA VALID FOR ALL GROSS WEIGHTS BETWEEN ALTITUDES OF SEA LEVEL AND 25,000 FEET.

48,550

Figure 4-21

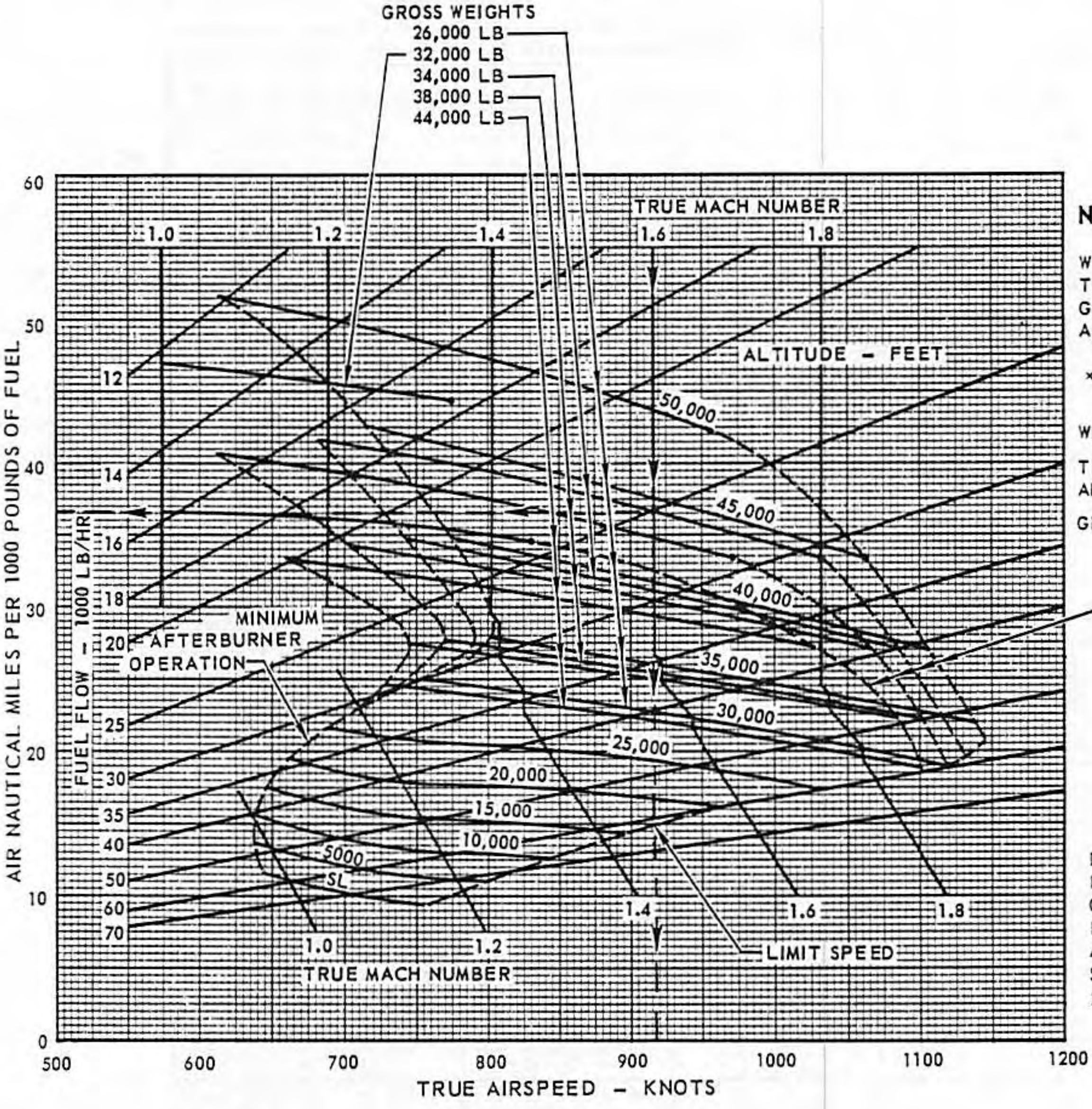
B

NAUTICAL MILES PER 1000 POUNDS – AFTERBURNER

MODEL: F-106B
DATE: 21 FEBRUARY 1967
DATA BASIS: FLIGHT TEST

CONFIGURATION: TWO 360-GALLON EXTERNAL TANKS
STANDARD ATMOSPHERE ARMAMENT IN

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL



NOTES

WIND CORRECTION TO N. MI/LB
GROUND N. MI/LB = AIR N. MI/LB $\times \frac{V_{GROUND}}{V_{AIR}}$
WHERE V_{AIR} IS TRUE AIRSPEED AND V_{GROUND} IS GROUND SPEED.

DATA VALID FOR ALL GROSS WEIGHTS BETWEEN ALTITUDES OF SEA LEVEL AND 25,000 FEET.

48,551

Figure 4-22

A B

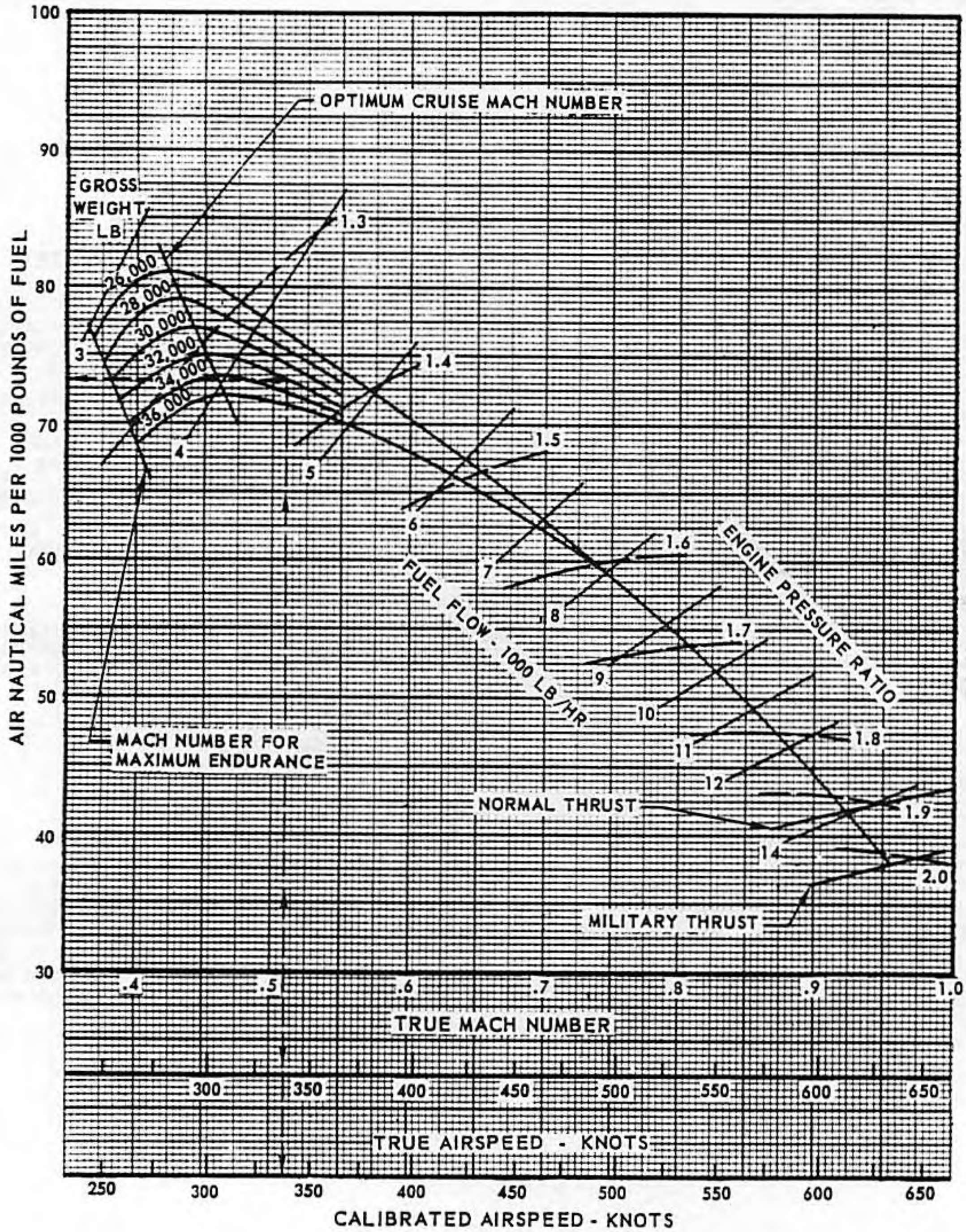
NAUTICAL MILES PER 1000 POUNDS - SEA LEVEL

CONFIGURATION: CLEAN ARMAMENT IN

STANDARD ATMOSPHERE

MODEL: F-106A/B
DATE: 1 SEPTEMBER 1961
DATA BASIS: FLIGHT TEST

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL



NOTE

WIND CORRECTION TO N.MI/LB

GROUND N.MI/LB = AIR N.MI/LB $\times \frac{V_{GROUND}}{V_{AIR}}$

WHERE V_{AIR} IS TRUE AIRSPEED AND V_{GROUND} IS GROUND SPEED

48,138C

Figure 4-23

A B

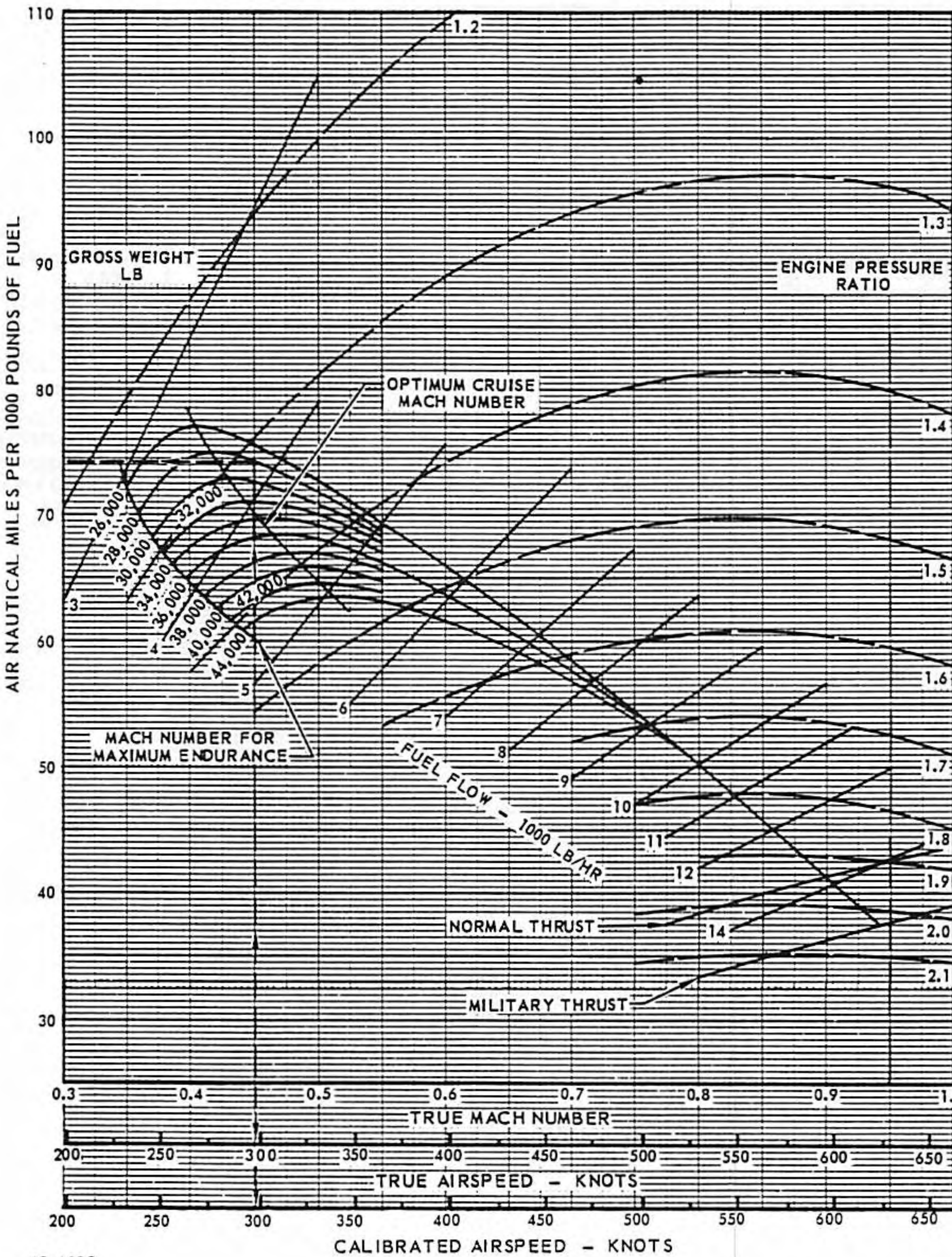
NAUTICAL MILES PER 1000 POUNDS – SEA LEVEL

MODEL: F-106A/B
DATE: 21 FEBRUARY 1967
DATA BASIS: FLIGHT TEST

CONFIGURATION: TWO 360-GALLON EXTERNAL TANKS

ARMAMENT IN   STANDARD ATMOSPHERE

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL



NOTE

WIND CORRECTION TO N. MI/LB
GROUND N.MI/LB = AIR N. MI/LB $\times \frac{V_{GROUND}}{V_{AIR}}$
WHERE V_{AIR} IS TRUE AIRSPEED AND V_{GROUND} IS GROUND SPEED.

48,139C

Figure 4-24

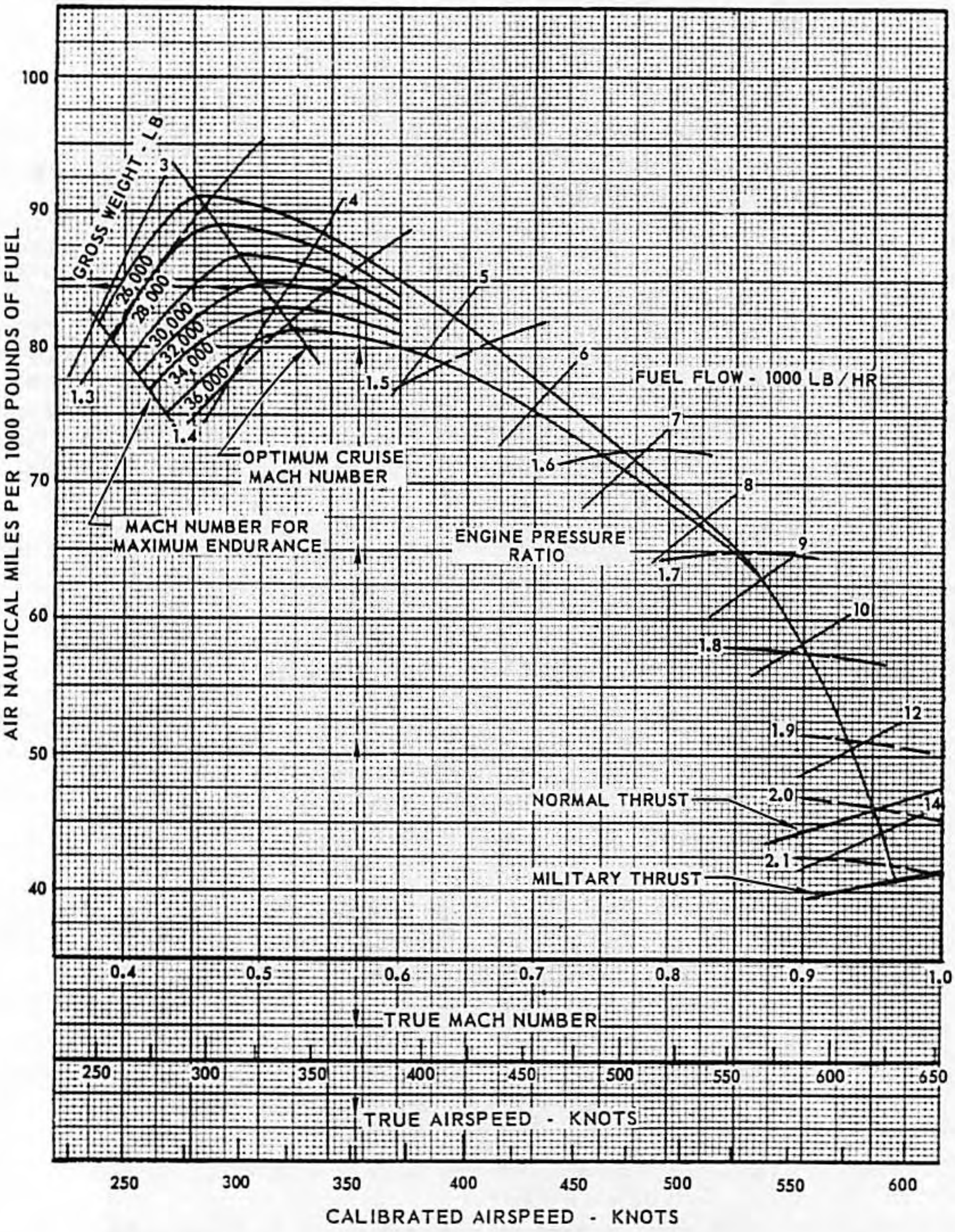
A B

NAUTICAL MILES PER 1000 POUNDS - 5,000 FEET

MODEL: F-106A/B
DATE: 1 SEPTEMBER 1961
DATA BASIS: FLIGHT TEST

CONFIGURATION: CLEAN   ARMAMENT IN
STANDARD ATMOSPHERE

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL



NOTE

WIND CORRECTION TO N. MI/LB

GROUND N. MI/LB = AIR N. MI/LB $\times \frac{V_{GROUND}}{V_{AIR}}$

WHERE V_{AIR} IS TRUE AIRSPEED AND V_{GROUND} IS GROUND SPEED.

48,152C

Figure 4-25

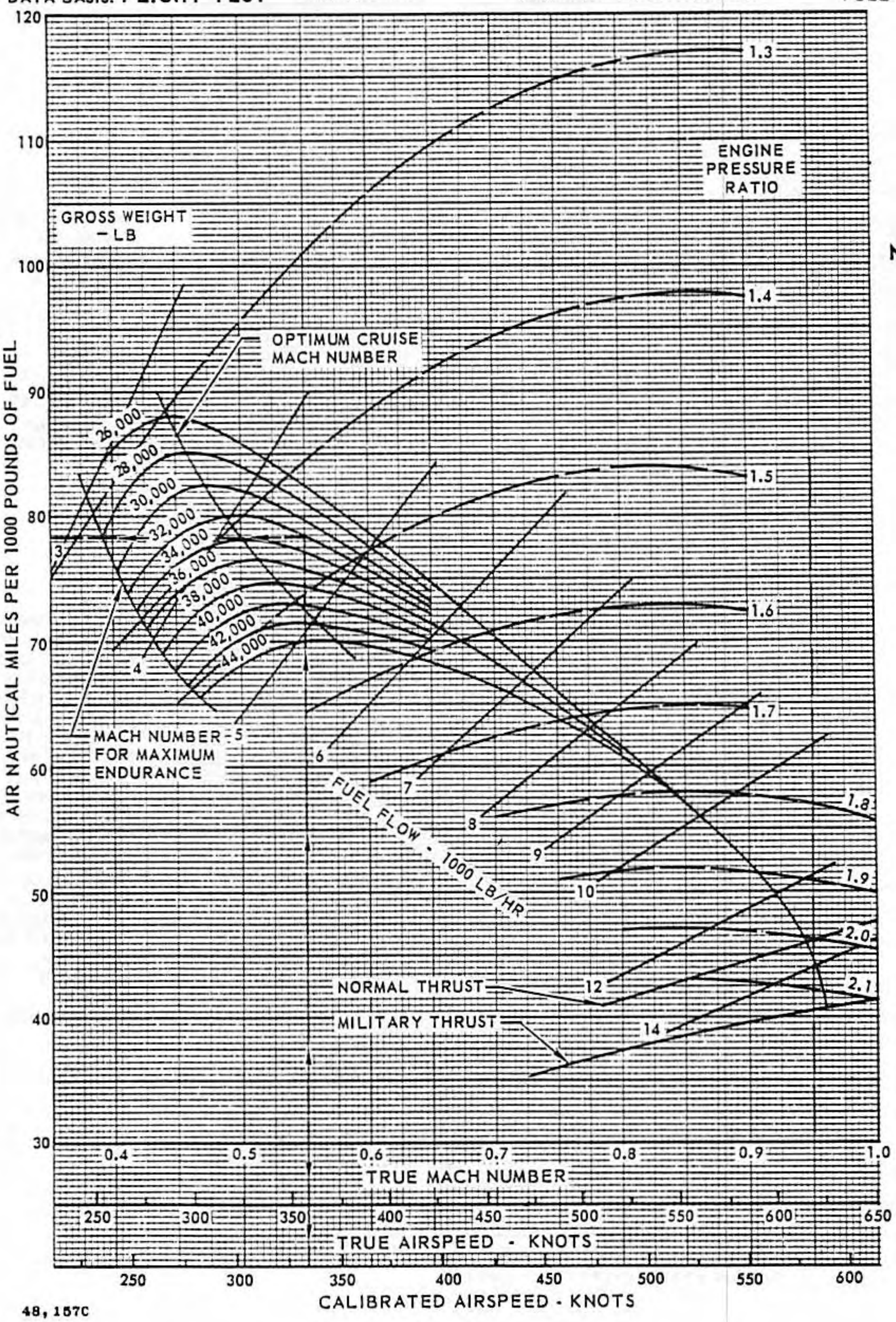
NAUTICAL MILES PER 1000 POUNDS - 5,000 FEET

A B

MODEL: F-106A/B
DATE: 21 FEBRUARY 1967
DATA BASIS: **FLIGHT TEST**

CONFIGURATION: TWO 360-GAL EXTERNAL TANKS
ARMAMENT
STANDARD ATMOSPHERE

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL



NOTE

WIND CORRECTION TO N. MI/LB

GROUND N. MI/LB = AIR N. MI/LB

$$\times \frac{V_{GROUND}}{V_{AIR}}$$

WHERE V_{AIR} IS TRUE AIRSPEED AND V_{GROUND} IS GROUND SPEED.

48,157C

Figure 4-26

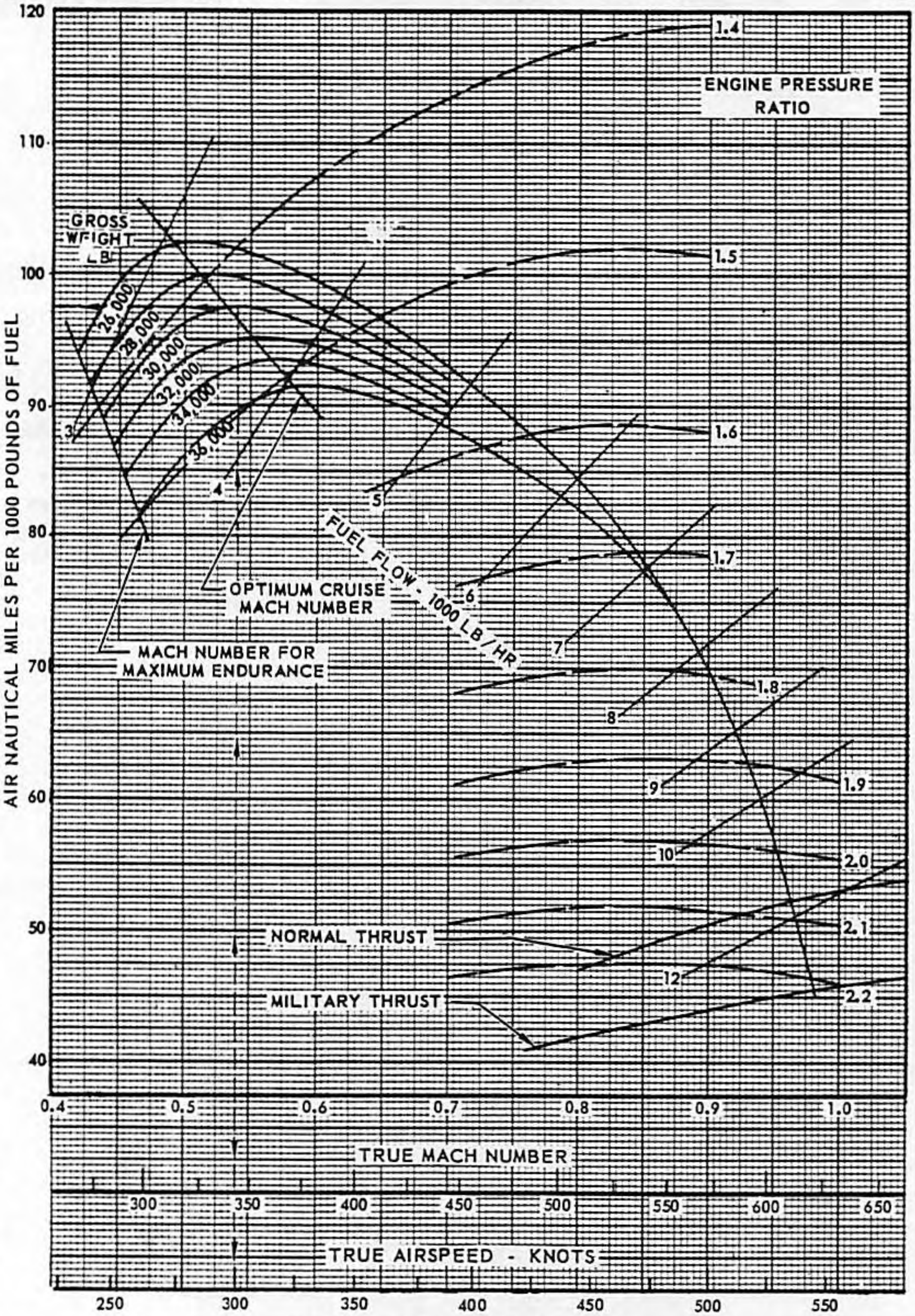
A B

NAUTICAL MILES PER 1000 POUNDS - 10,000 FEET

MODEL: F-106A/B
DATE: 1 SEPTEMBER 1961
DATA BASIS: FLIGHT TEST

CONFIGURATION: CLEAN ARMAMENT IN
STANDARD ATMOSPHERE

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL



NOTES

WIND CORRECTION TO N. MI/LB

GROUND N. MI/LB = AIR N. MI/LB

$$\times \frac{V_{GROUND}}{V_{AIR}}$$

WHERE V_{AIR} IS TRUE AIRSPEED AND V_{GROUND} IS GROUND SPEED.

FOR EMERGENCY CRUISE DATA, THE VALUES OBTAINED FROM THIS CHART SHOULD BE REDUCED BY THE FOLLOWING PERCENTS. 11% REDUCTION IN OPTIMUM CRUISE MACH NUMBER. 35% REDUCTION IN MAXIMUM NAUTICAL MILES PER 1000 POUNDS OF FUEL USED. THESE DATA ARE BASED ON ARMAMENT BAY DOORS OPEN, EITHER WITH OR WITHOUT AFT LAUNCHERS EXTENDED.

Figure 4-27

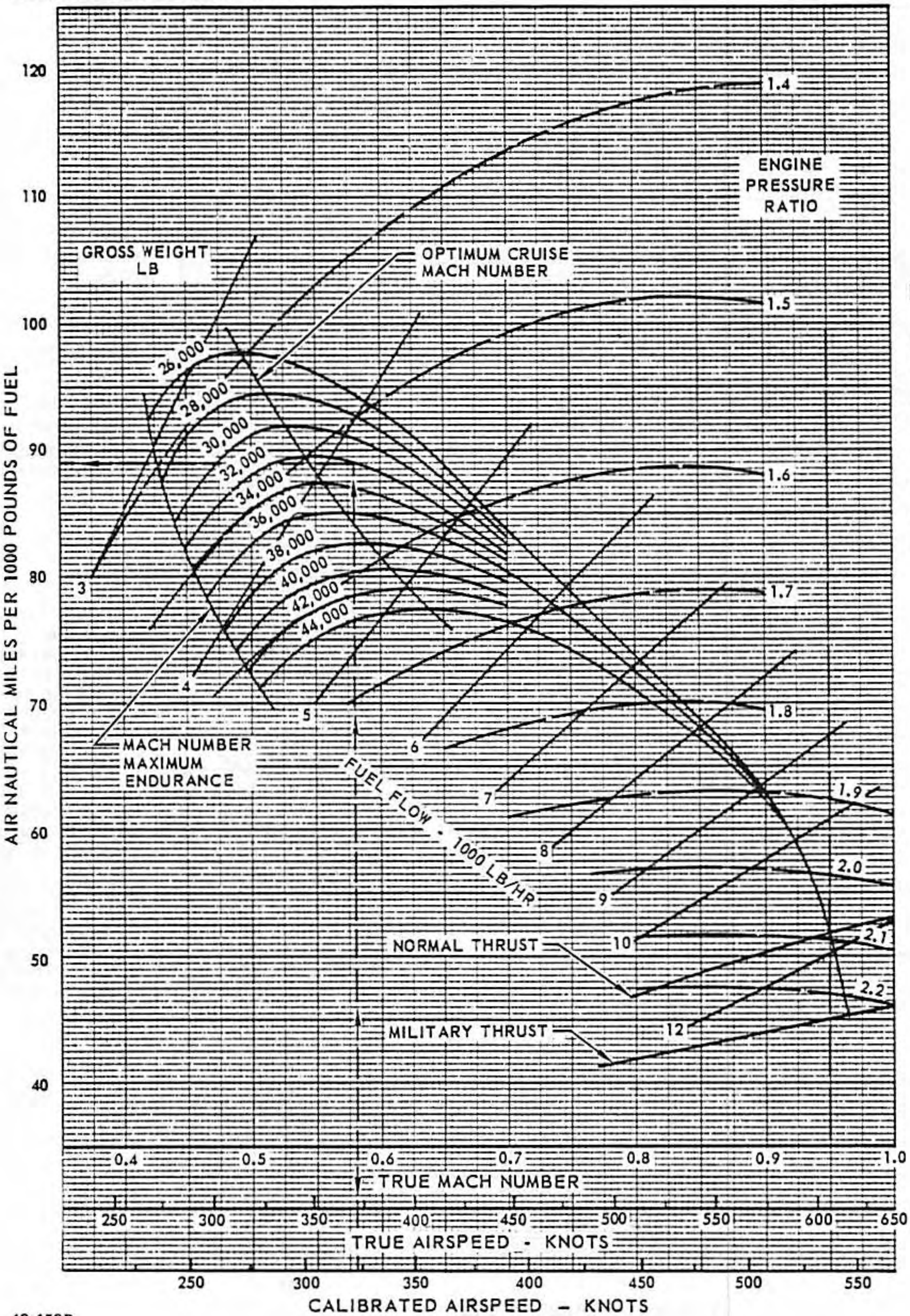
A B

NAUTICAL MILES PER 1000 POUNDS - 10,000 FEET

MODEL: F-106A/B
DATE: 21 FEBRUARY 1967
DATA BASIS: FLIGHT TEST

CONFIGURATION: TWO 360-GAL EXTERNAL TANKS
ARMAMENT IN STANDARD ATMOSPHERE

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL



NOTES

WIND CORRECTION TO N. MI/LB

GROUND N. MI/LB = AIR N. MI/LB $\times \frac{V_{GROUND}}{V_{AIR}}$

WHERE V_{AIR} IS TRUE AIRSPEED AND V_{GROUND} IS GROUND SPEED.

FOR EMERGENCY CRUISE DATA, THE VALUES OBTAINED FROM THIS CHART SHOULD BE REDUCED BY THE FOLLOWING PERCENTS. 11% REDUCTION IN OPTIMUM CRUISE MACH NUMBER. 35% REDUCTION IN MAXIMUM NAUTICAL MILES PER 1000 POUNDS OF FUEL USED. THESE DATA ARE BASED ON ARMAMENT BAY DOORS OPEN, EITHER WITH OR WITHOUT AFT LAUNCHERS EXTENDED.

Figure 4-28

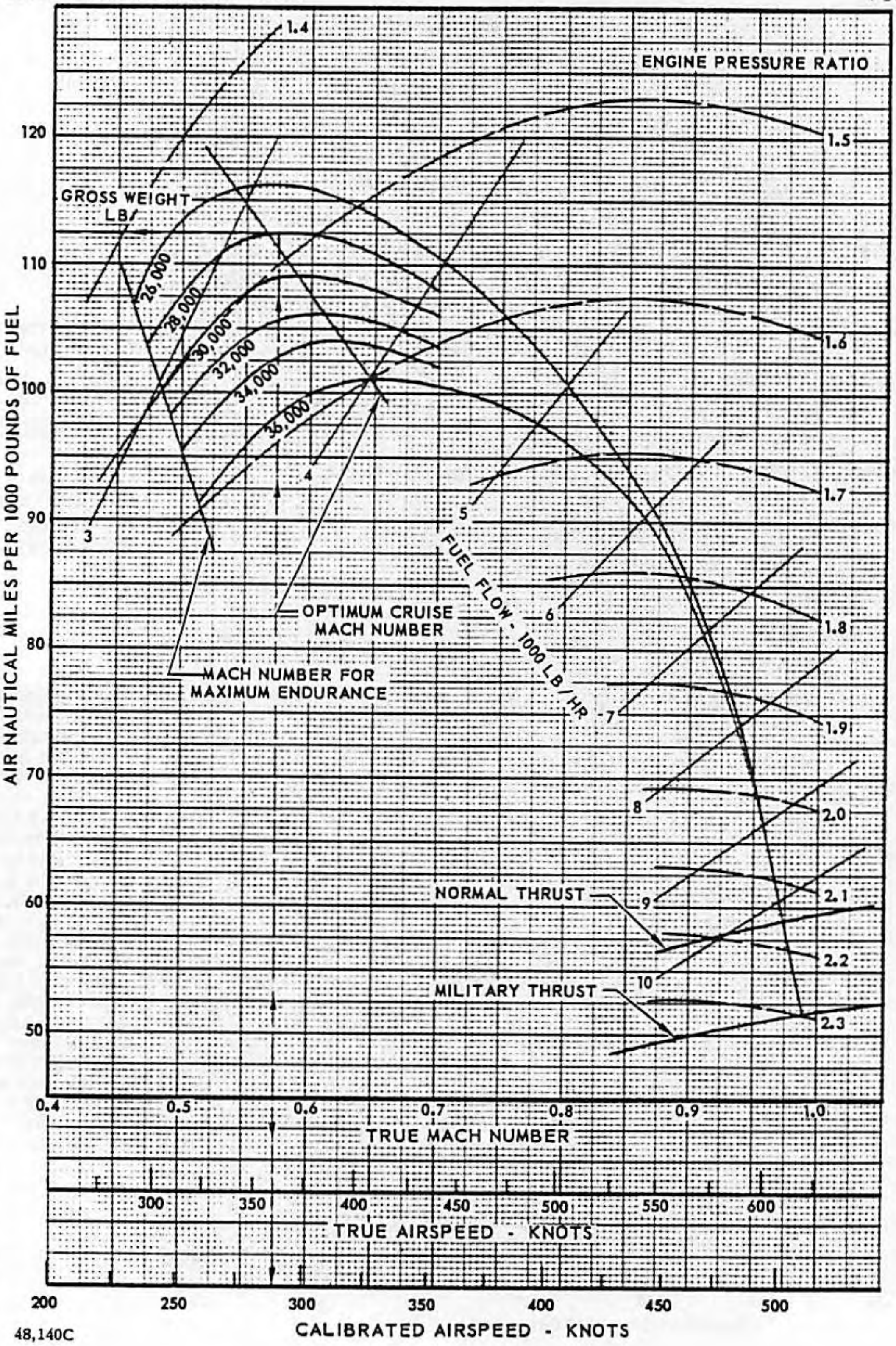
A B

NAUTICAL MILES PER 1000 POUNDS - 15,000 FEET

MODEL: F-106A/B
DATE: 1 SEPTEMBER 1961
DATA BASIS: FLIGHT TEST

CONFIGURATION: CLEAN
ARMAMENT IN
STANDARD ATMOSPHERE

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL



NOTES

WIND CORRECTION TO N. MI/LB

$$\text{GROUND N. MI/LB} = \text{AIR N. MI/LB} \times \frac{V_{GROUND}}{V_{AIR}}$$

WHERE V_{AIR} IS TRUE AIRSPEED AND V_{GROUND} IS GROUND SPEED.

FOR EMERGENCY CRUISE DATA, THE VALUES OBTAINED FROM THIS CHART SHOULD BE REDUCED BY THE FOLLOWING PERCENTS. 11% REDUCTION IN OPTIMUM CRUISE MACH NUMBER. 35% REDUCTION IN MAXIMUM NAUTICAL MILES PER 1000 POUNDS OF FUEL USED. THESE DATA ARE BASED ON ARMAMENT BAY DOORS OPEN, EITHER WITH OR WITHOUT AFT LAUNCHERS EXTENDED.

Figure 4-29

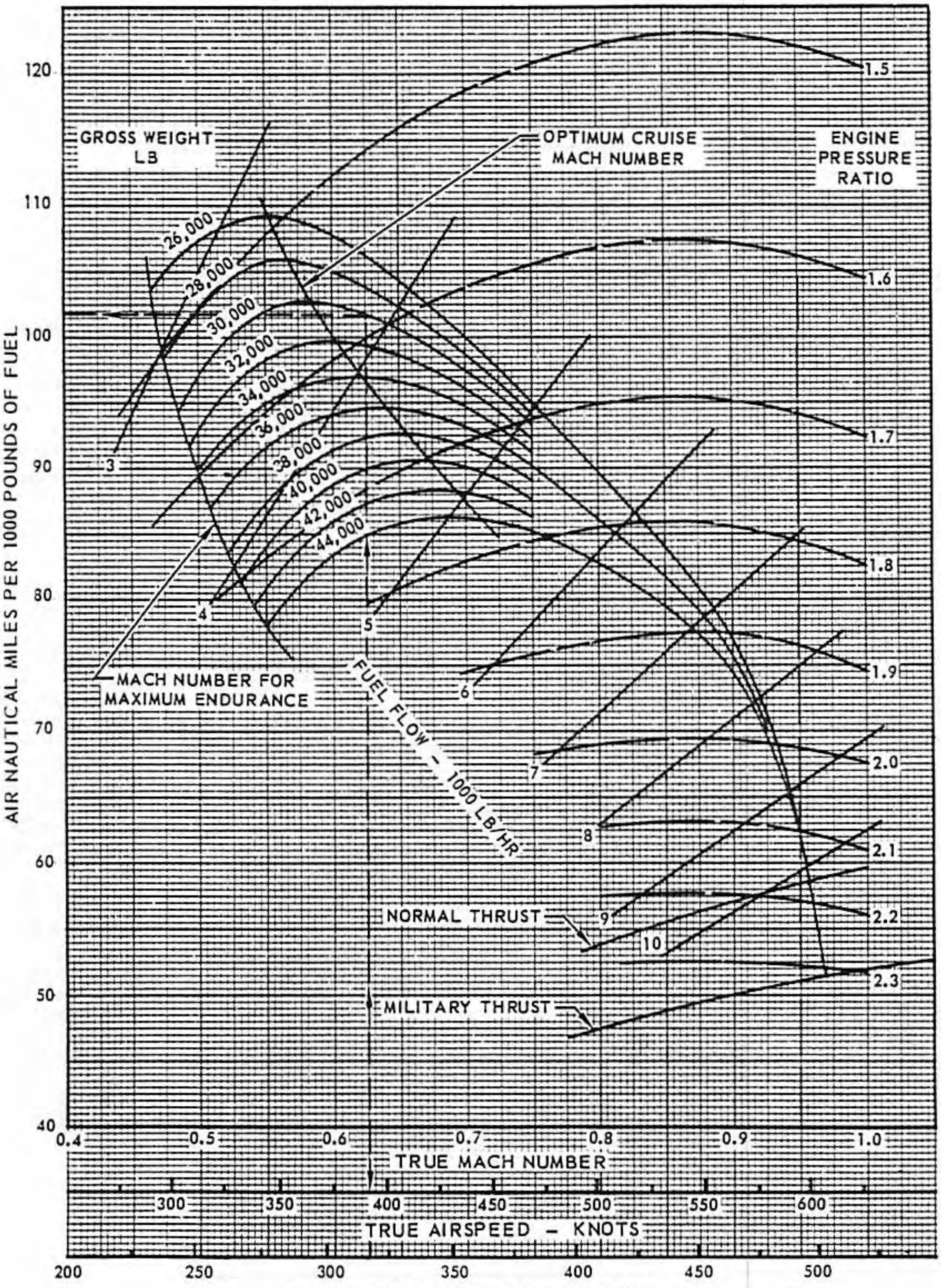
A B

NAUTICAL MILES PER 1000 POUNDS – 15,000 FEET

MODEL: F-106A/B
DATE: 21 FEBRUARY 1967
DATA BASIS: FLIGHT TEST

CONFIGURATION: TWO 360-GALLON EXTERNAL TANKS
ARMAMENT IN STANDARD ATMOSPHERE

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL



48,141C

NOTES

WIND CORRECTION TO N. MI/LB

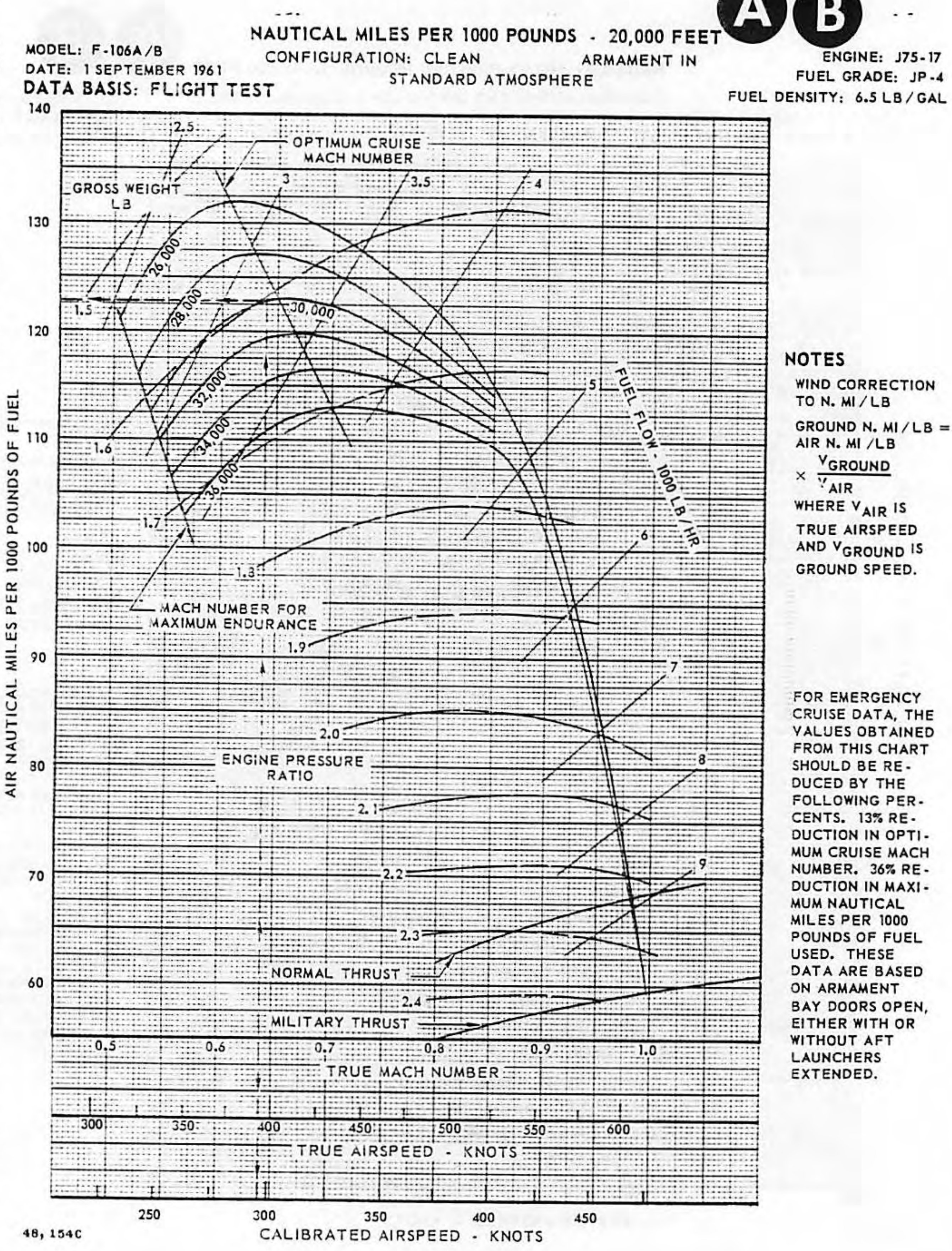
GROUND N. MI/LB = AIR N. MI/LB $\times \frac{V_{GROUND}}{V_{AIR}}$

WHERE V_{AIR} IS TRUE AIRSPEED AND V_{GROUND} IS GROUND SPEED.

FOR EMERGENCY CRUISE DATA, THE VALUES OBTAINED FROM THIS CHART SHOULD BE REDUCED BY THE FOLLOWING PERCENTS. 11% REDUCTION IN OPTIMUM CRUISE MACH NUMBER. 32% REDUCTION IN MAXIMUM NAUTICAL MILES PER 1000 POUNDS OF FUEL USED. THESE DATA ARE BASED ON ARMAMENT BAY DOORS OPEN, EITHER WITH OR WITHOUT AFT LAUNCHERS EXTENDED.

Figure 4-30

A B



NOTES

WIND CORRECTION TO N. MI/LB

GROUND N. MI/LB = AIR N. MI/LB $\times \frac{V_{GROUND}}{V_{AIR}}$

WHERE V_{AIR} IS TRUE AIRSPEED AND V_{GROUND} IS GROUND SPEED.

FOR EMERGENCY CRUISE DATA, THE VALUES OBTAINED FROM THIS CHART SHOULD BE REDUCED BY THE FOLLOWING PERCENTS. 13% REDUCTION IN OPTIMUM CRUISE MACH NUMBER. 36% REDUCTION IN MAXIMUM NAUTICAL MILES PER 1000 POUNDS OF FUEL USED. THESE DATA ARE BASED ON ARMAMENT BAY DOORS OPEN, EITHER WITH OR WITHOUT AFT LAUNCHERS EXTENDED.

Figure 4-31

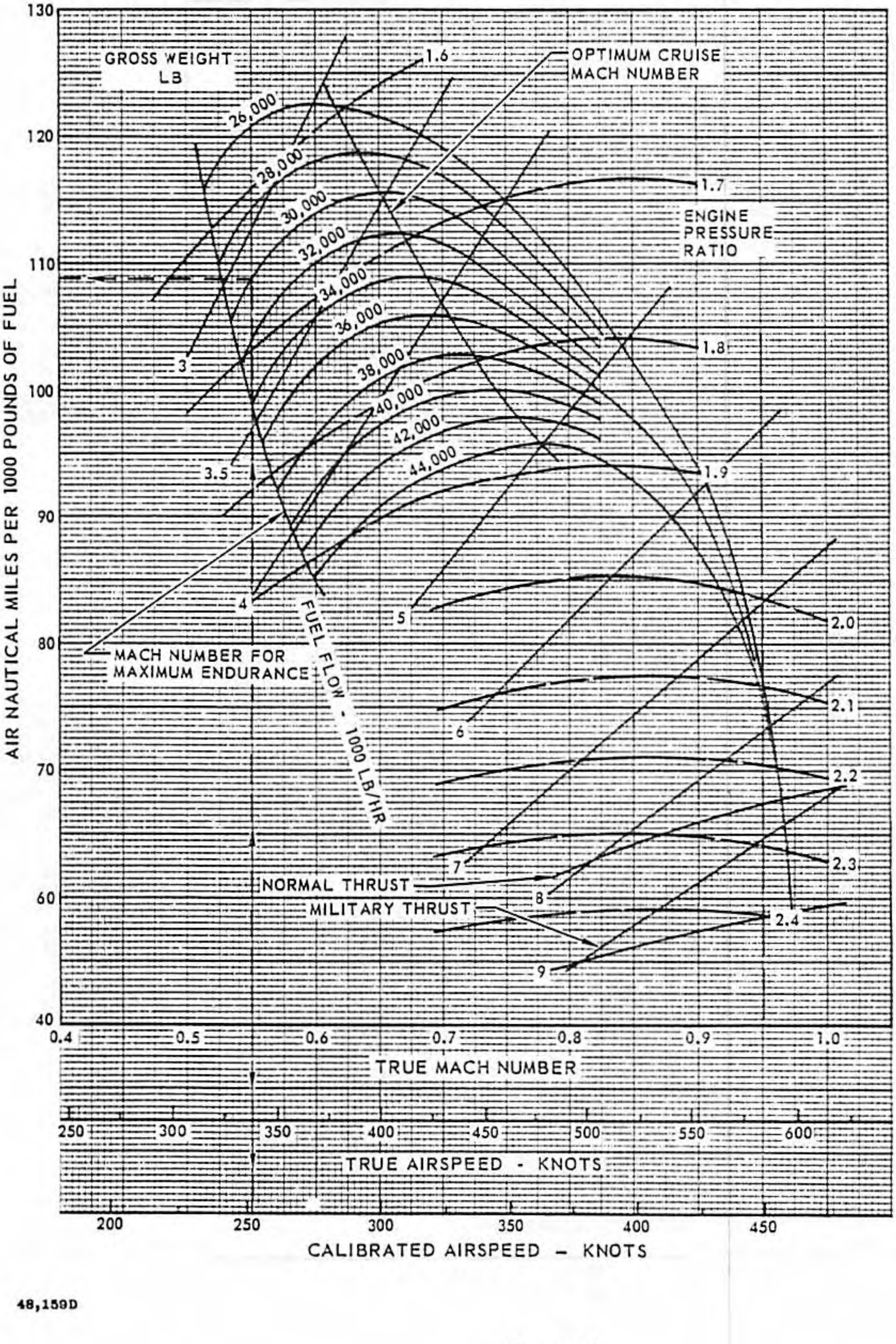
A B

MODEL: F-106A/B
DATE: 21 FEBRUARY 1967
DATA BASIS: FLIGHT TEST

NAUTICAL MILES PER 1000 POUNDS - 20,000 FEET

CONFIGURATION: TWO 360-GAL EXTERNAL TANKS
ARMAMENT IN   STANDARD ATMOSPHERE

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL



NOTES

WIND CORRECTION TO N. MI/LB

GROUND N. MI/LB = AIR N. MI/LB $\times \frac{V_{GROUND}}{V_{AIR}}$

WHERE V_{AIR} IS TRUE AIRSPEED AND V_{GROUND} IS GROUND SPEED.

FOR EMERGENCY CRUISE DATA, THE VALUES OBTAINED FROM THIS CHART SHOULD BE REDUCED BY THE FOLLOWING PERCENTS. 12% REDUCTION IN OPTIMUM CRUISE MACH NUMBER. 32% REDUCTION IN MAXIMUM NAUTICAL MILES PER 1000 POUNDS OF FUEL USED. THESE DATA ARE BASED ON ARMAMENT BAY DOORS OPEN, EITHER WITH OR WITHOUT AFT LAUNCHERS EXTENDED.

48,159D

Figure 4-32

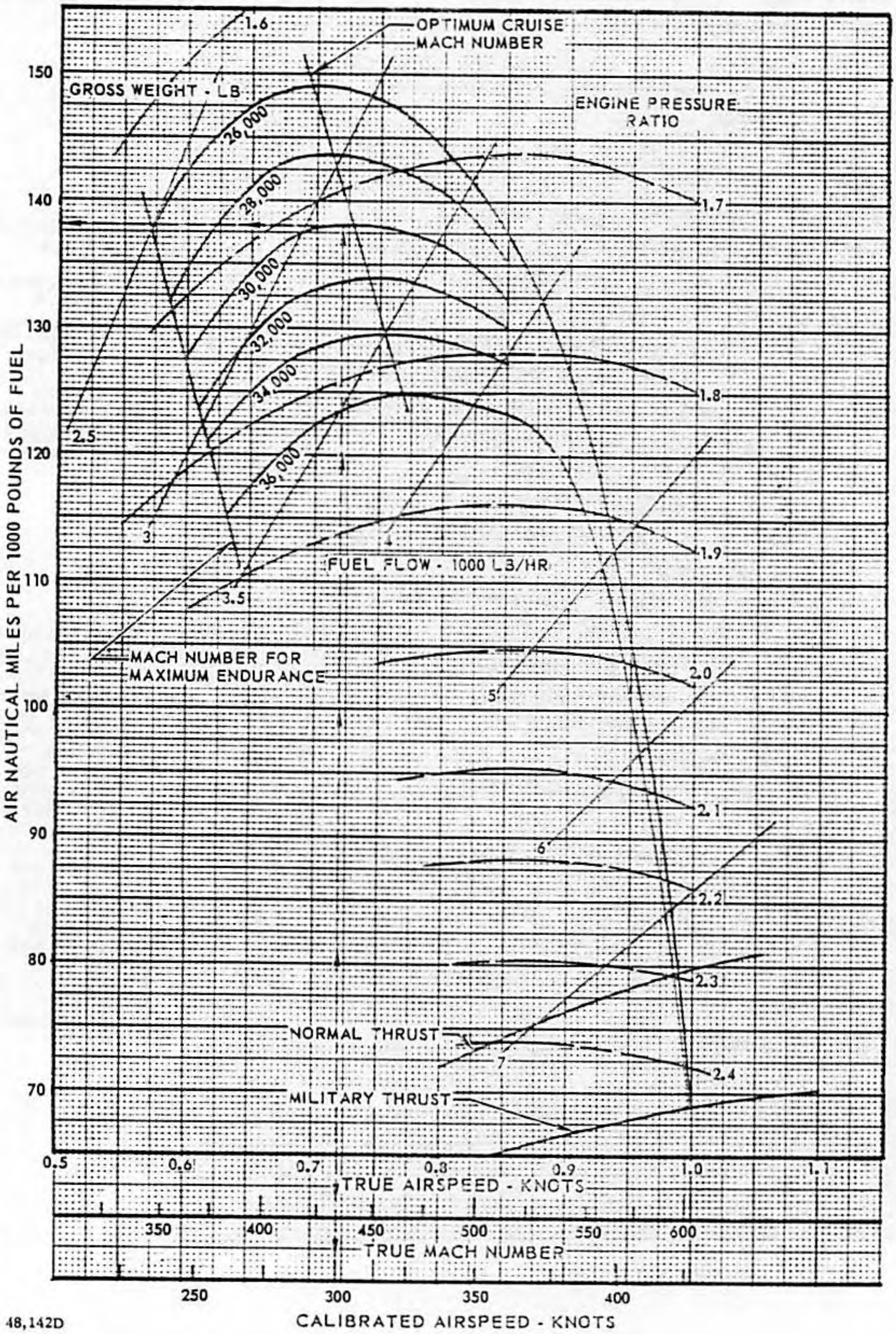
A B

NAUTICAL MILES PER 1000 POUNDS - 25,000 FEET

MODEL: F-106A/B
DATE: 1 SEPTEMBER 1961
DATA BASIS: FLIGHT TEST

CONFIGURATION: CLEAN ARMAMENT IN
STANDARD ATMOSPHERE

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL



48,142D

NOTES

WIND CORRECTION TO N. MI/LB

GROUND N. MI/LB = AIR N. MI/LB $\times \frac{V_{GROUND}}{V_{AIR}}$

WHERE V_{AIR} IS TRUE AIRSPEED AND V_{GROUND} IS GROUND SPEED

FOR EMERGENCY CRUISE DATA, THE VALUES OBTAINED FROM THIS CHART SHOULD BE REDUCED BY THE FOLLOWING PERCENTS.
13% REDUCTION IN OPTIMUM CRUISE MACH NUMBER.
37% REDUCTION IN MAXIMUM NAUTICAL MILES PER 1000 POUNDS OF FUEL USED. THESE DATA ARE BASED ON ARMAMENT BAY DOORS OPEN, EITHER WITH OR WITHOUT AFT LAUNCHERS EXTENDED.

Figure 4-33

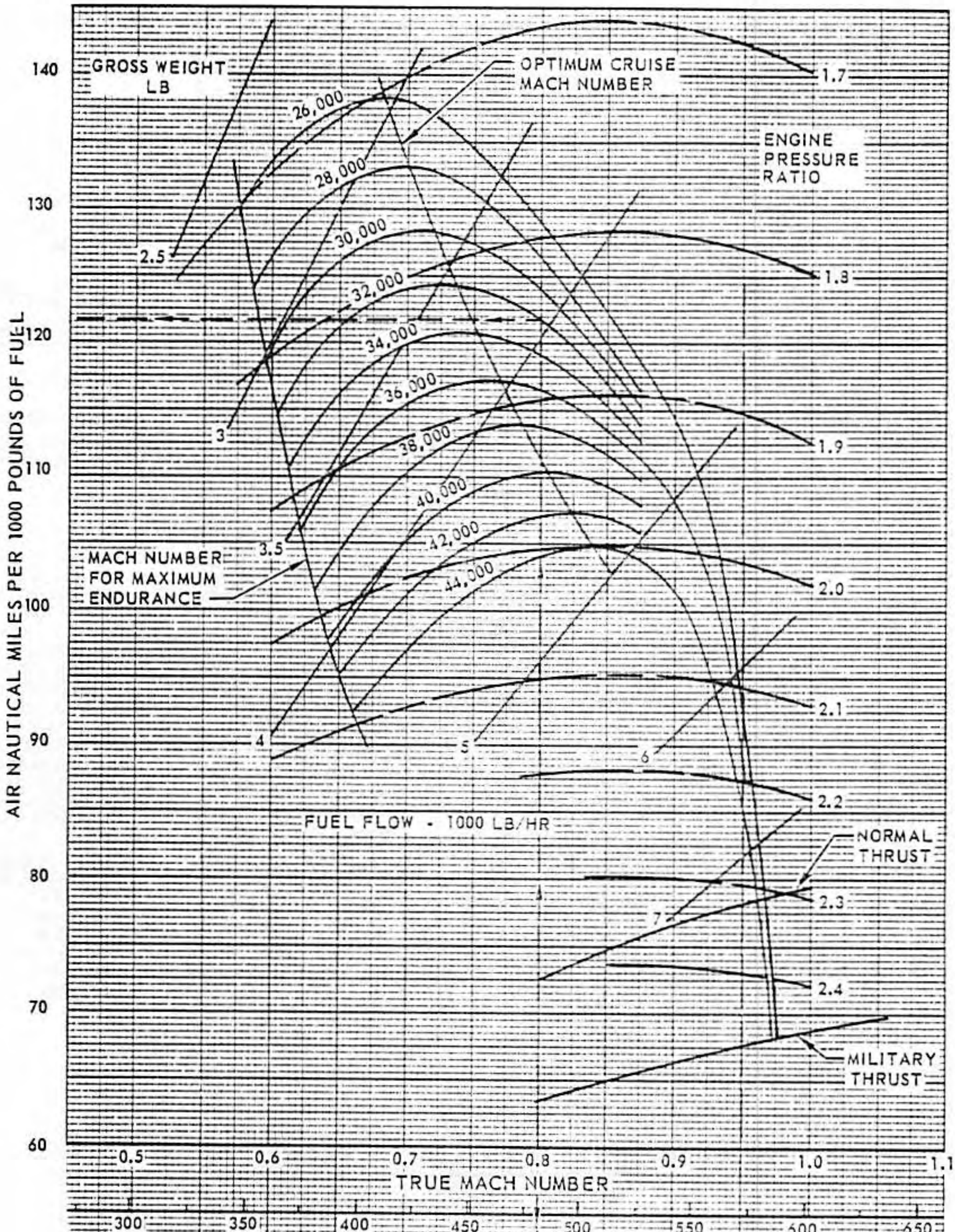
A B

NAUTICAL MILES PER 1000 POUNDS - 25,000 FEET

MODEL: F-106A/B
DATE: 21 FEBRUARY 1967
DATA BASIS: FLIGHT TEST

CONFIGURATION: TWO 360-GAL EXTERNAL TANKS
ARMAMENT IN   STANDARD ATMOSPHERE

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY; 6.5 LB/GAL



NOTES

WIND CORRECTION TO N. MI/LB

GROUND N. MI/LB = AIR N. MI/LB $\times \frac{V_{GROUND}}{V_{AIR}}$

WHERE V_{AIR} IS TRUE AIRSPEED AND V_{GROUND} IS GROUND SPEED

FOR EMERGENCY CRUISE DATA, THE VALUES OBTAINED FROM THIS CHART SHOULD BE REDUCED BY THE FOLLOWING PERCENTS. 12% REDUCTION IN OPTIMUM CRUISE MACH NUMBER. 35% REDUCTION IN MAXIMUM NAUTICAL MILES PER 1000 POUNDS OF FUEL USED. THESE DATA ARE BASED ON ARMAMENT BAY DOORS OPEN, EITHER WITH OR WITHOUT AFT LAUNCHERS EXTENDED.

48, 143C

Figure 4-34

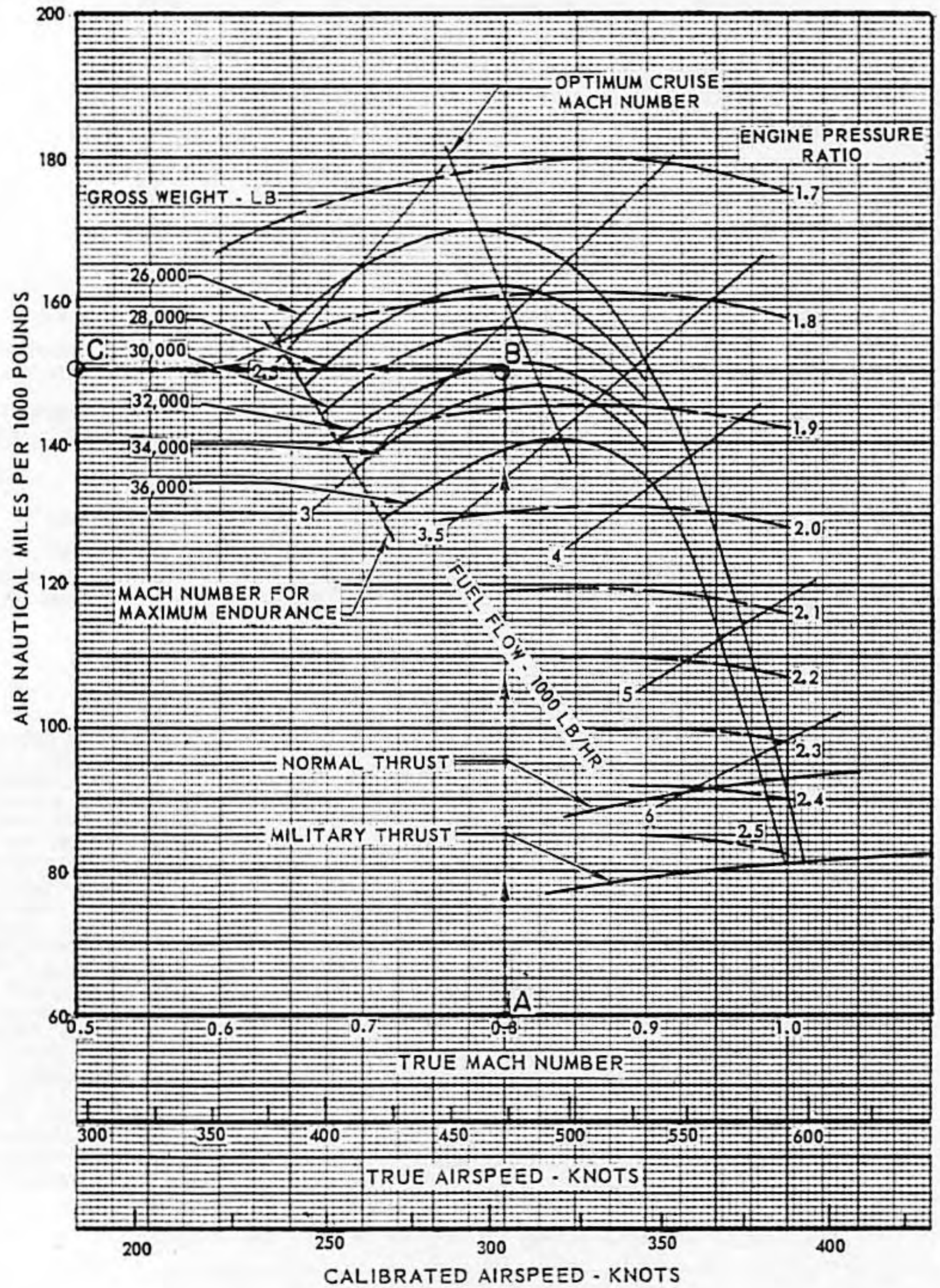
A B

NAUTICAL MILES PER 1000 POUNDS - 30,000 FEET

MODEL: F-106A/B
DATE: 1 SEPTEMBER 1961
DATA BASIS: FLIGHT TEST

CONFIGURATION: CLEAN
ARMAMENT IN STANDARD ATMOSPHERE

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL



NOTES

WIND CORRECTION TO N. MI/LB

GROUND N. MI/LB = AIR N. MI/LB

$$\times \frac{V_{GROUND}}{V_{AIR}}$$

WHERE V_{AIR} IS TRUE AIRSPEED AND V_{GROUND} IS GROUND SPEED

FOR EMERGENCY CRUISE DATA, THE VALUES OBTAINED FROM THIS CHART SHOULD BE REDUCED BY THE FOLLOWING PERCENTS.
12% REDUCTION IN OPTIMUM CRUISE MACH NUMBER.
40% REDUCTION IN MAXIMUM NAUTICAL MILES PER 1000 POUNDS OF FUEL USED. THESE DATA ARE BASED ON ARMAMENT BAY DOORS OPEN, EITHER WITH OR WITHOUT AFT LAUNCHERS EXTENDED.

48,155E

Figure 4-35

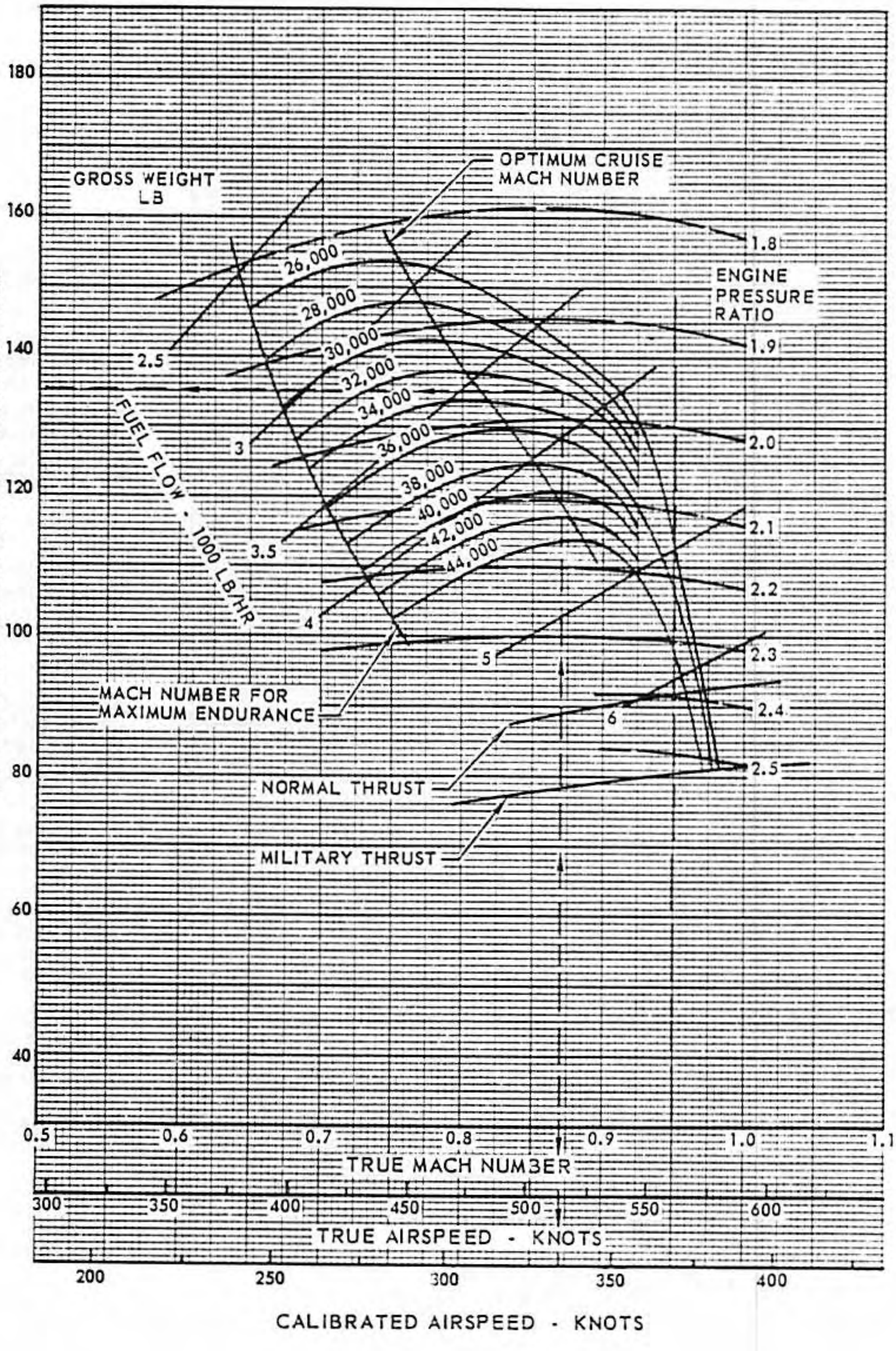
NAUTICAL MILES PER 1000 POUNDS - 30,000 FEET

A B

MODEL: F-106A/B
DATE: 21 FEBRUARY 1967
DATA BASIS: FLIGHT TEST

CONFIGURATION: TWO 360-GAL EXTERNAL TANKS
ARMAMENT IN STANDARD ATMOSPHERE

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL



NOTES

WIND CORRECTION TO N. MI/LB

GROUND N. MI/LB = AIR N. MI/LB $\times \frac{V_{GROUND}}{V_{AIR}}$

WHERE V_{AIR} IS TRUE AIRSPEED AND V_{GROUND} IS GROUND SPEED.

FOR EMERGENCY CRUISE DATA, THE VALUES OBTAINED FROM THIS CHART SHOULD BE REDUCED BY THE FOLLOWING PERCENTS. 12% REDUCTION IN OPTIMUM CRUISE MACH NUMBER. 38% REDUCTION IN MAXIMUM NAUTICAL MILES PER 1000 POUNDS OF FUEL USED. THESE DATA ARE BASED ON ARMAMENT BAY DOORS OPEN, EITHER WITH OR WITHOUT AFT LAUNCHERS EXTENDED.

48,160C

Figure 4-36

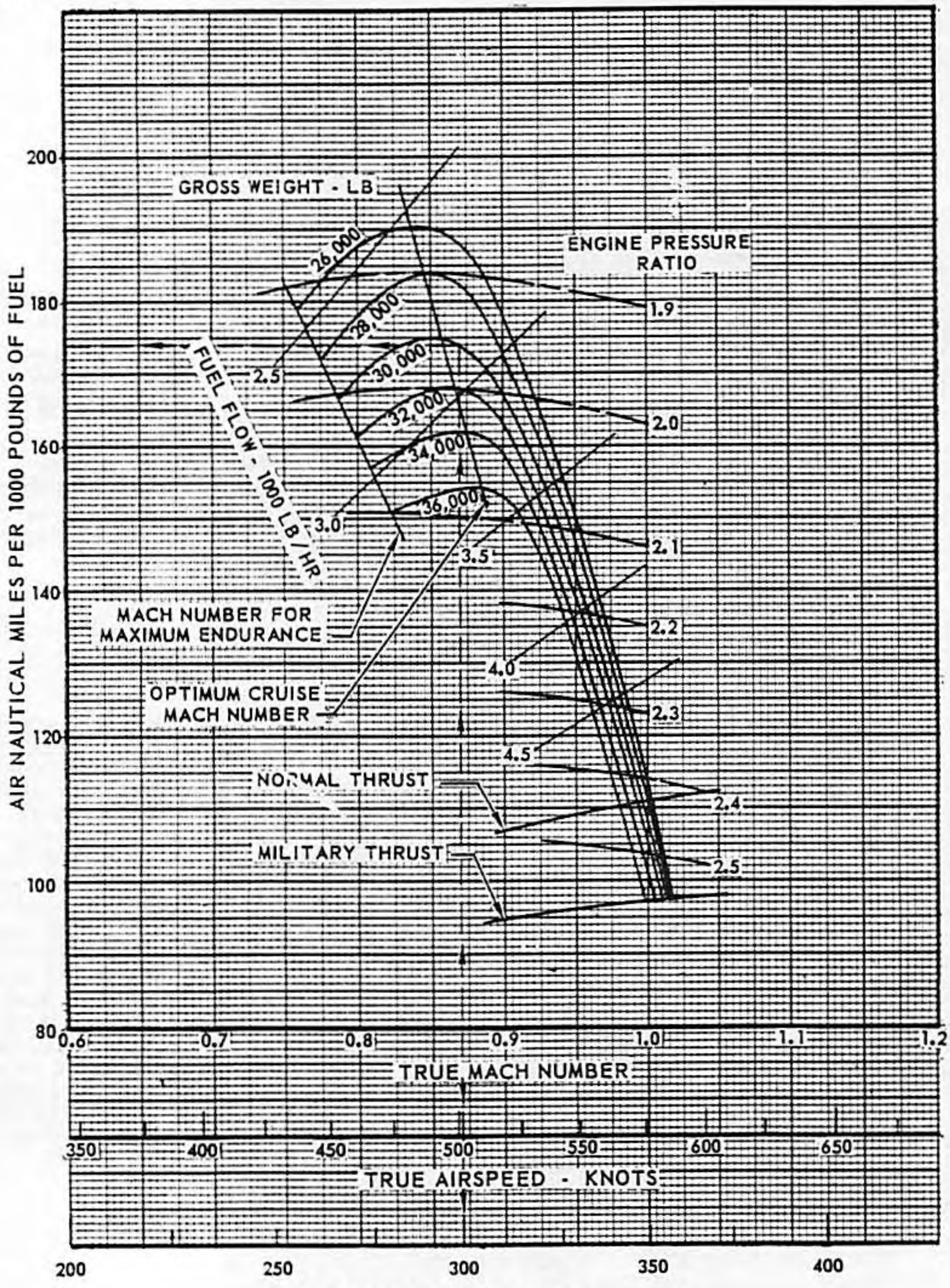
A B

NAUTICAL MILES PER 1000 POUNDS - 35,000 FEET

MODEL: F-106A/B
DATE: 1 SEPTEMBER 1961
DATA BASIS: FLIGHT TEST

CONFIGURATION: CLEAN ARMAMENT IN
STANDARD ATMOSPHERE

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL



NOTES

WIND CORRECTION TO N. MI/LB

GROUND N. MI/LB = AIR N. MI/LB $\times \frac{V_{GROUND}}{V_{AIR}}$

WHERE V_{AIR} IS TRUE AIRSPEED AND V_{GROUND} IS GROUND SPEED.

FOR EMERGENCY CRUISE DATA, THE VALUES OBTAINED FROM THIS CHART SHOULD BE REDUCED BY THE FOLLOWING PERCENTS. 8% REDUCTION IN OPTIMUM CRUISE MACH NUMBER. 43% REDUCTION IN MAXIMUM NAUTICAL MILES PER 1000 POUNDS OF FUEL USED. THESE DATA ARE BASED ON ARMAMENT BAY DOORS OPEN, EITHER WITH OR WITHOUT AFT LAUNCHERS EXTENDED.

48,144C

Figure 4-37

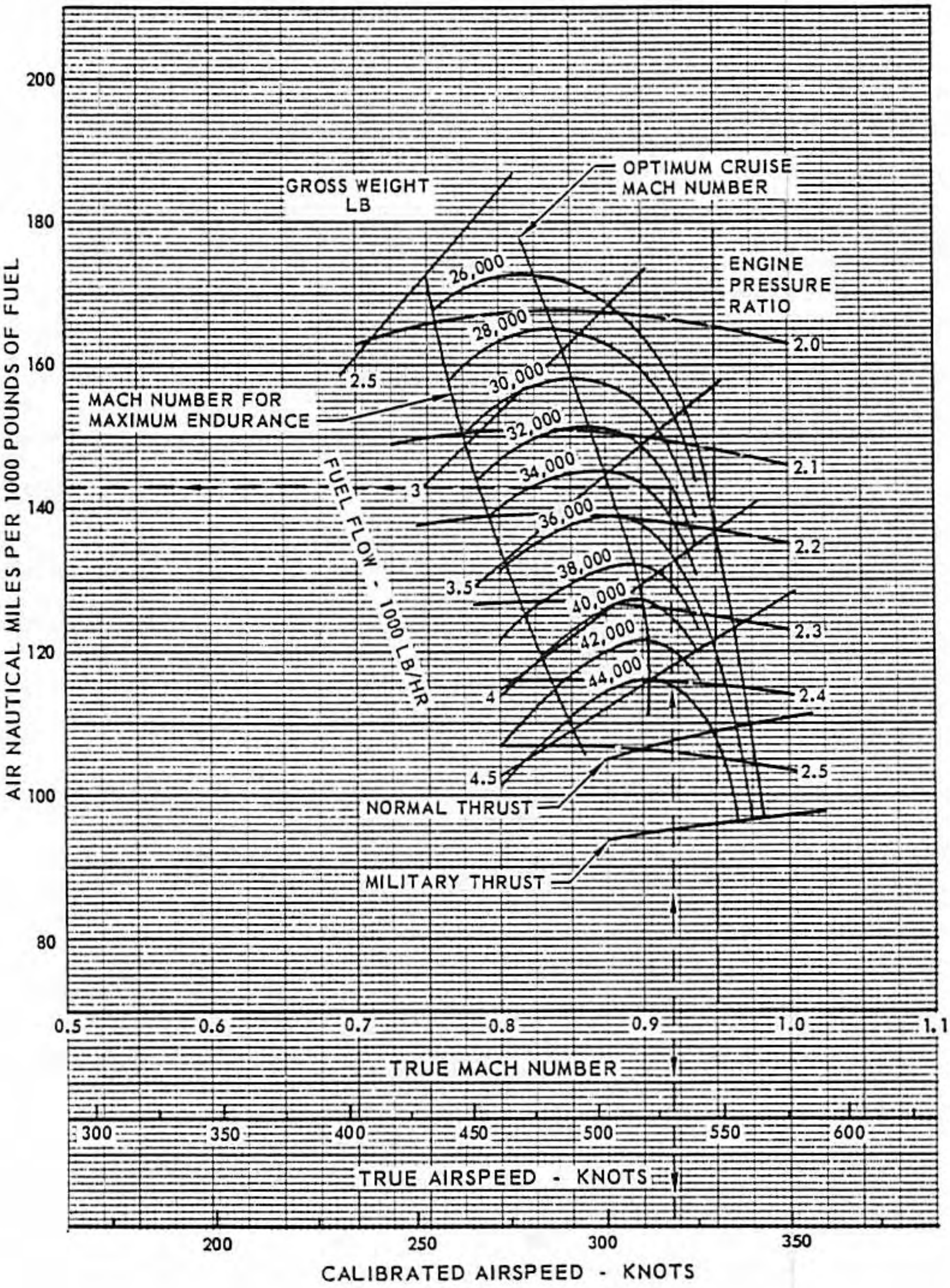
A B

NAUTICAL MILES PER 1000 POUNDS - 35,000 FEET

MODEL: F-106A/B
DATE: 21 FEBRUARY 1967
DATA BASIS: FLIGHT TEST

CONFIGURATION: TWO 360-GAL EXTERNAL TANKS
ARMAMENT IN STANDARD ATMOSPHERE

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL



NOTES·

WIND CORRECTION TO N. MI/LB

GROUND N. MI/LB = AIR N. MI/LB $\times \frac{V_{GROUND}}{V_{AIR}}$

WHERE V_{AIR} IS TRUE AIRSPEED AND V_{GROUND} IS GROUND SPEED.

FOR EMERGENCY CRUISE DATA, THE VALUES OBTAINED FROM THIS CHART SHOULD BE REDUCED BY THE FOLLOWING PERCENTS. 9% REDUCTION IN OPTIMUM CRUISE MACH NUMBER. 41% REDUCTION IN MAXIMUM NAUTICAL MILES PER 1000 POUNDS OF FUEL USED. THESE DATA ARE BASED ON ARMAMENT BAY DOORS OPEN, EITHER WITH OR WITHOUT AFT LAUNCHERS EXTENDED.

48,145D

Figure 4-38

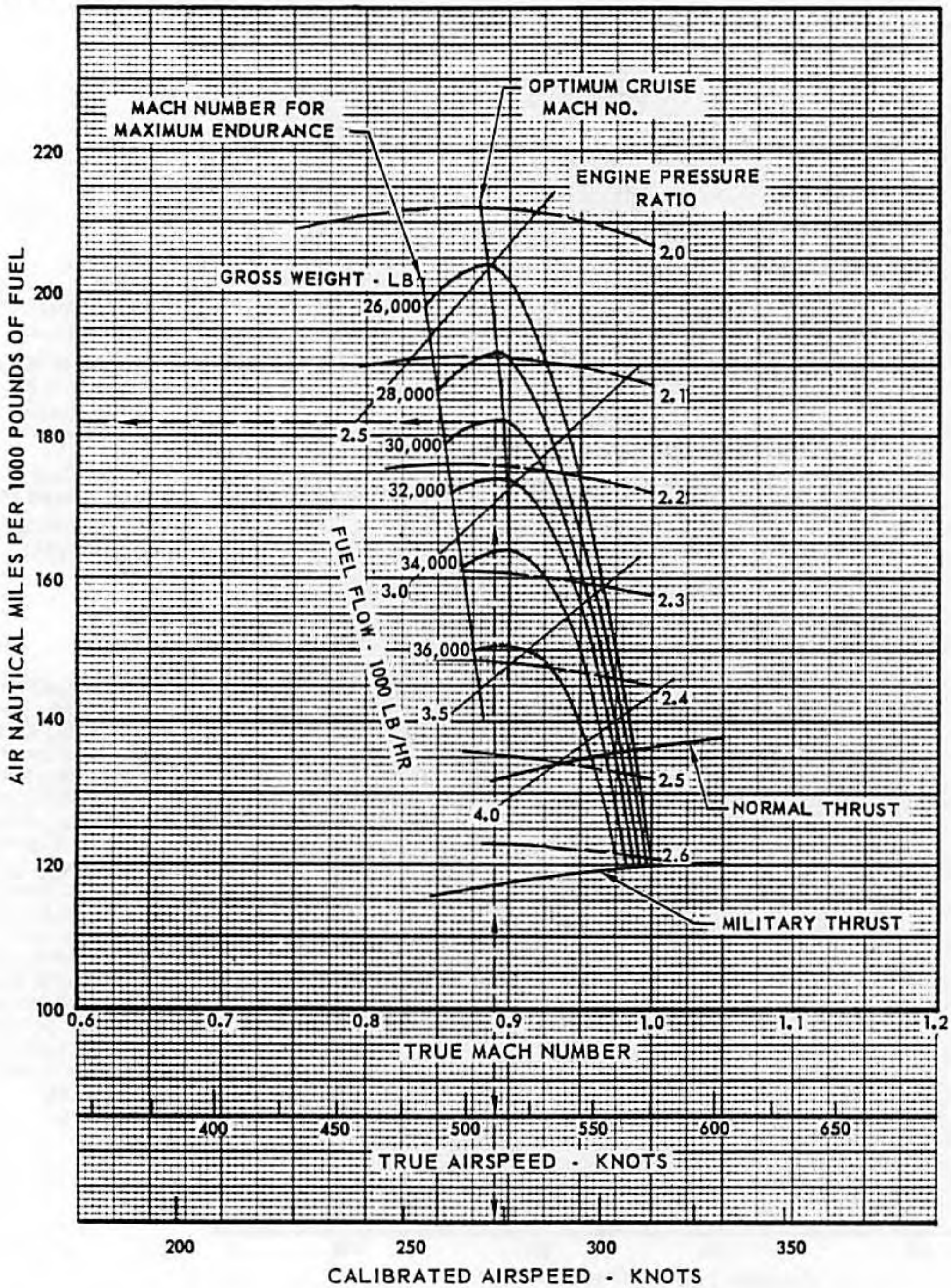
A B

NAUTICAL MILES PER 1000 POUNDS - 40,000 FEET

MODEL: F-106A/B
DATE: 1 SEPTEMBER 1961
DATA BASIS: FLIGHT TEST

CONFIGURATION: CLEAN ARMAMENT IN
STANDARD ATMOSPHERE

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL



NOTE

WIND CORRECTION TO N. MI/LB

GROUND N. MI/LB = AIR N. MI/LB $\times \frac{V_{GROUND}}{V_{AIR}}$

WHERE V_{AIR} IS TRUE AIRSPEED, AND V_{GROUND} IS GROUND SPEED.

48,156B

Figure 4-39

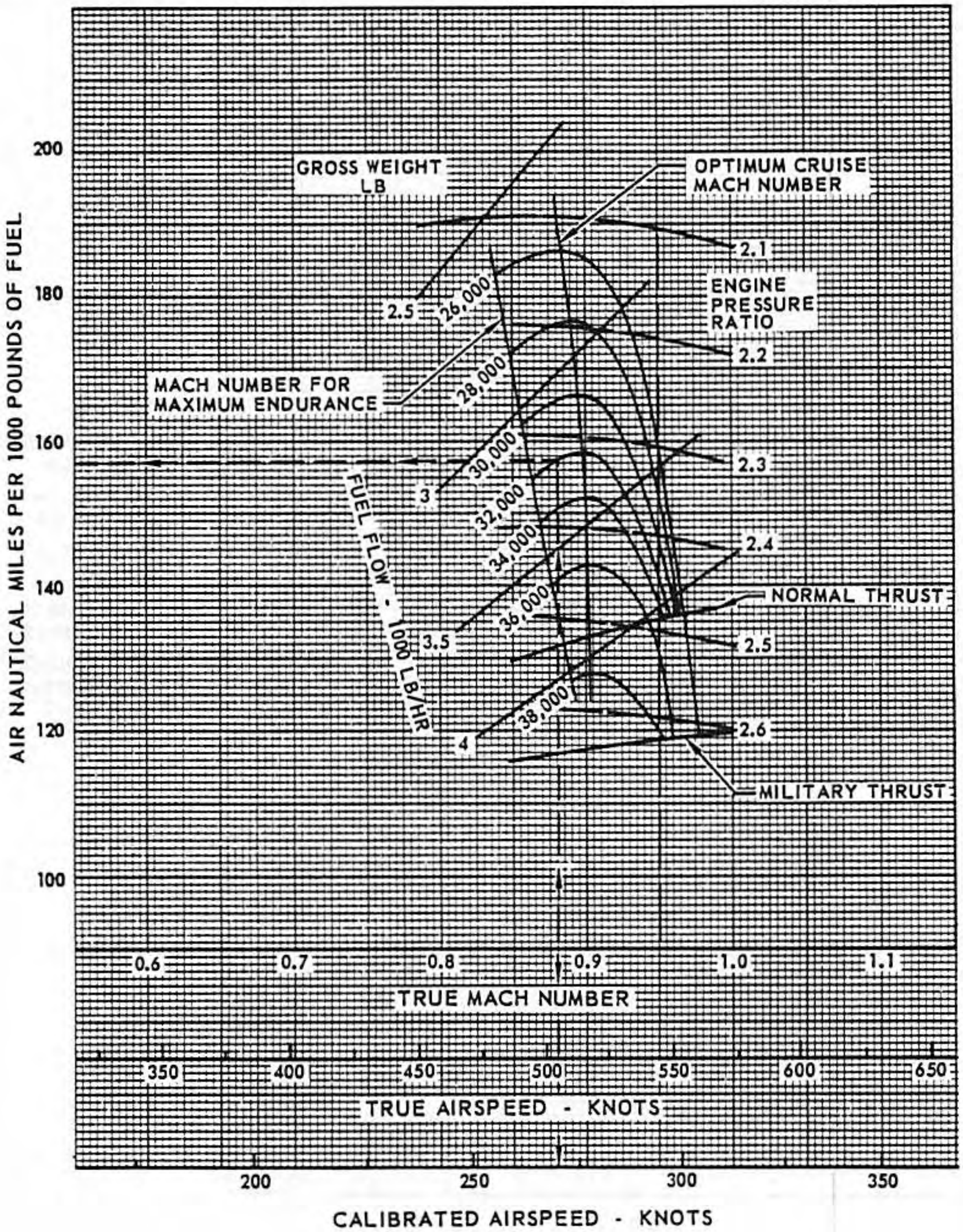
A B

NAUTICAL MILES PER 1000 POUNDS - 40,000 FEET

MODEL: F-106A/B
DATE: 21 FEBRUARY 1967
DATA BASIS: FLIGHT TEST

CONFIGURATION: TWO 360-GAL EXTERNAL TANKS
ARMAMENT IN STANDARD ATMOSPHERE

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL



NOTE

WIND CORRECTION TO N. MI/LB

GROUND N. MI/LB = AIR N. MI/LB $\times \frac{V_{GROUND}}{V_{AIR}}$

WHERE V_{AIR} IS TRUE AIRSPEED AND V_{GROUND} IS GROUND SPEED.

48,161D

Figure 4-40

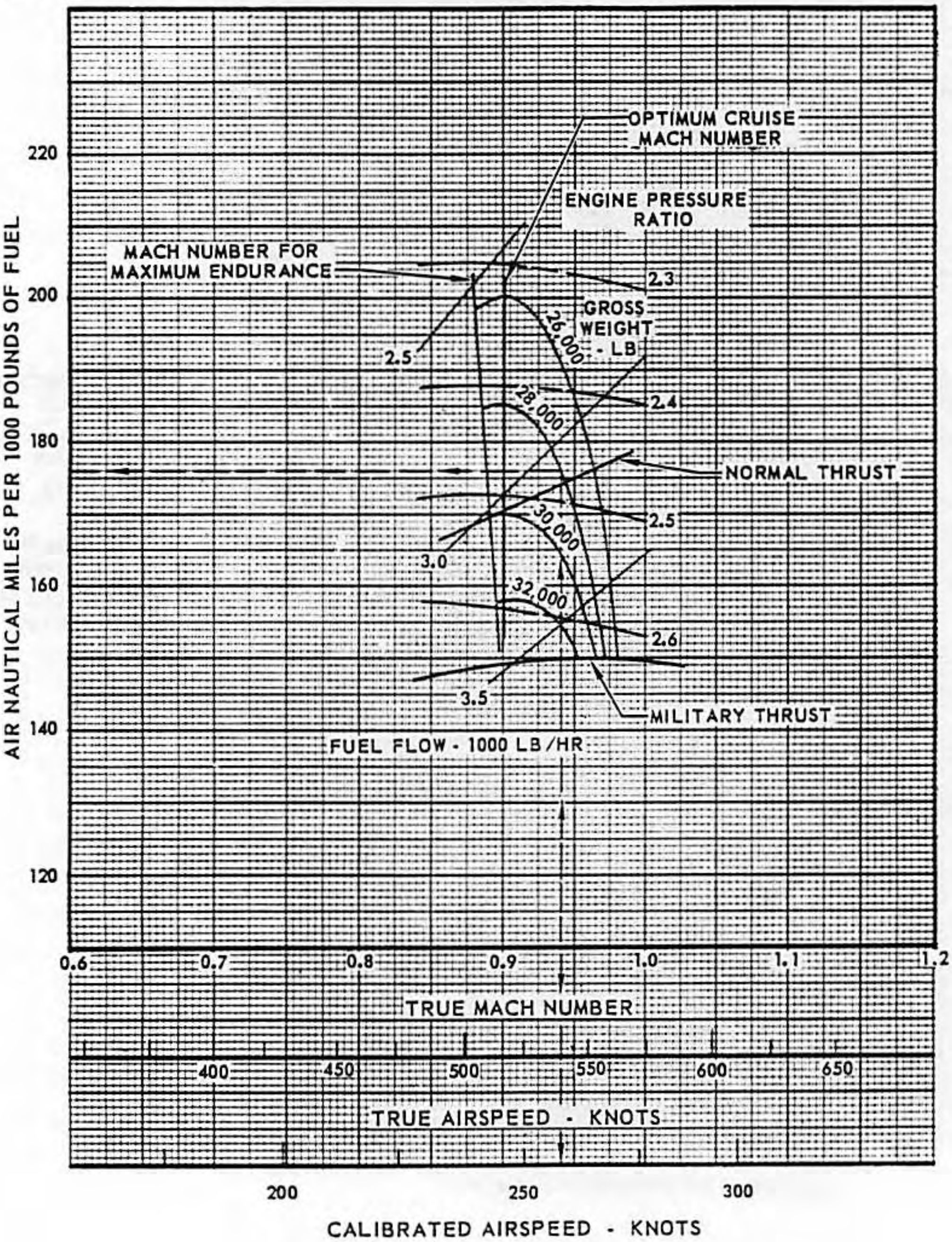
A **B**

NAUTICAL MILES PER 1000 POUNDS - 45,000 FEET

MODEL: F-106A/B
DATE: 1 SEPTEMBER 1961
DATA BASIS: FLIGHT TEST

CONFIGURATION: CLEAN ARMAMENT IN
STANDARD ATMOSPHERE

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL



NOTE

WIND CORRECTION TO N. MI/LB

GROUND N. MI/LB = AIR N. MI/LB $\times \frac{V_{GROUND}}{V_{AIR}}$

WHERE V_{AIR} IS TRUE AIRSPEED AND V_{GROUND} IS GROUND SPEED.

48, 146B

Figure 4-41

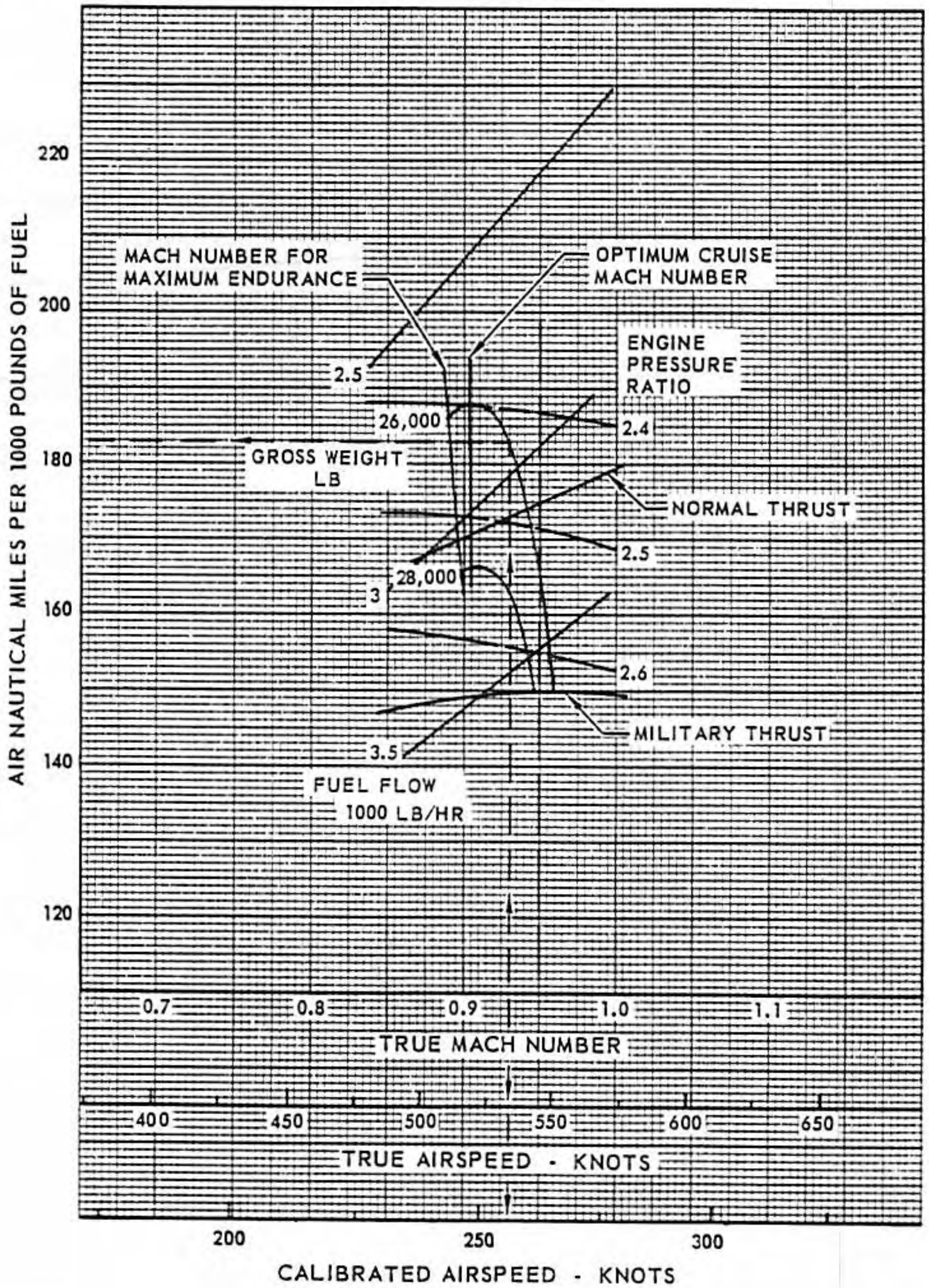
A B

NAUTICAL MILES PER 1000 POUNDS - 45,000 FEET

MODEL: F-106A/B
DATE: 21 FEBRUARY 1967
DATA BASIS: FLIGHT TEST

CONFIGURATION: TWO 360-GAL EXTERNAL TANKS
ARMAMENT IN
STANDARD ATMOSPHERE

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL



NOTE

WIND CORRECTION TO N. MI/LB

GROUND N. MI/LB = AIR N. MI/LB × $\frac{V_{GROUND}}{V_{AIR}}$

WHERE V_{AIR} IS TRUE AIRSPEED AND V_{GROUND} IS GROUND SPEED.

48,147C

Figure 4-42

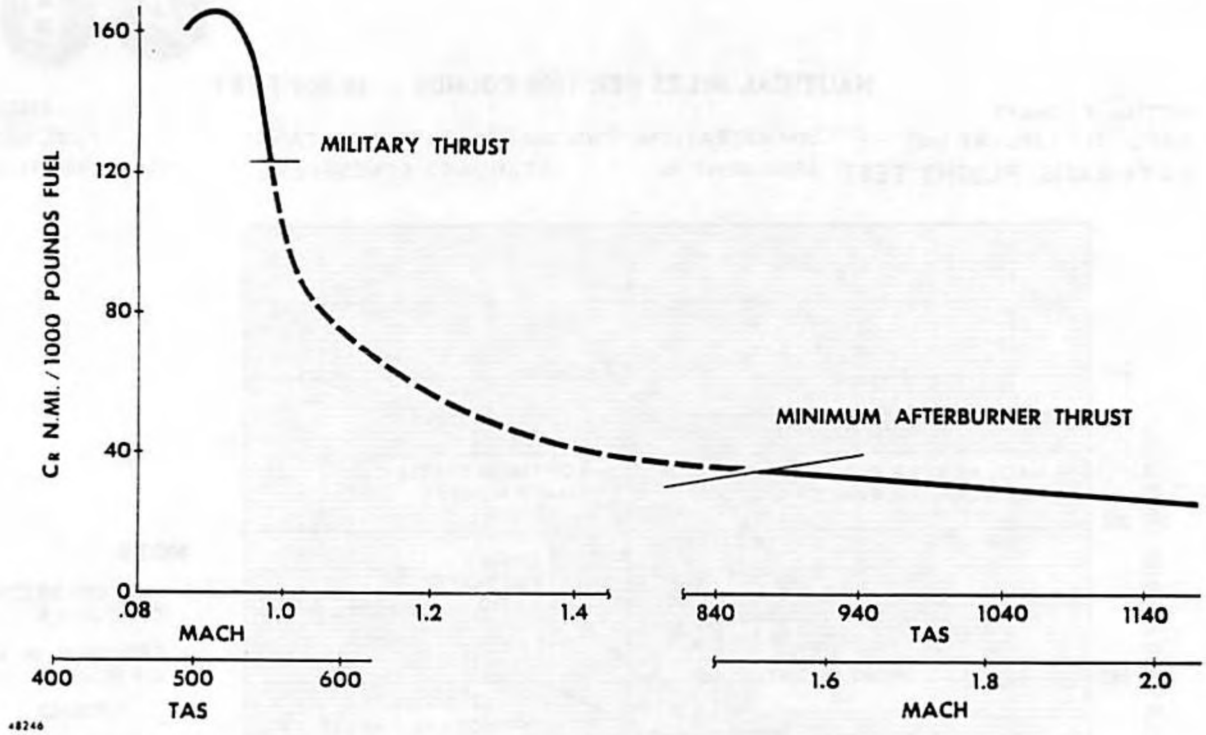

MILITARY THRUST
MINIMUM AFTERBURNER THRUST
CR N.MI. / 1000 POUNDS FUEL
160
120
80
40
0
.08
1.0
1.2
1.4
MACH
400
500
600
TAS
840
940
1040
1140
TAS
1.6
1.8
2.0
MACH
48246

Figure 4-43

SECTION V
ENDURANCE

TABLE OF CONTENTS

MAXIMUM ENDURANCE PROFILE

Figures 5-1 through 5-4 show the constant altitude endurance characteristics for the clean airplane and the airplane with external fuel tanks. These charts are plots of endurance time as a function of altitude and fuel remaining. The recommended operating speeds are tabulated, at 5000-foot intervals, on the chart.

Use

Maximum endurance time available for a specified amount of fuel may be found by entering the chart at the endurance altitude, reading right to the desired fuel remaining, and then down to the maximum endurance time available. Conversely, fuel required for endurance for a specific time may be determined by entering the chart with the endurance time, reading up to the endurance altitude, and interpolating if necessary for the fuel required.

NOTE

Fuel allowance for descent on landing has not been included.

Sample Problem

Find the maximum endurance time available with 3580 pounds of fuel remaining for endurance at 32,500 feet. The airplane is in its clean configuration:

A. Enter figure 5-1 at the endurance altitude—32,500 feet.

B. Proceed right to the fuel remaining—3,580 pounds.

C. Read down for the maximum endurance time—1 hour, 23 minutes.

OPTIMUM MAXIMUM ENDURANCE PROFILE CHART

The maximum possible endurance time available for a given fuel quantity at any initial altitude is shown in figure 5-5 and figure 5-6 for the clean airplane and in figures 5-7 and 5-8 for the airplane with two 360-gallon external tanks. These charts are based on an optimum flight path from any starting altitude. The basic flight path consists of a military thrust climb or an idle thrust descent to the optimum endurance altitude (where required), a loiter at constant altitude, and a maximum range descent to sea level with idle thrust. Notes and guide lines on the charts indicate the proper flight path to be used. Tabular data include speeds for climb, descent, and loiter, and also loiter fuel flows at 5000-foot altitude intervals.

Use

Mission planning with the optimum maximum endurance profile is the same as with the optimum return profile except that cruise distance is replaced by loiter time, and the flight path utilizes an idle thrust descent.

NOTE

Fuel allowance for landing is not included.

COMBAT ALLOWANCE CHART

The combat allowance chart, figures 5-9 and 5-10, shows the relationship between time and fuel consumed for military thrust high-speed and maximum thrust high-speed operation. Basically, these charts show time as a function of altitude for various amounts of combat fuel available. Supplementary charts of fuel flow in pounds per minute as a function of altitude for the same speed and thrust conditions are also shown.

Use

To find the combat time available for a given amount of fuel, enter the chart at the combat altitude, read to the right to the allotted fuel, and then read down for the time available. Conversely, fuel required for a specific combat time may be determined by entering the chart with combat time, reading to the combat altitude and interpolating if necessary for the fuel required. For maximum or military thrust fuel flows, enter the chart at the desired altitude and proceed horizontally to the respective fuel flow curve and then down to obtain the fuel flow in pounds per minute.

NOTE

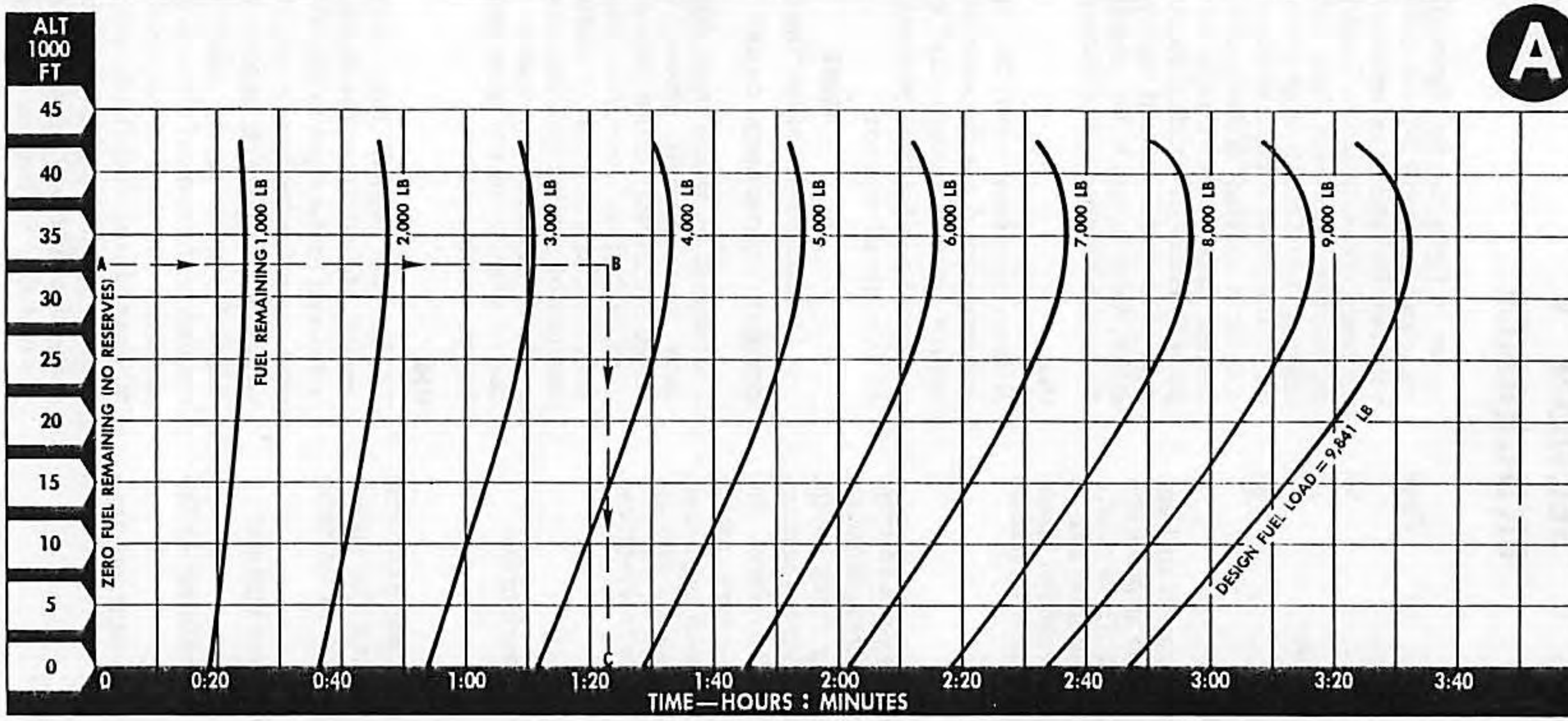
Does not include fuel to accelerate to combat Mach number.

maximum endurance profile

MODEL: F-106A
DATE: 1 SEPTEMBER 1961
DATA BASIS: FLIGHT TEST

CONFIGURATION: CLEAN
STANDARD ATMOSPHERE
TAKEOFF GROSS WEIGHT=35,875 LB.
EMPTY GROSS WEIGHT=26,034 LB.

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL



LOITER: CLEAN CONFIGURATION					
TRUE ALTITUDE 1,000 FT	TRUE MACH NO.	CAS KNOTS	TAS KNOTS	FUEL FLOW LB/HR	ENGINE PRESSURE RATIO
40	.86	262	492	3340-2440	2.39-2.09
35	.79	269	455	3220-2420	2.13-1.93
30	.68	253	399	3220-2450	1.97-1.79
25	.59	246	359	3280-2510	1.84-1.66
20	.53	244	329	3370-2600	1.71-1.55
15	.48	245	305	3490-2720	1.60-1.45
10	.44	246	283	3620-2870	1.48-1.36
5	.41	249	266	3760-3040	1.38-1.29
SEA LEVEL	.39	254	254	3900-3240	1.35-1.25

48,131C

Figure 5-1

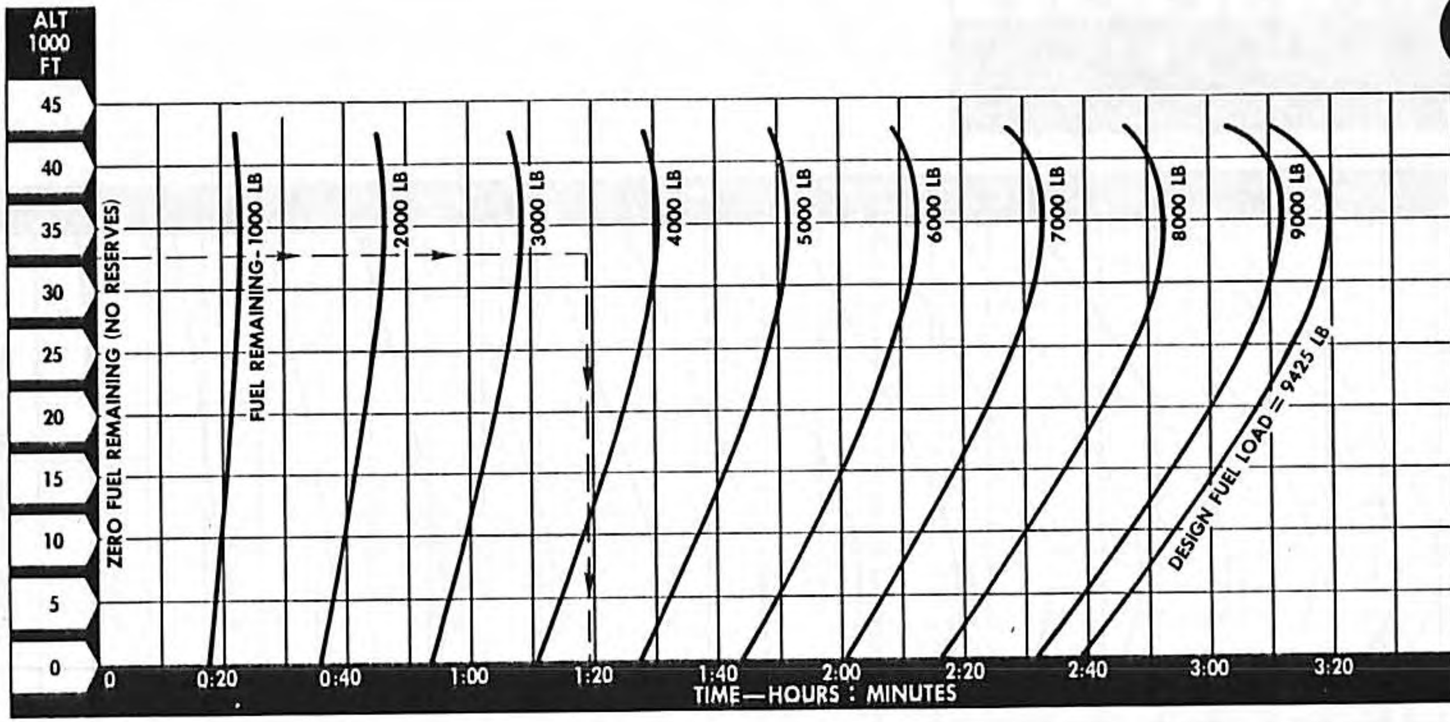
maximum endurance profile

MODEL: F-106B
DATE: 1 SEPTEMBER 1961
DATA BASIS: FLIGHT TEST

CONFIGURATION: CLEAN
STANDARD ATMOSPHERE
TAKEOFF GROSS WEIGHT = 36,300 LB
EMPTY GROSS WEIGHT = 26,875 LB

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

B



LOITER: CLEAN CONFIGURATION					
TRUE ALTITUDE 1,000 FT	TRUE MACH NO.	CAS KNOTS	TAS KNOTS	FUEL FLOW LB/HR	ENGINE PRESSURE RATIO
40	.86	263	493	3450-2520	2.41-2.11
35	.79	270	456	3340-2490	2.14-1.95
30	.68	255	401	3340-2520	1.98-1.81
25	.60	250	362	3380-2570	1.85-1.68
20	.54	247	332	3460-2660	1.73-1.56
15	.49	247	307	3580-2780	1.61-1.46
10	.45	250	286	3700-2930	1.49-1.37
5	.41	257	269	3820-3100	1.39-1.29
SEA LEVEL	.39	255	255	3950-3280	1.35-1.25

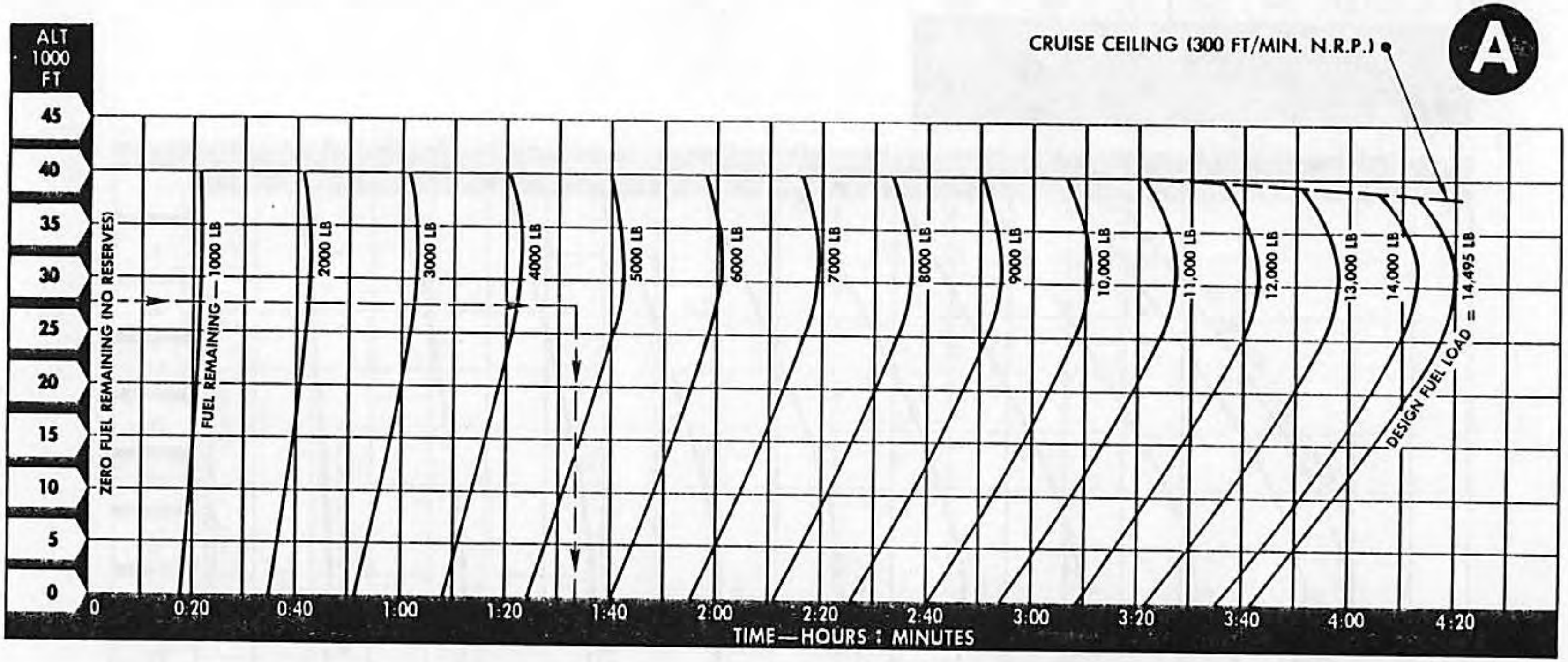
Figure 5-2

maximum endurance profile

MODEL: F-106A
DATE: 21 FEBRUARY 1967
DATE BASIS: FLIGHT TEST

CONFIGURATION: TWO 360-GAL EXTERNAL TANKS
STANDARD ATMOSPHERE
TAKEOFF GROSS WEIGHT = 41,831 LB
EMPTY GROSS WEIGHT = 27,336 LB

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL



LOITER: TWO 360-GAL EXTERNAL TANKS					
TRUE ALTITUDE 1000 FT	TRUE MACH NO	CAS KNOTS	TAS KNOTS	FUEL FLOW LB/HR	ENGINE PRESSURE RATIO
40	.88	268	503	4720-2770	2.64-2.21
35	.80	272	461	4200-2730	2.41-2.04
30	.70	262	411	4110-2740	2.22-1.88
25	.62	256	371	4110-2790	2.05-1.74
20	.56	254	341	4150-2860	1.88-1.61
15	.51	255	317	4240-2950	1.72-1.49
10	.46	255	294	4350-3060	1.60-1.40
5	.42	256	275	4480-3180	1.49-1.31
SEA LEVEL	.39	260	260	4620-3330	1.40-1.25

48552

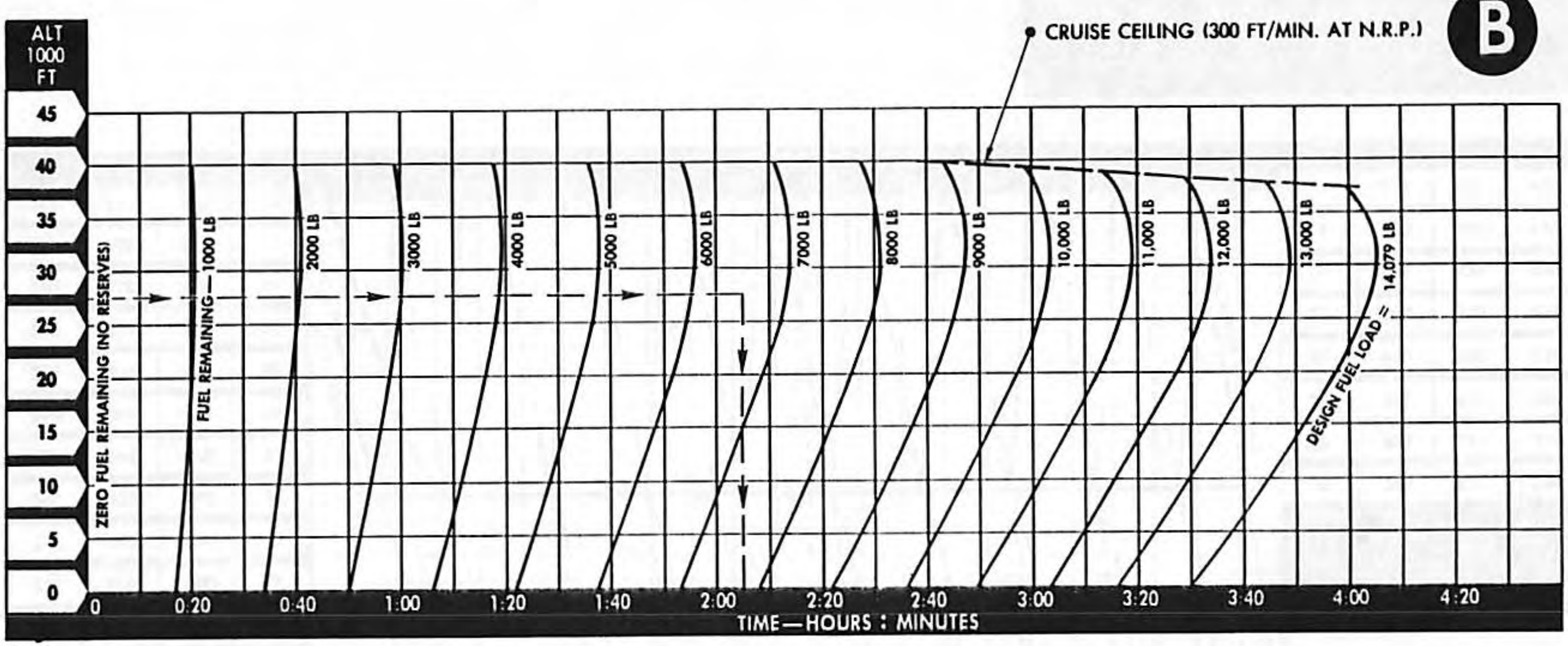
Figure 5-3

maximum endurance profile

MODEL: F-106B
DATE: 21 FEBRUARY 1967
DATE BASIS: FLIGHT TEST

CONFIGURATION: TWO 360-GAL EXTERNAL TANKS
STANDARD ATMOSPHERE
TAKEOFF GROSS WEIGHT = 42,720 LB
EMPTY GROSS WEIGHT = 28,641 LB

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL



LOITER: TWO 360-GAL EXTERNAL TANKS					
TRUE ALTITUDE 1,000 FT	TRUE MACH NO	CAS KNOTS	TAS KNOTS	FUEL FLOW LB/HR	ENGINE PRESSURE RATIO
40	.88	270	505	4900-2900	2.75-2.25
35	.81	274	464	4290-2850	2.43-2.08
30	.70	264	414	4190-2860	2.23-1.92
25	.62	258	374	4190-2910	2.07-1.77
20	.56	257	345	4230-2990	1.90-1.65
15	.51	257	320	4310-3090	1.74-1.52
10	.47	258	297	4410-3200	1.61-1.43
5	.43	259	278	4550-3320	1.49-1.33
SEA LEVEL	.40	264	264	4670-3470	1.39-1.27

48553

Figure 5-4

optimum maximum endurance profile

MODEL: F-106A
DATE: 1 SEPTEMBER 1961
DATA BASIS: FLIGHT TEST

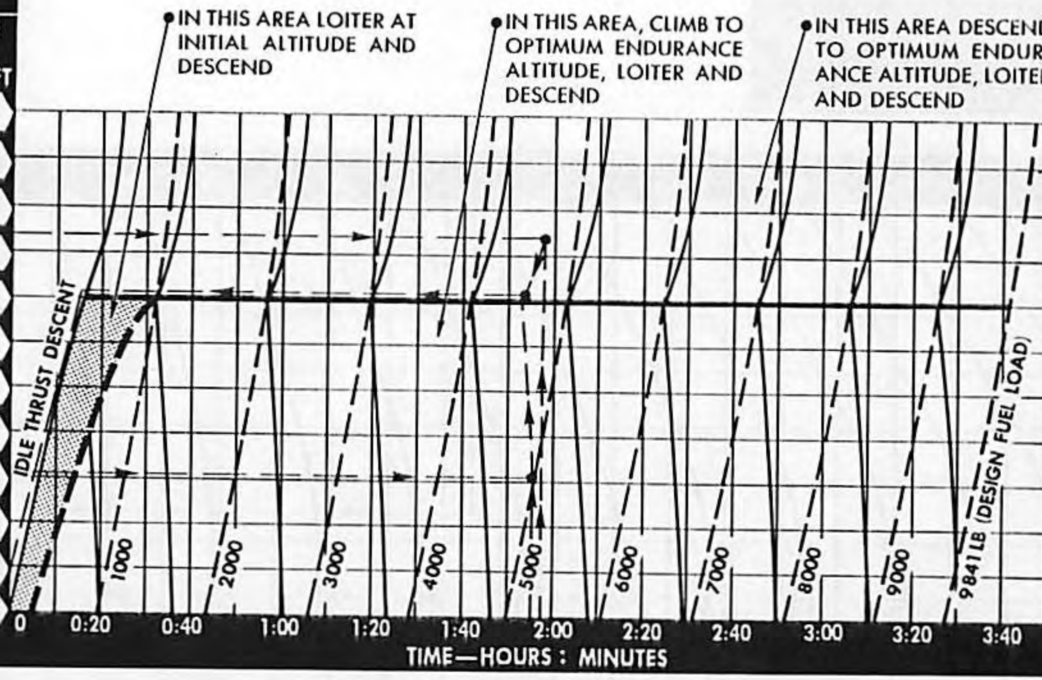
CONFIGURATION: CLEAN
STANDARD ATMOSPHERE
TAKEOFF GROSS WEIGHT = 35,875 LB.
EMPTY GROSS WEIGHT = 26,034 LB.

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

A

IDLE THRUST DESCENT

CAS KNOTS	TAS KNOTS	TRUE MACH NO.	TRUE ALT 1,000 FT
198	516	.900	55
220	516	.900	50
247	516	.900	45
250	473	.830	40
250	425	.740	35
250	394	.670	30
250	364	.600	25
250	335	.550	20
250	310	.500	15
250	288	.450	10
250	268	.410	5
250	250	.380	0



MILITARY THRUST CLIMB

TRUE ALT 1,000 FT	TRUE MACH NO.	TAS KNOTS	CAS KNOTS
35	.925	533	320
30	.925	545	354
25	.925	557	394
20	.925	568	436
15	.890	556	459
10	.820	521	459
5	.750	489	459
0	.690	459	459

LOITER CLEAN CONFIGURATION

TRUE ALTITUDE 1,000 FT	TRUE MACH NO.	CAS KNOTS	TAS KNOTS	FUEL FLOW LB/HR	ENGINE PRESSURE RATIO
35	.79	269	455	3220-2440	2.13-1.93
30	.65	243	384	2490	1.80
25	.57	237	346	2530	1.67
20	.51	234	315	2620	1.55
15	.46	232	288	2740	1.45
10	.42	233	268	2890	1.36
5	.39	235	252	3060	1.29
SEA LEVEL	.37	243	243	3250	1.25

———— OPTIMUM ENDURANCE: ALTITUDE
———— CLIMB PATH AND DESCENT PATH GUIDE LINES
- - - - - FUEL REQUIRED
— — — — DEMARCATION LINE FOR BEST ENDURANCE AT CONSTANT ALTITUDE

NOTE
- FUEL REQUIRED AT ANY POINT INCLUDES MILITARY THRUST CLIMB OR IDLE THRUST MAXIMUM RANGE DESCENT, IF REQUIRED, LOITER, AND DESCEND TO SEA LEVEL.
- NO ALLOWANCE OR RESERVE MADE FOR LANDING.
- ALL DESCENTS ARE IDLE THRUST MAXIMUM RANGE DESCENTS.

48133

Figure 5-5

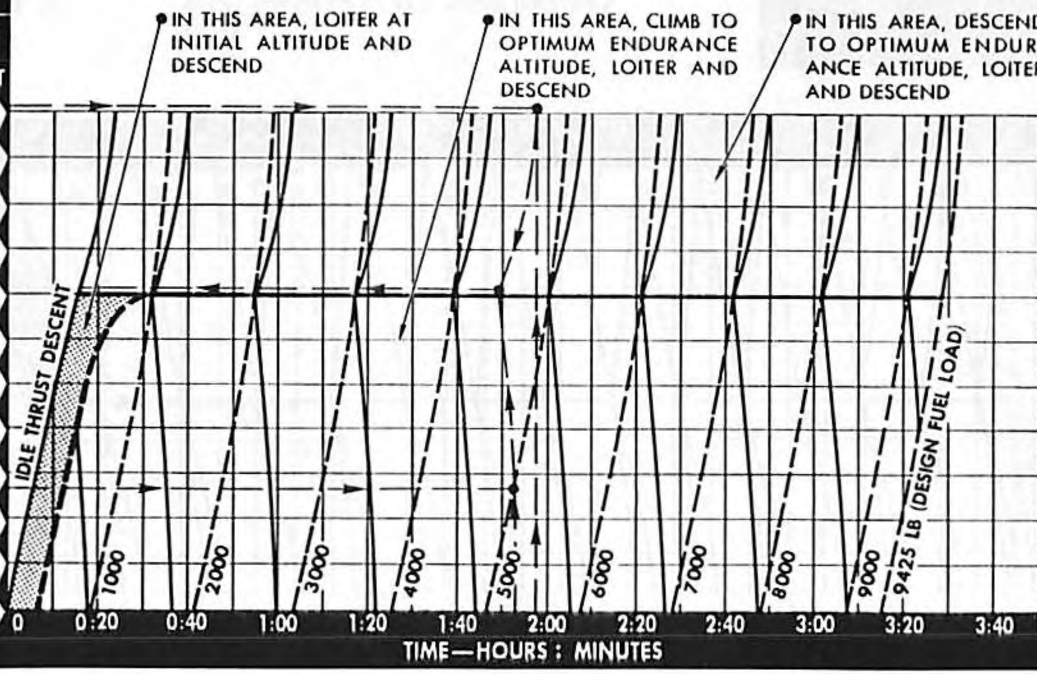
optimum maximum endurance profile

MODEL: F-106B
DATE: 1 SEPTEMBER 1961
DATA BASIS: FLIGHT TEST

CONFIGURATION: CLEAN
STANDARD ATMOSPHERE
TAKEOFF GROSS WEIGHT = 36,300 LB
EMPTY GROSS WEIGHT = 26,875 LB

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

IDLE THRUST DESCENT			
CAS KNOTS	TAS KNOTS	TRUE MACH NO.	TRUE ALT 1,000 FT
198	516	.900	55
220	516	.900	50
247	516	.900	45
250	473	.830	40
250	425	.740	35
250	394	.670	30
250	364	.600	25
250	335	.550	20
250	310	.500	15
250	288	.450	10
250	268	.410	5
250	250	.380	0



B

MILITARY THRUST CLIMB			
TRUE ALT 1,000 FT	TRUE MACH NO.	TAS KNOTS	CAS KNOTS
35	.925	533	320
30	.925	545	354
25	.925	557	394
20	.925	568	436
15	.890	556	459
10	.820	521	459
5	.750	489	459
0	.690	459	459

LOITER: CLEAN CONFIGURATION					
TRUE ALTITUDE 1,000 FT	TRUE MACH NO	CAS KNOTS	TAS KNOTS	FUEL FLOW LB/HR	ENGINE PRESSURE RATIO
35	.79	271	457	3340-2520	2.14-1.95
30	.66	245	387	2540	1.82
25	.58	238	347	2600	1.68
20	.52	236	318	2690	1.57
15	.47	234	292	2800	1.46
10	.43	236	271	2950	1.37
5	.40	240	257	3120	1.30
SEA LEVEL	.37	246	246	3300	1.26

——— OPTIMUM ENDURANCE ALTITUDE
——— CLIMB PATH AND DESCENT PATH GUIDE LINES
– – – – FUEL REQUIRED
— — — DEMARCATION LINE FOR BEST ENDURANCE AT CONSTANT ALTITUDE

NOTE
- FUEL REQUIRED AT ANY POINT INCLUDES MILITARY THRUST CLIMB OR IDLE THRUST MAXIMUM RANGE DESCENT, IF REQUIRED, LOITER, AND DESCEND TO SEA LEVEL.
- NO ALLOWANCE OR RESERVE MADE FOR LANDING.
- ALL DESCENTS ARE IDLE THRUST MAXIMUM RANGE DESCENTS.

48278

Figure 5-6

optimum maximum endurance profile

MODEL: F-106A
DATE: 21 FEBRUARY 1967
DATE BASIS: FLIGHT TEST

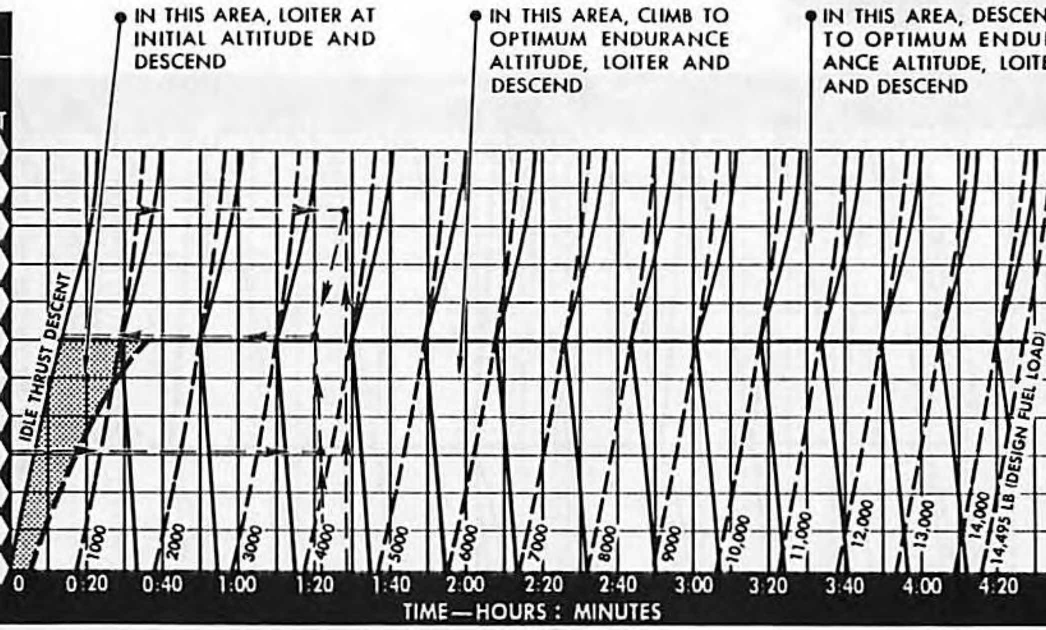
CONFIGURATION: TWO 360-GAL EXTERNAL TANKS
STANDARD ATMOSPHERE
TAKEOFF GROSS WEIGHT = 41,831 LB
EMPTY GROSS WEIGHT = 27,336 LB

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

A

IDLE THRUST DESCENT

CAS KNOTS	TAS KNOTS	TRUE MACH NO.	TRUE ALT 1,000 FT
198	516	.900	55
220	516	.900	50
247	516	.900	45
250	473	.830	40
250	425	.740	35
250	394	.670	30
250	364	.600	25
250	335	.550	20
250	310	.500	15
250	288	.450	10
250	268	.410	5
250	250	.380	0



MILITARY THRUST CLIMB

TRUE ALT 1,000 FT	TRUE MACH NO.	TAS KNOTS	CAS KNOTS
30	.92	542	352
25	.92	554	392
20	.85	522	400
15	.78	488	400
10	.71	456	400
5	.66	426	400
0	.61	400	400

LOITER: TWO 360-GAL EXTERNAL TANKS

TRUE ALTITUDE 1,000 FT	TRUE MACH NO	CAS KNOTS	TAS KNOTS	FUEL FLOW LB/HR	ENGINE PRESSURE RATIO
30	.70	262	411	4110-2770	2.22-1.89
25	.58	242	352	2840	1.75
20	.52	239	321	2910	1.63
15	.47	238	296	2990	1.50
10	.43	236	273	3090	1.40
5	.39	235	253	3210	1.31
SEA LEVEL	.36	237	237	3350	1.25

———— OPTIMUM ENDURANCE ALTITUDE
———— CLIMB PATH AND DESCENT PATH GUIDE LINES
– – – FUEL REQUIRED
—·— DEMARCATION LINE FOR BEST ENDURANCE AT CONSTANT ALTITUDE

NOTE

- FUEL REQUIRED AT ANY POINT INCLUDES MILITARY THRUST CLIMB OR IDLE THRUST MAXIMUM RANGE DESCENT, IF REQUIRED, LOITER, AND DESCENT TO SEA LEVEL.
- NO ALLOWANCE OR RESERVE MADE FOR LANDING.
- ALL DESCENTS ARE IDLE THRUST MAXIMUM RANGE DESCENTS.

48554

Figure 5-7

optimum maximum endurance profile

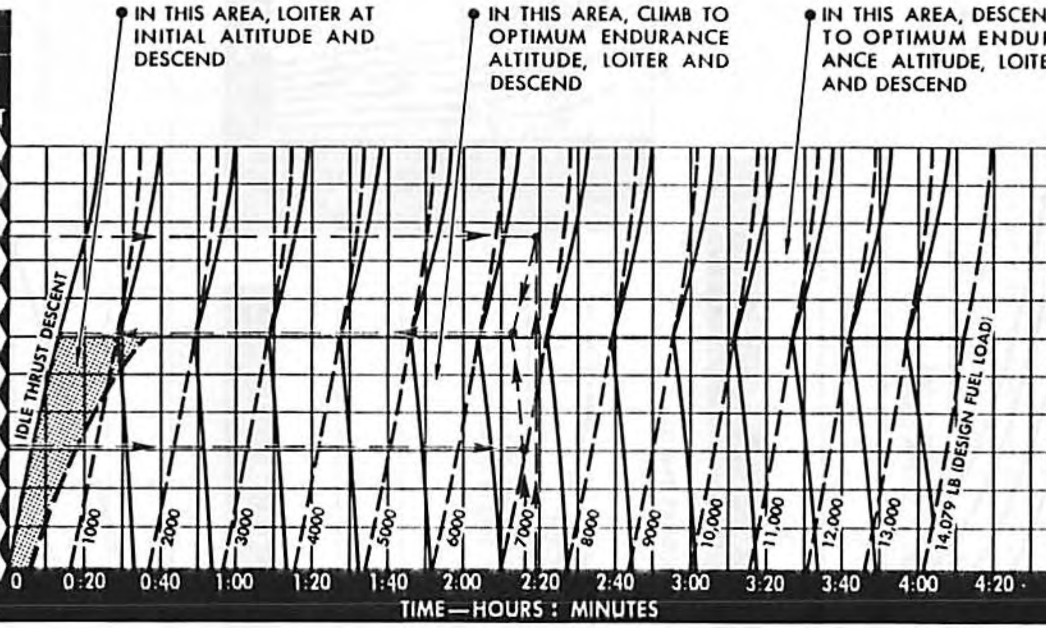
MODEL: F-106B
DATE: 21 FEBRUARY 1967
DATE BASIS: FLIGHT TEST

CONFIGURATION: TWO 360-GAL EXTERNAL TANKS
STANDARD ATMOSPHERE
TAKEOFF GROSS WEIGHT = 42,720 LB
EMPTY GROSS WEIGHT = 28,641 LB

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

B

IDLE THRUST DESCENT			
CAS KNOTS	TAS KNOTS	TRUE MACH NO.	TRUE ALT 1,000FT
198	516	.900	55
220	516	.900	50
247	516	.900	45
250	473	.830	40
250	425	.740	35
250	394	.670	30
250	364	.600	25
250	335	.550	20
250	310	.500	15
250	288	.450	10
250	268	.410	5
250	250	.380	0



MILITARY THRUST CLIMB			
TRUE ALT 1,000FT	TRUE MACH NO.	TAS KNOTS	CAS KNOTS
30	.92	542	352
25	.92	554	392
20	.85	522	400
15	.78	488	400
10	.71	456	400
5	.66	426	400
0	.61	400	400

———— OPTIMUM ENDURANCE ALTITUDE
———— CLIMB PATH AND DESCENT PATH GUIDE LINES
- - - - FUEL REQUIRED
— — DEMARCATION LINE FOR BEST ENDURANCE AT CONSTANT ALTITUDE

NOTE

- FUEL REQUIRED AT ANY POINT INCLUDES MILITARY THRUST CLIMB OR IDLE THRUST MAXIMUM RANGE DESCENT, IF REQUIRED, LOITER, AND DESCENT TO SEA LEVEL.
- NO ALLOWANCE OR RESERVE MADE FOR LANDING.
- ALL DESCENTS ARE IDLE THRUST MAXIMUM RANGE DESCENTS.

LOITER: TWO 360-GAL EXTERNAL TANKS					
TRUE ALTITUDE 1,000 FT	TRUE MACH NO	CAS KNOTS	TAS KNOTS	FUEL FLOW LB/HR	ENGINE PRESSURE RATIO
30	.70	264	414	4190-2880	2.23-1.92
25	.59	244	355	2960	1.79
20	.53	242	322	3040	1.65
15	.48	241	300	3130	1.53
10	.43	240	277	3230	1.43
5	.40	240	257	3350	1.34
SEA LEVEL	.36	241	241	3490	1.27

48555

Figure 5-8

combat allowance chart

MODEL: F-106A/B
DATE: 1 SEPTEMBER 1961
DATA BASIS: FLIGHT TEST

CONFIGURATION: CLEAN
STANDARD ATMOSPHERE

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

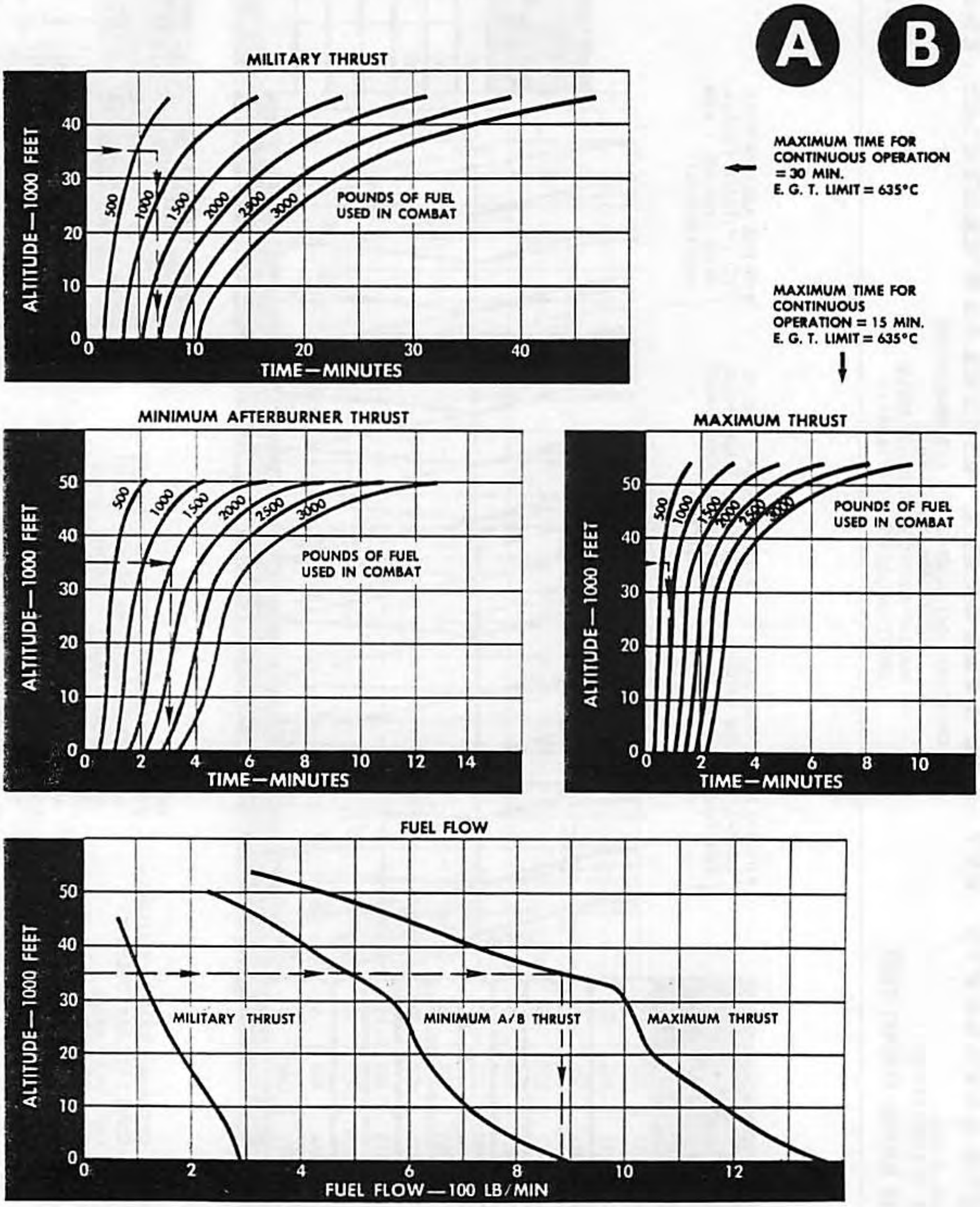


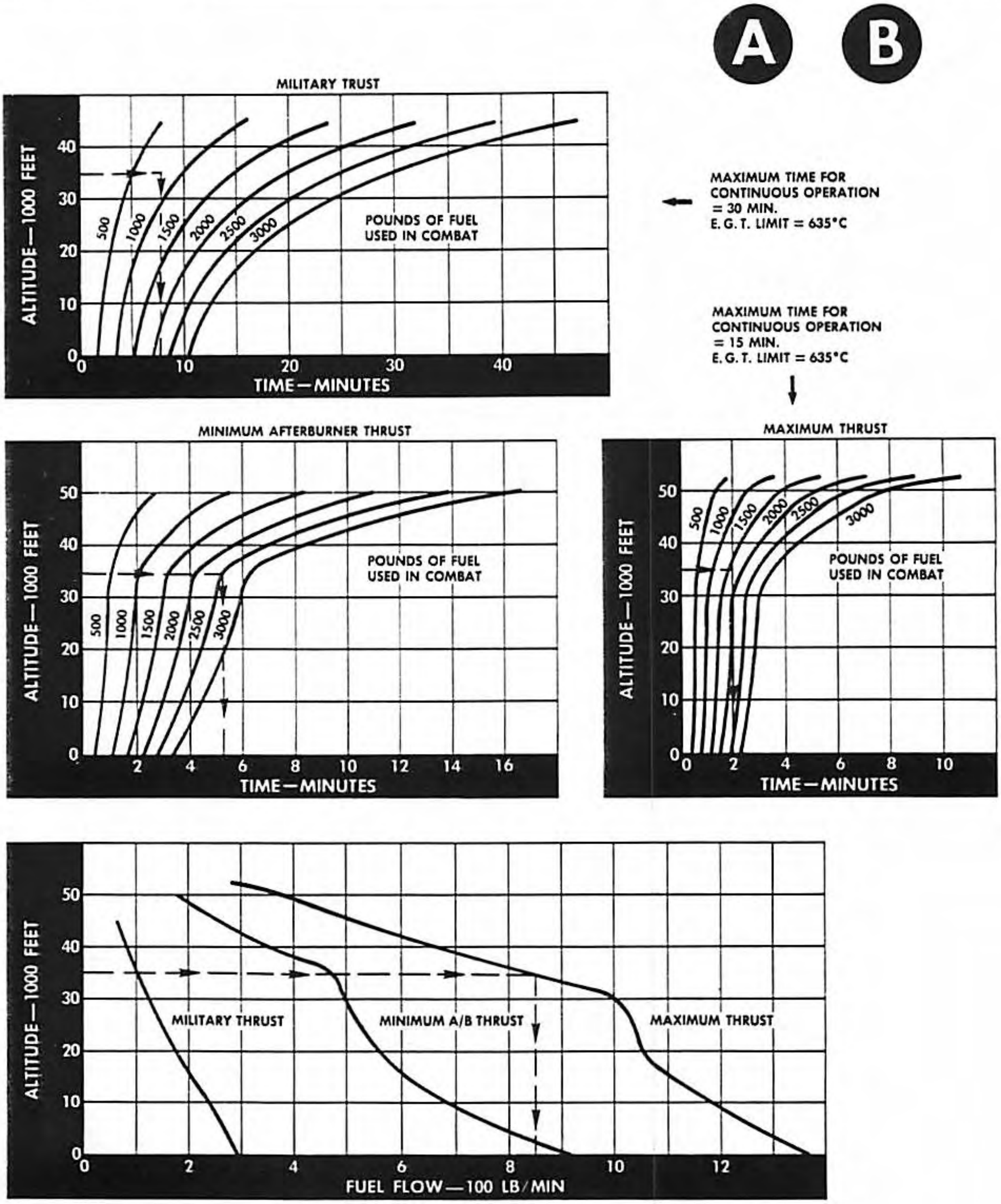
Figure 5-9

combat allowance chart

MODEL: F-106A/B
DATE: 21 FEBRUARY 1967
DATE BASIS: FLIGHT TEST

CONFIGURATION: TWO 360-GAL EXTERNAL TANKS
STANDARD ATMOSPHERE

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL



48556

Figure 5-10

SECTION VI
AIR REFUELING

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MAXIMUM FORMATING SPEEDS

Figures 6-1 through 6-4 present data for determining maximum formating speed-altitude capabilities with the KC-135A tanker. These charts show the maximum level flight speed envelope of the tanker together with the maximum altitude capability of the receiver while flying in refueling formation (boom in contact position). The data presented cover the complete weight ranges of both the receiver and tanker airplanes and are based upon operating all engines at normal rated thrust. Lines of constant calibrated airspeed are included on the charts for purposes of readily obtaining the CAS which corresponds to a given mach number and altitude.

Use

To determine the maximum refueling speed at the maximum refueling altitude, enter the chart on the horizontal scale at any mach number in the range between 0.6 and 0.85 and proceed vertically to the receiver maximum altitude which corresponds to the post refueling gross weight of the receiver. Follow parallel to the nearest receiver maximum altitude line to the right or to the left until the point is reached which corresponds to the tanker maximum speed at the appropriate refueling gross weight. Read directly down to obtain the refueling mach number and to the left to obtain the refueling altitude. CAS is obtained directly by interpolating between the lines of constant CAS.

Sample Problem

Find the maximum mach number at the maximum refueling altitude for refueling the receiver to a gross weight of 41,000 pounds from a tanker weighing 210,000 pounds. The receiver is carrying two 360-gallon external fuel tanks.

A. Enter figure 6-3 at Mach 0.65 (arbitrary value).

B. Proceed to maximum receiver altitude 30,000 feet.

C. Proceed to the right parallel to 42,000 pound receiver maximum altitude line to the tanker maximum speed for 210,000 pounds gross weight.

D. CAS is 282 knots.

E. Read down to refueling mach number—.815.

F. Read to the left for refueling altitude—34,200 feet.

FUEL CONSUMPTION DURING AIR REFUELING

Receiver fuel consumption during refueling is given in figure 6-5. The data are presented for constant airspeeds between 250 KCAS and 310 KCAS and are valid for the complete range of refueling altitudes between 20,000 feet and the maximum with normal rated thrust as presented in figures 6-1 through 6-4. Fuel flow values shown include the effects of tanker downwash and correspond to the configuration with two 360-gallon external tanks. Values for the clean airplane configuration are obtained by reducing the values shown by a constant amount as shown on figure 6-5.

Use

Since the fuel transfer time is ordinarily quite small, an average between the fuel flow at the start of refueling and the fuel flow at the end of refueling can normally be used for mission planning without significant error. Enter the chart on the horizontal scale with the receiver gross weight at the start of refueling and proceed vertically to the refueling speed. Proceed horizontally to the left scale to read the initial fuel flow. Re-enter the horizontal scale at the post-refueling gross weight of the receiver and proceed vertically to the refueling speed. Proceed horizontally to the left scale to read the final fuel flow during refueling.

Sample Problem

Find the average fuel consumption for the receiver configuration with two 360-gallon tanks while being refueled to a gross weight of 41,500 pounds. The initial gross weight is 30,000 pounds and the refueling speed is 290 KCAS at 28,000 feet. Also, find the amount of fuel used by the receiver during the refueling operation if the transfer rate from the tanker is 2200 pounds per minute.

A. Enter figure 6-5 with the receiver gross weight at start of refueling—30,000 pounds.

B. Read up to the refueling airspeed—290 KCAS.

C. Read to the left for the initial fuel flow—62.8 pounds per minute.

D. Re-enter the chart with the receiver gross weight at the end of refueling—41,500 pounds.

E. Read up to the refueling airspeed—290 KCAS.

F. Read to the left for the final fuel flow—80.6 pounds per minute.

G. The average fuel flow is 71.7 pounds per minute.

H. The net amount of fuel transferred is 41,500 − 30,000 = 11,500 pounds.

I. The net fuel transfer rate is 2200 − 71.7 = 2128.3 pounds per minute.

J. The transfer time is 11,500 ÷ 2128.3 = 5.40 minutes.

K. The amount of fuel used by the receiver is 71.7 × 5.40 = 387 pounds.

AIR REFUELING PROFILE

The air refueling profile charts, figures 6-6 through 6-9, present the relationship of time, fuel, and altitude for maximum range with various fuel loads within the weight range of the airplane configuration after refueling. The climb path guide lines show the distance traveled from refueling altitude to cruise altitude with military thrust using the climb speed schedule shown at the left of the chart. Approximate operating conditions for best cruise including cruise speed, fuel flow, and engine pressure ratio are presented in the tabulation below the chart for both cruise-climb procedure and for cruise at constant altitude.

NOTE

Fuel required for loiter, descent or landing is not included in these profiles.

Use

To determine the distance which may be traveled after refueling, enter the chart on the altitude scale at the refueling altitude. Proceed to the right to the appropriate cruise altitude climb path guide line, read the distance on the distance scale at the bottom of the plot. Follow the climb path to the desired cruise altitude. Note the distance at the bottom of the plot. Note also the cruise time available by interpolating between the time lines. Proceed to the right along the cruise altitude line to the intersection with the fuel line which corresponds to the desired amount of fuel remaining at the end of cruise. Note distance and time as before. The difference between the distance read at the end of cruise and the distance read at the start of climb represents the total distance available. The distance in cruise is the difference between the distances read at the start of cruise and at the end of cruise. Cruise time is the difference between the two time values obtained above. Note that time spent in climb is not included on the profile. (Detailed climb information may be obtained from the appropriate military thrust climb chart.)

Sample Problem

Find the air distance which may be flown after refueling the airplane with two 360-gallon tanks to full capacity at 30,000 feet. Cruise is at the optimum cruise-climb altitude and the desired amount of fuel remaining at the end of cruise is 3,000 pounds.

A. Enter figure 6-8 at the refueling altitude, 30,000 feet.

B. Proceed horizontally to the right to the climb guide line.

C. Read directly down to obtain the total distance including climb—2146 nautical miles.

D. Follow the climb guide line to the initial cruise-climb altitude.

E. Read directly down to obtain the initial cruise distance—2125 nautical miles.

F. Cruise time available is 4 hours, 7 minutes.

G. Proceed along the cruise climb path to the 3,000 pound fuel line.

H. Read down to obtain the final cruise distance—520 nautical miles.

I. Cruise time available is 1 hour.

J. Net cruise time (F − I) is 3 hours, 7 minutes.

K. Net cruise distance (E − H) is 1605 nautical miles.

L. Net cruise distance plus climb distance (C − H) is 1626 nautical miles.

A

MAXIMUM FORMATING SPEEDS

CONFIGURATION: CLEAN

MODEL: F-106A NORMAL RATED THRUST STANDARD ATMOSPHERE ENGINE: J75-17

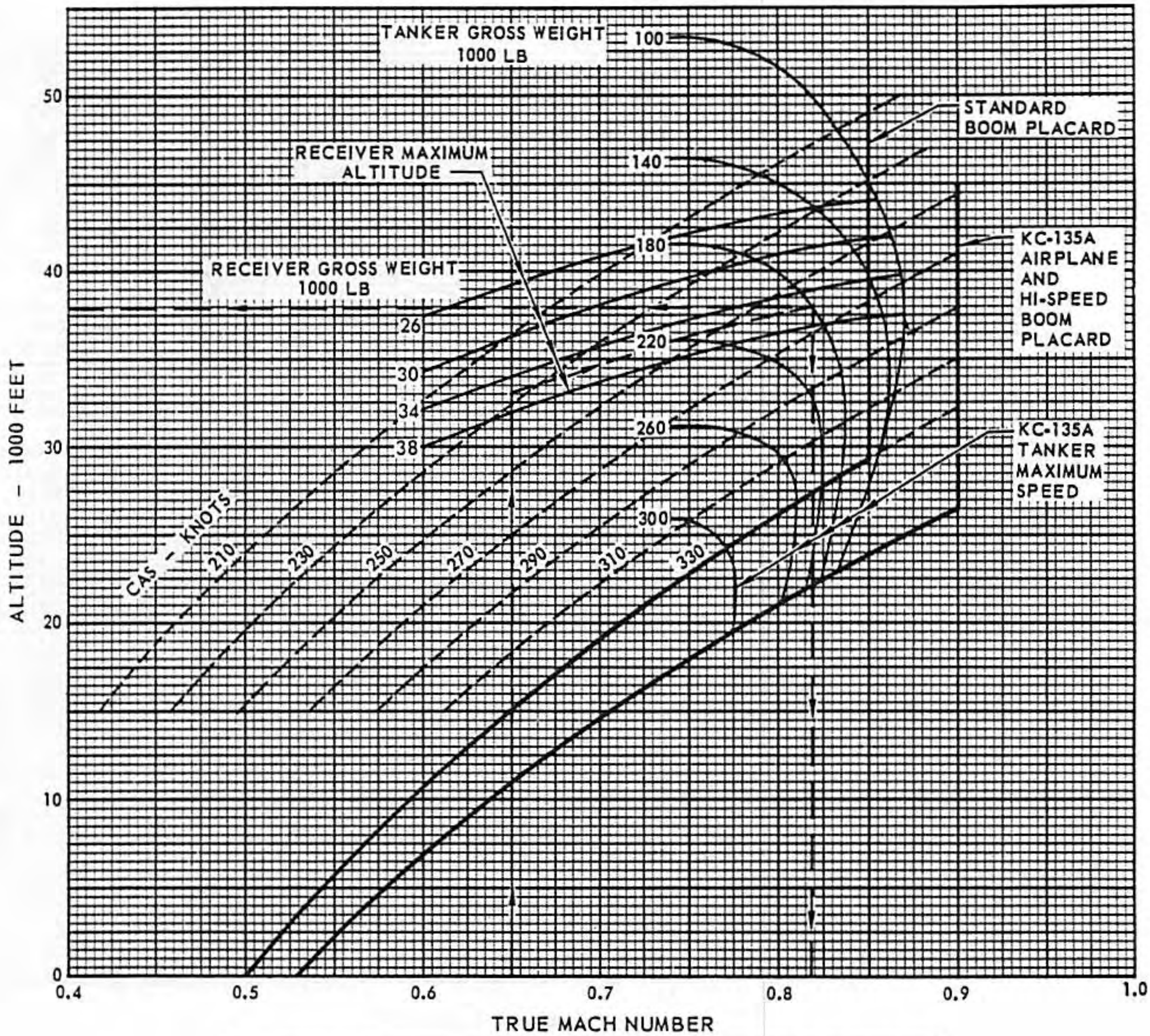
DATE: 21 FEBRUARY 1967 LEVEL FLIGHT 200 FT/MIN RATE OF CLIMB POTENTIAL IN TANKER DOWNWASH FUEL GRADE: JP-4

DATA BASIS: FLIGHT TEST FUEL DENSITY: 6.5 LB/GAL

KC-135A TANKER

CONFIGURATION: BOOM DOWN

FOUR ENGINES AT NORMAL RATED THRUST



REDUCTION IN RECEIVER MAXIMUM ALTITUDE (FEET) PER DEGREE CENTIGRADE TEMPERATURE VARIATION ABOVE STANDARD	GROSS WEIGHT (LB)	MACH NUMBER .7	.8	.85
	26,000	73	90	108
	30,000	77	95	114
	34,000	85	107	128
	38,000	92	123	147

48,557

Figure 6-1

B

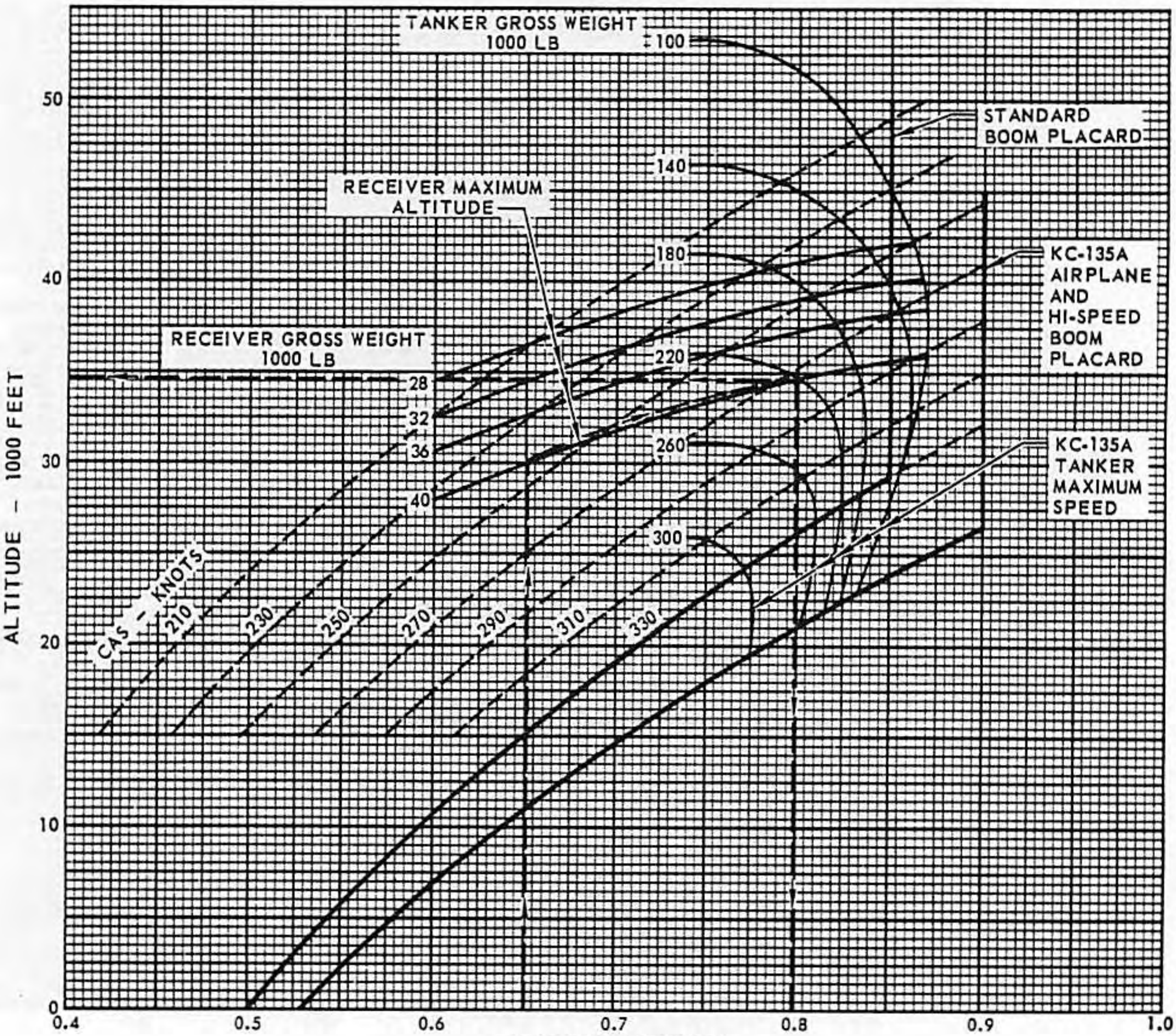
MAXIMUM FORMATING SPEEDS

CONFIGURATION: CLEAN
NORMAL RATED THRUST STANDARD ATMOSPHERE
LEVEL FLIGHT 200 FT/MIN RATE OF CLIMB POTENTIAL
IN TANKER DOWNWASH

MODEL: F-106B
DATE: 21 FEBRUARY 1967
DATA BASIS: FLIGHT TEST

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

KC-135A TANKER
CONFIGURATION: BOOM DOWN
FOUR ENGINES AT NORMAL RATED THRUST



REDUCTION IN RECEIVER MAXIMUM ALTITUDE (FEET) PER DEGREE CENTIGRADE TEMPERATURE VARIATION ABOVE STANDARD	GROSS WEIGHT (LB)	MACH NUMBER		
		.7	.8	.85
	28,000	75	92	107
	32,000	80	100	116
	36,000	88	114	132
	40,000	96	133	155

48,558

Figure 6-2

A

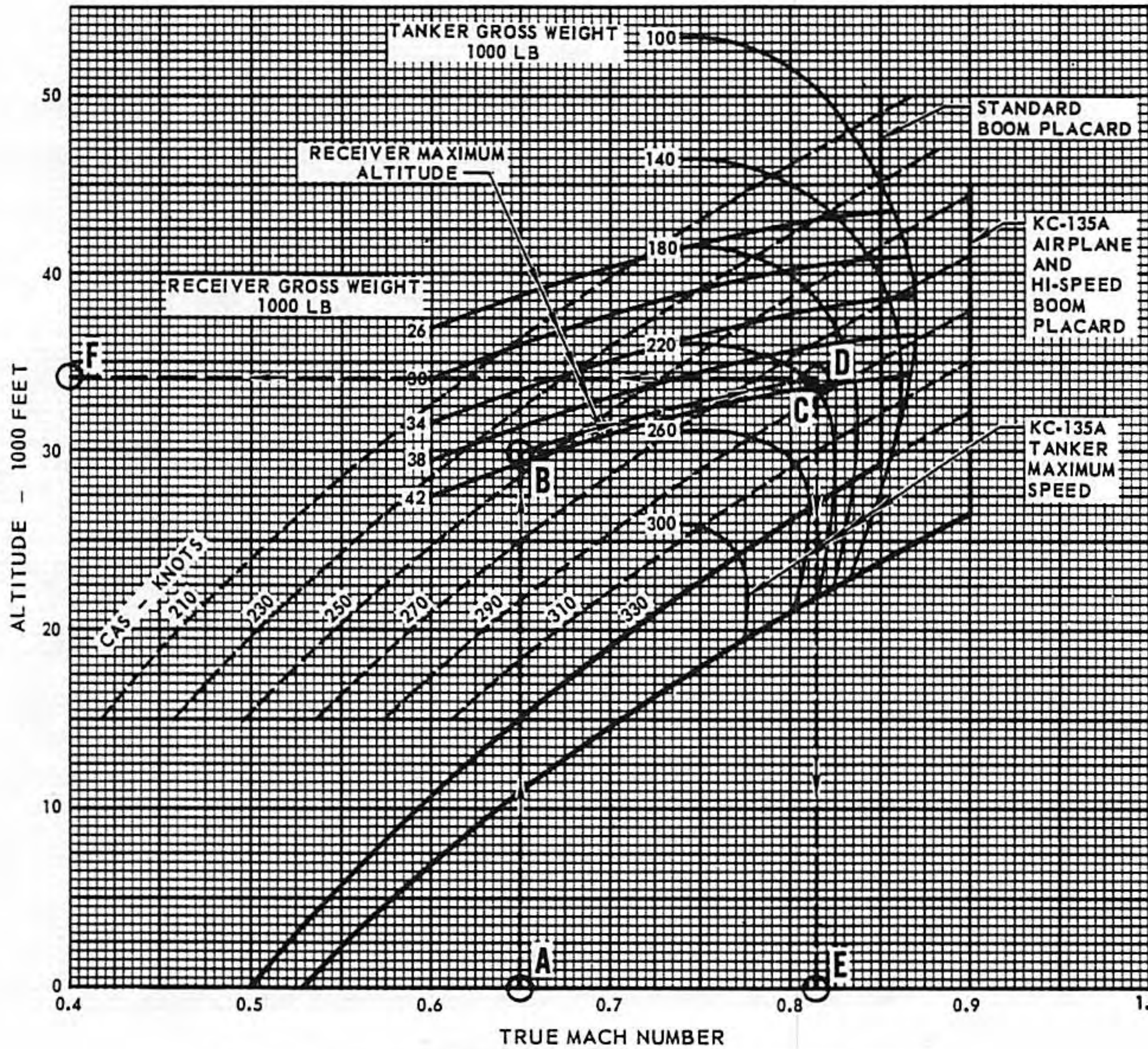
MAXIMUM FORMATING SPEEDS

CONFIGURATION: TWO 360-GALLON EXTERNAL TANKS
NORMAL RATED THRUST STANDARD ATMOSPHERE
LEVEL FLIGHT 200 FT/MIN RATE OF CLIMB POTENTIAL IN TANKER DOWNWASH

MODEL: F-106A
DATE: 21 FEBRUARY 1967
DATA BASIS: FLIGHT TEST

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

KC-135A TANKER
CONFIGURATION: BOOM DOWN
FOUR ENGINES AT NORMAL RATED THRUST



REDUCTION IN RECEIVER MAXIMUM ALTITUDE (FEET PER DEGREE CENTIGRADE TEMPERATURE VARIATION ABOVE STANDARD	GROSS WEIGHT (LB)	MACH NUMBER .7	.8	.85
	30,000	88	115	135
	34,000	95	130	154
	38,000	101	149	183
	42,000	110	173	220

48,559A

Figure 6-3

B

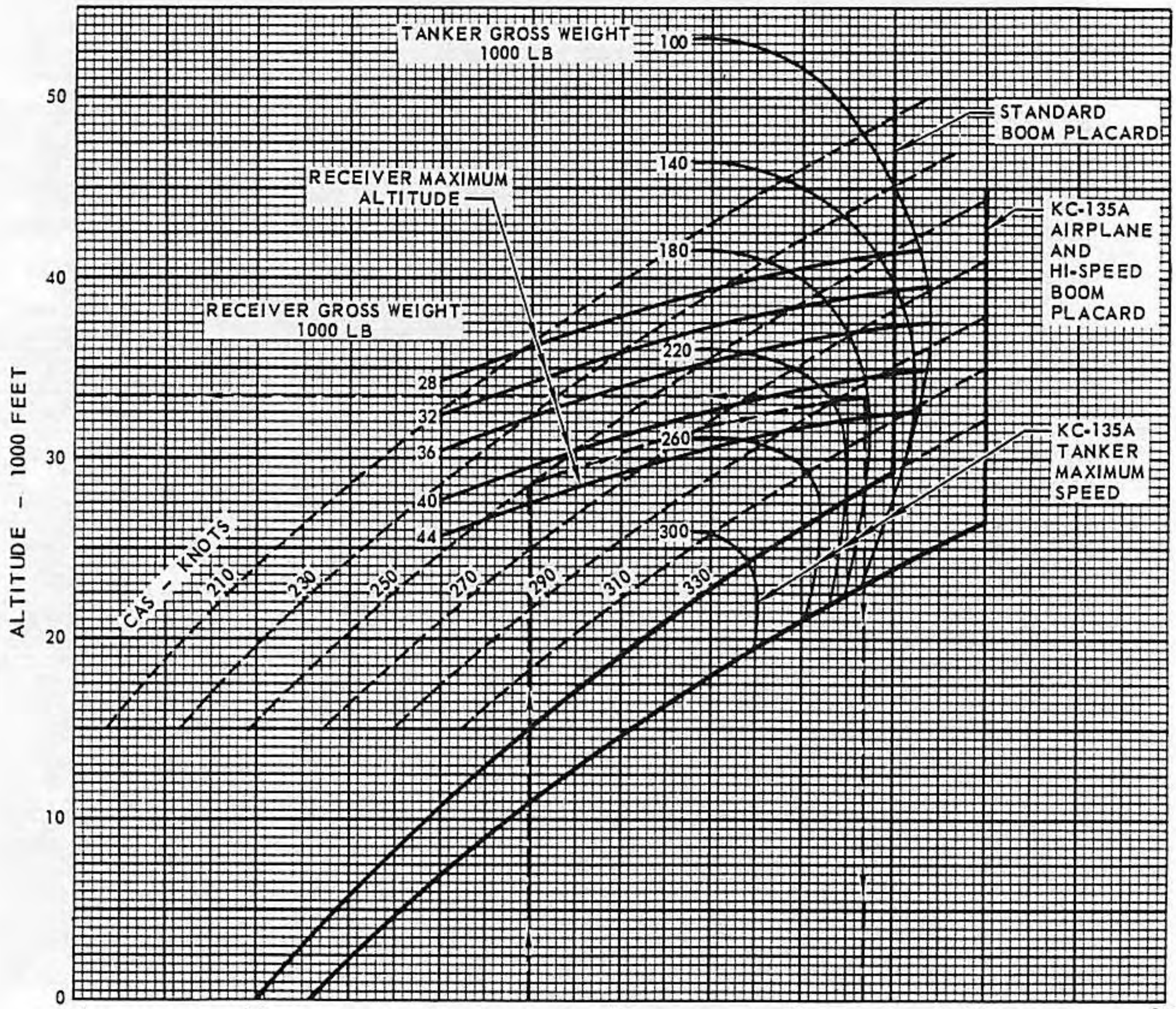
MAXIMUM FORMATING SPEEDS

CONFIGURATION: TWO 360-GALLON EXTERNAL TANKS
NORMAL RATED THRUST STANDARD ATMOSPHERE
LEVEL FLIGHT 200 FT/MIN RATE OF CLIMB POTENTIAL IN TANKER DOWNWASH

MODEL: F-106B
DATE: 21 FEBRUARY 1967
DATA BASIS: FLIGHT TEST

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

KC-135A TANKER
CONFIGURATION: BOOM DOWN
FOUR ENGINES AT NORMAL RATED THRUST



REDUCTION IN RECEIVER MAXIMUM ALTITUDE (FEET) PER DEGREE CENTIGRADE TEMPERATURE VARIATION ABOVE STANDARD	GROSS WEIGHT (LB)	MACH NUMBER .7	.8	.85
	32,000	92	122	144
	36,000	98	138	167
	40,000	105	160	200
	44,000	115	183	240

48,560

Figure 6-4

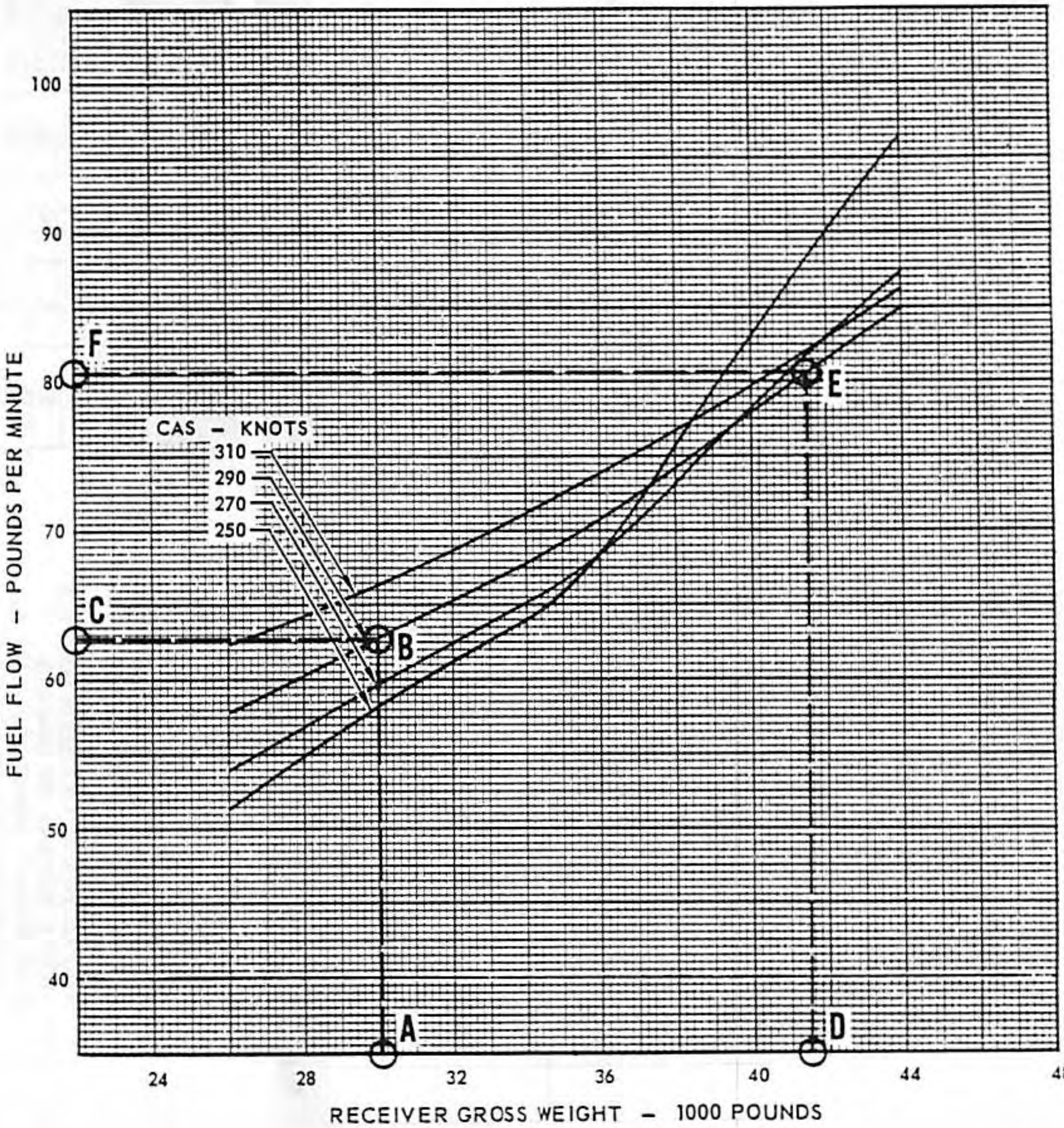
A B

FUEL CONSUMPTION DURING AIR REFUELING

MODEL: F-106A/B
DATE: 21 FEBRUARY 1967
DATA BASIS: FLIGHT TEST

CONFIGURATION: TWO 360-GALLON EXTERNAL TANKS
STANDARD ATMOSPHERE

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL



NOTES

DATA VALID FOR REFUELING ALTITUDES ABOVE 20,000 FEET AND WITH ALL TANKER GROSS WEIGHTS.

INCREASE FUEL FLOW 0.2% FOR EACH DEGREE CENTIGRADE VARIATION ABOVE STANDARD AIR TEMPERATURE.

REDUCE FUEL FLOW 3 LB/MIN TO OBTAIN VALUES FOR CLEAN AIRPLANE CONFIGURATION.

48,561A

Figure 6-5

air refueling profile

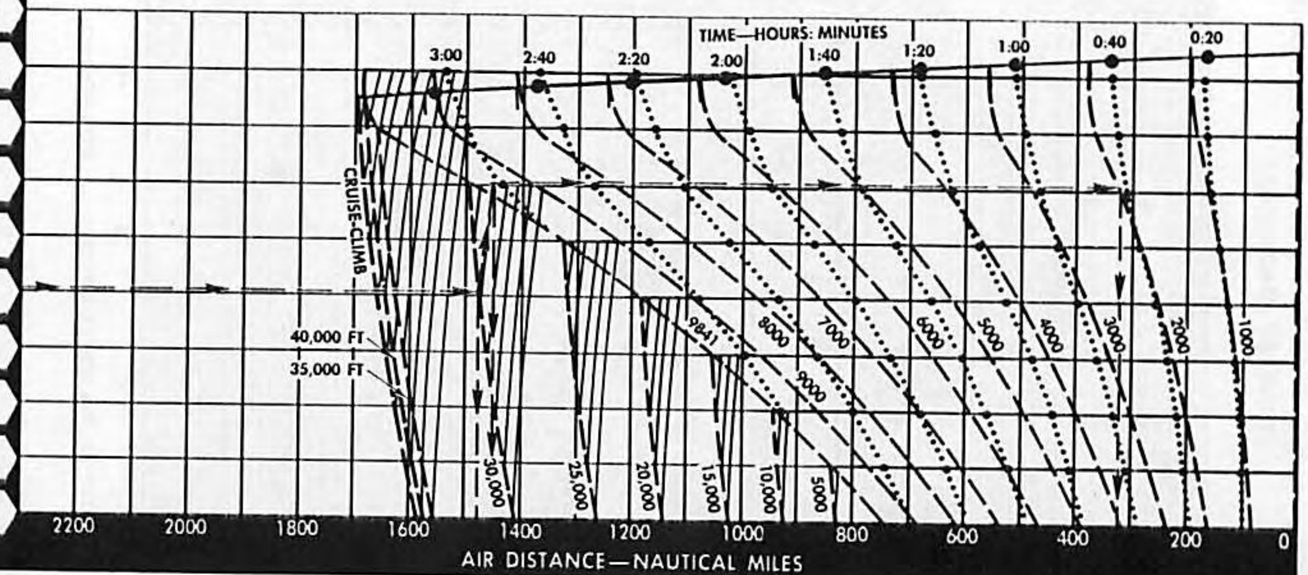
MODEL: F-106A
DATE: 21 FEBRUARY 1967
DATE BASIS: FLIGHT TEST

CONFIGURATION: CLEAN
STANDARD ATMOSPHERE
POST REFUELING GROSS WEIGHT = 36,663 LB
EMPTY GROSS WEIGHT = 26,822 LB

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

A

MILITARY THRUST CLIMB			
CAS KNOTS	TAS KNOTS	TRUE MACH NO.	TRUE ALT 1,000 FT
253	528	.92	45
284	528	.92	40
318	530	.92	35
352	542	.92	30
392	554	.92	25
400	522	.85	20
400	488	.78	15
400	456	.71	10
400	426	.66	5
400	400	.61	0



CRUISE CLEAN CONFIGURATION					
TRUE ALTITUDE 1,000 FT	TRUE MACH NO	CAS KNOTS	TAS KNOTS	FUEL FLOW LB/HR	ENGINE PRESSURE RATIO
CRUISE-CLIMB	.90	292-262	516	3440-2610	2.25-2.20
40	.90	276	515	3540-2570	2.41-2.06
35	.87	297	500	3410-2600	2.13-1.89
30	.81	310	480	3570-2800	1.95-1.76
25	.74	309	443	3730-2900	1.82-1.65
20	.66	306	408	3890-2910	1.71-1.55
15	.60	303	375	4010-3010	1.59-1.43
10	.54	302	347	4130-3140	1.51-1.38
5	.49	298	319	4250-3300	1.42-1.30
SEA LEVEL	.45	295	296	4360-3480	1.33-1.24

- — — — ZERO FUEL REMAINING
- — — — FUEL AVAILABLE
- ——— CRUISE-CLIMB PATH
- •··········• TIME
- ——— CONSTANT ALTITUDE CRUISE FLIGHT PATH
- ——— CLIMB PATH GUIDE LINE

NOTE
- DOES NOT INCLUDE FUEL, TIME OR DISTANCE TO ACCELERATE TO BEST CLIMB FROM FORMATING SPEED.
- NO ALLOWANCE OR RESERVE MADE FOR LOITER, DESCENT, OR LANDING.
- USE MILITARY THRUST FOR CLIMB (SEE MILITARY THRUST CLIMB CHART FOR DETAILED INFORMATION).
- CRUISE AT RECOMMENDED MACH NUMBER.

48563

Figure 6-6

air refueling profile

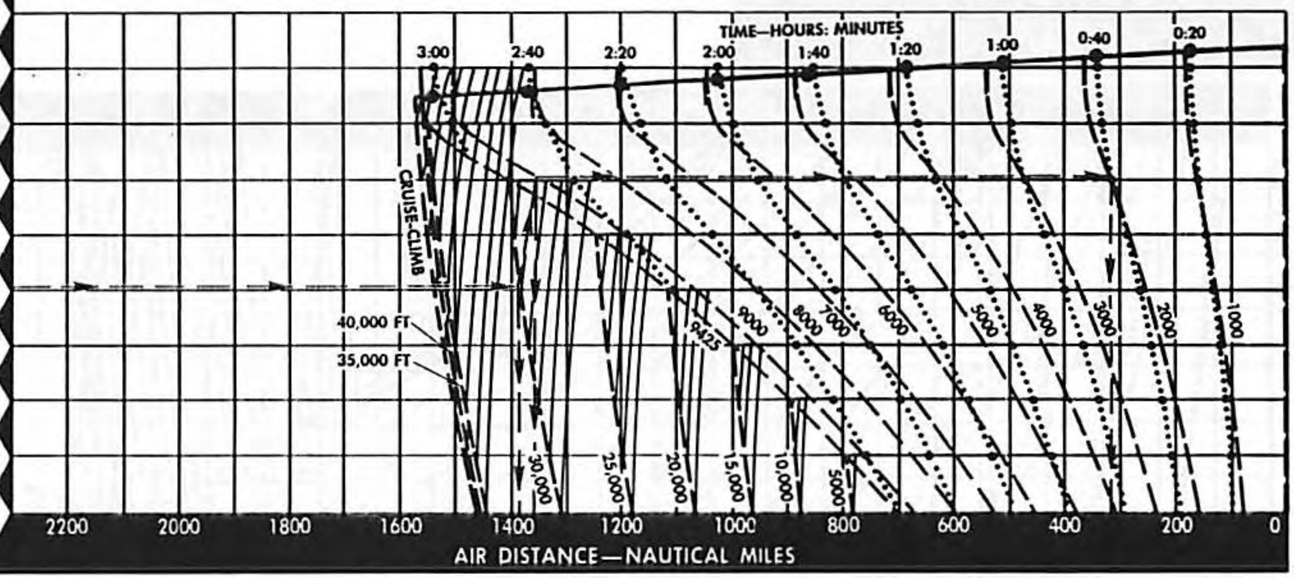
MODEL: F-106B
DATE: 21 FEBRUARY 1967
DATE BASIS: FLIGHT TEST

CONFIGURATION: CLEAN
STANDARD ATMOSPHERE
POST REFUELING GROSS WEIGHT = 37,552 LB
EMPTY GROSS WEIGHT = 28,127 LB

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

B

MILITARY THRUST CLIMB			
CAS KNOTS	TAS KNOTS	TRUE MACH NO.	TRUE ALT 1,000 FT
253	528	.92	45
284	528	.92	40
318	530	.92	35
352	542	.92	30
392	554	.92	25
400	522	.85	20
400	488	.78	15
400	456	.71	10
400	426	.66	5
400	400	.61	0



CRUISE CLEAN CONFIGURATION					
TRUE ALTITUDE 1,000 FT	TRUE MACH NO	CAS KNOTS	TAS KNOTS	FUEL FLOW LB/HR	ENGINE PRESSURE RATIO
CRUISE-CLIMB	.90	295-266	516	3530-2700	2.16-1.92
40	.90	277	516	3700-2710	2.46-2.10
35	.85	292	492	3530-2700	2.16-1.92
30	.82	312	483	3700-2890	1.97-1.79
25	.74	313	448	3820-3000	1.84-1.68
20	.68	312	415	3980-3040	1.72-1.58
15	.61	309	382	4100-3140	1.60-1.48
10	.55	308	354	4220-3270	1.52-1.40
5	.50	305	327	4330-3420	1.44-1.32
SEA LEVEL	.45	299	299	4440-3590	1.35-1.25

- — — ZERO FUEL REMAINING
- — — FUEL AVAILABLE
- ——— CRUISE-CLIMB PATH
- •·········• TIME
- ——— CONSTANT ALTITUDE CRUISE FLIGHT PATH
- ——— CLIMB PATH GUIDE LINE

NOTE
- DOES NOT INCLUDE FUEL, TIME OR DISTANCE TO ACCELERATE TO BEST CLIMB FROM FORMATING SPEED.
- NO ALLOWANCE OR RESERVE MADE FOR LOITER, DESCENT, OR LANDING.
- USE MILITARY THRUST FOR CLIMB (SEE MILITARY THRUST CLIMB CHART FOR DETAILED INFORMATION).
- CRUISE AT RECOMMENDED MACH NUMBER.

48564

Figure 6-7

air refueling profile

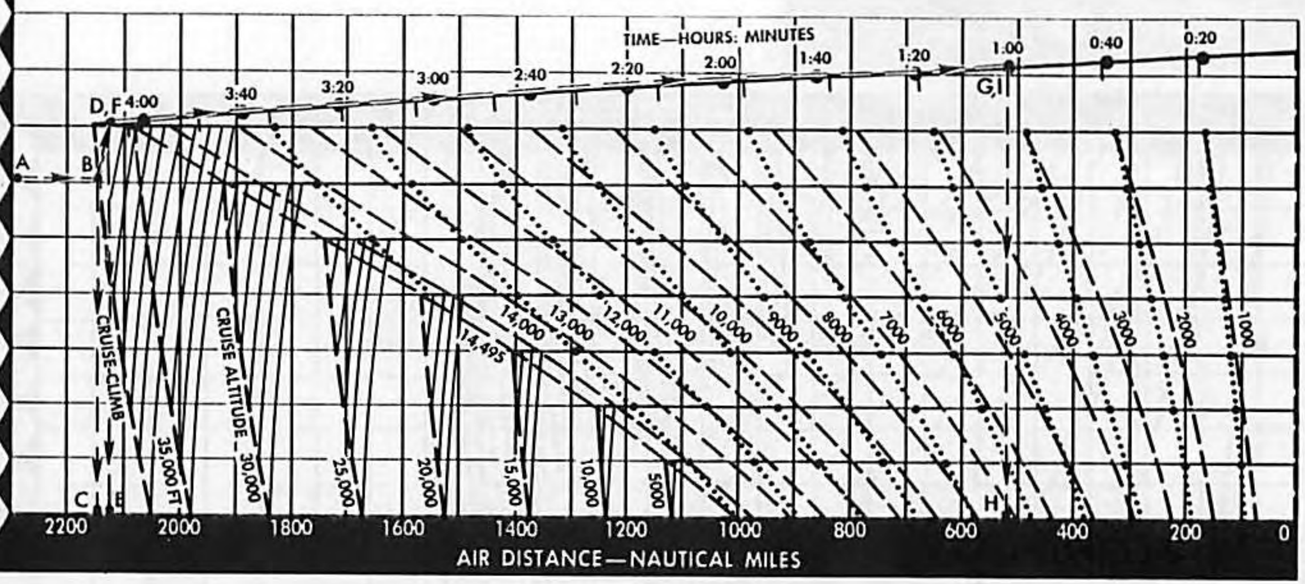
MODEL: F-106A
DATE: 21 FEBRUARY 1967
DATE BASIS: FLIGHT TEST

CONFIGURATION: TWO 360-GAL EXTERNAL TANKS
STANDARD ATMOSPHERE
POST REFUELING GROSS WEIGHT = 41,831 LB
EMPTY GROSS WEIGHT = 27,336 LB

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

A

MILITARY THRUST CLIMB			
CAS KNOTS	TAS KNOTS	TRUE MACH NO.	TRUE ALT 1,000 FT
253	528	.92	45
284	528	.92	40
318	530	.92	35
352	542	.92	30
392	554	.92	25
400	522	.85	20
400	488	.78	15
400	456	.71	10
400	426	.66	5
400	400	.61	0



- ZERO FUEL REMAINING
- FUEL AVAILABLE
- CRUISE-CLIMB PATH
- TIME
- CONSTANT ALTITUDE CRUISE FLIGHT PATH
- CLIMB PATH GUIDE LINE

NOTE
- DOES NOT INCLUDE FUEL, TIME OR DISTANCE TO ACCELERATE TO BEST CLIMB FROM FORMATING SPEED.
- NO ALLOWANCE OR RESERVE MADE FOR LOITER, DESCENT, OR LANDING.
- USE MILITARY THRUST FOR CLIMB (SEE MILITARY THRUST CLIMB CHART FOR DETAILED INFORMATION).
- CRUISE AT RECOMMENDED MACH NO.

CRUISE: TWO 360-GAL EXTERNAL TANKS					
TRUE ALTITUDE 1,000 FT	TRUE MACH NO	CAS KNOTS	TAS KNOTS	FUEL FLOW LB/HR	ENGINE PRESSURE RATIO
CRUISE-CLIMB	.90	309-263	516	4240-2840	2.35-2.28
35	.87	300	503	4270-2870	2.34-2.00
30	.82	312	483	4390-3030	2.12-1.86
25	.75	317	454	4590-3100	1.97-1.73
20	.69	319	424	4770-3220	1.85-1.61
15	.62	316	391	4880-3300	1.73-1.51
10	.56	310	357	5030-3370	1.64-1.41
5	.51	306	328	5100-3450	1.52-1.33
SEA LEVEL	.45	300	300	5110-3630	1.43-1.27

Figure 6-8

48565A

air refueling profile

MODEL: F-106B
DATE: 21 FEBRUARY 1967
DATE BASIS: FLIGHT TEST

CONFIGURATION: TWO 360-GAL EXTERNAL TANKS
STANDARD ATMOSPHERE
POST REFUELING GROSS WEIGHT = 42,720 LB
EMPTY GROSS WEIGHT = 28,641 LB

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

B

MILITARY THRUST CLIMB			
CAS KNOTS	TAS KNOTS	TRUE MACH NO.	TRUE ALT 1,000 FT
253	528	.92	45
284	528	.92	40
318	530	.92	35
352	542	.92	30
392	554	.92	25
400	522	.85	20
400	488	.78	15
400	456	.71	10
400	426	.66	5
400	400	.61	0

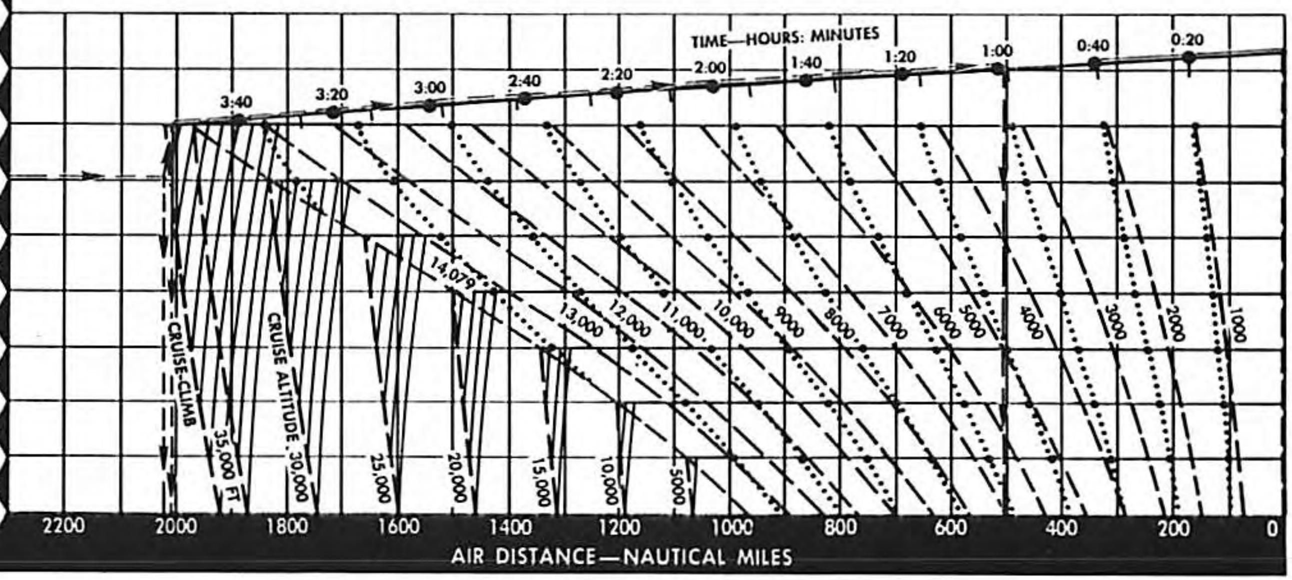


Figure 6-9

CRUISE: TWO 360-GAL EXTERNAL TANKS					
TRUE ALTITUDE 1,000 FT	TRUE MACH NO	CAS KNOTS	TAS KNOTS	FUEL FLOW LB/HR	ENGINE PRESSURE RATIO
CRUISE-CLIMB	.90	310-267	514	4330-2970	2.36-2.30
35	.88	302	506	4360-2980	2.36-2.03
30	.82	311	487	4470-3140	2.14-1.89
25	.76	321	459	4690-3230	1.98-1.76
20	.70	324	430	4870-3350	1.86-1.64
15	.63	322	397	4990-3430	1.75-1.53
10	.57	316	363	5130-3520	1.65-1.44
5	.51	312	334	5220-3600	1.54-1.35
SEA LEVEL	.46	305	305	5200-3710	1.44-1.28

— — — ZERO FUEL REMAINING
—— —— FUEL AVAILABLE
CRUISE-CLIMB PATH
•········• TIME
CONSTANT ALTITUDE CRUISE FLIGHT PATH
CLIMB PATH GUIDE LINE

NOTE

- DOES NOT INCLUDE FUEL, TIME OR DISTANCE TO ACCELERATE TO BEST CLIMB FROM FORMATING SPEED.
- NO ALLOWANCE OR RESERVE MADE FOR LOITER, DESCENT, OR LANDING.
- USE MILITARY THRUST FOR CLIMB (SEE MILITARY THRUST CLIMB CHART FOR DETAILED INFORMATION).
- CRUISE AT RECOMMENDED MACH NUMBER.

48566

SECTION VII
DESCENT

TABLE OF CONTENTS

DESCENTS

Figures 7-1 through 7-4 graphically illustrate the descent characteristics. The data shown are fuel used, rate of descent, time to descend and distance traveled versus pressure altitude. Speed schedules are noted on the charts and in the remarks.

Use

Enter the charts with initial altitude and final altitude. Read down for initial and final times, distances, rates of descent, and fuel used. Subtract the final values from the initial values to obtain the time, distance, rate of descent, and fuel used.

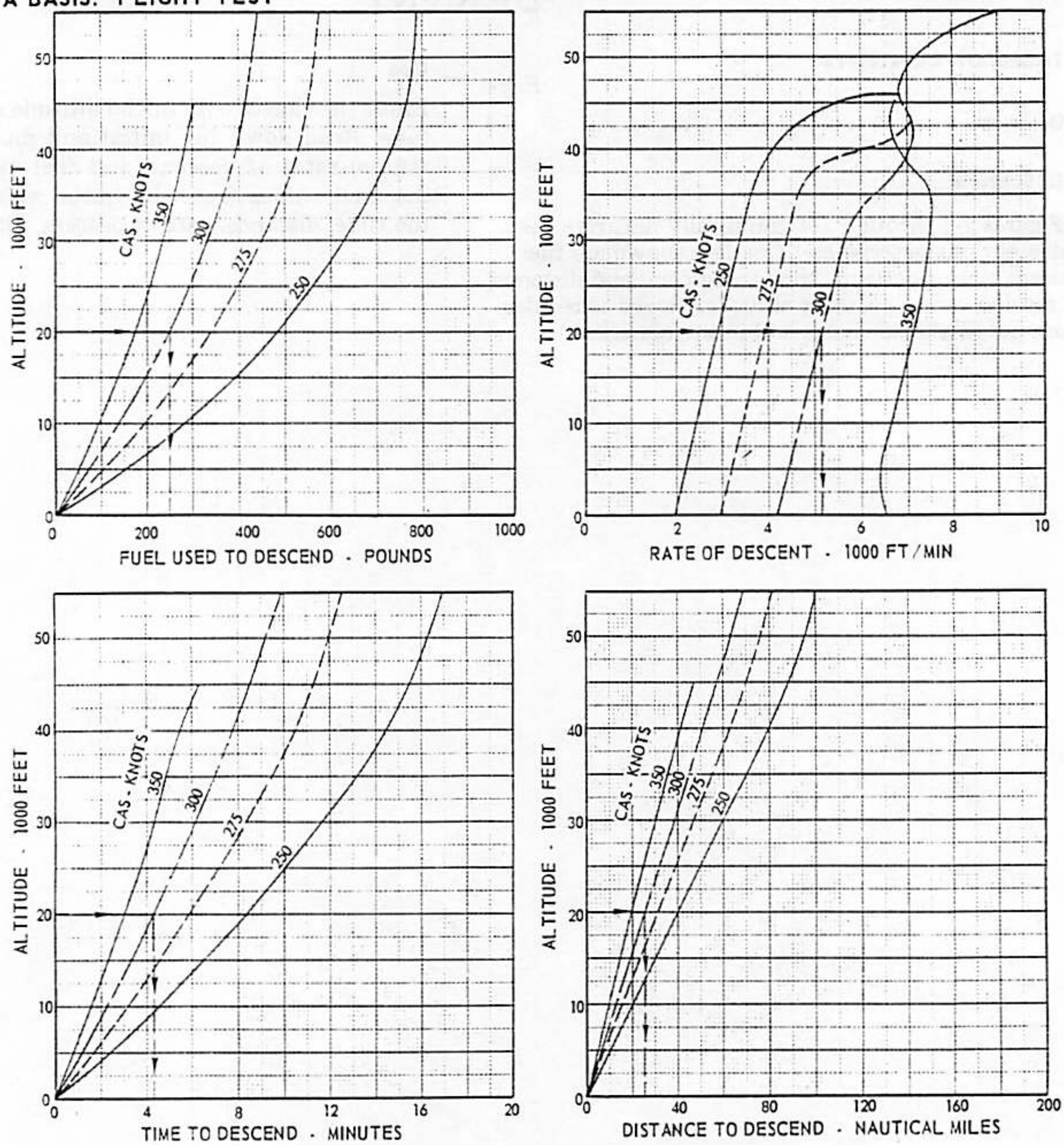
A B

DESCENT - RECOMMENDED

MODEL: F-106A/B
DATE: 1 SEPTEMBER 1961
DATA BASIS: FLIGHT TEST

CONFIGURATION: CLEAN SPEED BRAKES OPEN
85% ENGINE RPM STANDARD ATMOSPHERE
ALL GROSS WEIGHTS

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL



CAS-KNOTS	250*		275*		300*		350*	
PRESSURE ALTITUDE 1000 FEET	MACH NUMBER	TAS KNOTS	MACH NUMBER	TAS KNOTS	MACH NUMBER	TAS KNOTS	MACH NUMBER	TAS KNOTS
55	.90	516	.90	516	.90	516	.90	516
50	.90	516	.90	516	.90	516	.90	516
45	.90	516	.90	516	.90	516	.90	516
40	.82	473	.90	513	.90	516	.90	516
35	.74	425	.81	464	.87	503	.90	519
30	.67	394	.73	431	.79	466	.90	530
25	.61	364	.66	398	.72	431	.83	498
20	.54	335	.60	369	.65	399	.75	463
15	.50	310	.54	341	.59	371	.69	430
10	.45	288	.50	317	.54	345	.63	402
5	.41	268	.45	294	.50	321	.58	375
SL	.38	251	.42	275	.46	301	.53	350

48,135D

NOTES

* TRUE MACH NUMBER NOT TO EXCEED 0.90

THE EFFECT OF WEIGHT CHANGE IS NEGLIGIBLE.

Figure 7-1

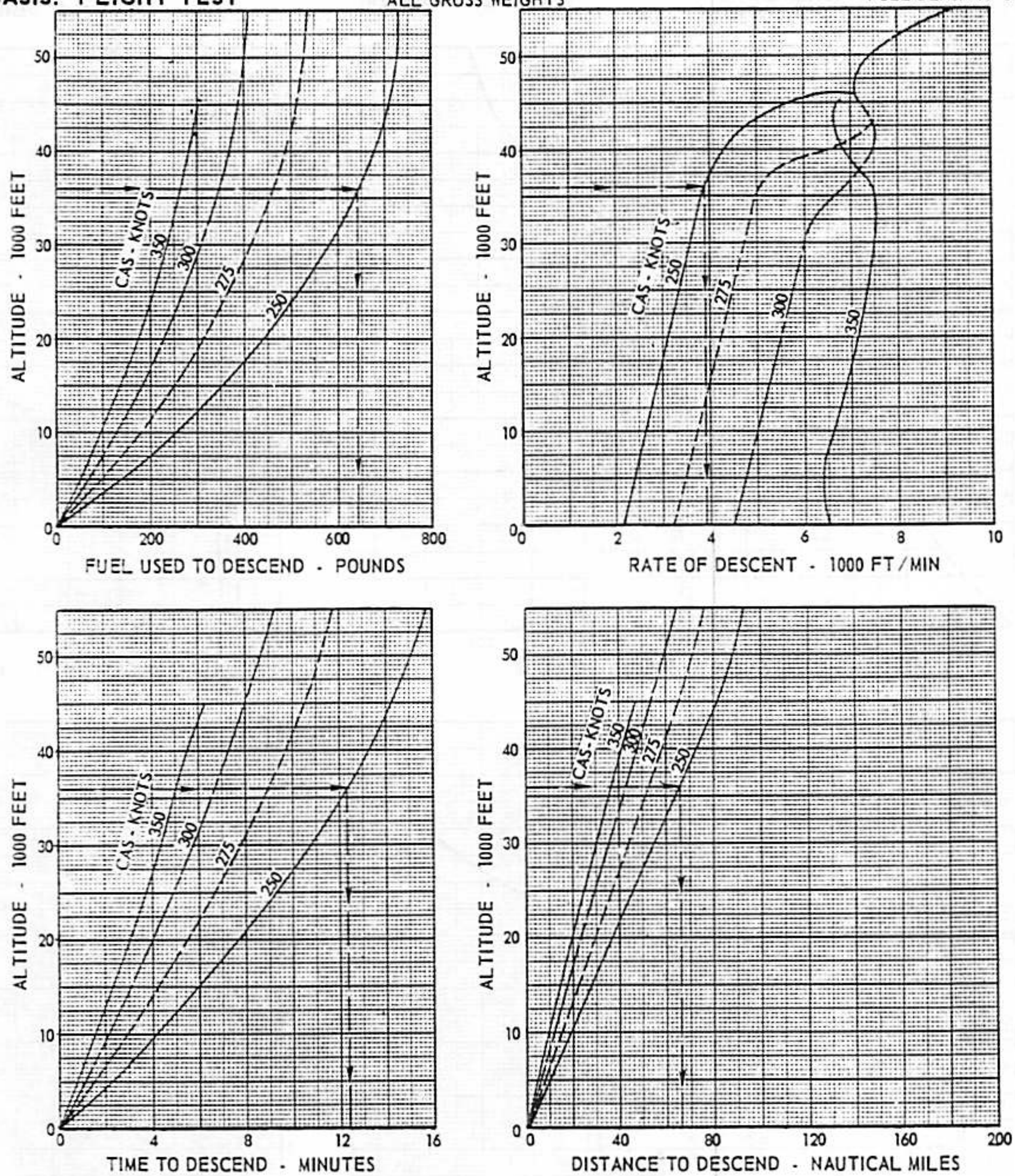
A B

DESCENT - RECOMMENDED

MODEL: F-106A/B
DATE: 21 FEBRUARY 1967
DATA BASIS: FLIGHT TEST

CONFIGURATION: TWO 360-GAL EXTERNAL TANKS
85% ENGINE RPM
SPEED BRAKES OPEN
STANDARD ATMOSPHERE
ALL GROSS WEIGHTS

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL



CAS-KNOTS	250*		275*		300*		350*	
PRESSURE ALTITUDE 1000 FEET	MACH NUMBER	TAS KNOTS	MACH NUMBER	TAS KNOTS	MACH NUMBER	TAS KNOTS	MACH NUMBER	TAS KNOTS
55	.90	516	.90	516	.90	516	.90	516
50	.90	516	.90	516	.90	516	.90	516
45	.90	516	.90	516	.90	516	.90	516
40	.82	473	.90	513	.90	516	.90	516
35	.74	425	.81	464	.87	503	.90	519
30	.67	394	.73	431	.79	466	.90	530
25	.61	364	.66	398	.72	431	.83	498
20	.54	335	.60	369	.65	399	.75	463
15	.50	310	.54	341	.59	371	.69	430
10	.45	288	.50	317	.54	345	.63	402
5	.41	268	.45	294	.50	321	.58	375
SL	.38	250	.42	275	.46	300	.53	350

NOTES

* TRUE MACH NUMBER NOT TO EXCEED 0.90

THE EFFECT OF WEIGHT CHANGE IS NEGLIGIBLE.

48,134E

Figure 7-2

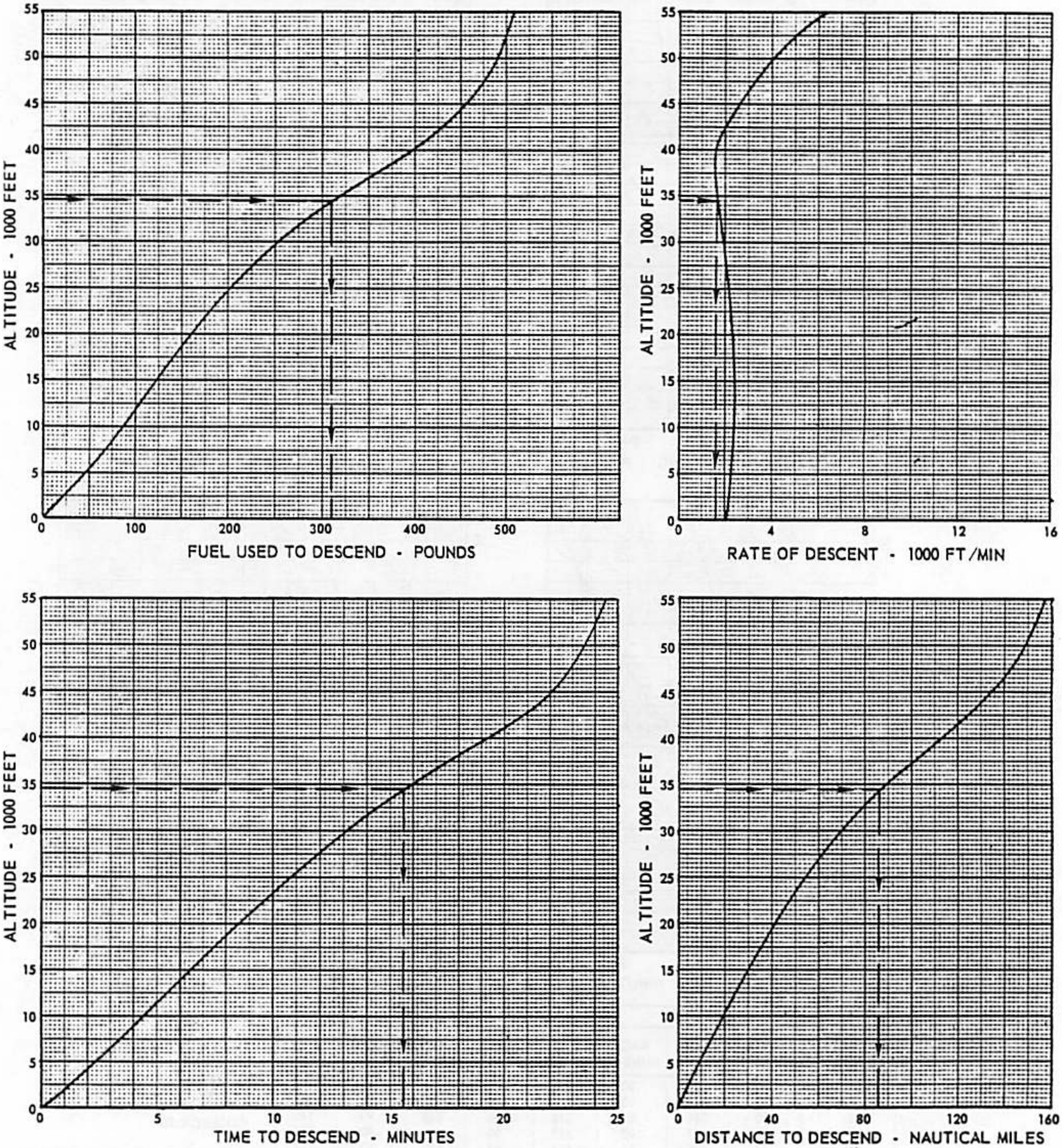
A B

DESCENT - MAXIMUM RANGE

MODEL: F-106A/B
DATE: 1 SEPTEMBER 1961
DATA BASIS: FLIGHT TEST

CONFIGURATION: CLEAN   IDLE THRUST
ALL GROSS WEIGHTS
STANDARD ATMOSPHERE

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL



NOTES

THE EFFECT OF WEIGHT CHANGE IS NEGLIGIBLE.

MAXIMUM RANGE DESCENT: DESCEND AT 250 KNOTS CAS NOT TO EXCEED 0.9 TRUE MACH NUMBER.

48,165D

Figure 7-3

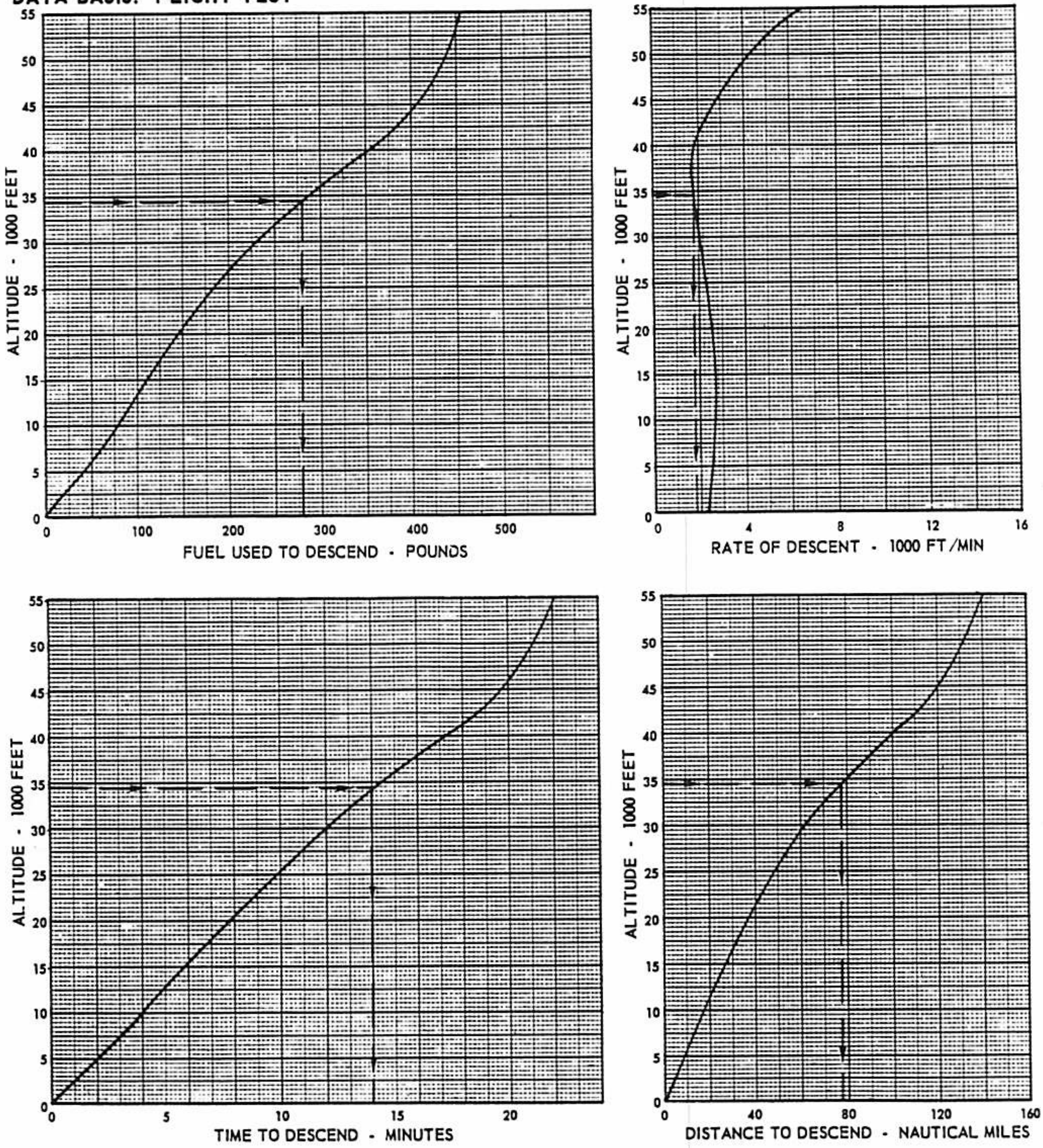
A B

DESCENT - MAXIMUM RANGE

CONFIGURATION: TWO 360-GALLON EXTERNAL TANKS
ALL GROSS WEIGHTS
STANDARD ATMOSPHERE

MODEL: F-106 A/B
DATE: 21 FEBRUARY 1967
DATA BASIS: FLIGHT TEST

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL



NOTES

THE EFFECT OF WEIGHT CHANGE IS NEGLIGIBLE.

48,166E

MAXIMUM RANGE DESCENT: DESCEND AT 250 KNOTS CAS NOT TO EXCEED 0.9 TRUE MACH NUMBER.

Figure 7-4

SECTION VIII
APPROACH AND LANDING

TABLE OF CONTENTS *Page*

LANDING DISTANCE CHARTS

Landing distance charts are shown for two basic configurations: speed brakes open (figures 8-1 and 8-2), and speed brakes open with drag chute deployed at touchdown (figures 8-3 and 8-4). Either chart is valid for use with or without external tanks. As indicated on the sample problem, these charts account for the effects of ambient temperature, pressure altitude, gross weight and headwind for ground roll and total distance including the landing flare over a 50-foot obstacle.

Use

Enter the chart at a given ambient temperature, then read vertically up to intersect the field pressure altitude. Proceed horizontally to the right to the amount of fuel remaining, then read vertically down to the runway braking condition (RCR) base line and parallel lines to the RCR value given for the braking condition. Read vertically down to zero headwind base line and parallel lines to the amount of headwind. Then read vertically down to zero increase in recommended touchdown speed base line and parallel lines to the increase in recommended touchdown speed. Read vertically down for ground roll and distance to clear a 50-foot obstacle.

Sample Problem

Given: Air temperature of 15°C, pressure altitude at sea level, 6000 pounds fuel remaining, and a runway condition reading (RCR) of 23.

Determine: The ground roll and total distance to clear a 50-foot obstacle and land, under good braking conditions in a 30-knot headwind, when touching down 10 knots faster than recommended.

A. Enter figure A8-3 with the ambient air temperature — 15°C or 59°F.
B. Read up to the pressure altitude — sea level.
C. Read horizontally to the right, for the fuel remaining — 6000 pounds.
D. Read down to base line for all types of braking.
E. Follow parallel lines to RCR of 23.
F. Read down to zero headwind base line.
G. Follow parallel lines to a 15 knot headwind (one-half of headwind component).
H. Read down to zero increase in recommended touchdown speed base line.
I. Follow parallel lines to 10 knots.
J. Read down for ground roll distance — 3650 feet.
K. Read down for total distance to clear 50-foot obstacle — 5080 feet.

TAKEOFF AND LANDING DATA CARD

F-106 TAKEOFF AND LANDING
DATA CARD
CONDITIONS

	TAKEOFF	LANDING
Runway Length	________	________
Wind	________	________
Outside Air Temp	________	________
Pressure Altitude	________	________
Fuel Remaining	________	________

TAKEOFF

Engine Pressure Ratio	________
Acceleration Check	______Kts. at______Ft.
Takeoff Distance	________Ft.
Takeoff Speed	________Kts.
Refusal Speed & Distance	______Kts. at______Ft.
Maximum Abort Speed	________Kts.
Initial Climb Speed	________Kts.

LANDING

	IMMEDIATELY AFTER TAKEOFF	FINAL LANDING
Final Approach Speed	________	________
Prior To Flare Speed	________	________
Touchdown Speed	________	________
Landing Ground Roll:		
Wheel Brakes Only	________	________
Drag Chute Deployed	________	________

The landing portion of the Takeoff and Landing Data Card must be filled out in conjunction with the Takeoff Data. Landing Data nomenclature definitions are as follows:

Conditions

1. Runway Length. Usable length of runway in feet.
2. Wind. The wind component parallel to the runway.
3. Outside Air Temperature. Runway air temperature in degrees centigrade.
4. Pressure Altitude. Field pressure altitude obtained by setting altimeter to 29.92 inches Hg and reading altimeter.
5. Fuel Remaining. Fuel remaining in pounds at start of final approach.

Landing

1. Final Approach Speed. Recommended minimum speeds for the latter portion of final approach are included in the landing distance charts (figures 8-1 through 8-4).
2. Prior to Flare Speed. Recommended minimum prior to flare speeds are included in the landing distance charts (figures 8-1 through 8-4).
3. Touchdown Speed. Recommended minimum touchdown speeds at time wheels contact runway are included in the landing distance charts (figures 8-1 through 8-4).
4. Landing Ground Roll:
   a. Wheel Brakes Only. Distance in feet from airplane touchdown to full stop with no drag chute and speed brakes open, using wheel brakes only (figure 8-1 and figure 8-2).
   b. Drag Chute Deployed. Distance in feet from airplane touchdown to full stop with drag chute (inflated at touchdown), speed brakes open, and using wheel brakes (figure 8-3 and figure 8-4).

CROSSWIND LANDINGS

The minimum touchdown speeds for a given crosswind condition are determined from the Takeoff and Landing Crosswind Chart, figure 2-10.

Use

The use of this chart is explained in part 2 titled "Takeoff and Landing Crosswind Chart."

Sample Problem

Given: A wind of 15 knots, gusts to 25 knots, 45° relative to runway heading.

Determine: The headwind and crosswind components and the minimum touchdown speed for 3000 pounds of fuel remaining.

A. Enter figure 2-10 on the wind angle line—45°.

B. Proceed to the wind velocity circle—25 knots (maximum gust velocity).

C. Move horizontally to the left and read the headwind component — 18 knots (used to obtain the landing distance from the landing charts).

D. Move vertically downward and read the crosswind component — 18 knots.

E. Enter table with crosswind component and read the minimum touchdown speed — 163 knots.

Compute the gust factor (25 knots—15 knots) × ½ = 5 knots. The recommended touchdown speed for 3000 pounds of fuel remaining is 151 KCAS (figure 8-1). Add the gust factor to the recommended touchdown speed—156 KCAS. Since the value obtained in the crosswind chart is higher, it should be used.

NOTE

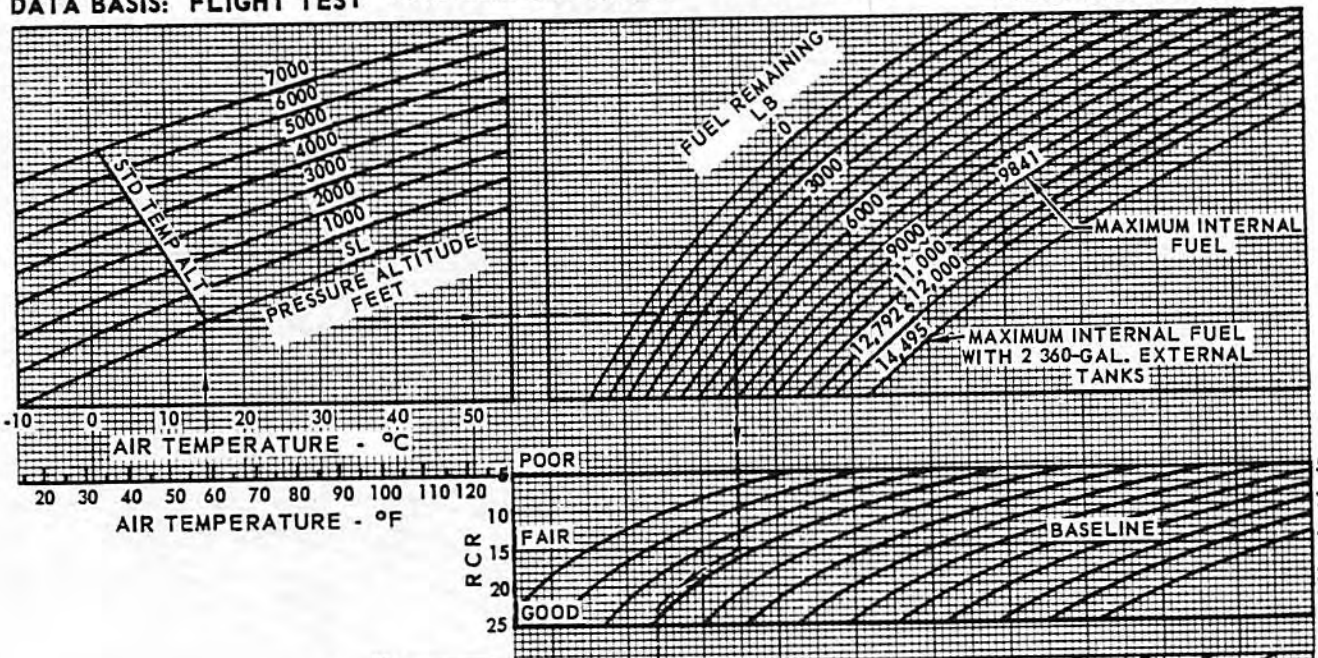
If the touchdown speed is increased over the recommended touchdown speed, the landing distance will be increased (see figures 8-1 through 8-4).

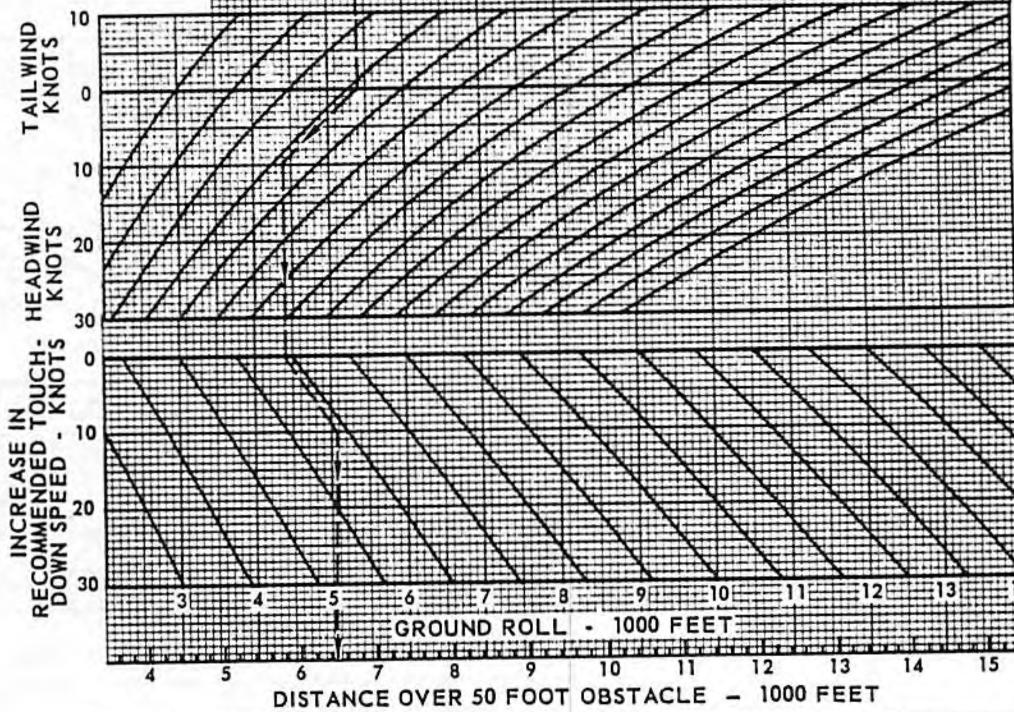
A

LANDING DISTANCE
CONFIGURATION: SPEED BRAKES OPEN
(DRAG CHUTE NOT DEPLOYED)
HARD SURFACE RUNWAY ARMAMENT IN

MODEL: F-106A
DATE: 21 FEBRUARY 1967
DATA BASIS: FLIGHT TEST

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL





NOTES

IF ARMAMENT LOAD IS EXPENDED, APPROACH PRIOR TO FLARE AND TOUCHDOWN SPEEDS CAN BE REDUCED 6 KNOTS. CORRESPONDING GROUND ROLL DISTANCES CAN BE REDUCED 9%.

FUEL REMAINING CURVES BASED ON A ZERO FUEL WEIGHT OF 27,336 POUNDS (INCLUDING 514 POUNDS FOR EXTERNAL TANKS).

FUEL	APPROACH SPEED KNOTS	PRIOR TO FLARE SPEED KNOTS	TOUCHDOWN SPEED KNOTS
	CAS	CAS	CAS
1000	179	166	147
2000	181	168	149
3000	184	171	151
4000	186	173	154
5000	188	175	156
6000	191	177	158
7000	193	179	160
8000	195	181	161

FUEL	APPROACH SPEED KNOTS	PRIOR TO FLARE SPEED KNOTS	TOUCHDOWN SPEED KNOTS
	CAS	CAS	CAS
9000	197	183	163
10,000	199	185	165
11,000	201	187	167
12,000	203	189	169
13,000	205	191	171
14,000	207	192	172
14,495*	208	193	173

* FULL FUEL WITH TWO 360-GALLON EXTERNAL TANKS

48,136H

Figure 8-1

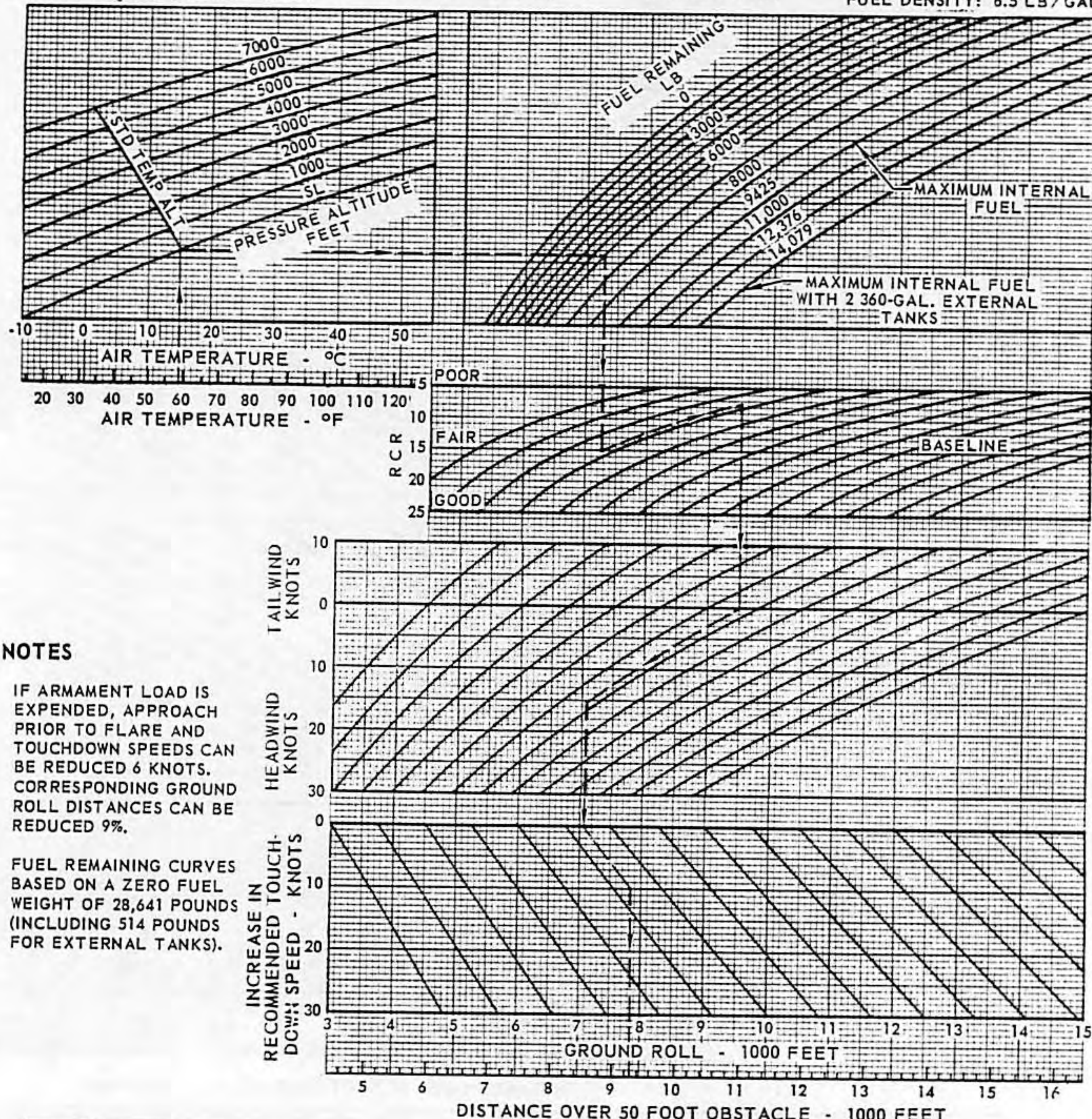
B

LANDING DISTANCE

MODEL: F-106B
DATE: 21 FEBRUARY 1967
DATA BASIS: FLIGHT TEST

CONFIGURATION: SPEED BRAKES OPEN
(DRAG CHUTE NOT DEPLOYED)
HARD SURFACE RUNWAY ARMAMENT IN

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL



NOTES

IF ARMAMENT LOAD IS EXPENDED, APPROACH PRIOR TO FLARE AND TOUCHDOWN SPEEDS CAN BE REDUCED 6 KNOTS. CORRESPONDING GROUND ROLL DISTANCES CAN BE REDUCED 9%.

FUEL REMAINING CURVES BASED ON A ZERO FUEL WEIGHT OF 28,641 POUNDS (INCLUDING 514 POUNDS FOR EXTERNAL TANKS).

FUEL	APPROACH SPEED KNOTS CAS	PRIOR TO FLARE SPEED KNOTS CAS	TOUCHDOWN SPEED KNOTS CAS
1000	190	177	156
2000	191	178	157
3000	192	178	158
4000	192	179	159
5000	193	179	159
6000	193	180	160
7000	193	183	163

FUEL	APPROACH SPEED KNOTS CAS	PRIOR TO FLARE SPEED KNOTS CAS	TOUCHDOWN SPEED KNOTS CAS
8000	202	187	166
9000	206	191	170
10,000	208	193	172
11,000	210	195	173
12,000	212	197	175
13,000	214	199	177
14,079*	216	200	178

48,285B

*FULL FUEL WITH TWO 360-GALLON EXTERNAL TANKS

Figure 8-2

A

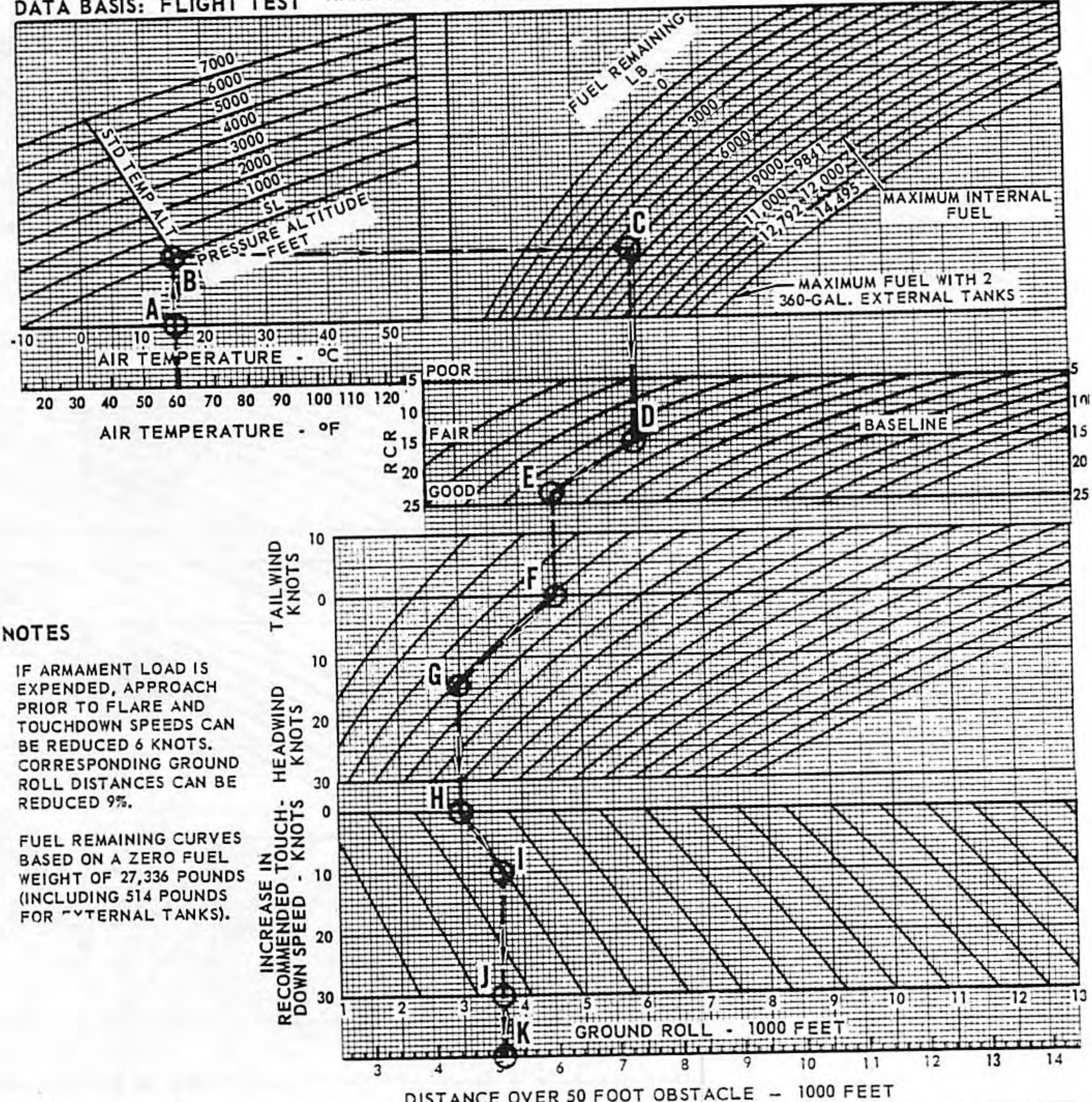
LANDING DISTANCE

CONFIGURATION: SPEED BRAKES OPEN (DRAG CHUTE DEPLOYED)

HARD SURFACE RUNWAY ARMAMENT IN

MODEL: F-106A
DATE: 21 FEBRUARY 1967
DATA BASIS: FLIGHT TEST

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL



NOTES

IF ARMAMENT LOAD IS EXPENDED, APPROACH PRIOR TO FLARE AND TOUCHDOWN SPEEDS CAN BE REDUCED 6 KNOTS. CORRESPONDING GROUND ROLL DISTANCES CAN BE REDUCED 9%.

FUEL REMAINING CURVES BASED ON A ZERO FUEL WEIGHT OF 27,336 POUNDS (INCLUDING 514 POUNDS FOR EXTERNAL TANKS).

FUEL	APPROACH SPEED KNOTS	PRIOR TO FLARE SPEED KNOTS	TOUCHDOWN SPEED KNOTS
	CAS	CAS	CAS
1000	179	166	147
2000	181	168	149
3000	184	171	151
4000	186	173	154
5000	188	175	156
6000	191	177	158
7000	193	179	160
8000	195	181	161

FUEL	APPROACH SPEED KNOTS	PRIOR TO FLARE SPEED KNOTS	TOUCHDOWN SPEED KNOTS
	CAS	CAS	CAS
9000	197	183	163
10,000	199	185	165
11,000	201	187	167
12,000	203	189	169
13,000	205	191	'71
14,000	207	192	72
14,495*	208	193	73

* FULL FUEL WITH TWO 360-GALLON EXTERNAL TANKS

48,137F

Figure 8-3

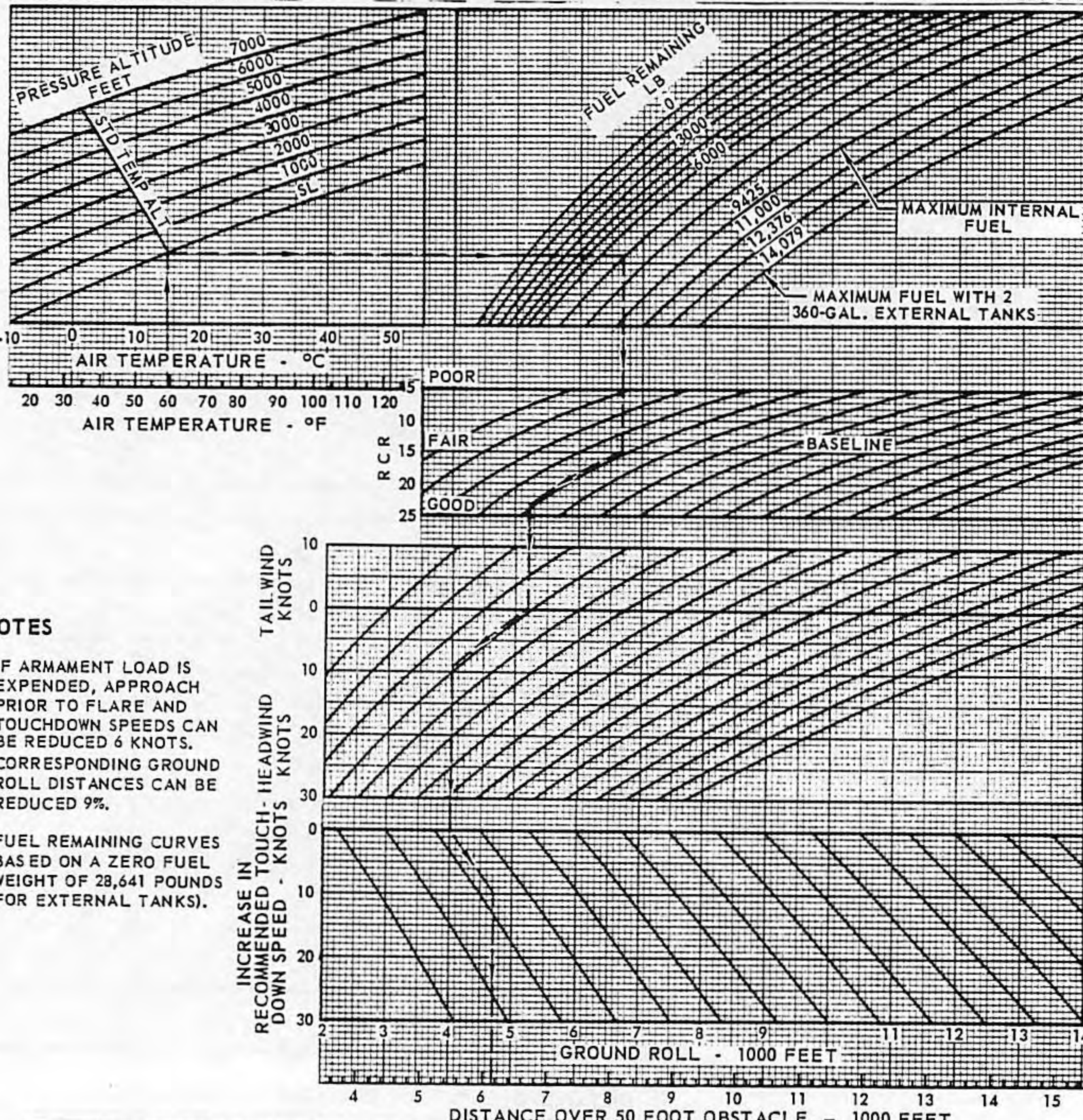
LANDING DISTANCE

B

MODEL: F-106B
DATE: 21 FEBRUARY 1967
DATA BASIS: FLIGHT TEST

CONFIGURATION: SPEED BRAKES OPEN
(DRAG CHUTE DEPLOYED)
HARD SURFACE RUNWAY   ARMAMENT IN

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL



NOTES

IF ARMAMENT LOAD IS EXPENDED, APPROACH PRIOR TO FLARE AND TOUCHDOWN SPEEDS CAN BE REDUCED 6 KNOTS. CORRESPONDING GROUND ROLL DISTANCES CAN BE REDUCED 9%.

FUEL REMAINING CURVES BASED ON A ZERO FUEL WEIGHT OF 28,641 POUNDS FOR EXTERNAL TANKS).

FUEL	APPROACH SPEED KNOTS	PRIOR TO FLARE SPEED KNOTS	TOUCHDOWN SPEED KNOTS
	CAS	CAS	CAS
1000	190	177	156
2000	191	178	157
3000	192	178	158
4000	192	179	159
5000	193	179	159
6000	193	180	160
7000	193	183	163

FUEL	APPROACH SPEED KNOTS	PRIOR TO FLARE SPEED KNOTS	TOUCHDOWN SPEED KNOTS
	CAS	CAS	CAS
8000	202	187	166
9000	206	181	170
10,000	208	193	172
11,000	210	195	173
12,000	212	197	175
13,000	214	199	177
14,079*	216	200	178

* FULL FUEL WITH TWO 360-GALLON EXTERNAL TANKS

Figure 8-4

SECTION IX
MISCELLANEOUS

TABLE OF CONTENTS

Page

MAXIMUM THRUST ACCELERATION

Figures 9-1 through 9-18 for the clean airplane and figures 9-19 through 9-36 for the airplanes with 360-gallon external tanks present level flight acceleration data with maximum thrust for pressure altitudes of 35,000, 40,000 and 45,000 feet. Three basic sets of data are presented for standard day temperature, -10°C below standard day temperatures, and +10°C above standard day temperatures. Time, distance, and fuel required to accelerate to any given supersonic Mach number from any Mach number may be obtained from the charts. The charts are entered at a known gross weight at any initial Mach number. Then read up the sloping guide lines to the desired final Mach line. By reading horizontally to the left and subtracting the initial conditions from the final conditions, time to accelerate may be obtained from the top chart and distance required to accelerate may be obtained from the lower chart on each presentation. By reading vertically down from the reference point, the fuel required for the acceleration may be obtained by subtracting this reading from the initial known gross weight. These data can be used to obtain the time, distance, and fuel used for acceleration from any altitude between 35,000 and 45,000 feet and for any temperature between standard -10°C and standard +10°C.

USE

Enter the charts with initial Mach number at the proper initial gross weight. Parallel the nearest guide line to the final Mach number. Read initial and final times and distances from the left side of the chart. To obtain time and distance to accelerate, subtract the initial conditions from the final conditions. Read the final gross weight from the bottom of the chart. To obtain the fuel used subtract the final gross weight from the initial gross weight.

NOTE

Interpolations for altitudes and temperatures other than those shown must be cross-plotted as linear interpolations are not valid.

See figure 9-3 for sample problem.

MAXIMUM THRUST ACCELERATION - 35,000 FEET

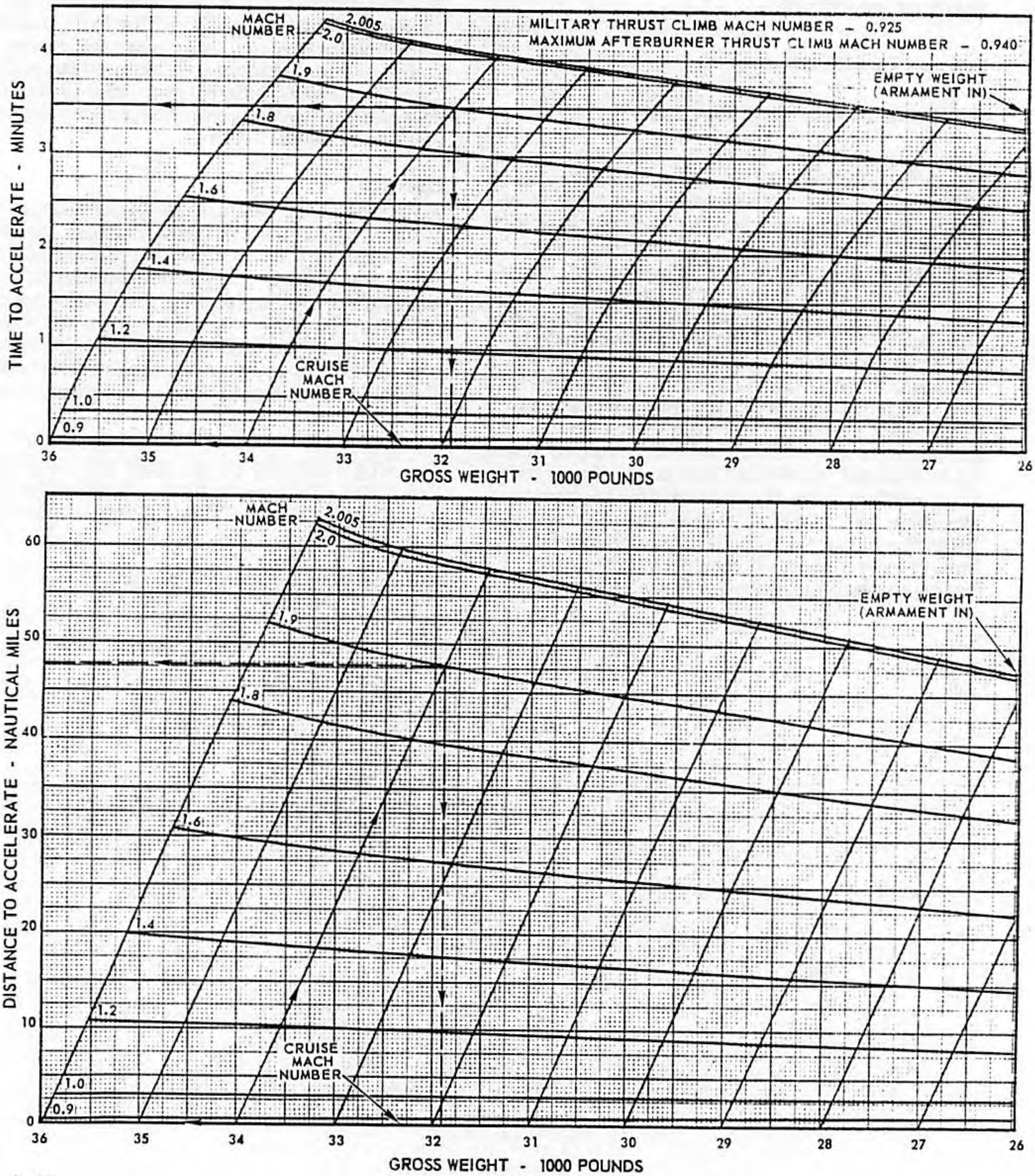
A

MODEL: F-106A
DATE: 1 SEPTEMBER 1961
DATA BASIS: FLIGHT TEST

CONFIGURATION: CLEAN
ARMAMENT IN

STANDARD ATMOSPHERE

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL



48,213

Figure 9-1

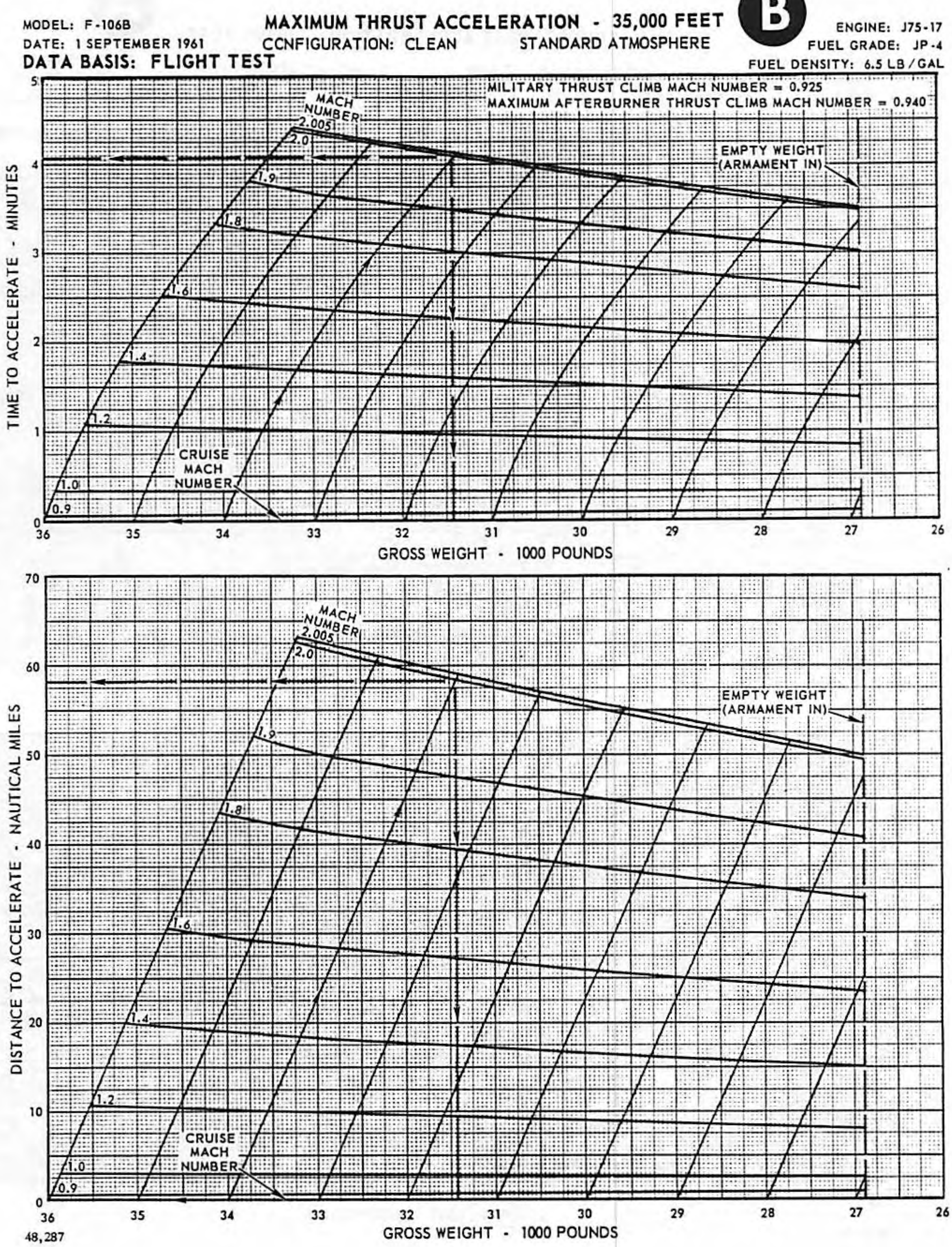

MODEL: F-106B
DATE: 1 SEPTEMBER 1961
DATA BASIS: FLIGHT TEST
MAXIMUM THRUST ACCELERATION - 35,000 FEET
CONFIGURATION: CLEAN
STANDARD ATMOSPHERE
B
ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL
MILITARY THRUST CLIMB MACH NUMBER = 0.925
MAXIMUM AFTERBURNER THRUST CLIMB MACH NUMBER = 0.940
MACH NUMBER
2.005
2.0
1.9
1.8
1.6
1.4
1.2
1.0
0.9
EMPTY WEIGHT (ARMAMENT IN)
CRUISE MACH NUMBER
TIME TO ACCELERATE - MINUTES
GROSS WEIGHT - 1000 POUNDS
DISTANCE TO ACCELERATE - NAUTICAL MILES
48,287

Figure 9-2

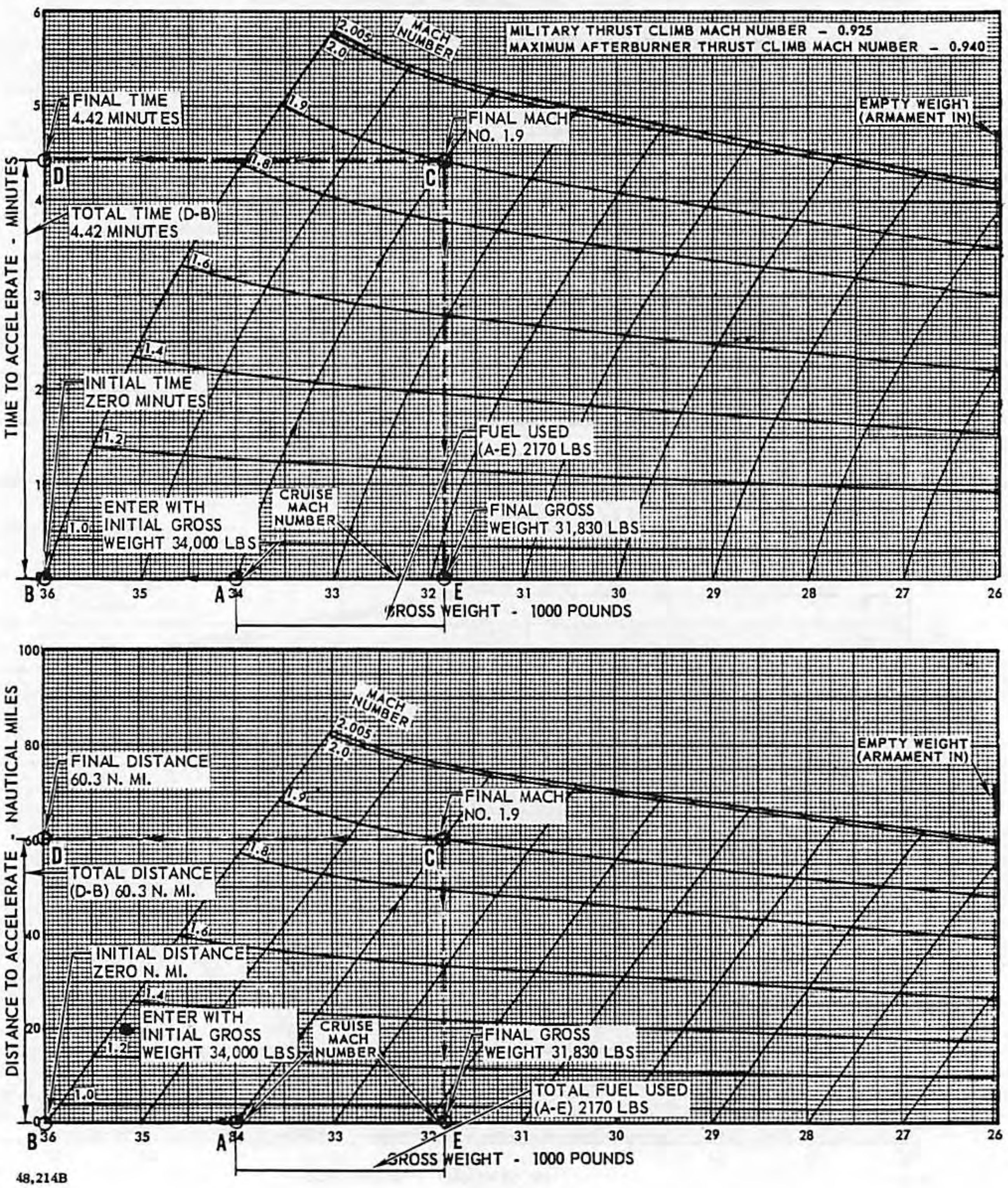
A

MAXIMUM THRUST ACCELERATION - 40,000 FEET

MODEL: F-106A
DATE: 1 SEPTEMBER 1961
DATA BASIS: FLIGHT TEST

CONFIGURATION: CLEAN
STANDARD ATMOSPHERE
ARMAMENT IN

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL



48,214B

Figure 9-3

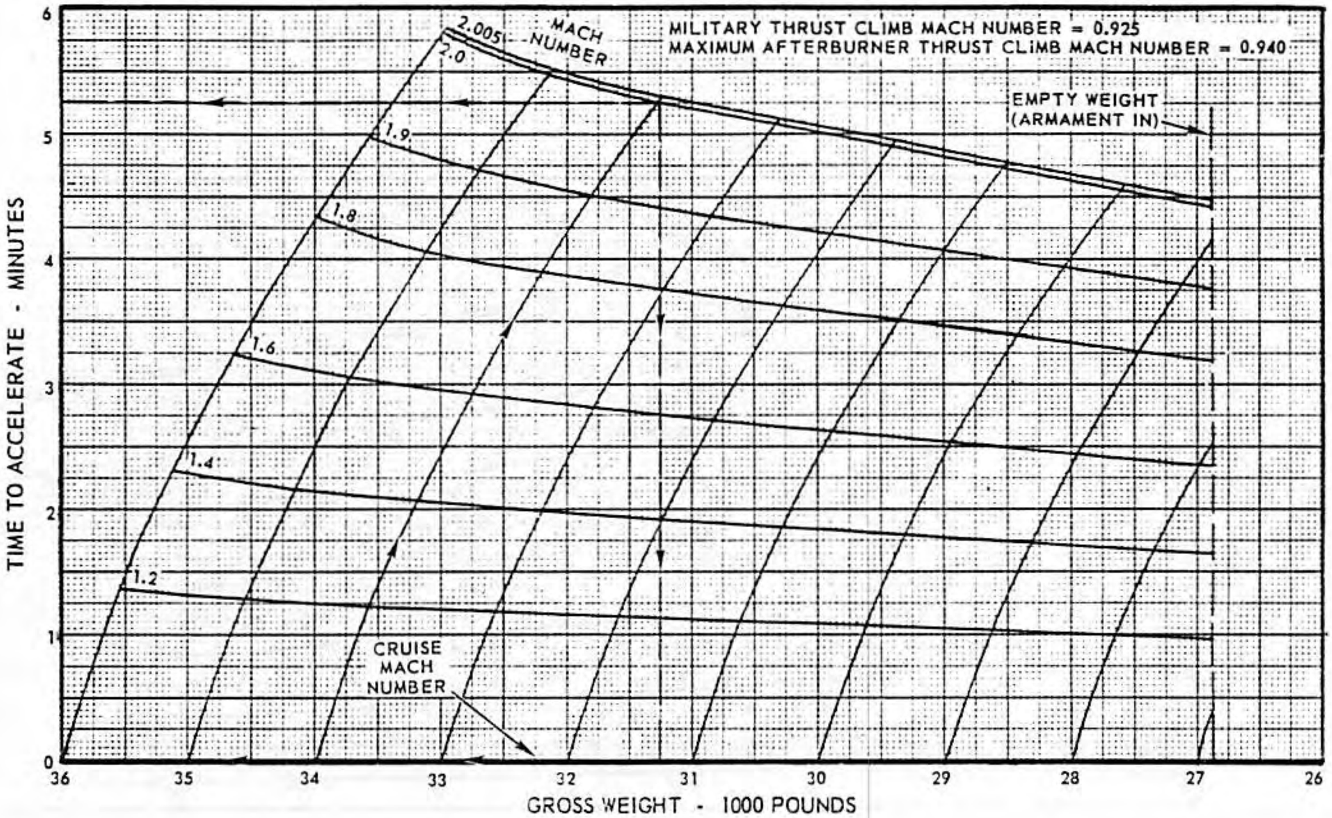
B

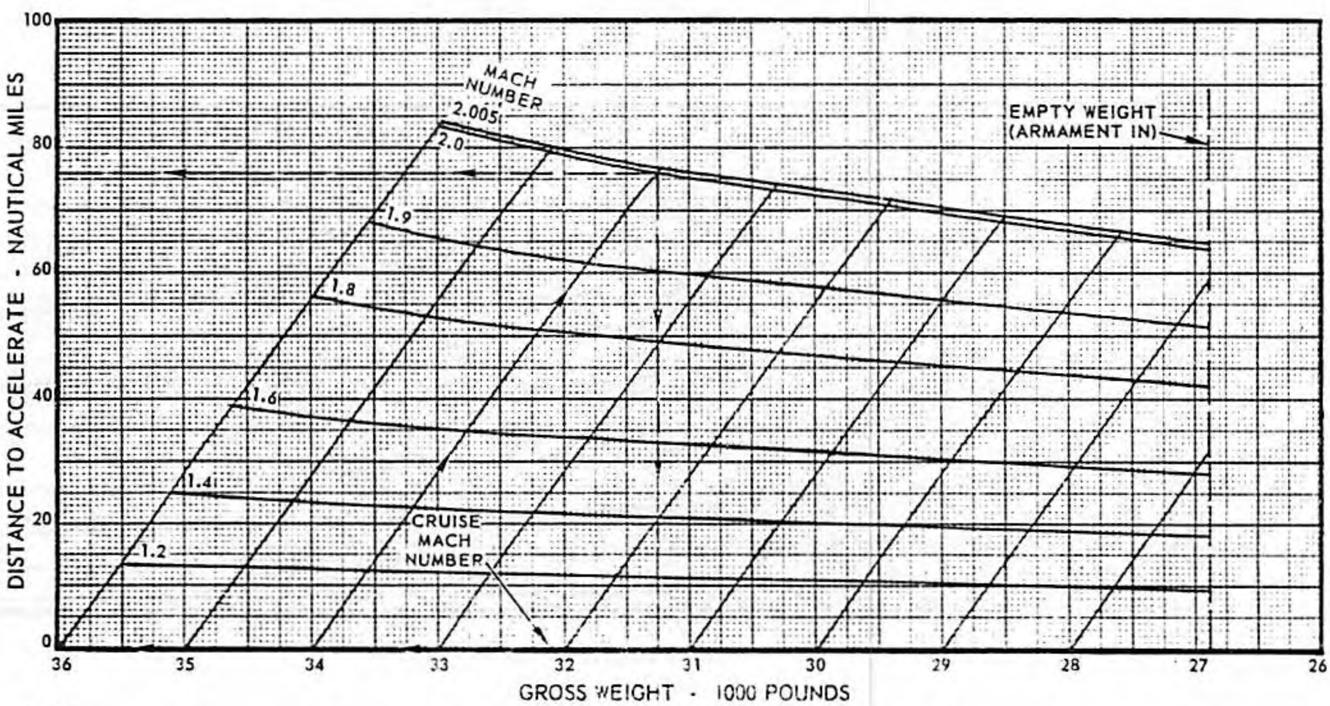
MAXIMUM THRUST ACCELERATION - 40,000 FEET

MODEL: F-106B
DATE: 1 SEPTEMBER 1961
DATA BASIS: FLIGHT TEST

CONFIGURATION: CLEAN   STANDARD ATMOSPHERE

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL





48,288

Figure 9-4

A

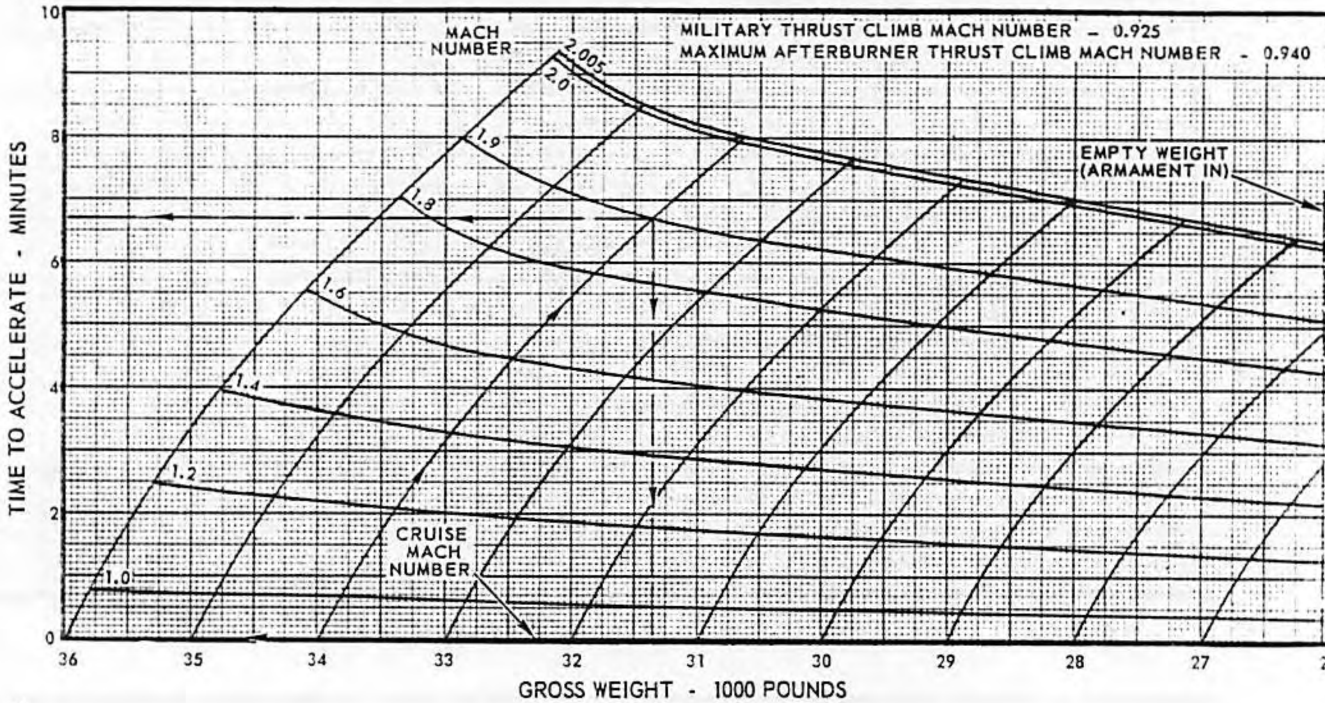
MAXIMUM THRUST ACCELERATION - 45,000 FEET

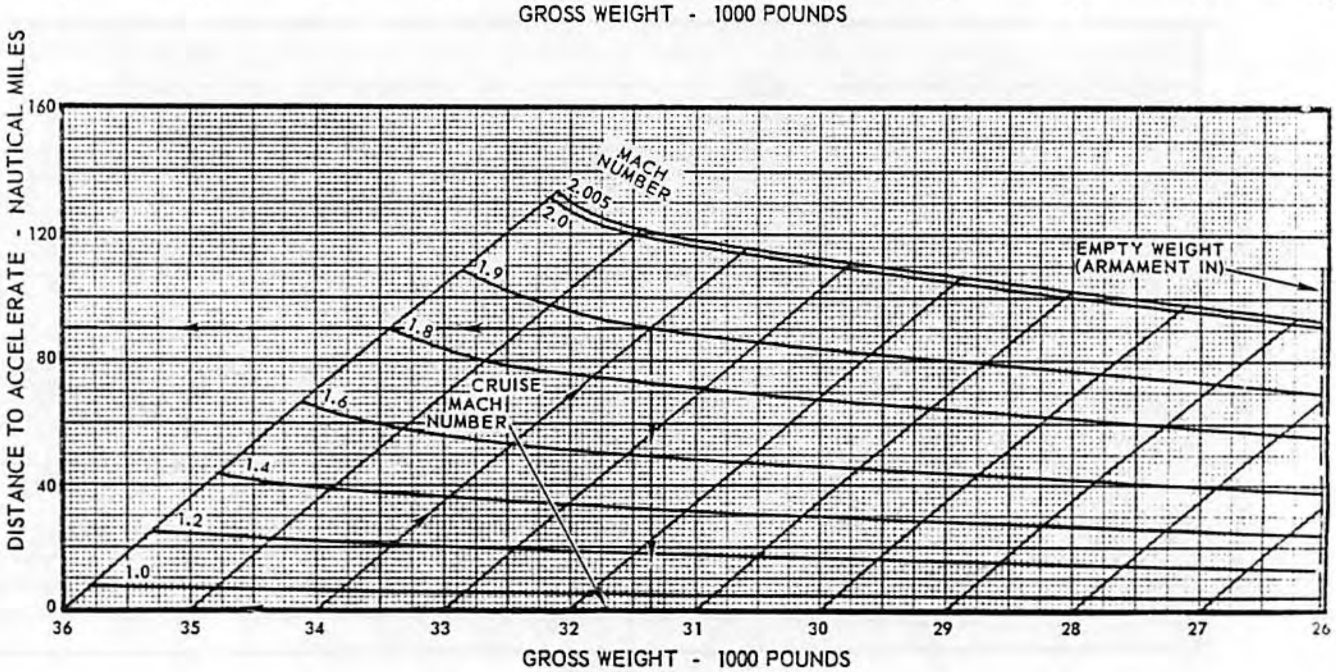
MODEL: F-106A
DATE: 1 SEPTEMBER 1961
DATA BASIS: FLIGHT TEST

CONFIGURATION: CLEAN
ARMAMENT IN

STANDARD ATMOSPHERE

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL





48,215

Figure 9-5

B

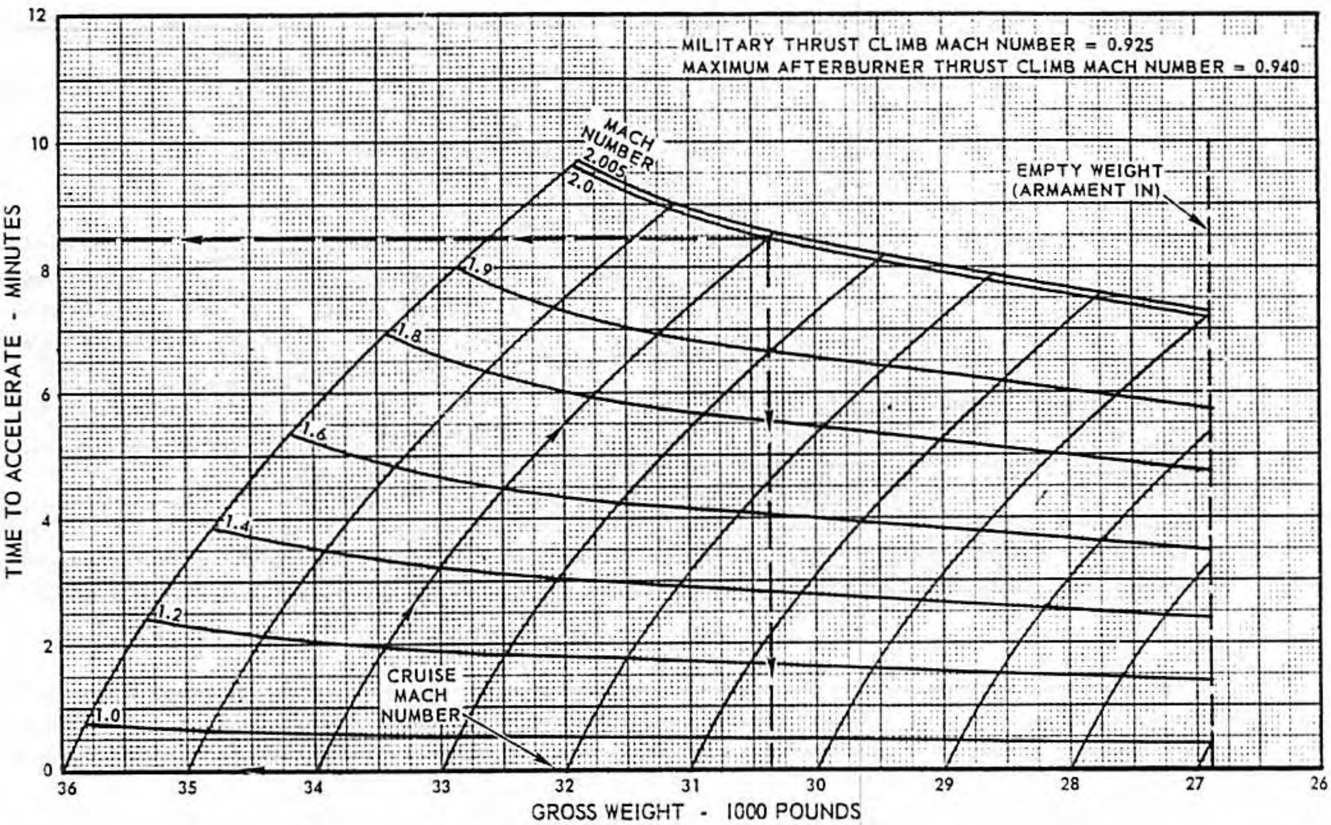
MAXIMUM THRUST ACCELERATION - 45,000 FEET

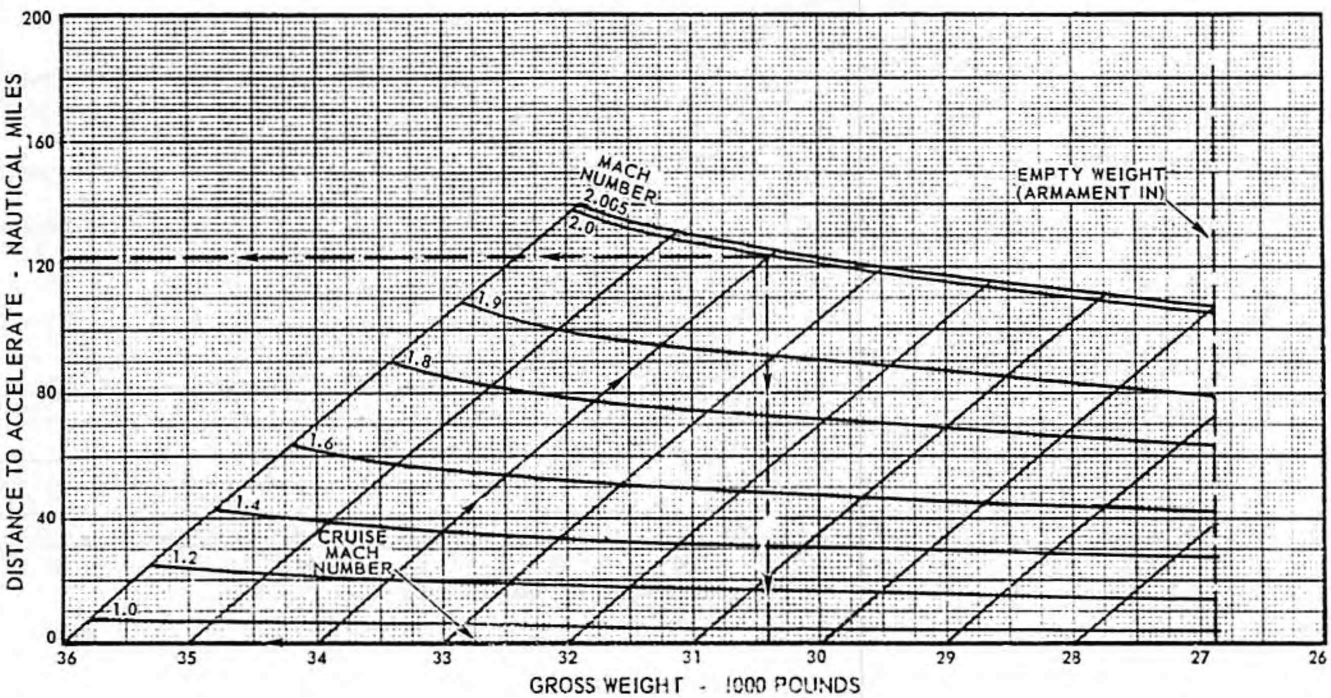
MODEL: F-106B
DATE: 1 SEPTEMBER 1961
DATA BASIS: FLIGHT TEST

CONFIGURATION: CLEAN

STANDARD ATMOSPHERE

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL





48,259

Figure 9-6

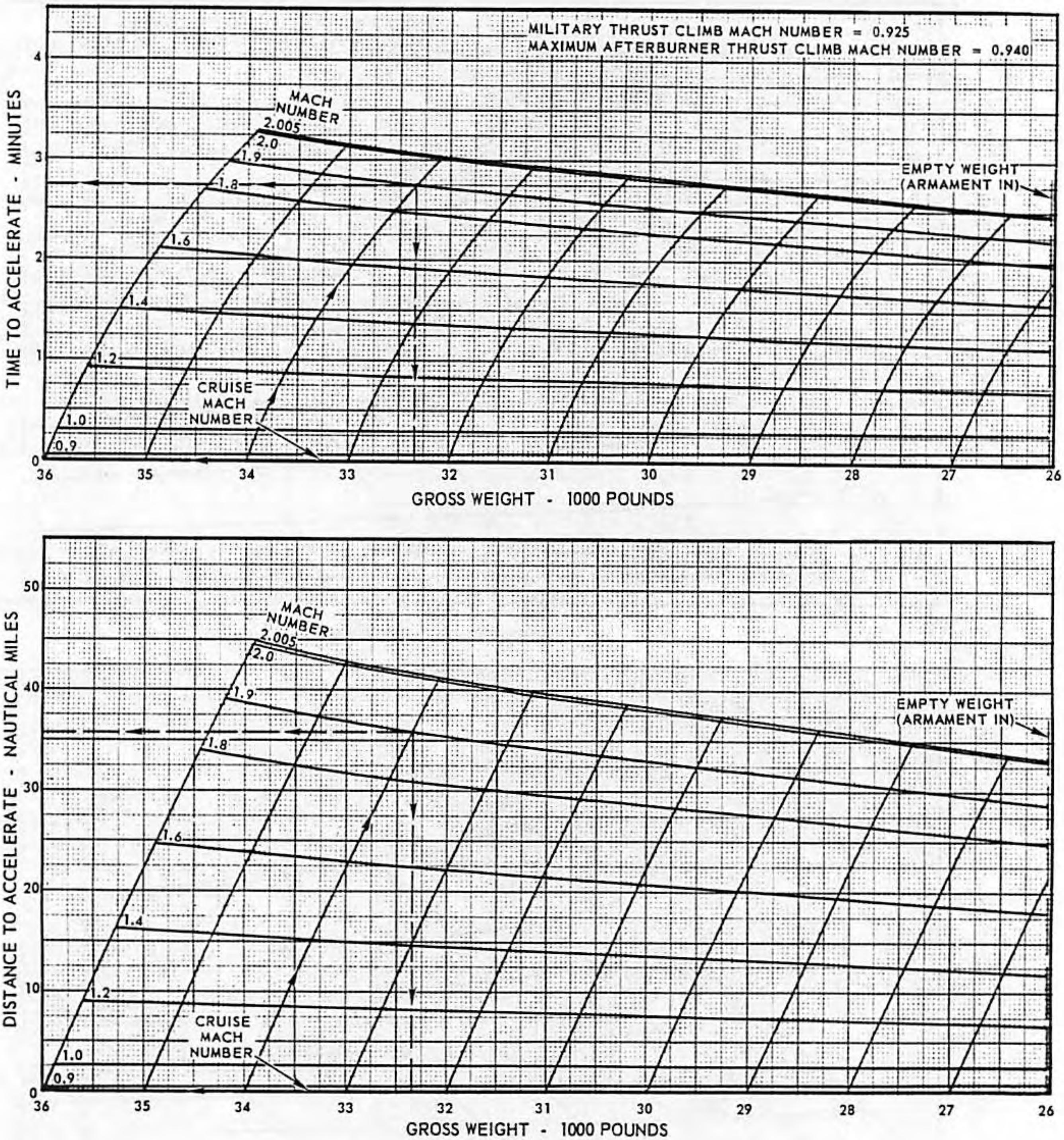
MAXIMUM THRUST ACCELERATION - 35,000 FEET

A

MODEL: F-106A
DATE: 1 SEPTEMBER 1961
DATA BASIS: FLIGHT TEST

CONFIGURATION: CLEAN   ARMAMENT IN
STANDARD ATMOSPHERE – 10°C

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL



48,311

Figure 9-7

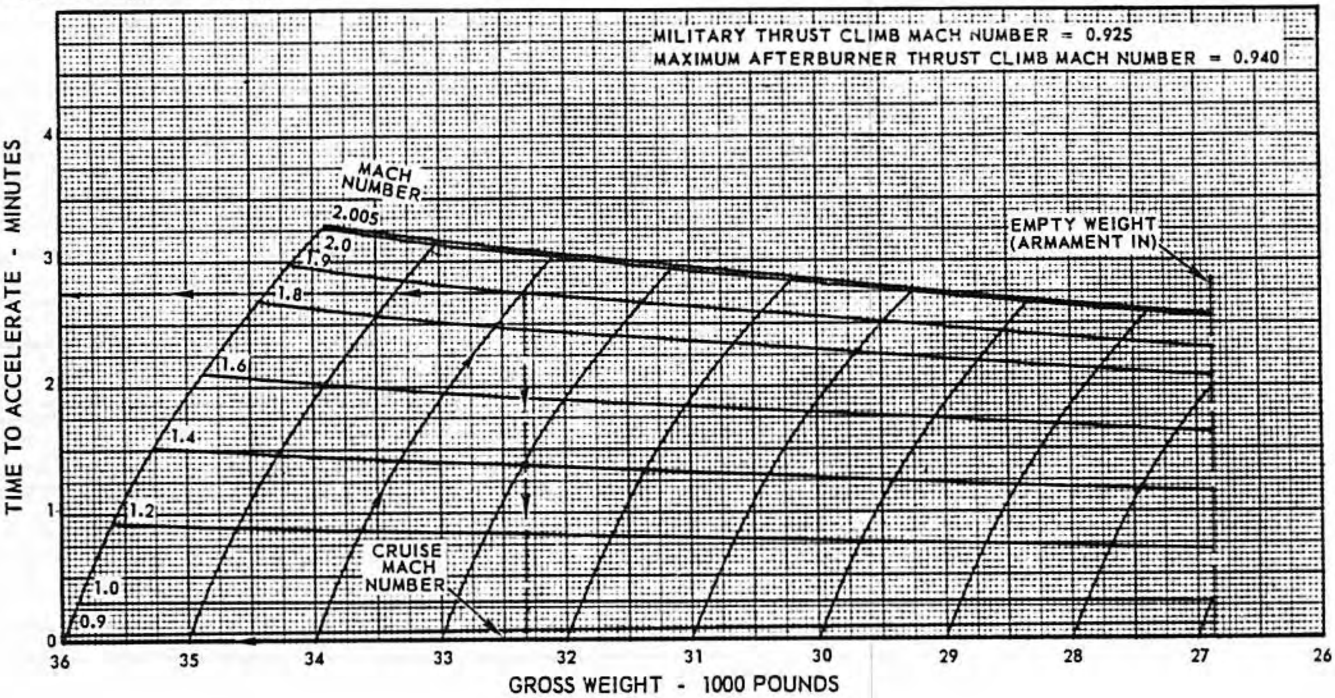
MAXIMUM THRUST ACCELERATION - 35,000 FEET

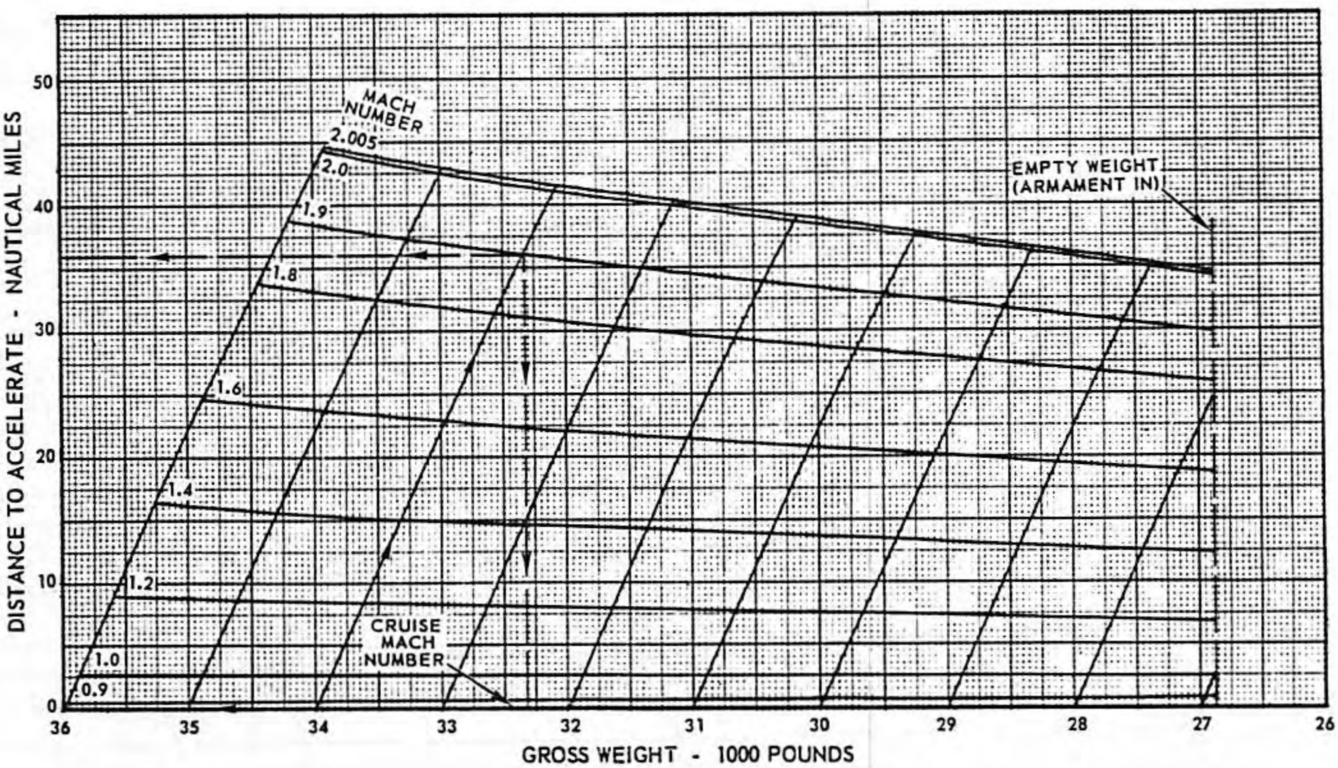
B

MODEL: F-106B
DATE: 1 SEPTEMBER 1961
DATA BASIS: FLIGHT TEST

CONFIGURATION: CLEAN   STANDARD ATMOSPHERE -10°C
ARMAMENT IN

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL





48,305

Figure 9-8

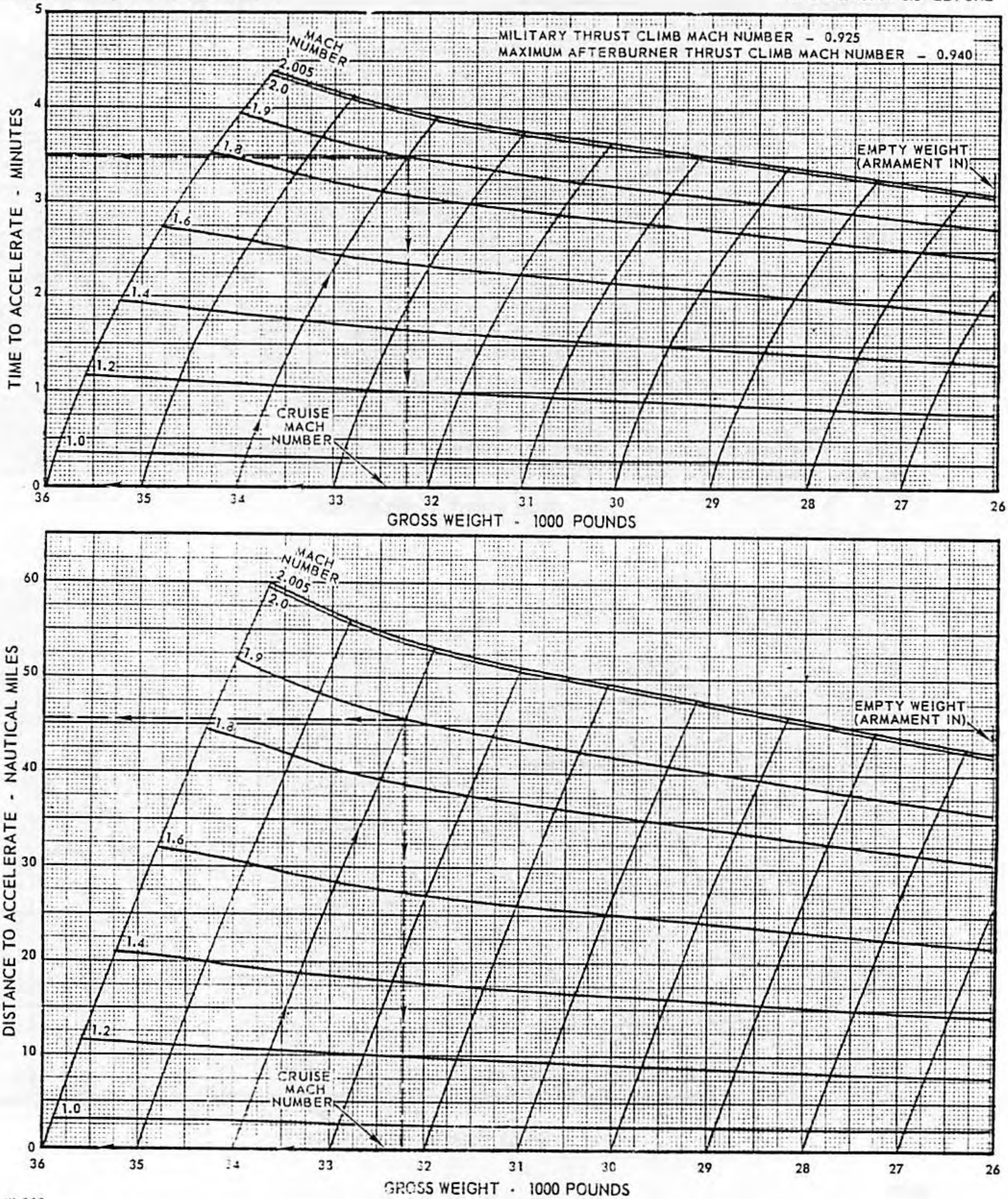
MAXIMUM THRUST ACCELERATION - 40,000 FEET

A

MODEL: F-106A
DATE: 1 SEPTEMBER 1961
DATA BASIS: FLIGHT TEST

CONFIGURATION: CLEAN
ARMAMENT IN
STANDARD ATMOSPHERE -10°C

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL



48,312

Figure 9-9

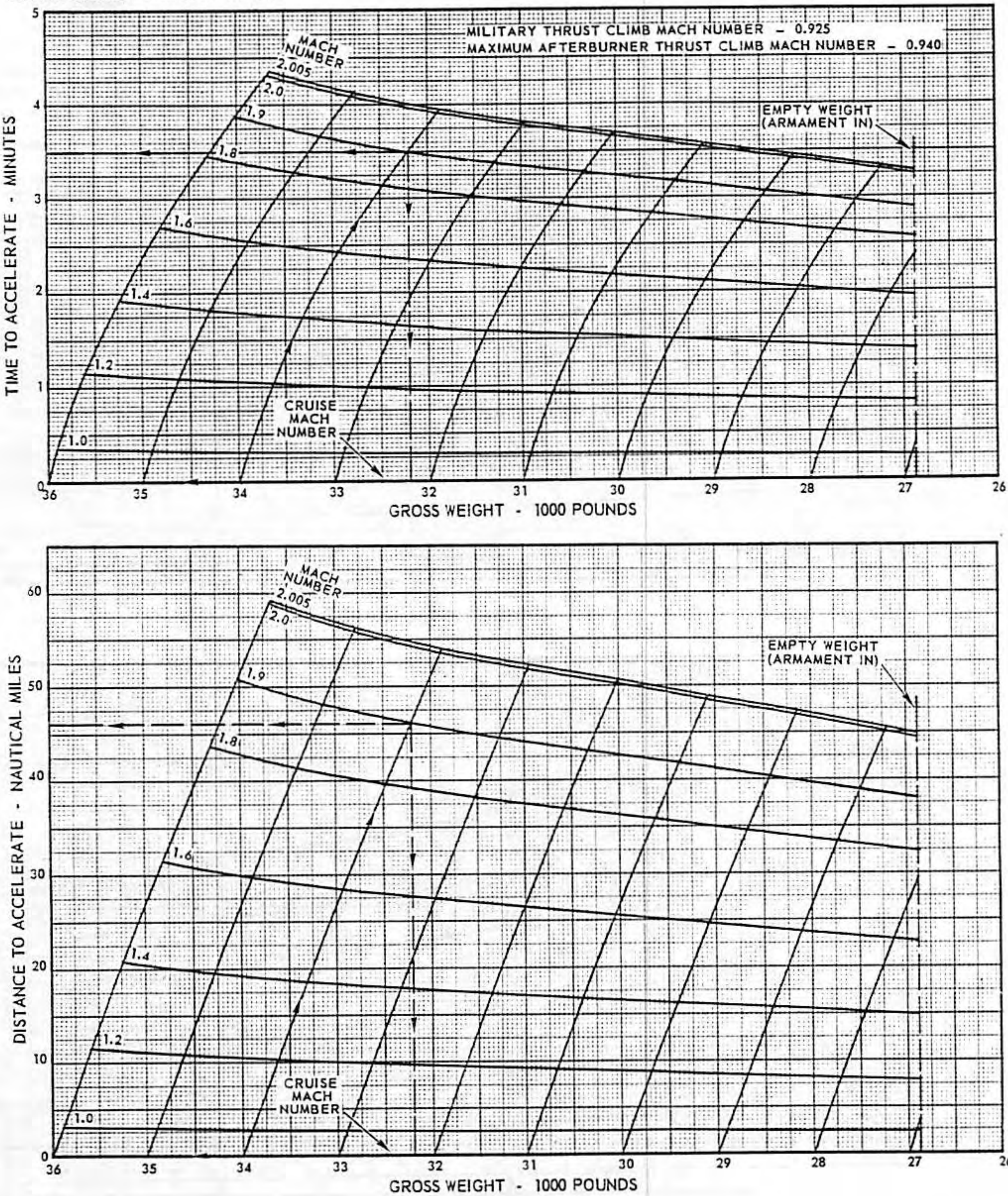
B

MAXIMUM THRUST ACCELERATION - 40,000 FEET

MODEL: F-106B
DATE: 1 SEPTEMBER 1961
DATA BASIS: FLIGHT TEST

CONFIGURATION: CLEAN
ARMAMENT IN
STANDARD ATMOSPHERE −10°C

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL



48,306

Figure 9-10

A

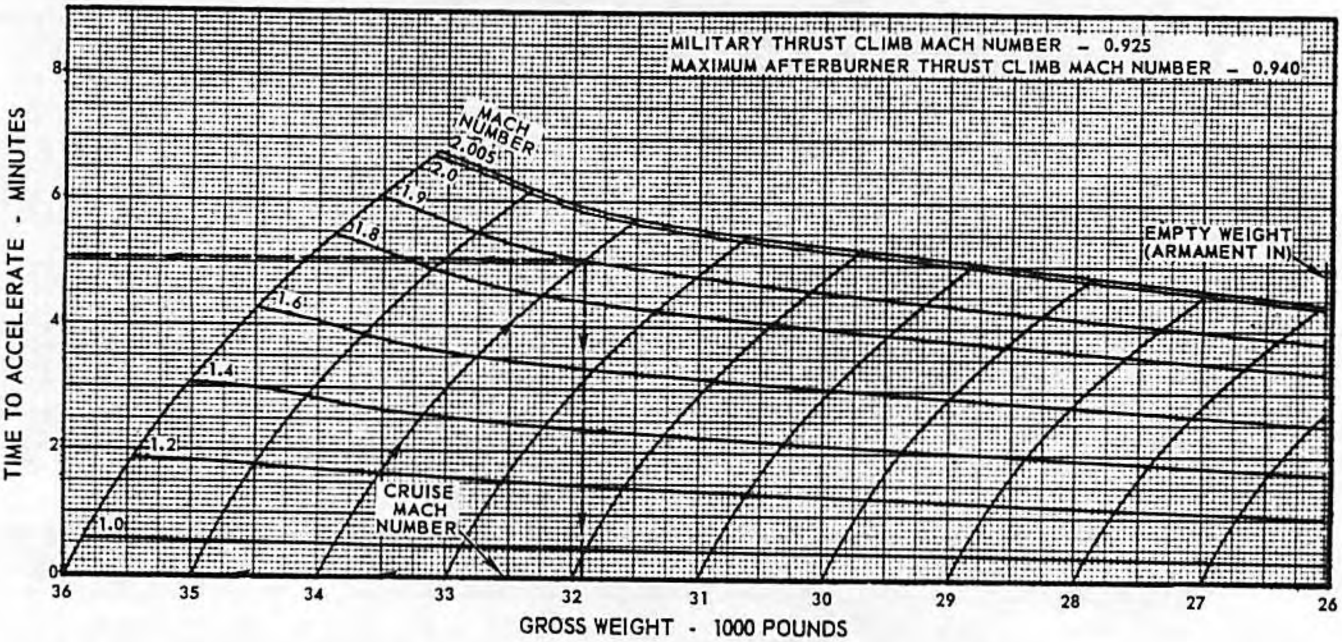
MAXIMUM THRUST ACCELERATION - 45,000 FEET

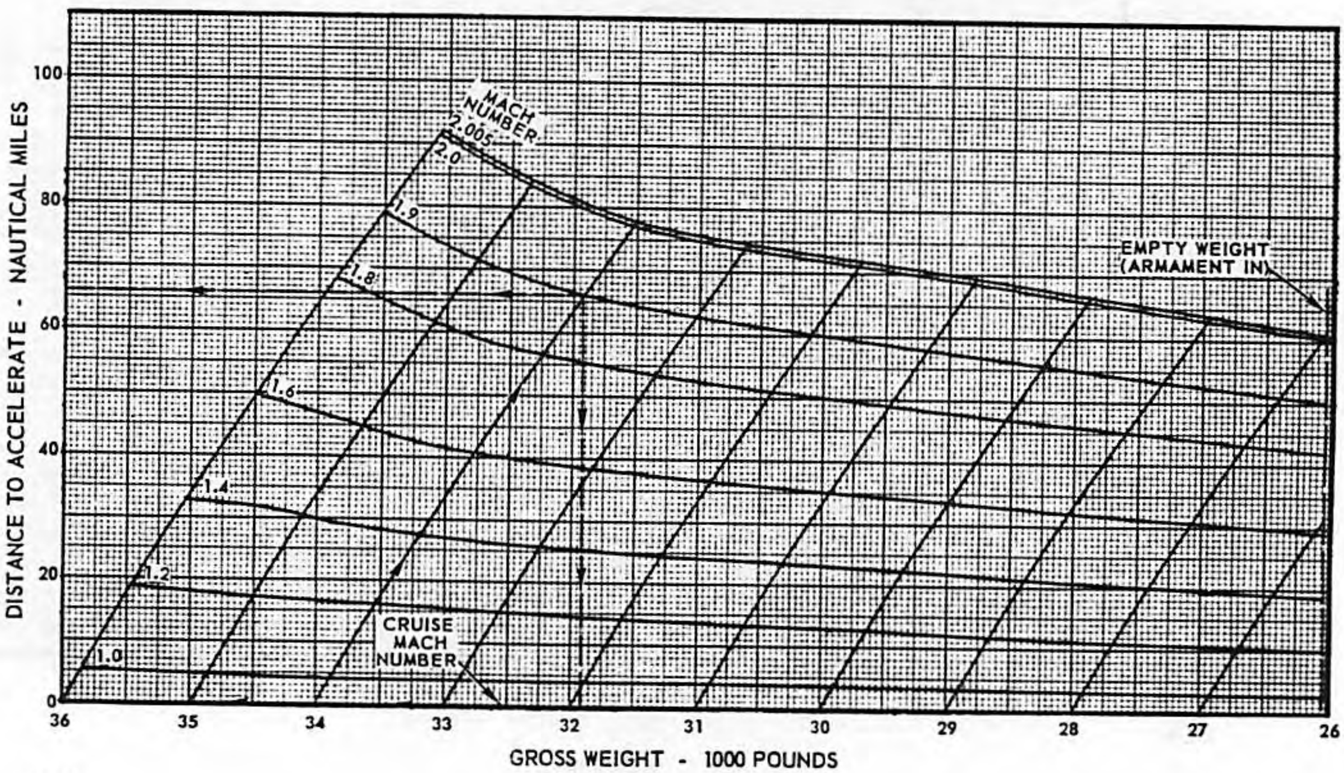
CONFIGURATION: CLEAN   STANDARD ATMOSPHERE -10°C

ARMAMENT IN

MODEL: F-106A
DATE: 1 SEPTEMBER 1961
DATA BASIS: FLIGHT TEST

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL





48,313

Figure 9-11

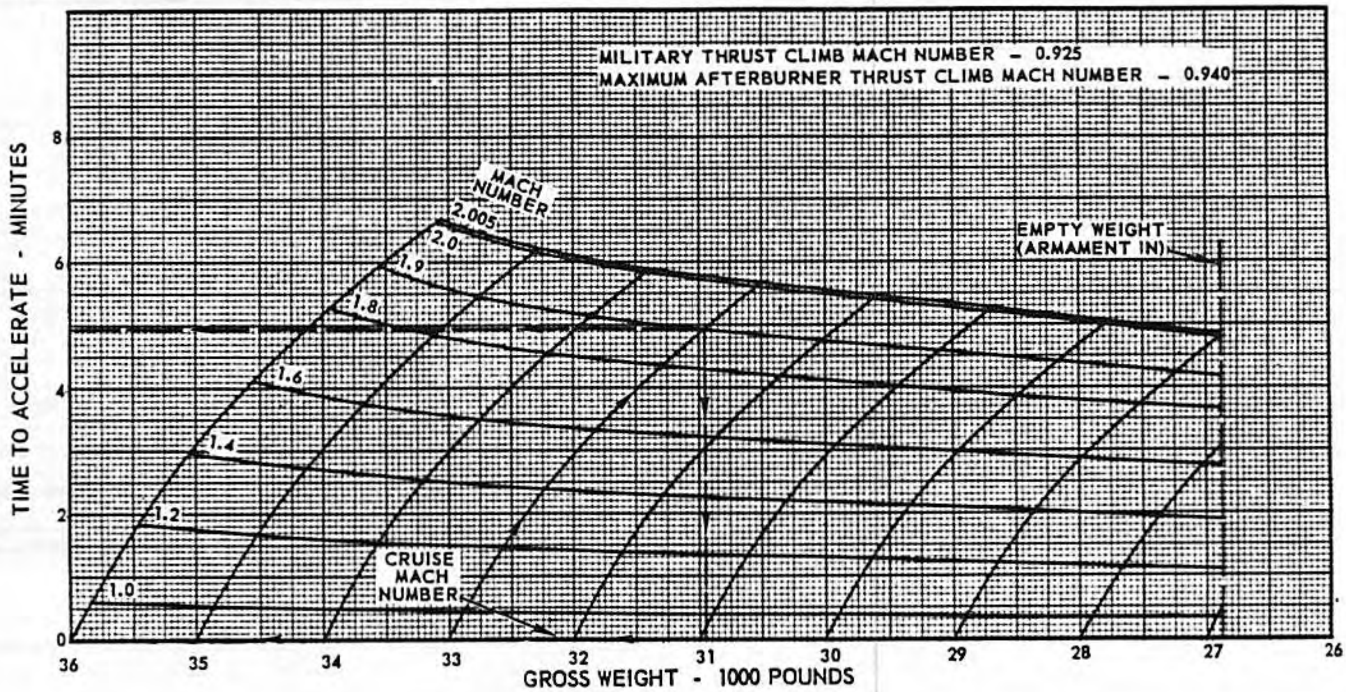
B

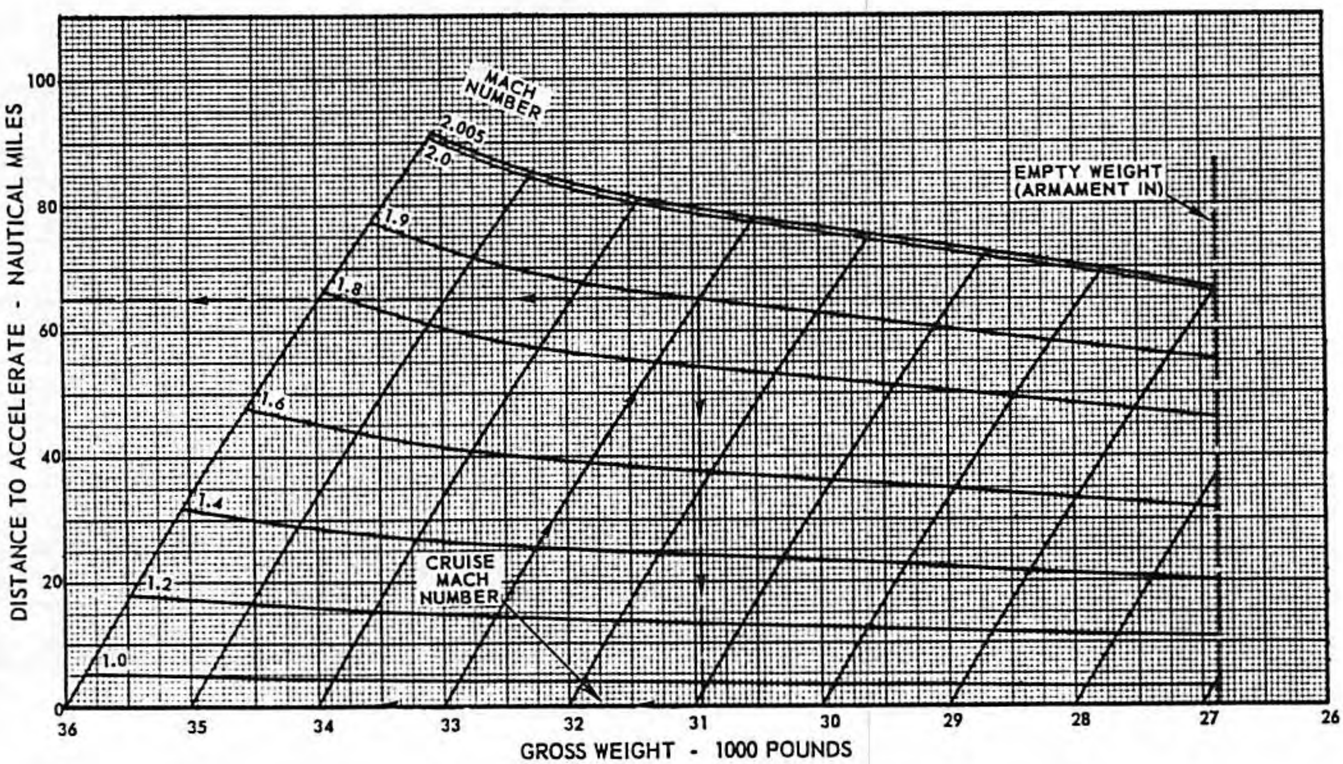
MAXIMUM THRUST ACCELERATION - 45,000 FEET

CONFIGURATION: CLEAN STANDARD ATMOSPHERE – 10°C
ARMAMENT IN

MODEL: F-106B
DATE: 1 SEPTEMBER 1961
DATA BASIS: FLIGHT TEST

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL





48,307

Figure 9-12

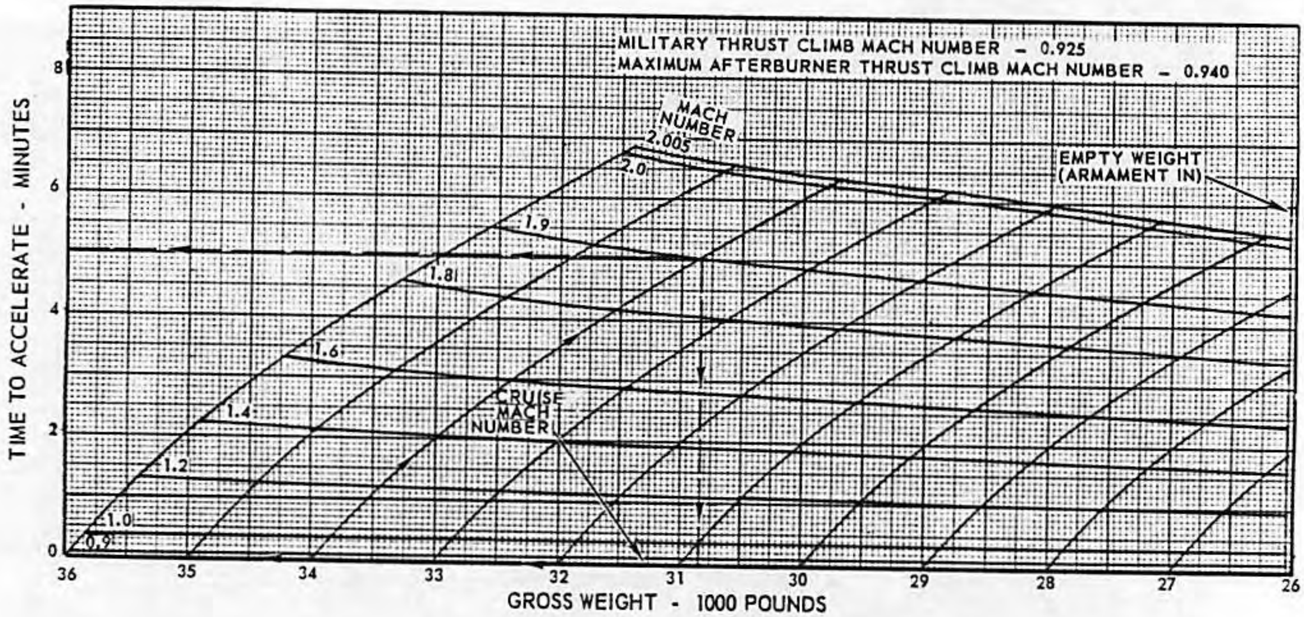
A

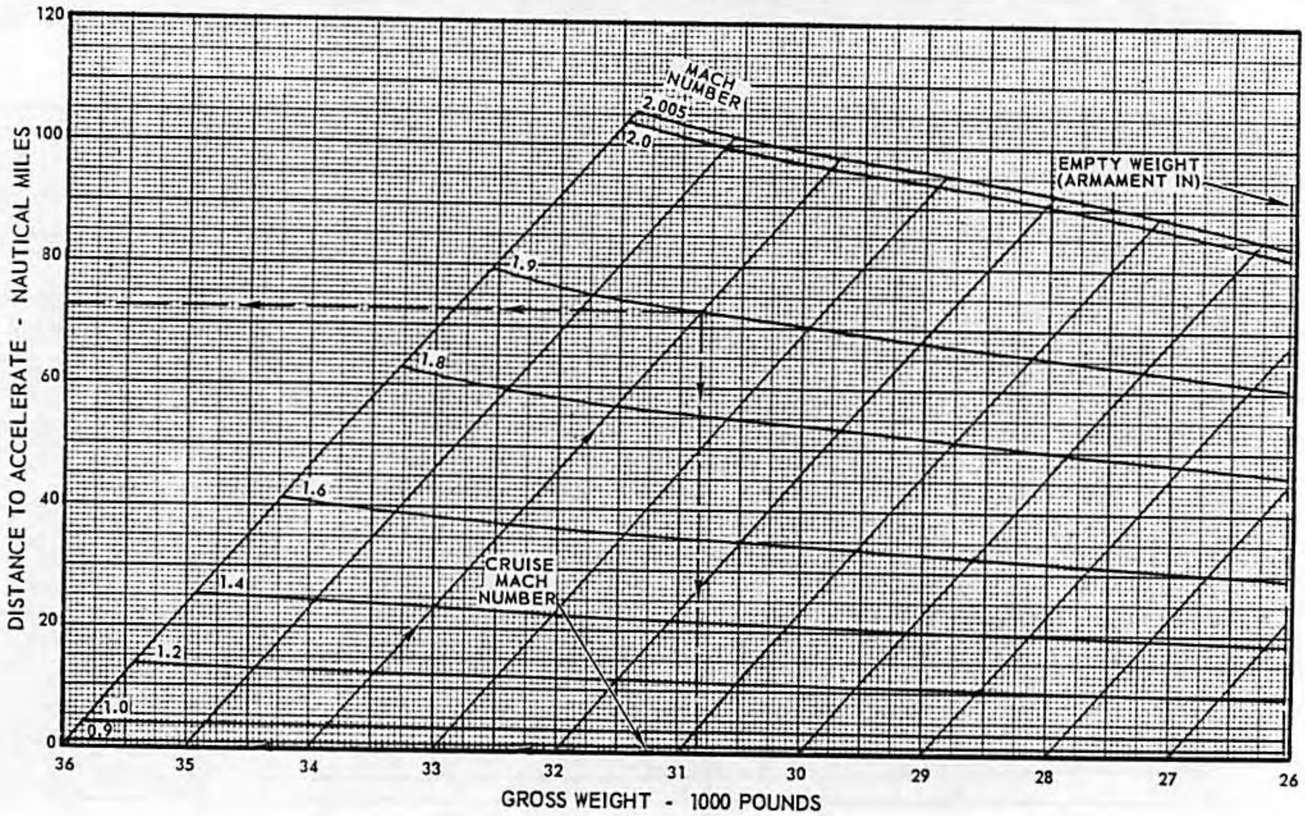
MAXIMUM THRUST ACCELERATION - 35,000 FEET

MODEL: F-106A
DATE: 1 SEPTEMBER 1961
DATA BASIS: FLIGHT TEST

CONFIGURATION: CLEAN STANDARD ATMOSPHERE + 10°C
ARMAMENT IN

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL





48,314

Figure 9-13

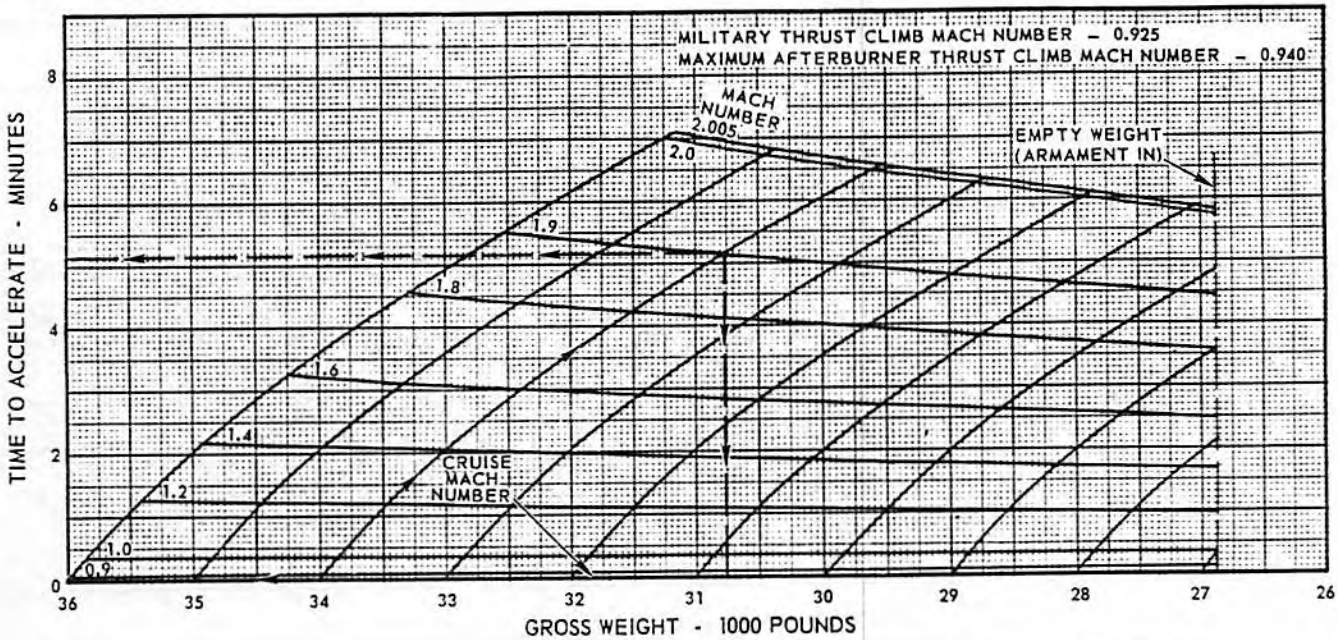
B

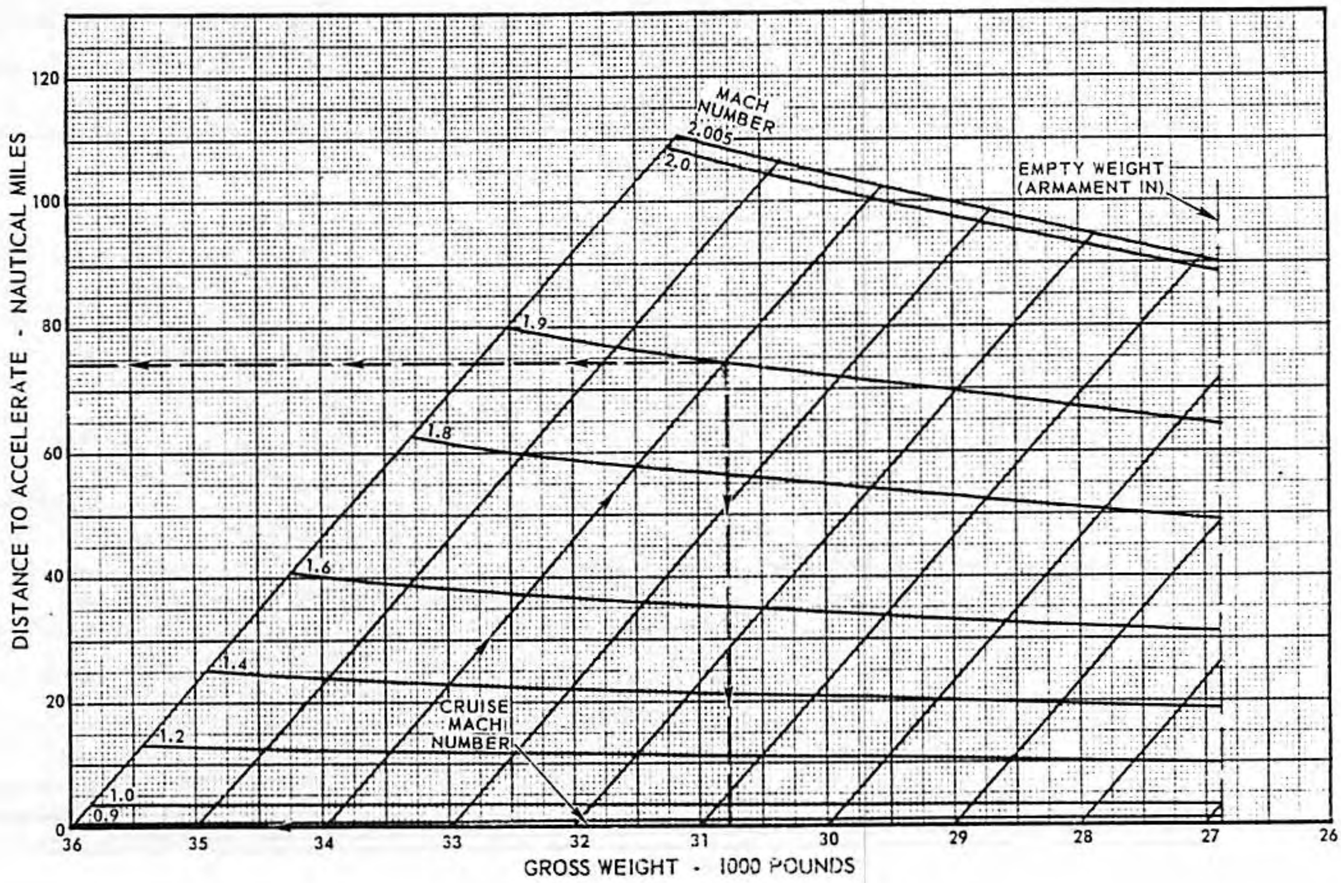
MAXIMUM THRUST ACCELERATION - 35,000 FEET

MODEL: F-106B
DATE: 1 SEPTEMBER 1961
DATA BASIS: FLIGHT TEST

CONFIGURATION: CLEAN ARMAMENT IN
STANDARD ATMOSPHERE +10ºC

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL





48,308

Figure 9-14

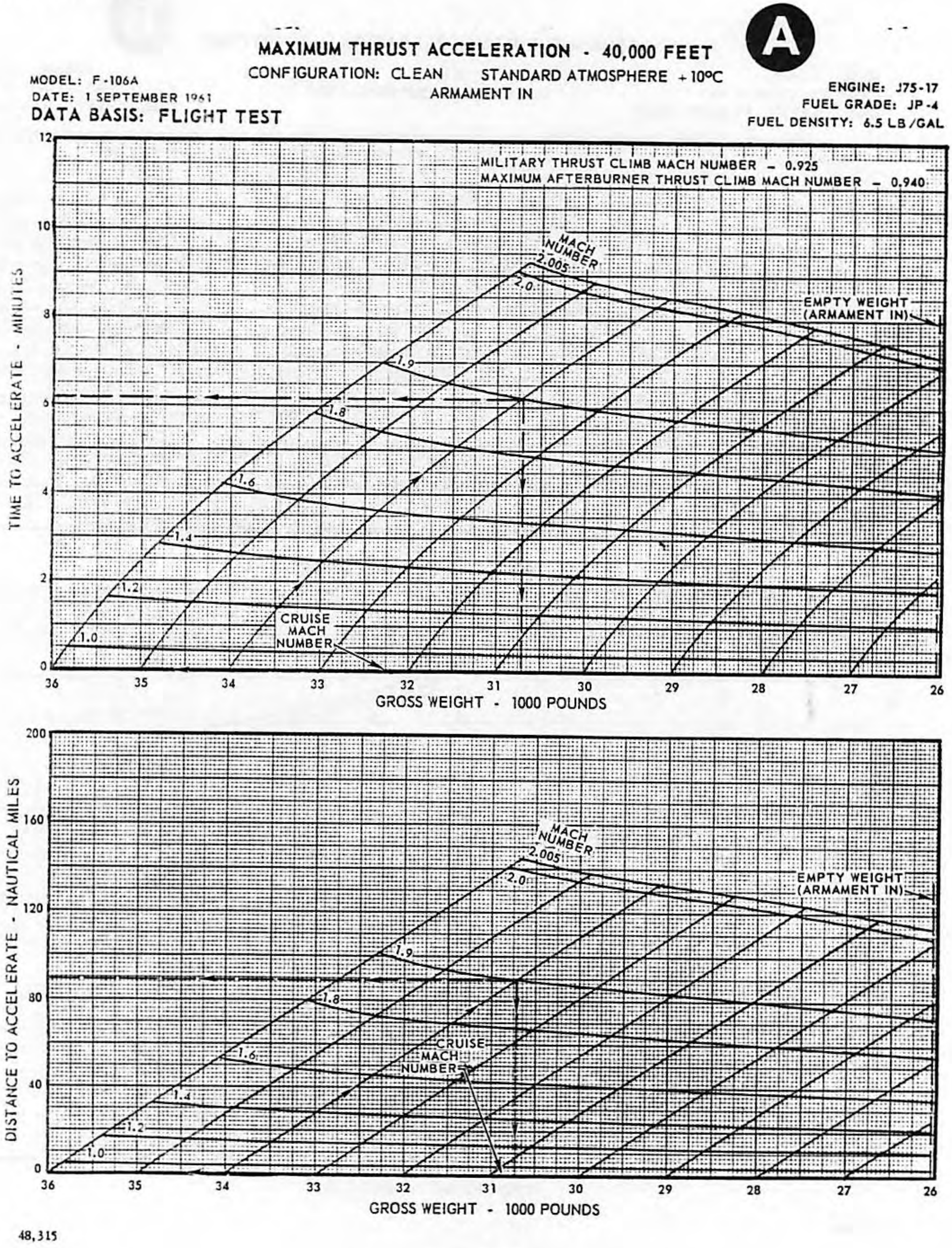

A
MAXIMUM THRUST ACCELERATION - 40,000 FEET
CONFIGURATION: CLEAN
STANDARD ATMOSPHERE +10°C
ARMAMENT IN
MODEL: F-106A
DATE: 1 SEPTEMBER 1961
DATA BASIS: FLIGHT TEST
ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL
MILITARY THRUST CLIMB MACH NUMBER - 0.925
MAXIMUM AFTERBURNER THRUST CLIMB MACH NUMBER - 0.940
MACH NUMBER
2.005
2.0
1.9
1.8
1.6
1.4
1.2
1.0
EMPTY WEIGHT (ARMAMENT IN)
CRUISE MACH NUMBER
TIME TO ACCELERATE - MINUTES
GROSS WEIGHT - 1000 POUNDS
DISTANCE TO ACCELERATE - NAUTICAL MILES
48,315

Figure 9-15

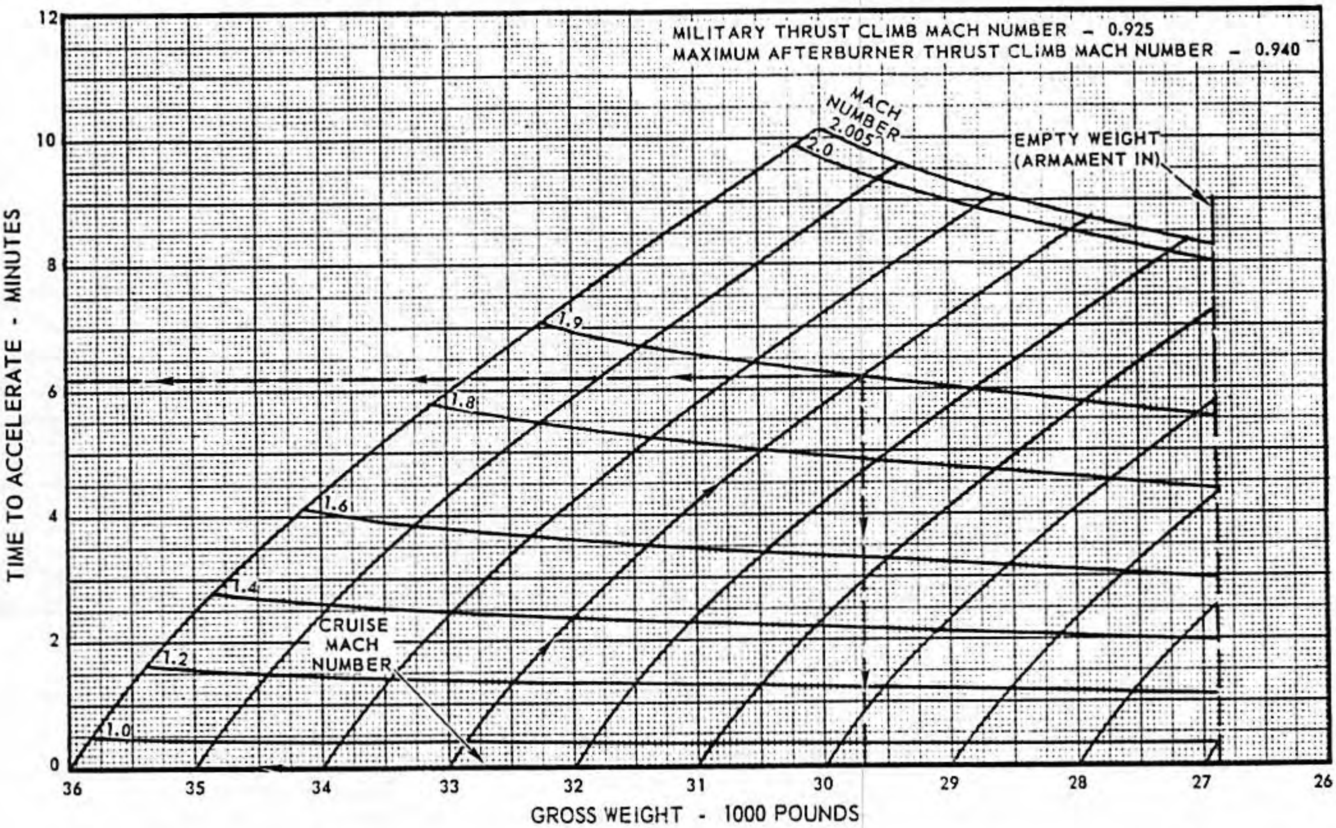
B

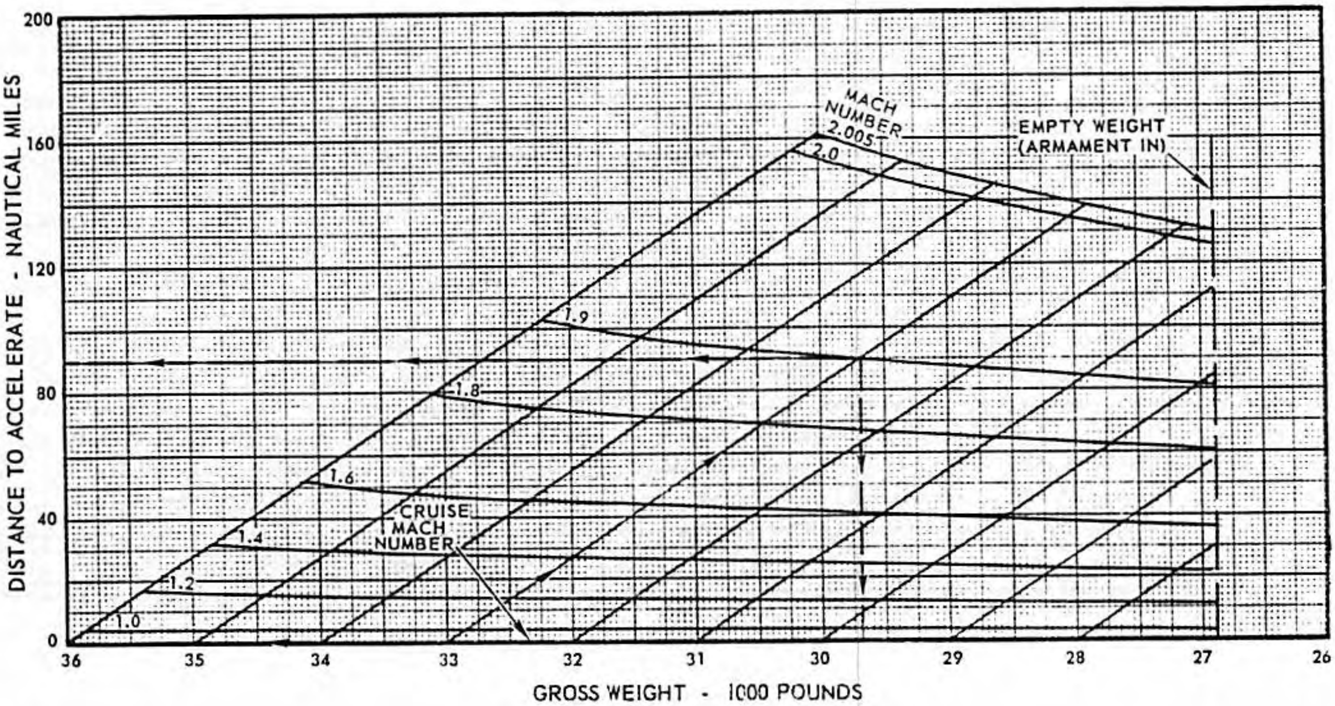
MAXIMUM THRUST ACCELERATION - 40,000 FEET

MODEL: F-106B
DATE: 1 SEPTEMBER 1961
DATA BASIS: FLIGHT TEST

CONFIGURATION: CLEAN ARMAMENT IN
STANDARD ATMOSPHERE + 10°C

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL





48,309

Figure 9-16

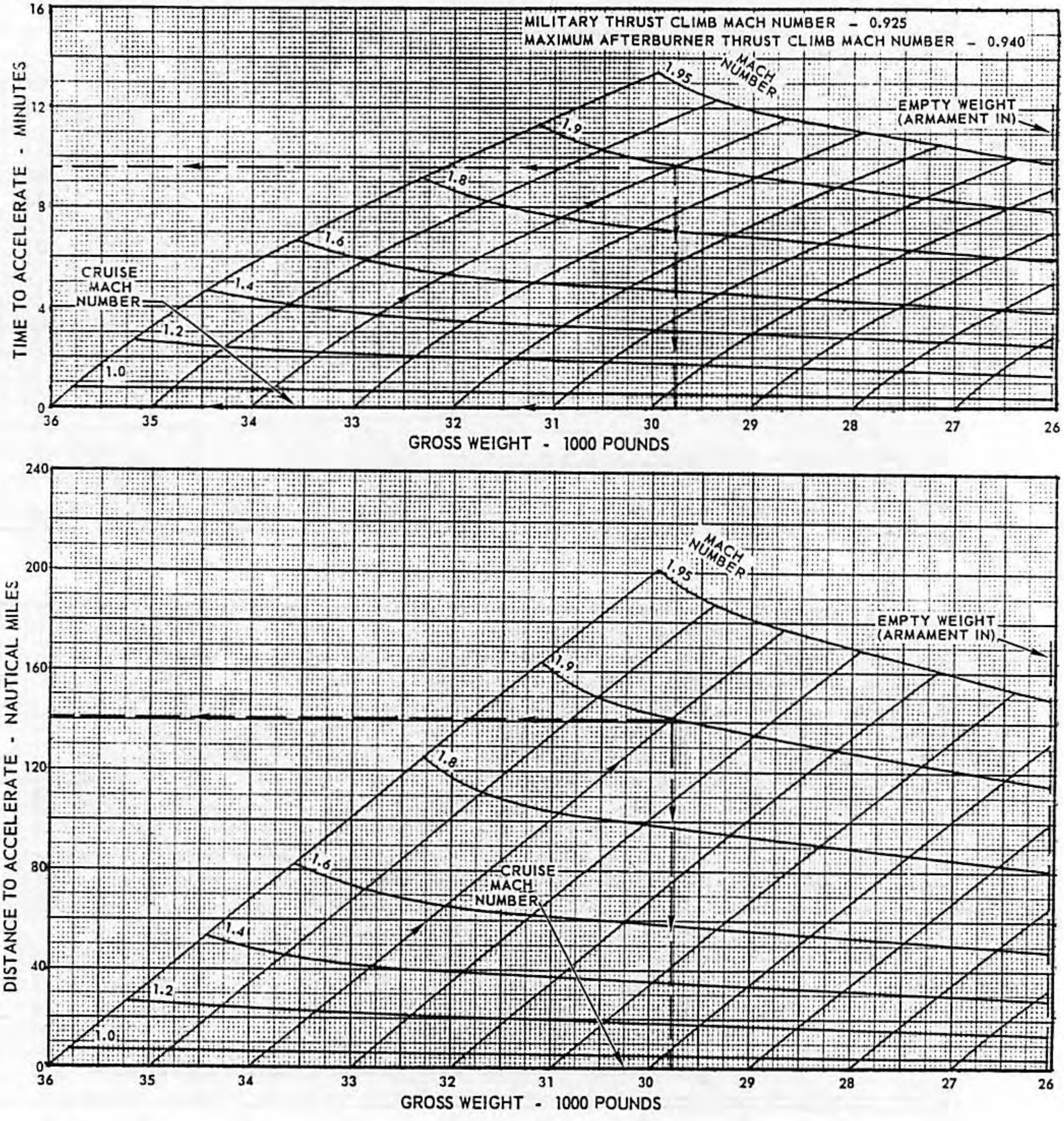
A

MAXIMUM THRUST ACCELERATION - 45,000 FEET

CONFIGURATION: CLEAN STANDARD ATMOSPHERE + 10°C
ARMAMENT IN

MODEL: F-106A
DATE: 1 SEPTEMBER 1961
DATA BASIS: FLIGHT TEST

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL



48,316

Figure 9-17

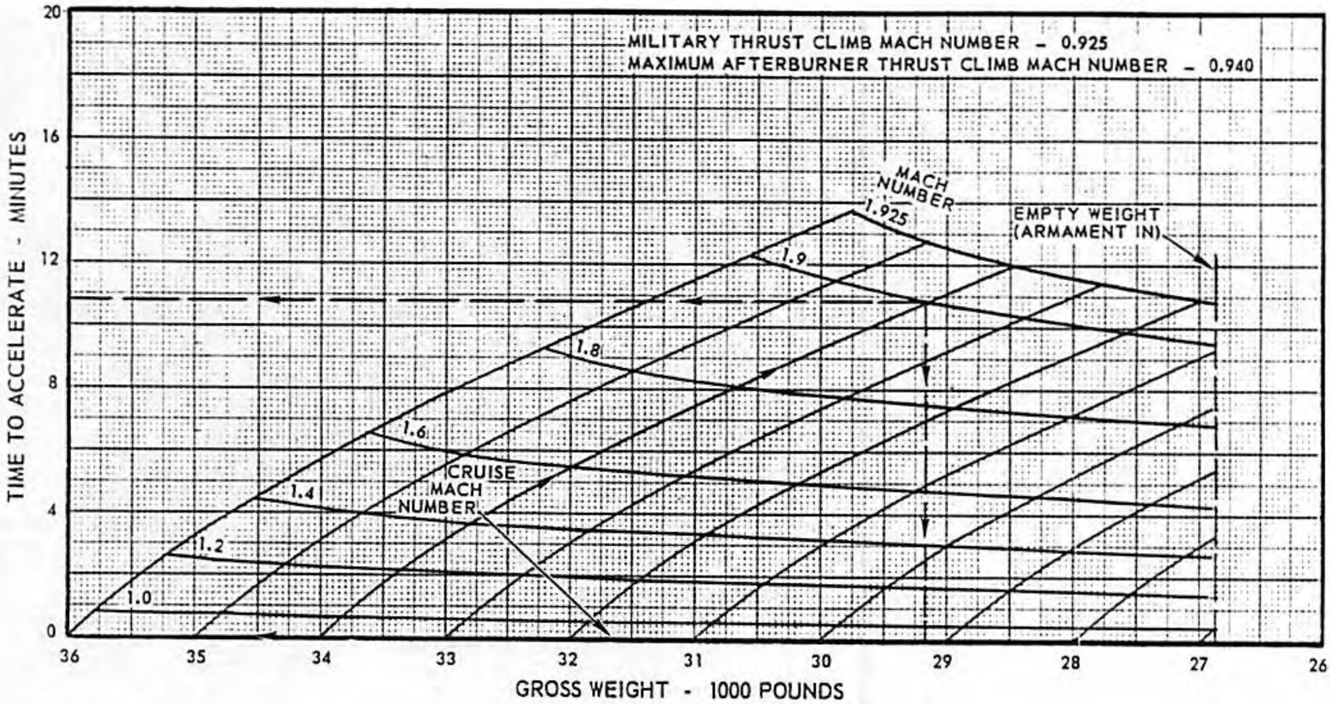
MAXIMUM THRUST ACCELERATION - 45,000 FEET (B)

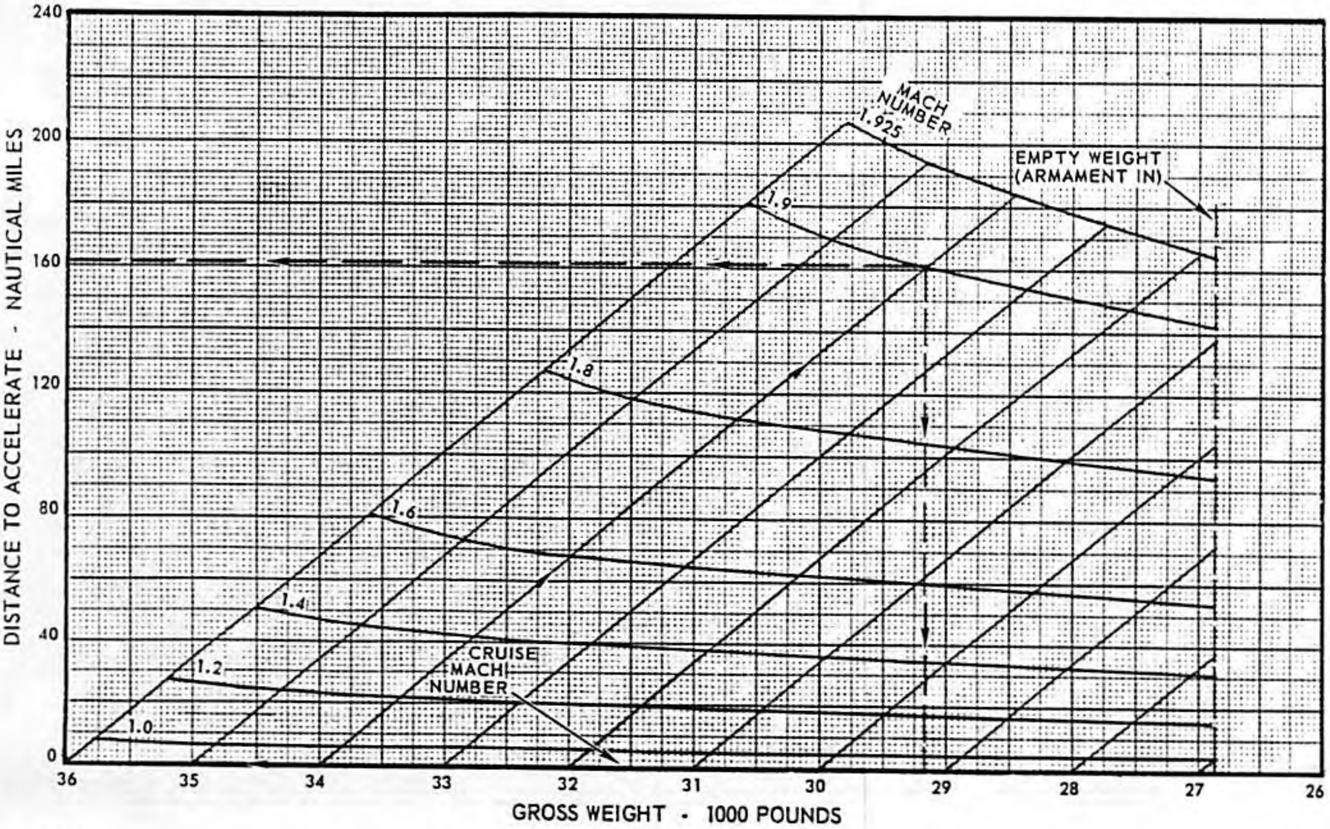
MODEL: F-106B
DATE: 1 SEPTEMBER 1961
DATA BASIS: FLIGHT TEST

CONFIGURATION: CLEAN
ARMAMENT IN

STANDARD ATMOSPHERE + 10°C

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL





48,310

Figure 9-18

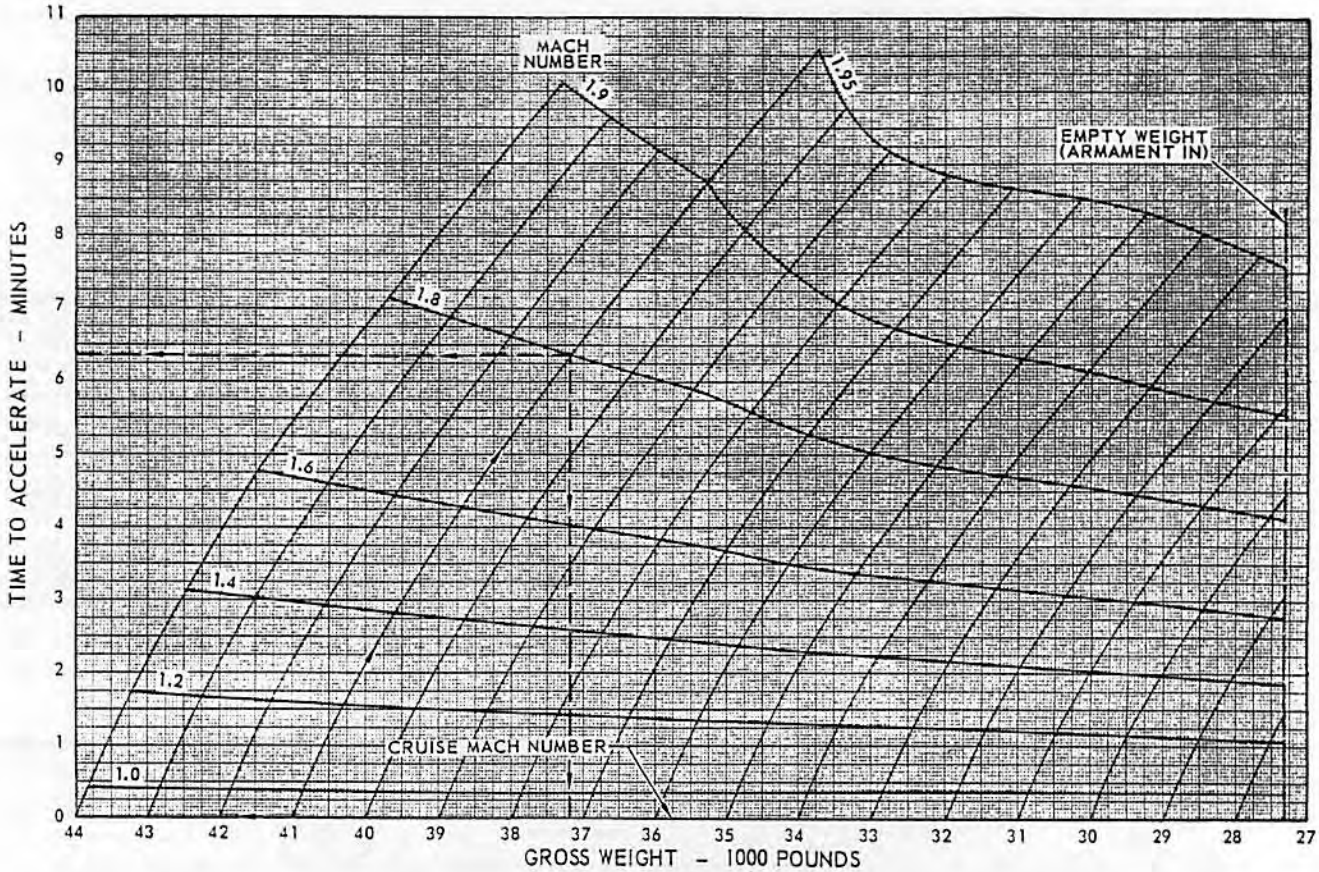
MAXIMUM THRUST ACCELERATION – 35,000 FEET

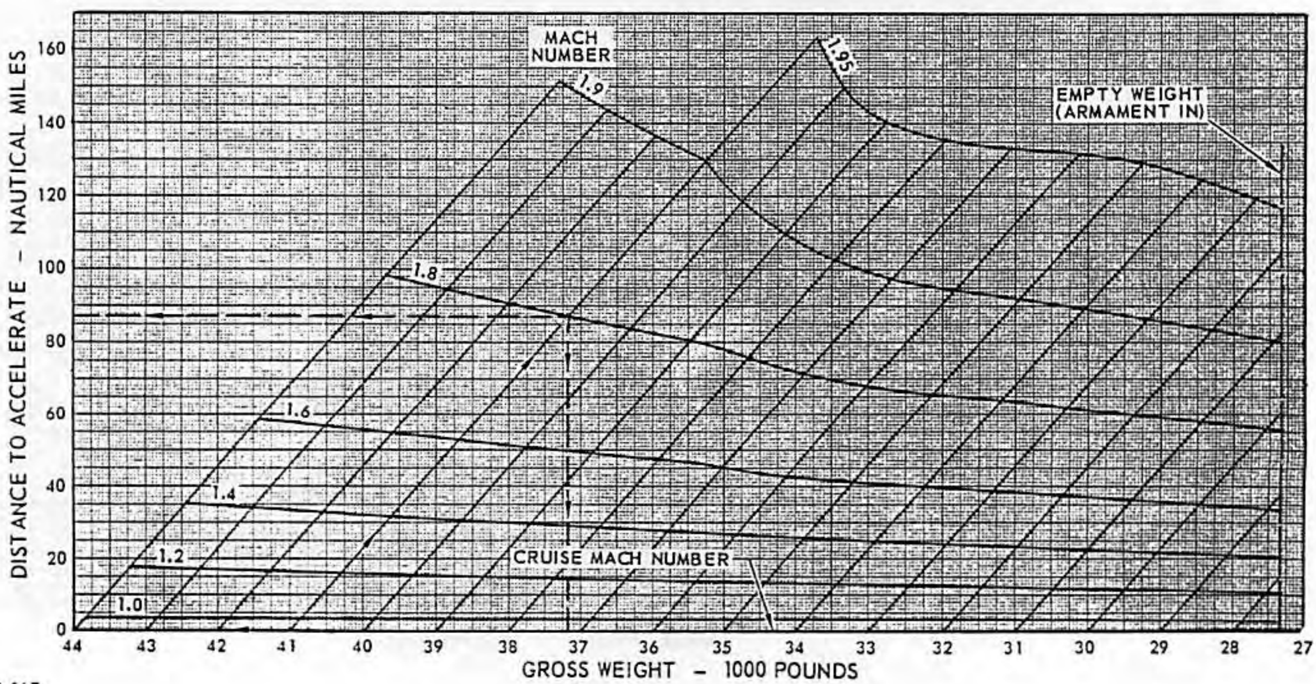
A

CONFIGURATION: TWO 360-GALLON EXTERNAL TANKS
STANDARD ATMOSPHERE ARMAMENT IN

MODEL: F-106A
DATE: 21 FEBRUARY 1967
DATA BASIS: FLIGHT TEST

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL





48,567

Figure 9-19

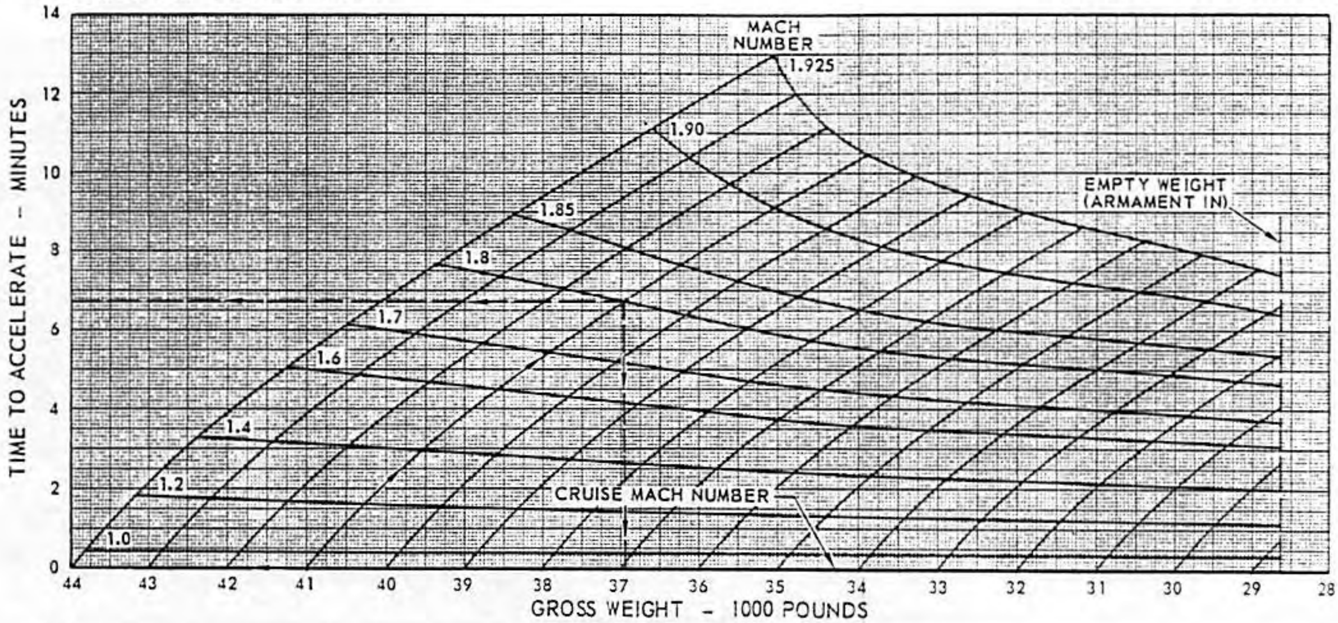
MAXIMUM THRUST ACCELERATION – 35,000 FEET

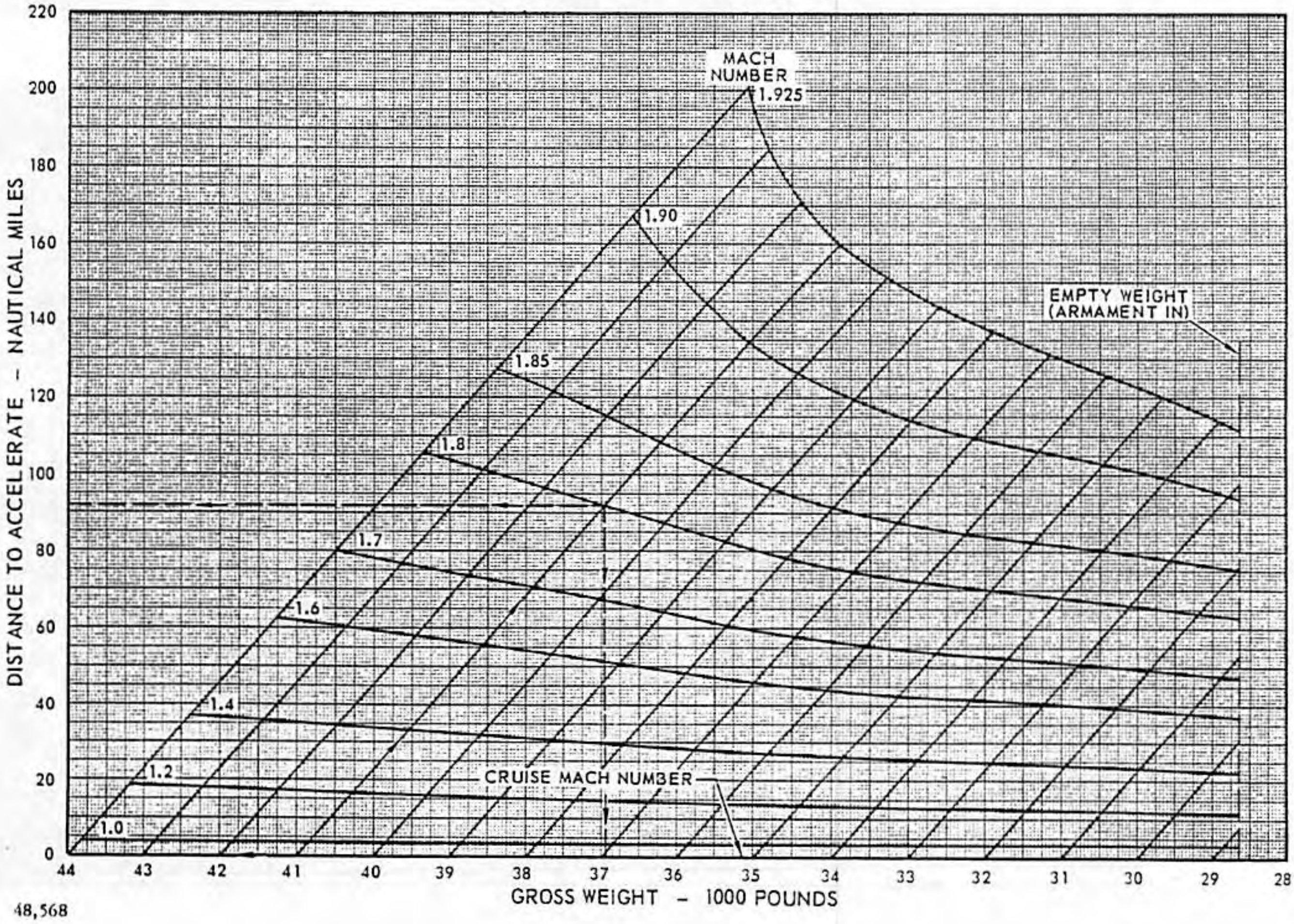
CONFIGURATION: TWO 360-GALLON EXTERNAL TANKS
STANDARD ATMOSPHERE ARMAMENT IN

B

MODEL: F-106B
DATE: 21 FEBRUARY 1967
DATA BASIS: FLIGHT TEST

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL





48,568

Figure 9-20

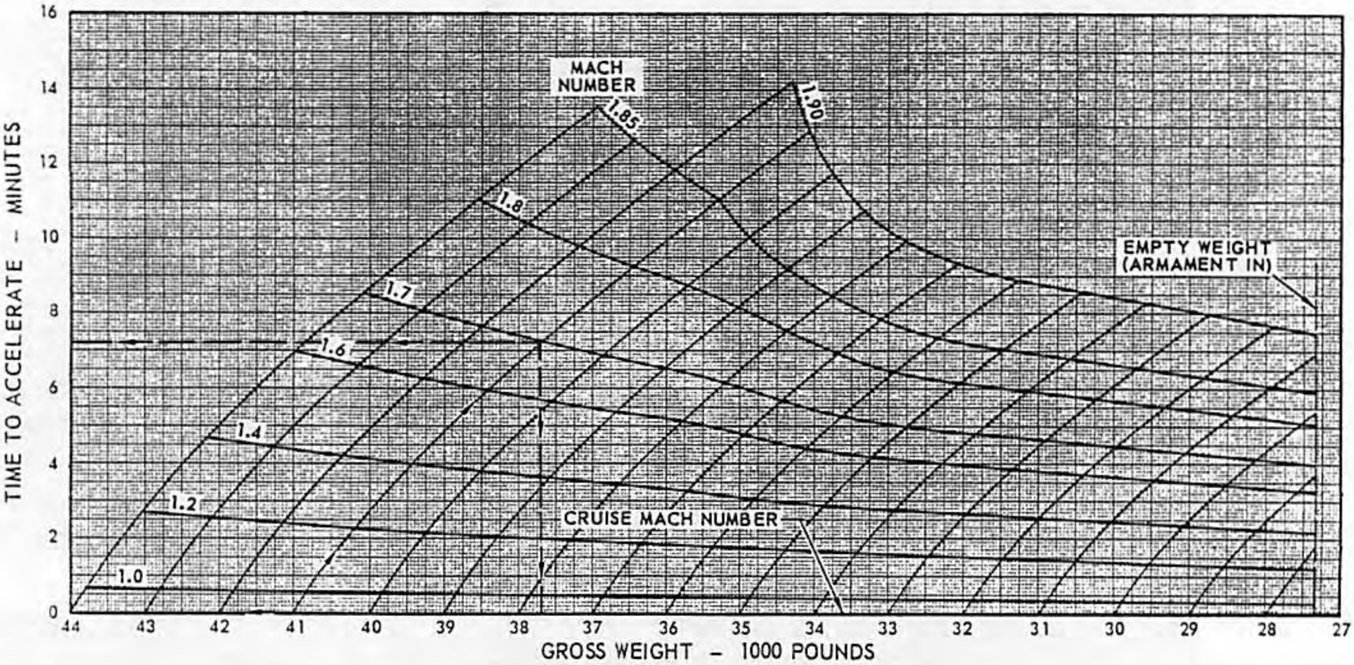
MAXIMUM THRUST ACCELERATION – 40,000 FEET

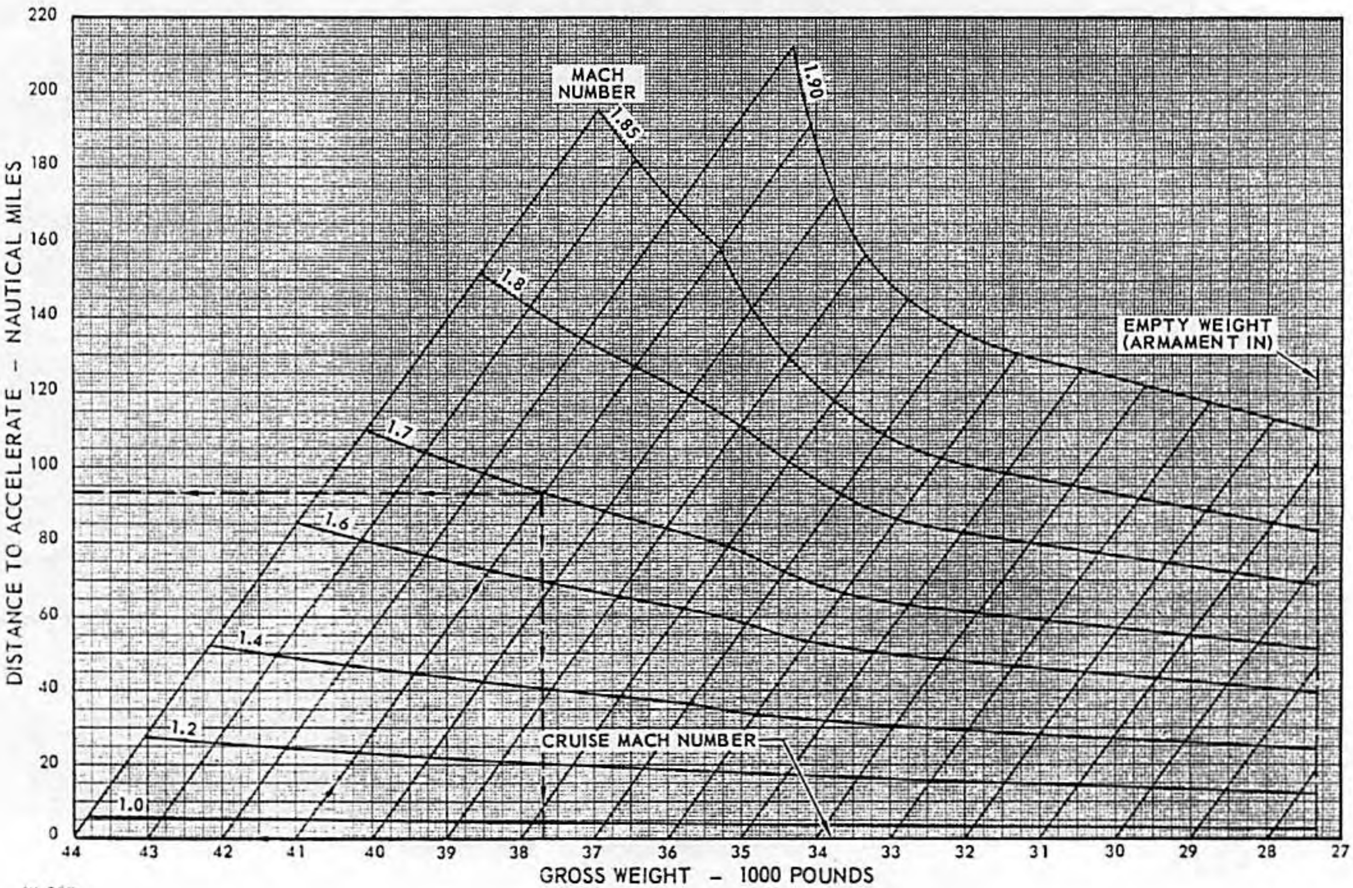
A

CONFIGURATION: TWO 360-GALLON EXTERNAL TANKS
STANDARD ATMOSPHERE ARMAMENT IN

MODEL: F-106A
DATE: 21 FEBRUARY 1967
DATA BASIS: FLIGHT TEST

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL





18,569

Figure 9-21

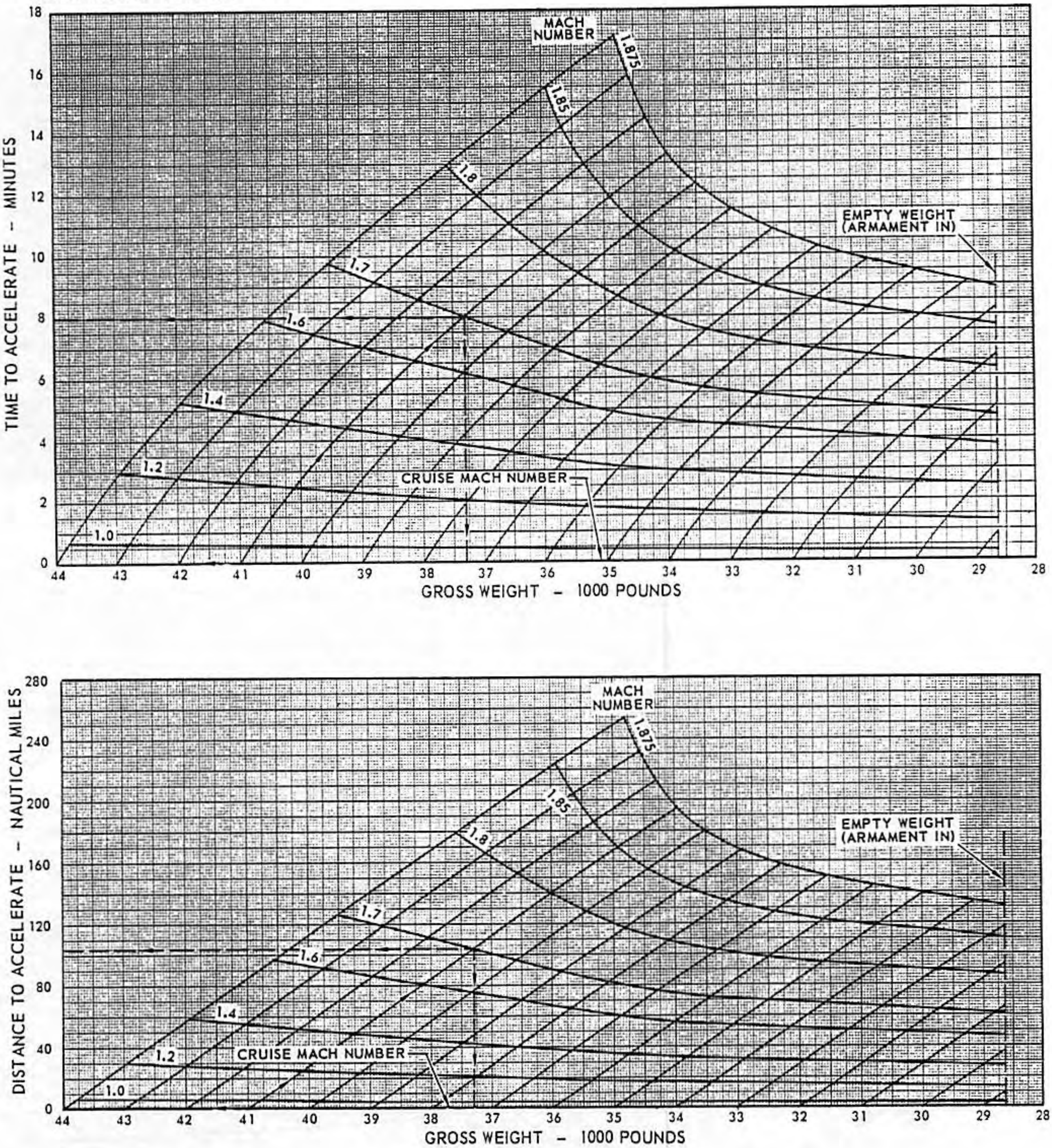
MAXIMUM THRUST ACCELERATION – 40,000 FEET

B

CONFIGURATION: TWO 360-GALLON EXTERNAL TANKS
STANDARD ATMOSPHERE ARMAMENT IN

MODEL: F-106B
DATE: 21 FEBRUARY 1967
DATA BASIS: FLIGHT TEST

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL



48,570

Figure 9-22

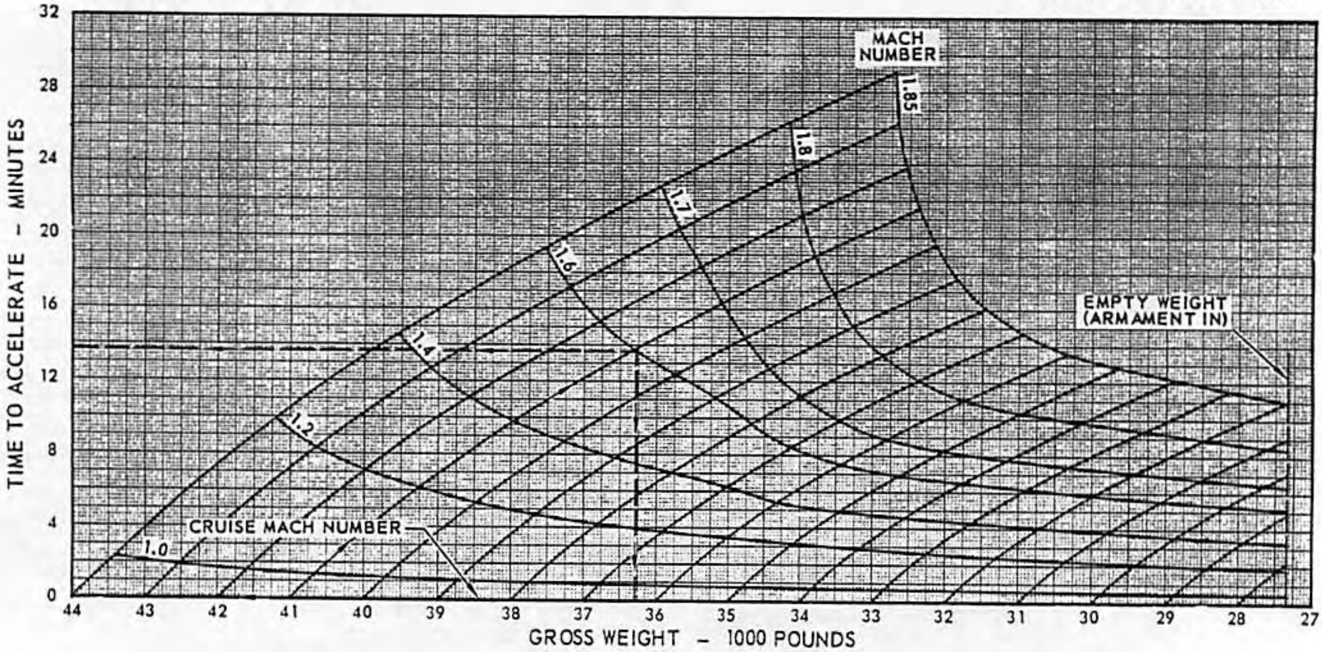
MAXIMUM THRUST ACCELERATION – 45,000 FEET

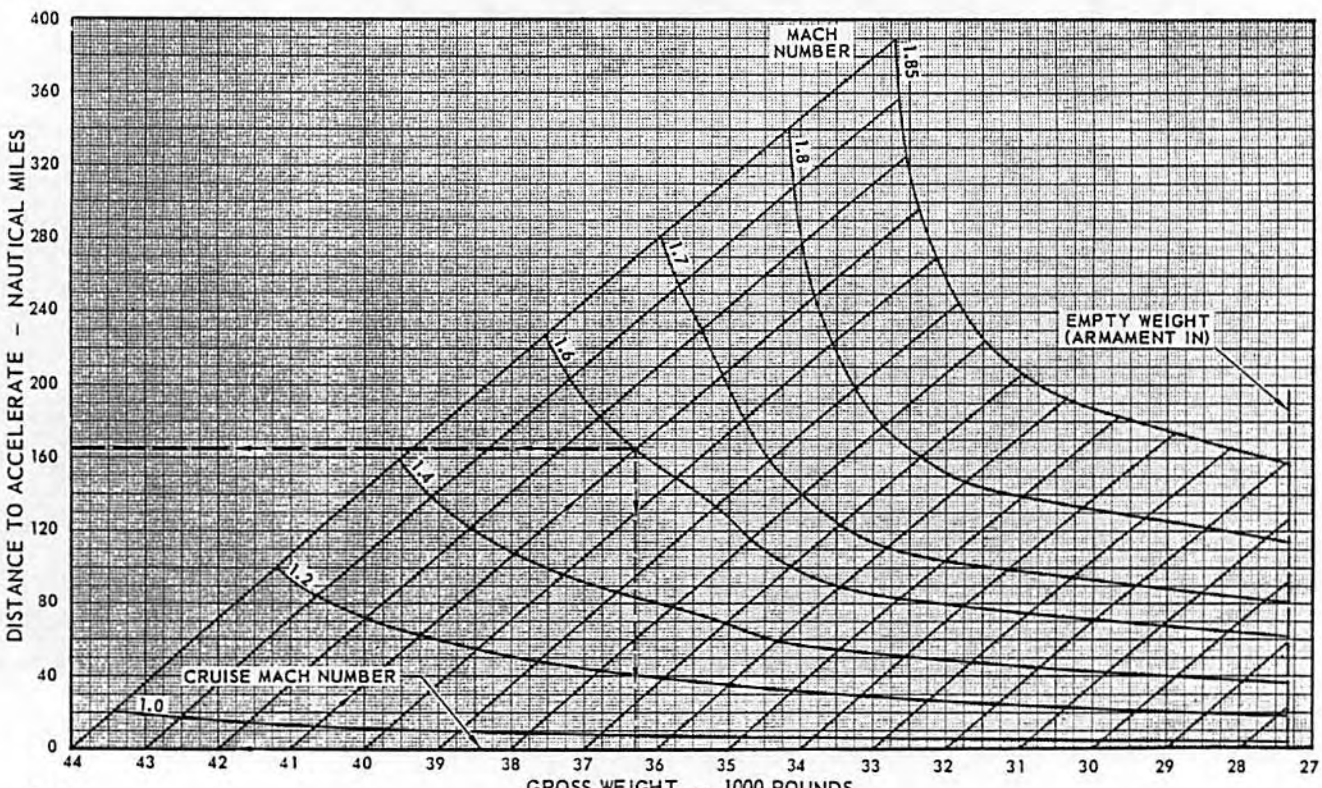
A

MODEL: F-106A
DATE: 21 FEBRUARY 1967
DATA BASIS: FLIGHT TEST

CONFIGURATION: TWO 360-GALLON EXTERNAL TANKS
STANDARD ATMOSPHERE ARMAMENT IN

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL





48,571

Figure 9-23

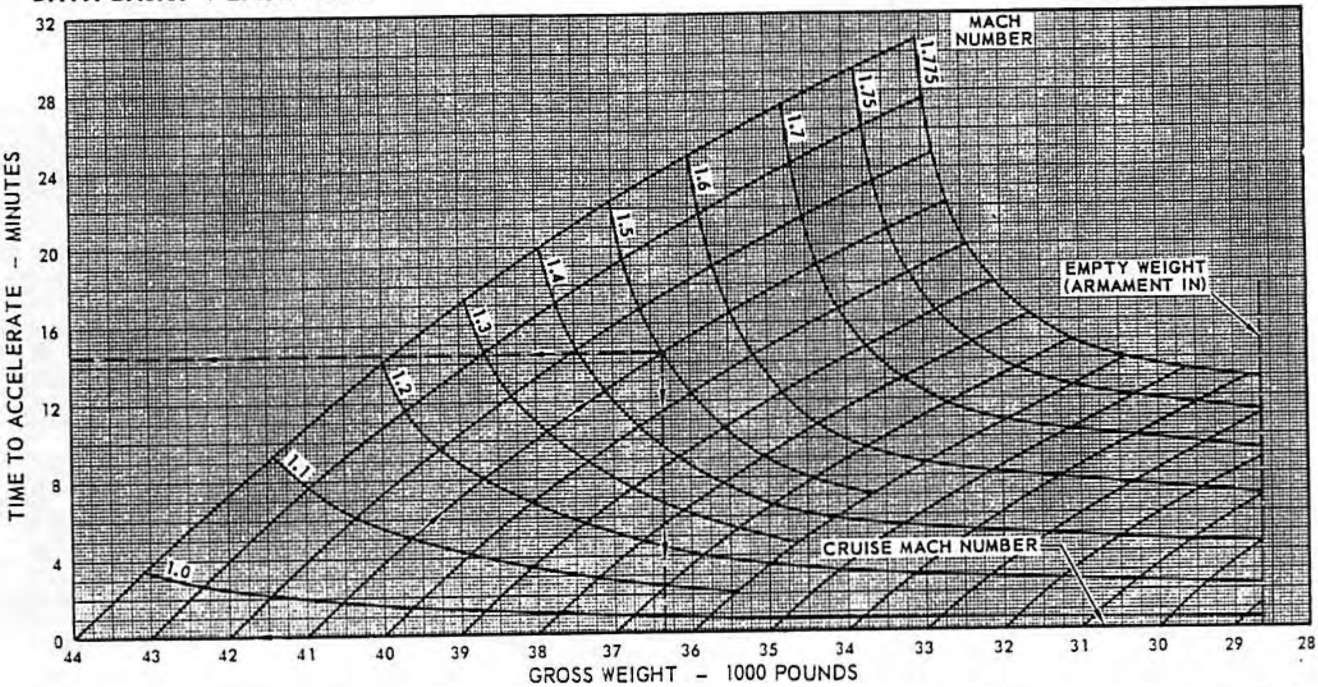
MAXIMUM THRUST ACCELERATION – 45,000 FEET

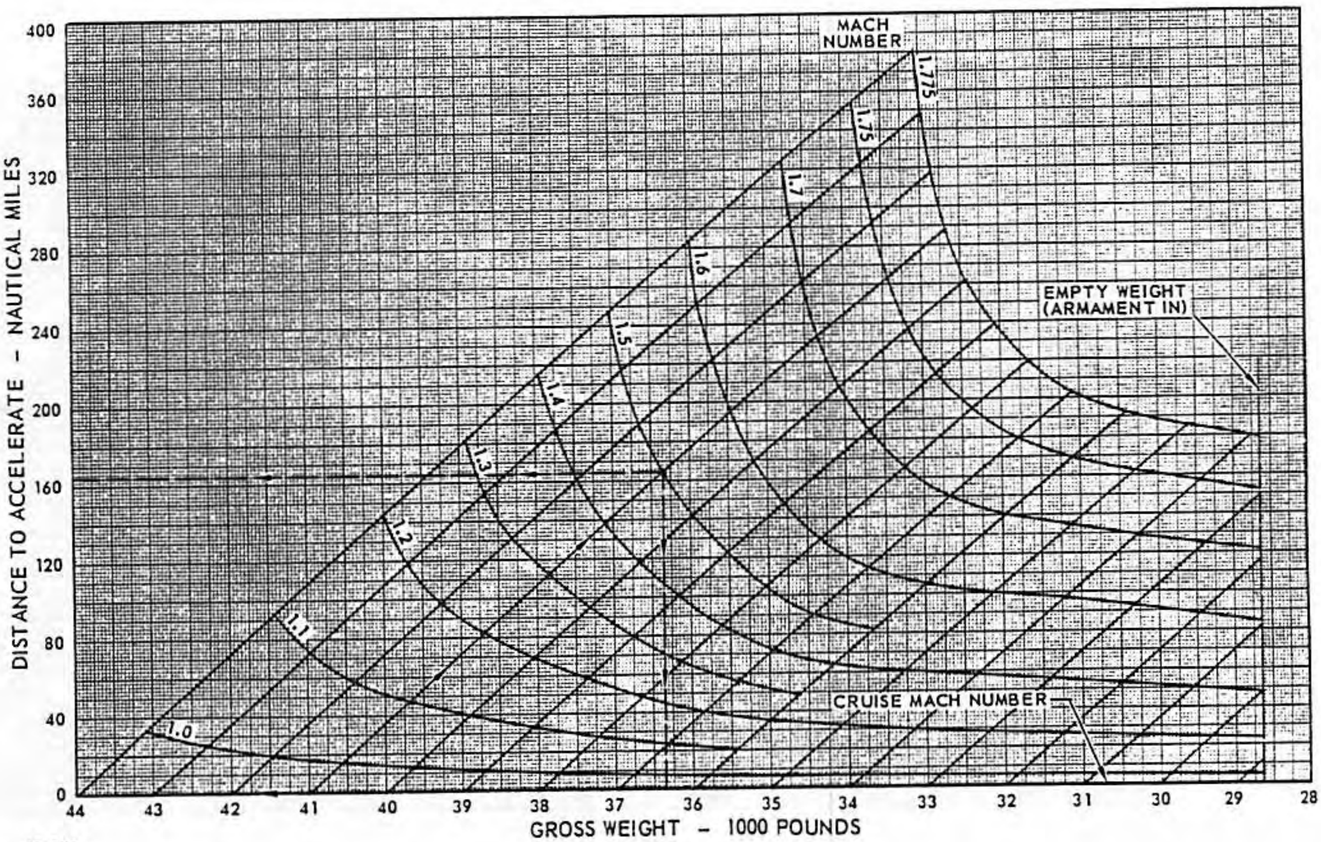
B

CONFIGURATION: TWO 360-GALLON EXTERNAL TANKS
STANDARD ATMOSPHERE ARMAMENT IN

MODEL: F-106B
DATE: 21 FEBRUARY 1967
DATA BASIS: FLIGHT TEST

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL





48,572

Figure 9-24

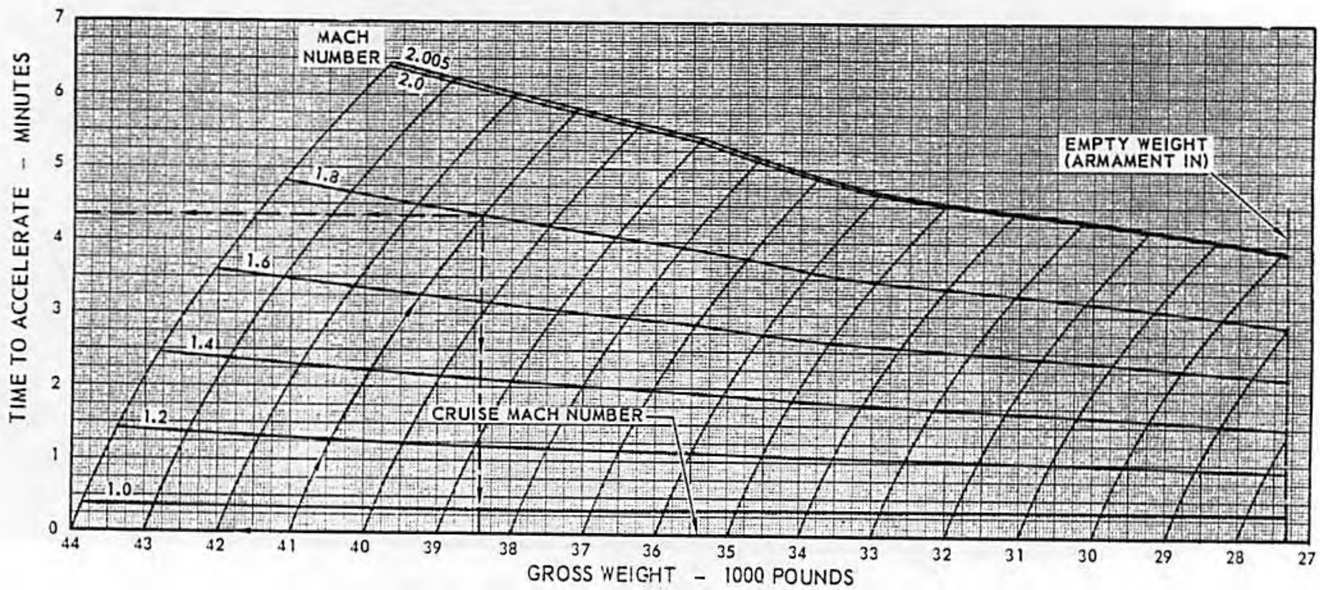
MAXIMUM THRUST ACCELERATION – 35,000 FEET

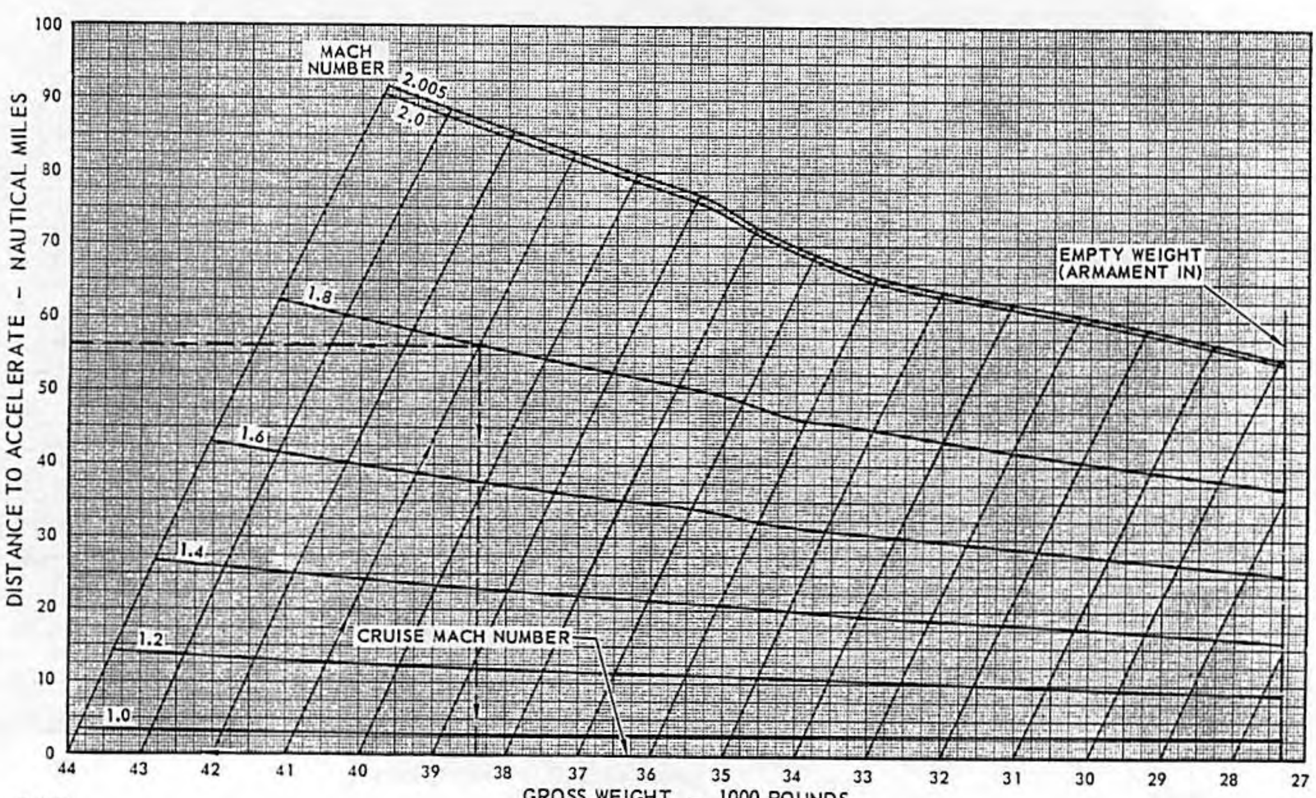
CONFIGURATION: TWO 360-GALLON EXTERNAL TANKS
STANDARD ATMOSPHERE -10°C ARMAMENT IN

A

MODEL: F-106A
DATE: 21 FEBRUARY 1967
DATA BASIS: FLIGHT TEST

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL





48,573

Figure 9-25

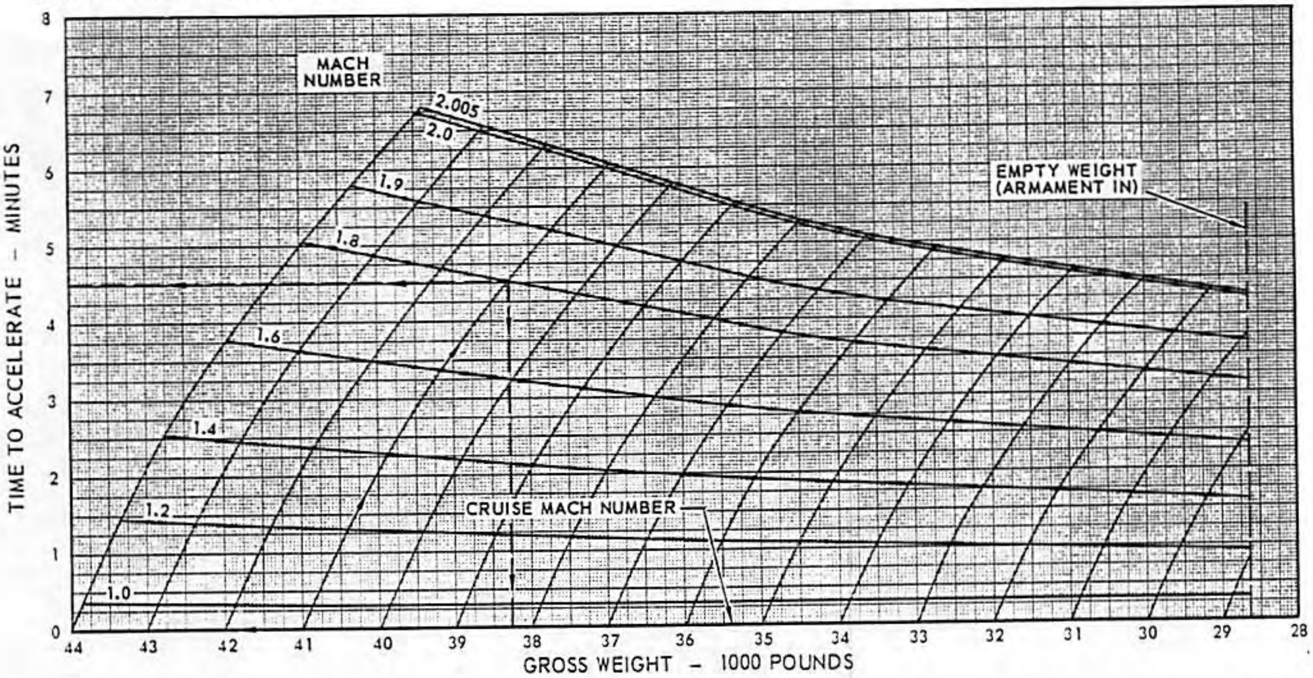
MAXIMUM THRUST ACCELERATION – 35,000 FEET

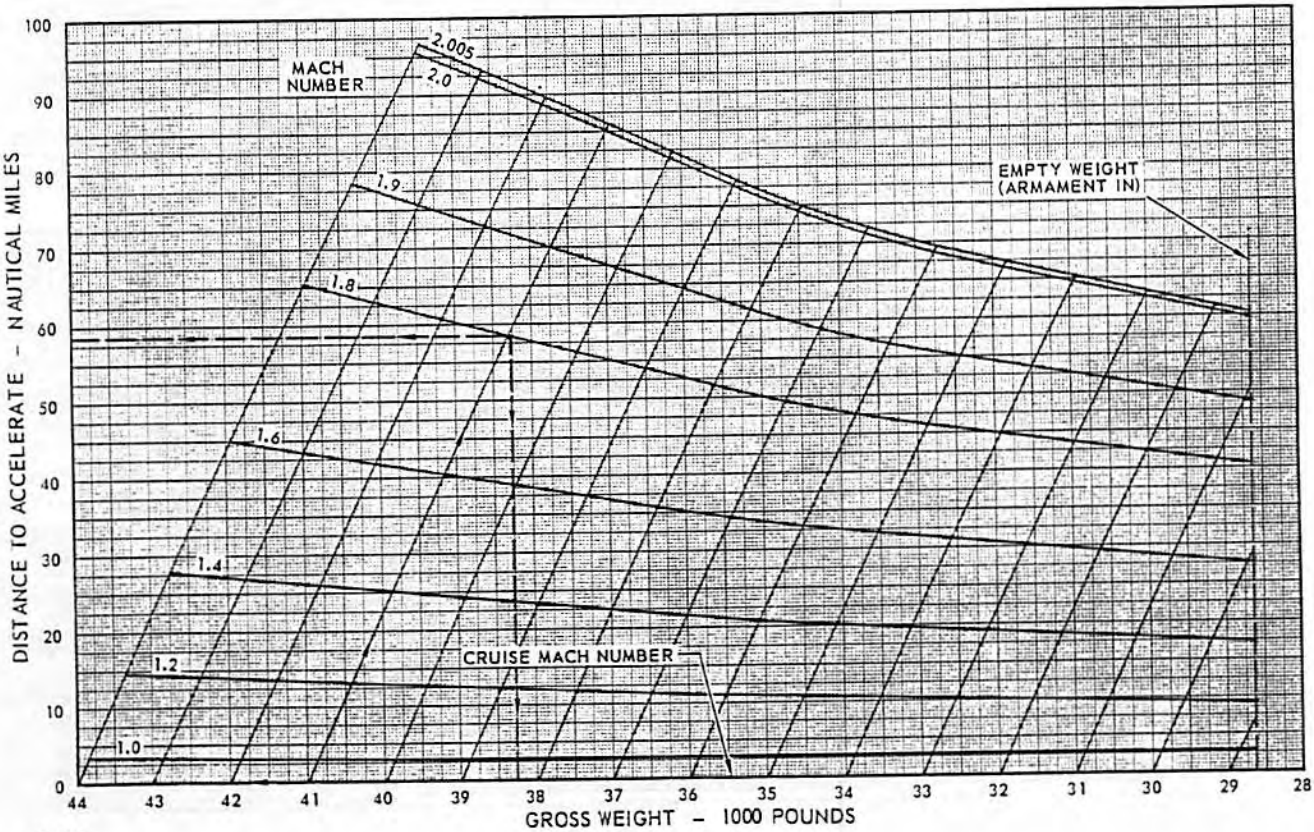
B

CONFIGURATION: TWO 360-GALLON EXTERNAL TANKS
STANDARD ATMOSPHERE -10°C ARMAMENT IN

MODEL: F-106B
DATE: 21 FEBRUARY 1967
DATA BASIS: FLIGHT TEST

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL





48,574

Figure 9-26

MAXIMUM THRUST ACCELERATION – 40,000 FEET

A

MODEL: F-106A
DATE: 21 FEBRUARY 1967
DATA BASIS: FLIGHT TEST

CONFIGURATION: TWO 360-GALLON EXTERNAL TANKS
STANDARD ATMOSPHERE -10°C ARMAMENT IN

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

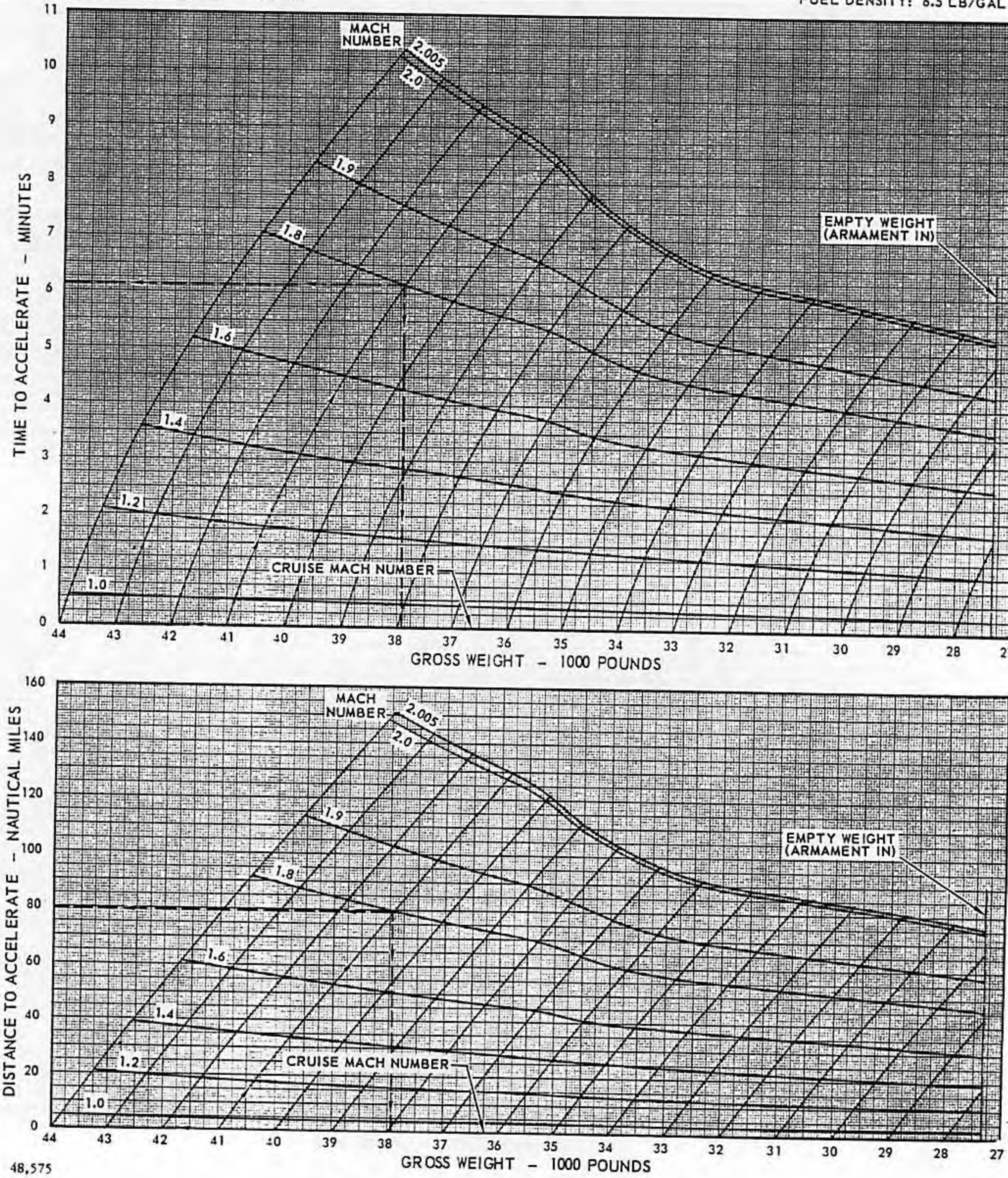


Figure 9-27

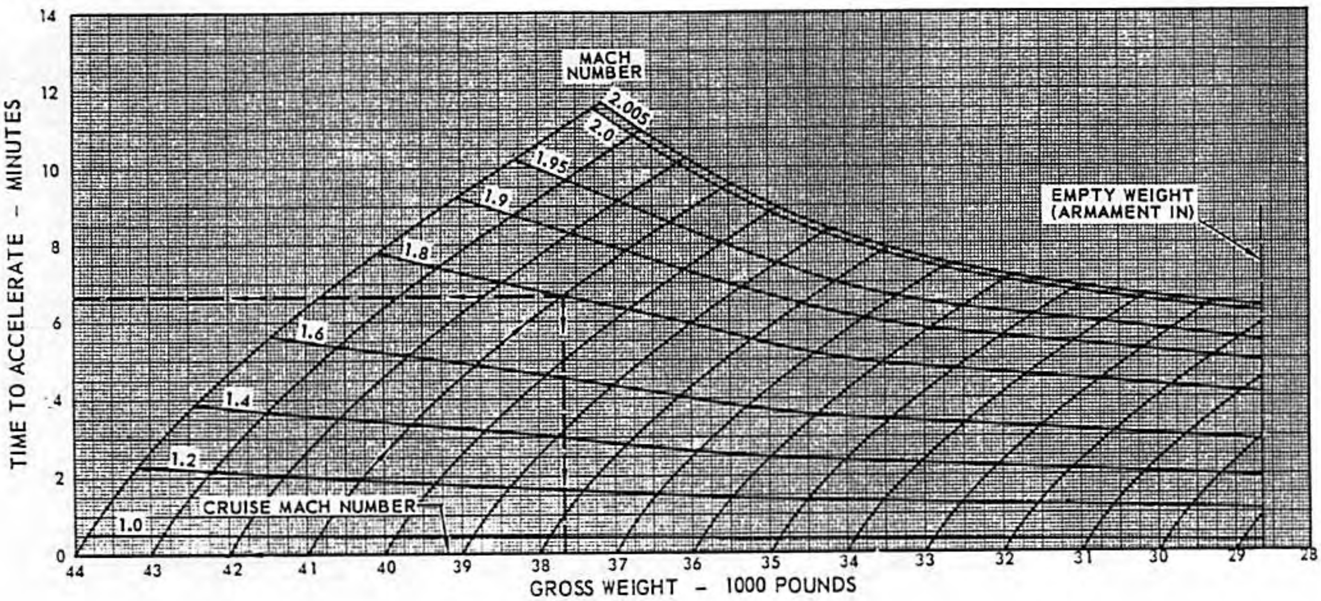
MAXIMUM THRUST ACCELERATION - 40,000 FEET

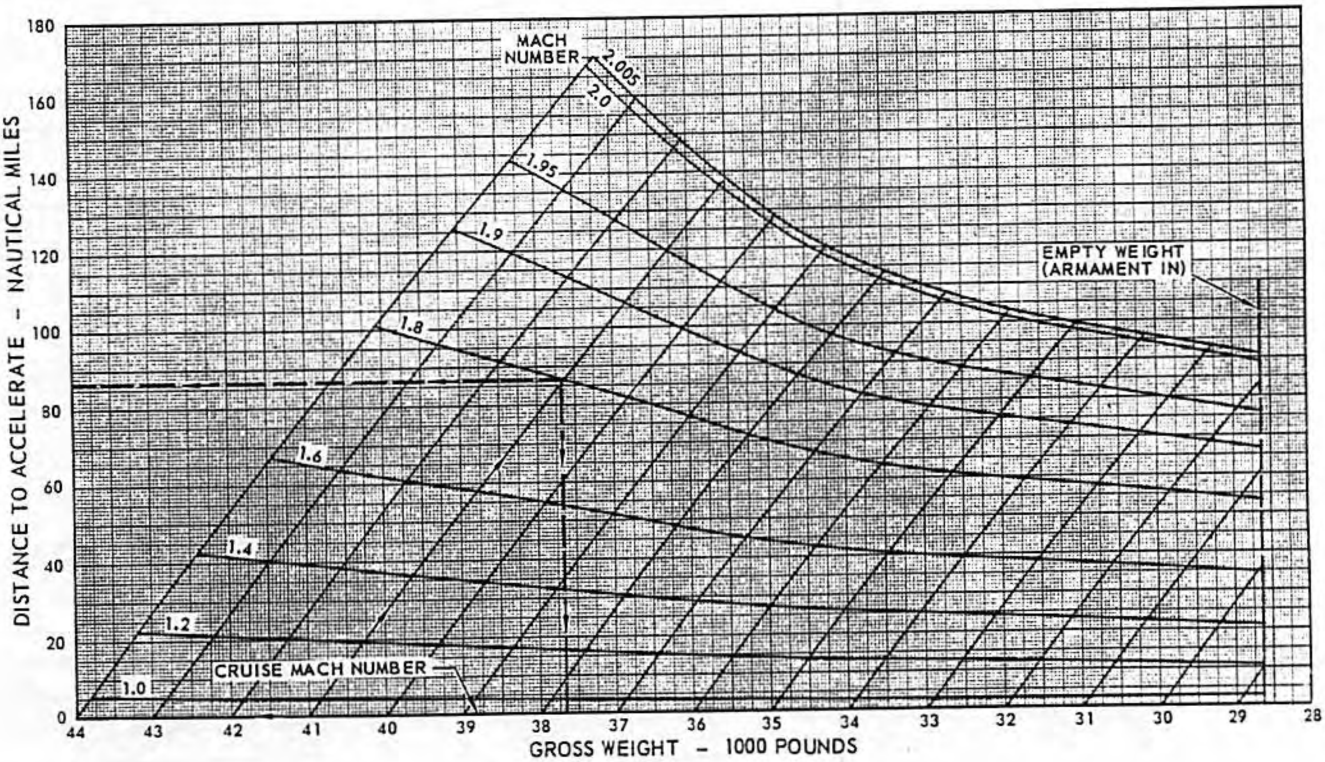
B

CONFIGURATION: TWO 360-GALLON EXTERNAL TANKS
STANDARD ATMOSPHERE -10°C ARMAMENT IN

MODEL: F-106B
DATE: 21 FEBRUARY 1967
DATA BASIS: FLIGHT TEST

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL





48,576

Figure 9-28

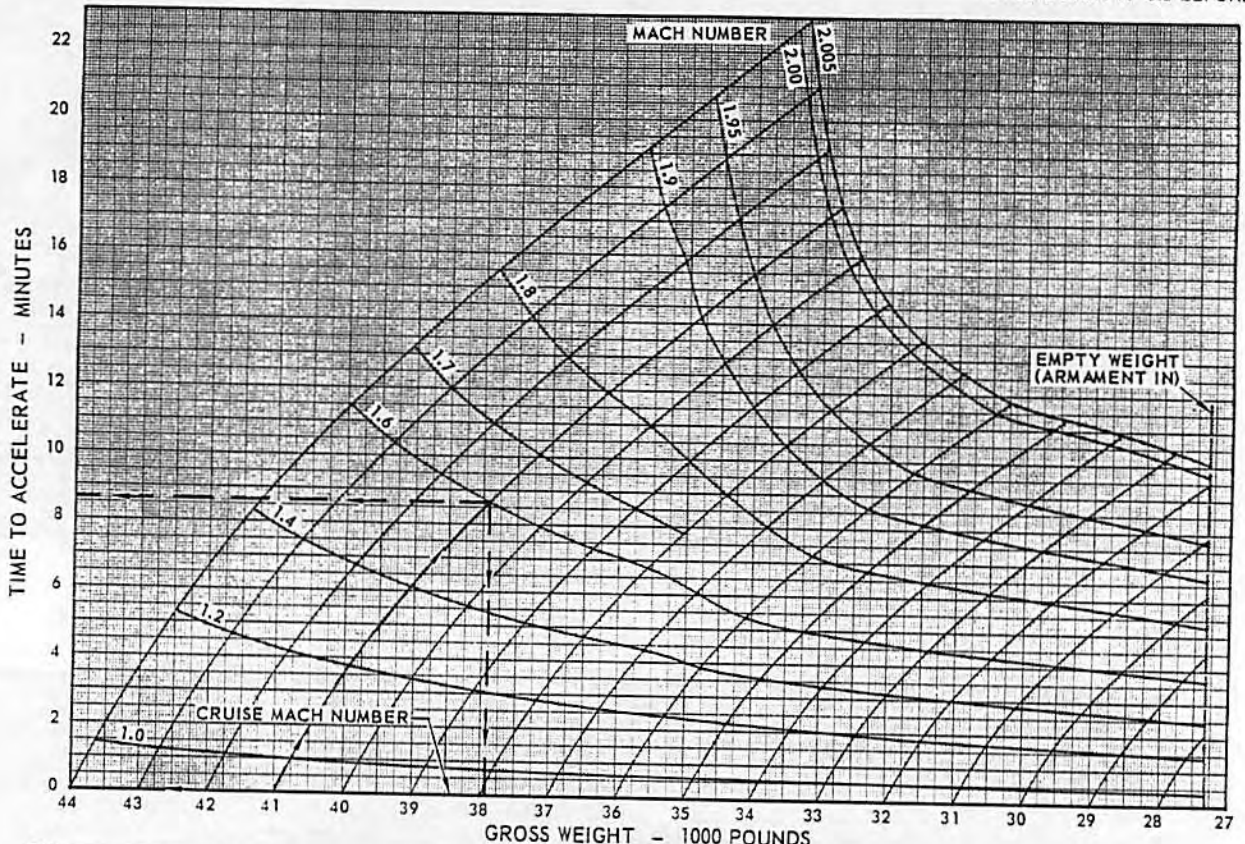
MAXIMUM THRUST ACCELERATION – 45,000 FEET

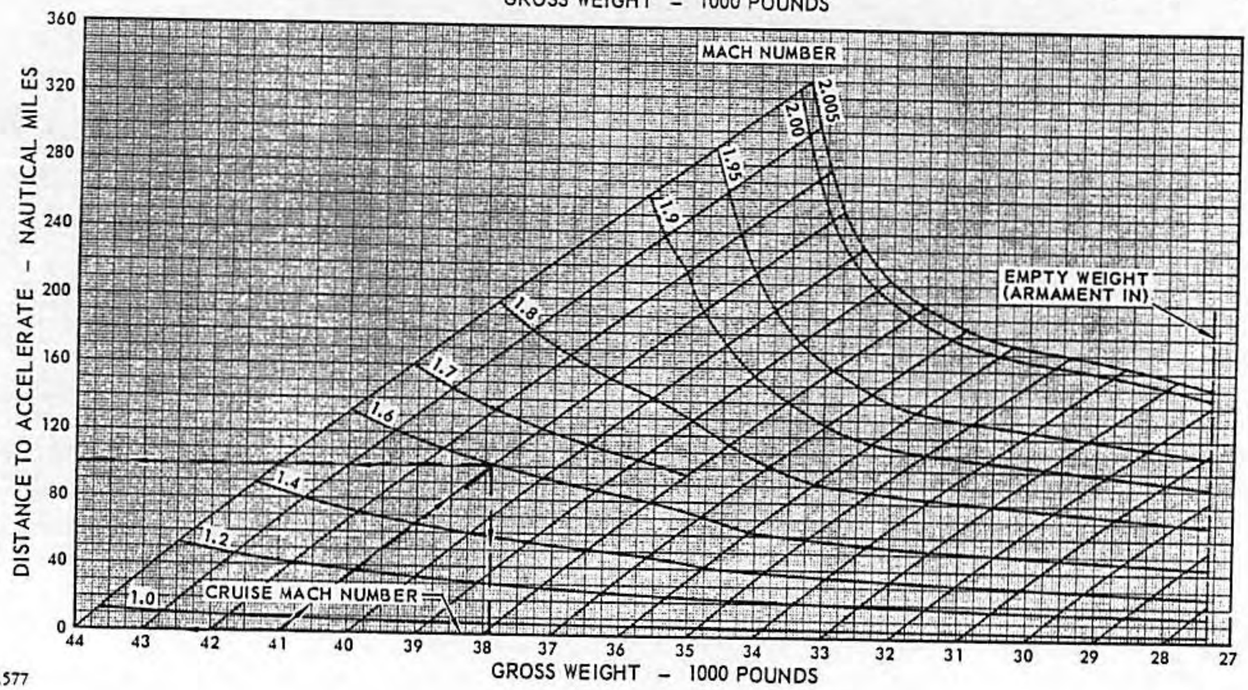
A

CONFIGURATION: TWO 360-GALLON EXTERNAL TANKS
STANDARD ATMOSPHERE -10°C ARMAMENT IN

MODEL: F-106A
DATE: 21 FEBRUARY 1967
DATA BASIS: FLIGHT TEST

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL





48,577

Figure 9-29

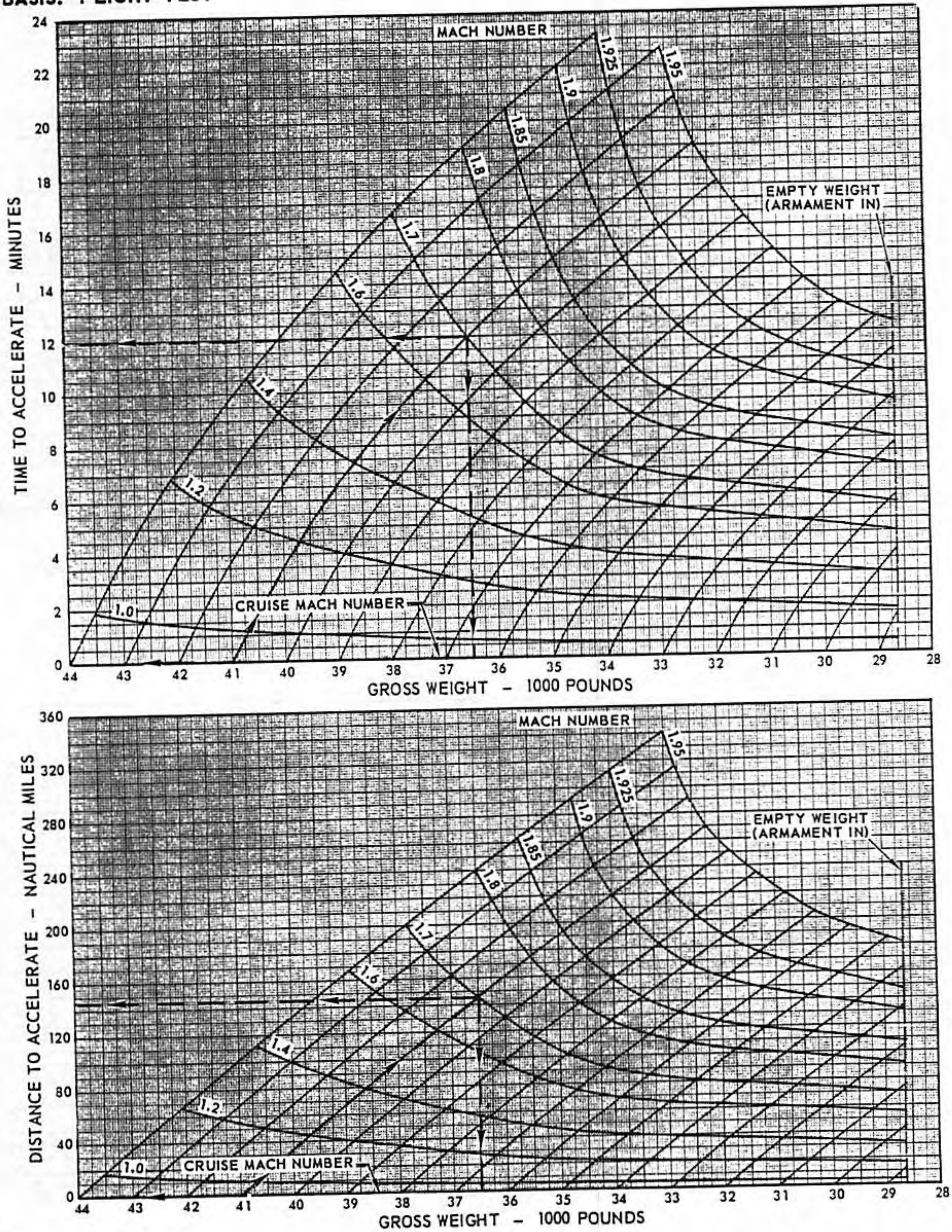
MAXIMUM THRUST ACCELERATION – 45,000 FEET

B

CONFIGURATION: TWO 360-GALLON EXTERNAL TANKS
STANDARD ATMOSPHERE -10°C ARMAMENT IN

MODEL: F-106B
DATE: 21 FEBRUARY 1967
DATA BASIS: FLIGHT TEST

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL



48,578

Figure 9-30

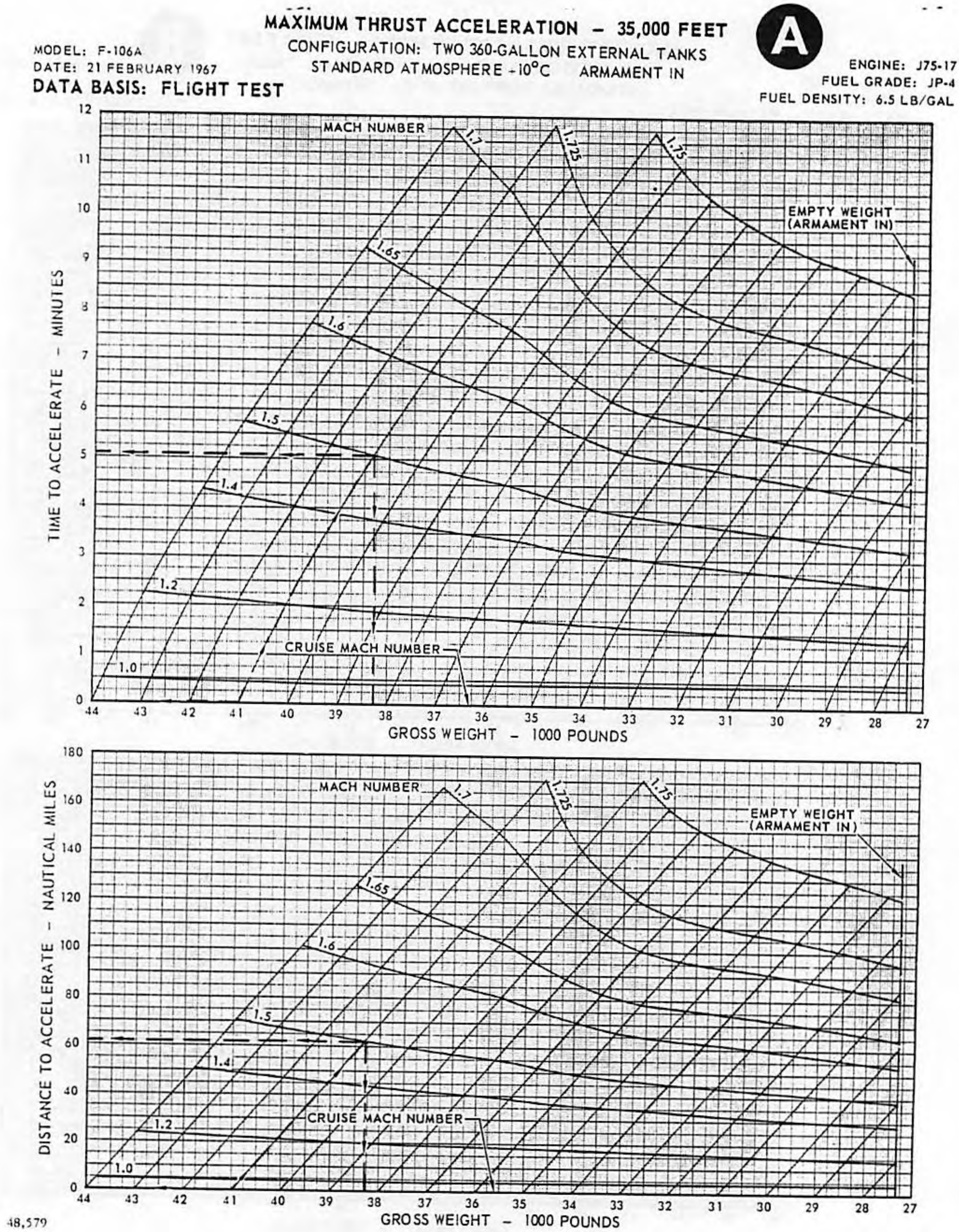

MAXIMUM THRUST ACCELERATION – 35,000 FEET
A
CONFIGURATION: TWO 360-GALLON EXTERNAL TANKS
STANDARD ATMOSPHERE +10°C ARMAMENT IN
MODEL: F-106A
DATE: 21 FEBRUARY 1967
DATA BASIS: FLIGHT TEST
ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL
TIME TO ACCELERATE – MINUTES
MACH NUMBER
1.0
1.2
1.4
1.5
1.6
1.65
1.7
1.725
1.75
EMPTY WEIGHT (ARMAMENT IN)
CRUISE MACH NUMBER
GROSS WEIGHT – 1000 POUNDS
DISTANCE TO ACCELERATE – NAUTICAL MILES
48,579

Figure 9-31

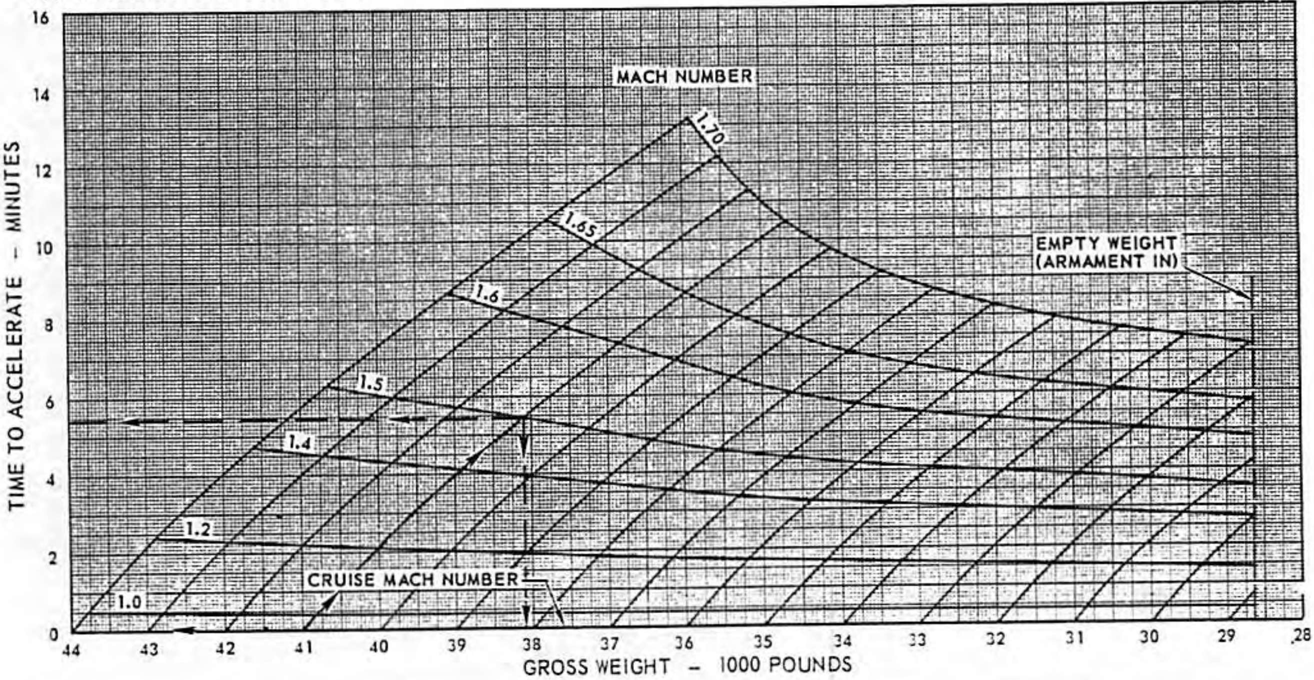
MAXIMUM THRUST ACCELERATION – 35,000 FEET

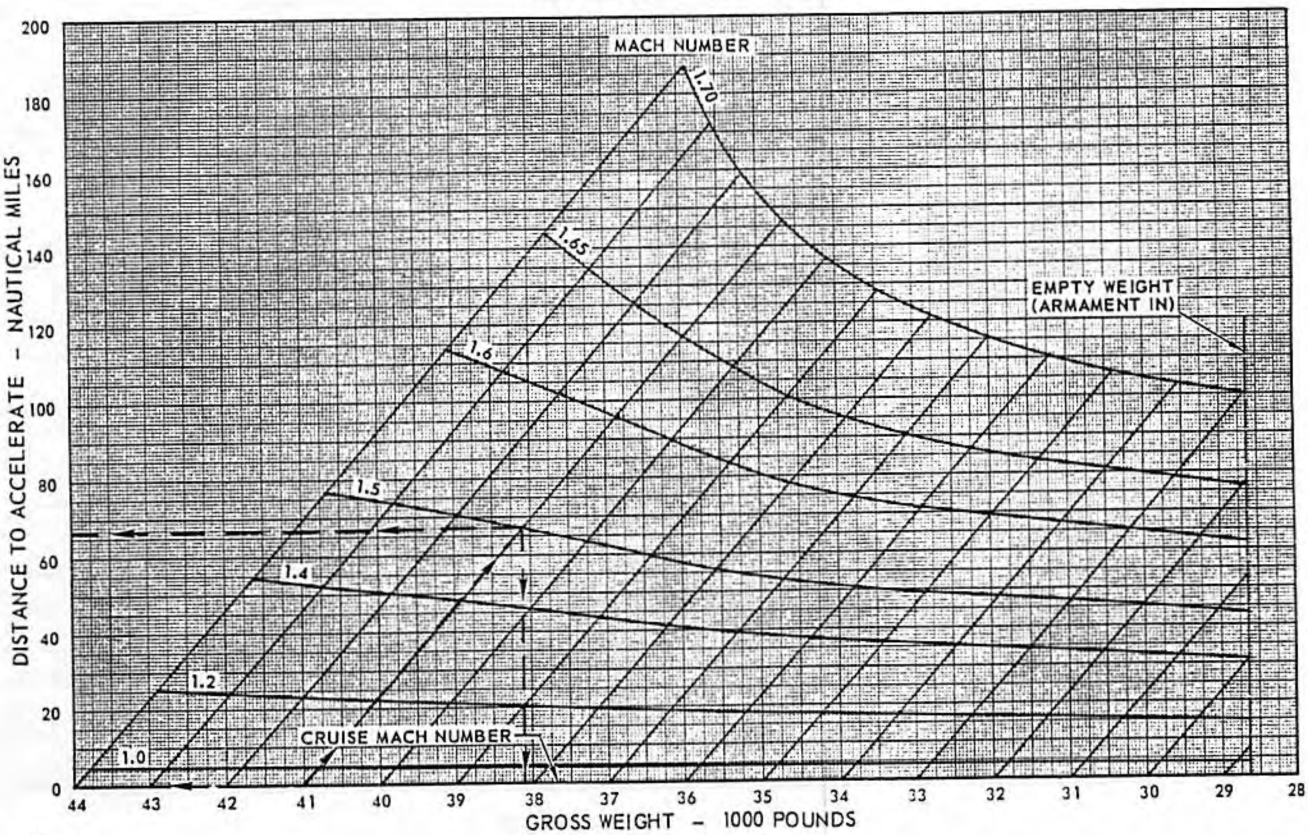
CONFIGURATION: TWO 360-GALLON EXTERNAL TANKS
STANDARD ATMOSPHERE +10°C ARMAMENT IN

B

MODEL: F-106B
DATE: 21 FEBRUARY 1967
DATA BASIS: FLIGHT TEST

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL





48,580

Figure 9-32

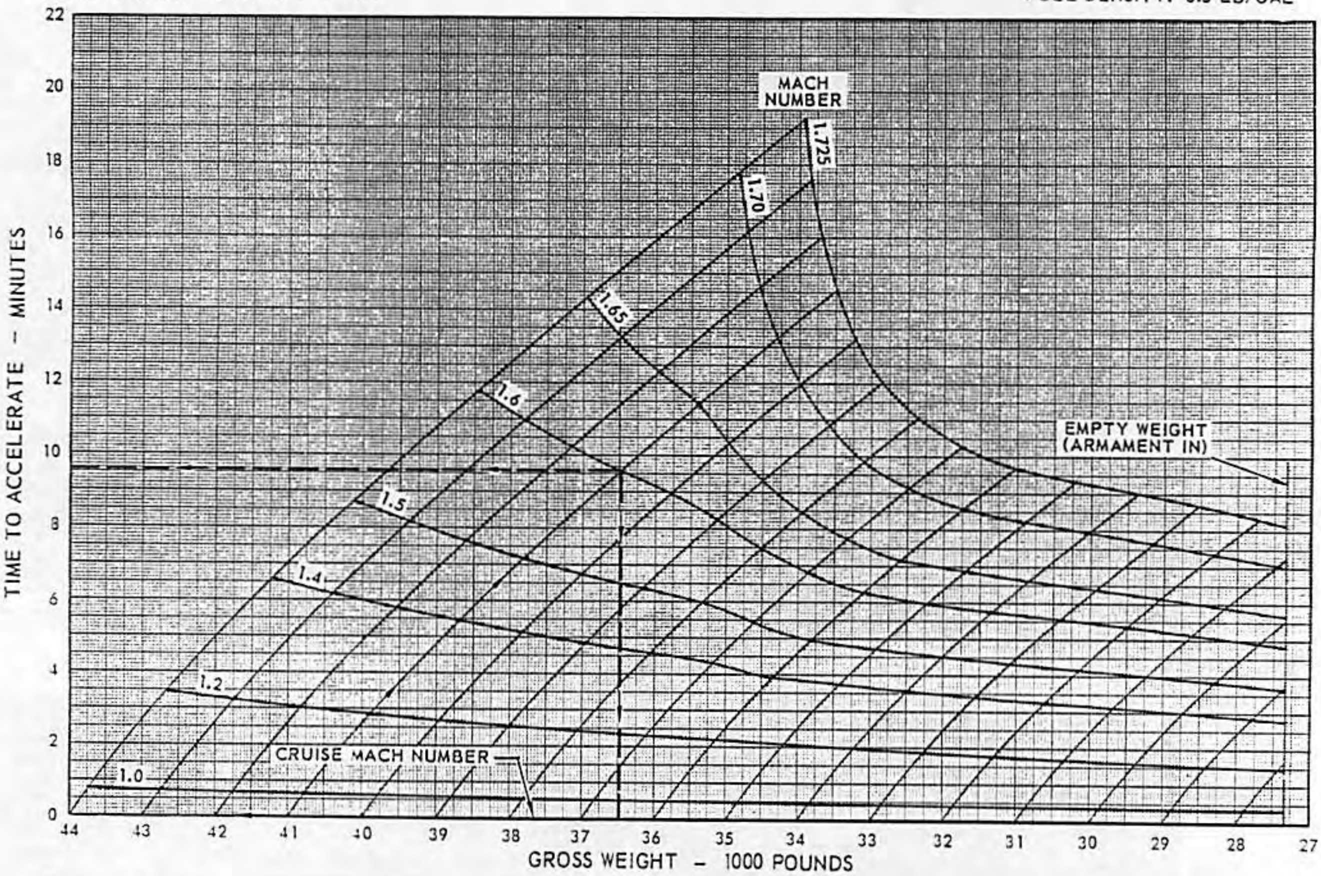
MAXIMUM THRUST ACCELERATION – 40,000 FEET

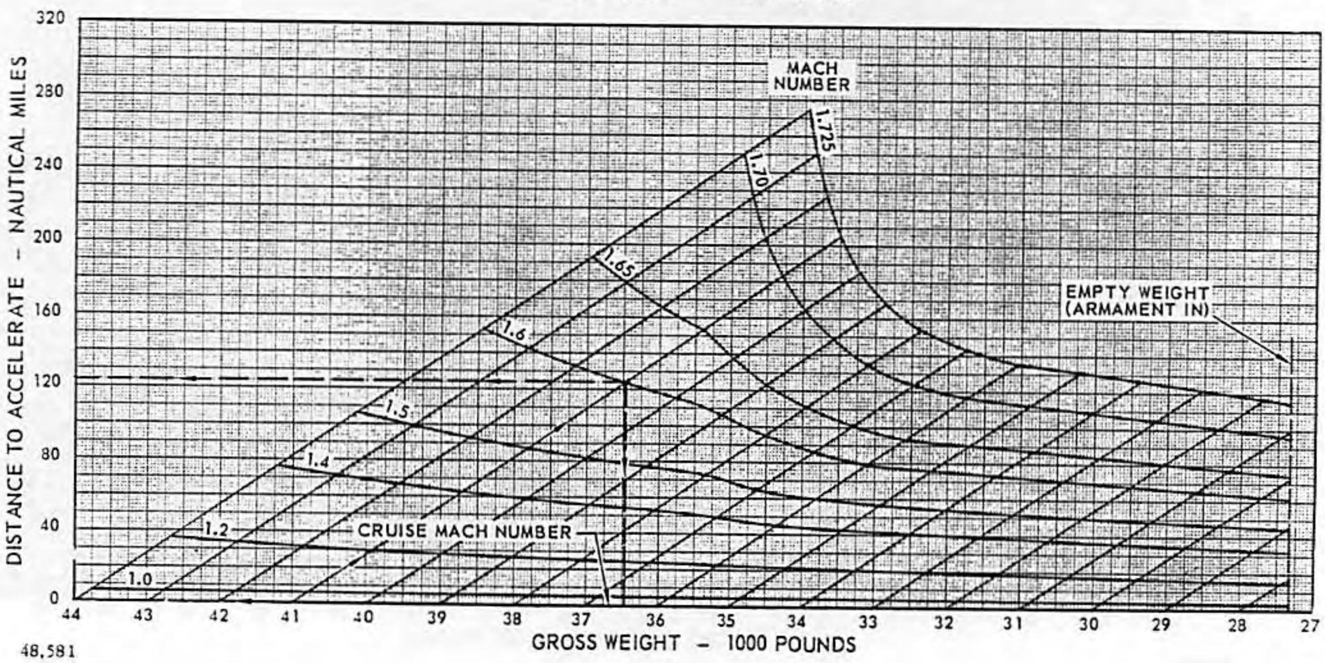
A

CONFIGURATION: TWO 360-GALLON EXTERNAL TANKS
STANDARD ATMOSPHERE +10°C ARMAMENT IN

MODEL: F-106A
DATE: 21 FEBRUARY 1967
DATA BASIS: FLIGHT TEST

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL





48,581

Figure 9-33

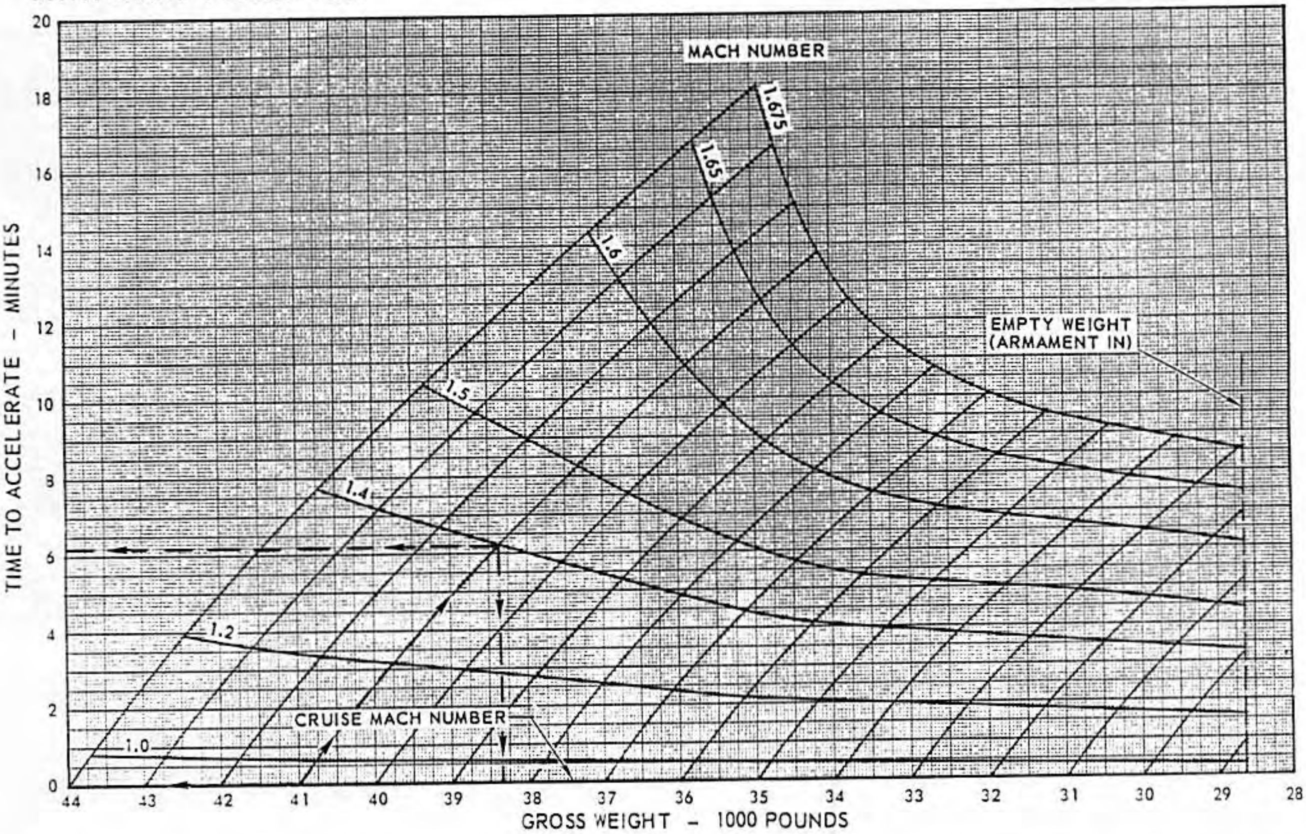
MAXIMUM THRUST ACCELERATION – 40,000 FEET

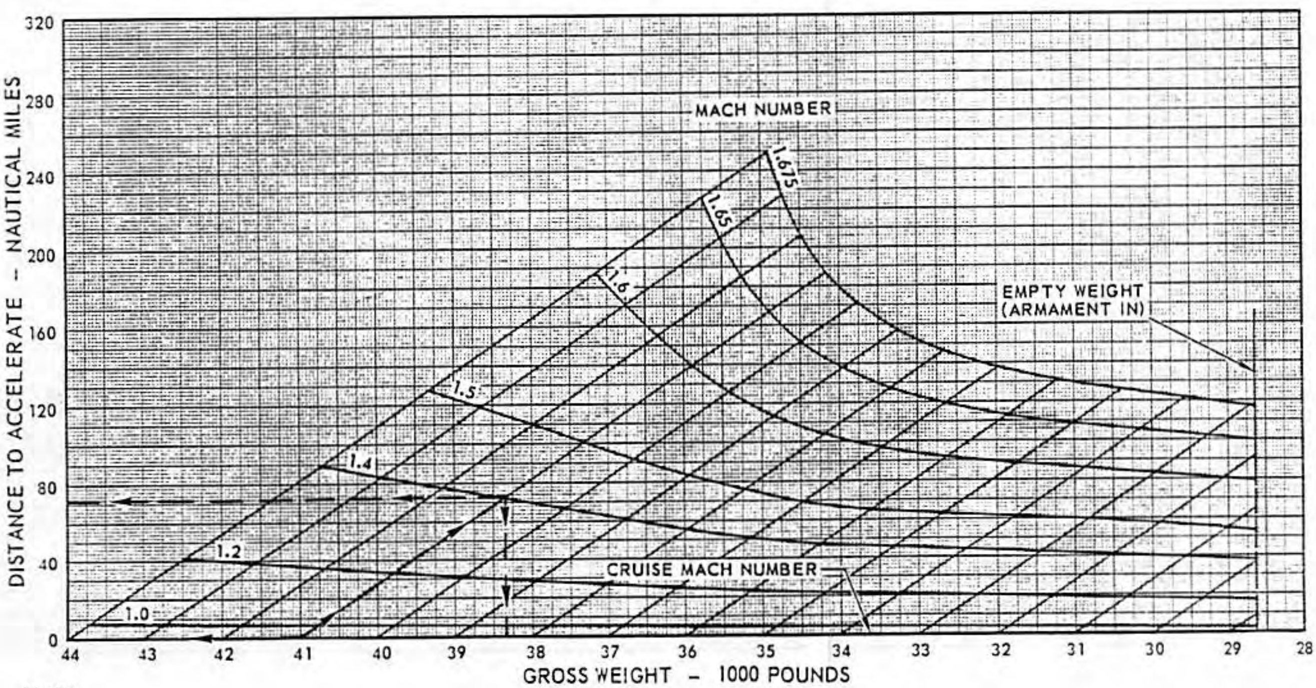
CONFIGURATION: TWO 360-GALLON EXTERNAL TANKS
STANDARD ATMOSPHERE +10°C ARMAMENT IN

B

MODEL: F-106B
DATE: 21 FEBRUARY 1967
DATA BASIS: FLIGHT TEST

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL





48,582

Figure 9-34

MAXIMUM THRUST ACCELERATION – 45,000 FEET

A

CONFIGURATION: TWO 360-GALLON EXTERNAL TANKS
STANDARD ATMOSPHERE +10°C ARMAMENT IN

MODEL: F-106A
DATE: 21 FEBRUARY 1967
DATA BASIS: FLIGHT TEST

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

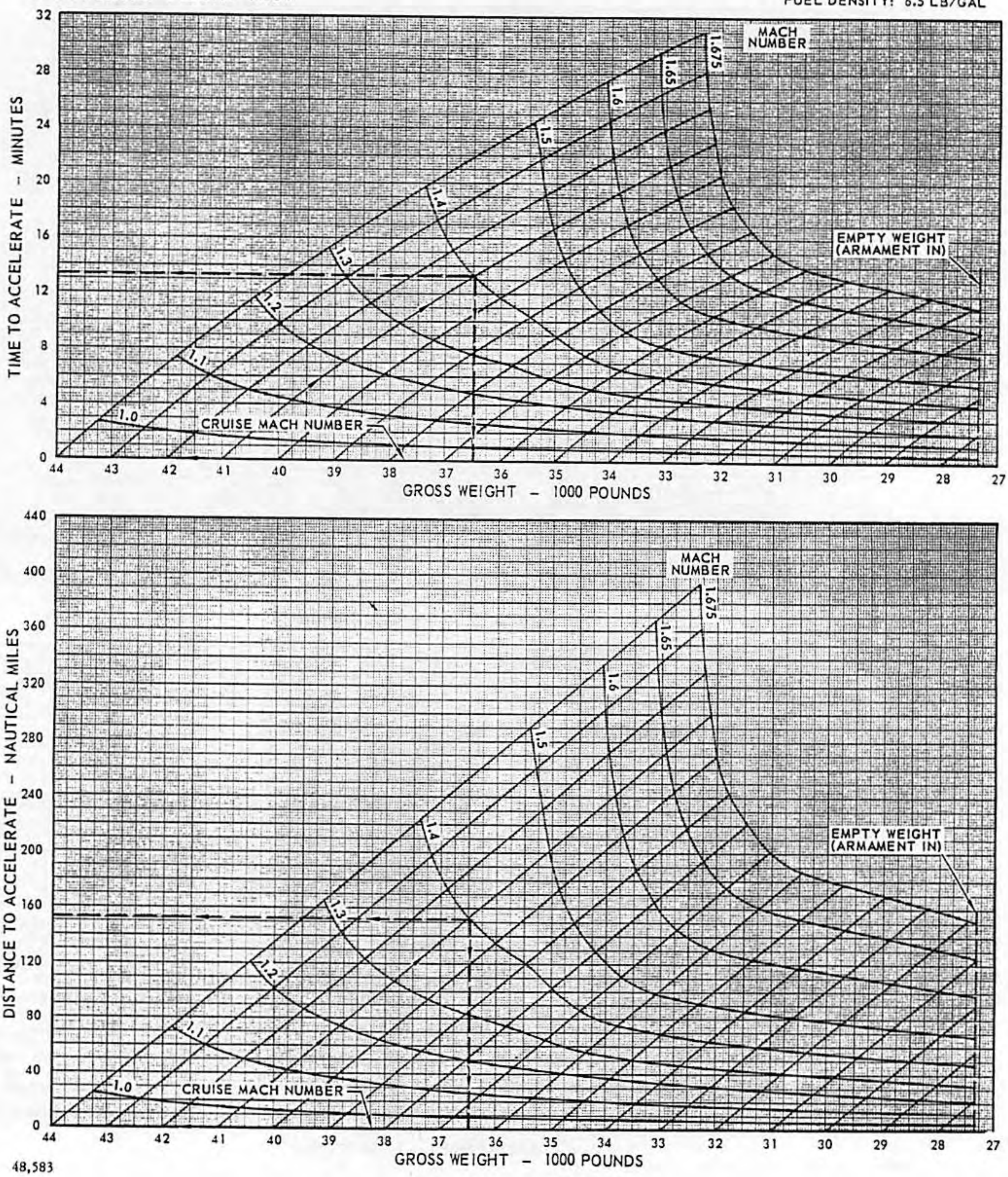


Figure 9-35

MAXIMUM THRUST ACCELERATION – 45,000 FEET

B

CONFIGURATION: TWO 360-GALLON EXTERNAL TANKS
STANDARD ATMOSPHERE -10°C ARMAMENT IN

MODEL: F-106B
DATE: 21 FEBRUARY 1967
DATA BASIS: FLIGHT TEST

ENGINE: J75-17
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

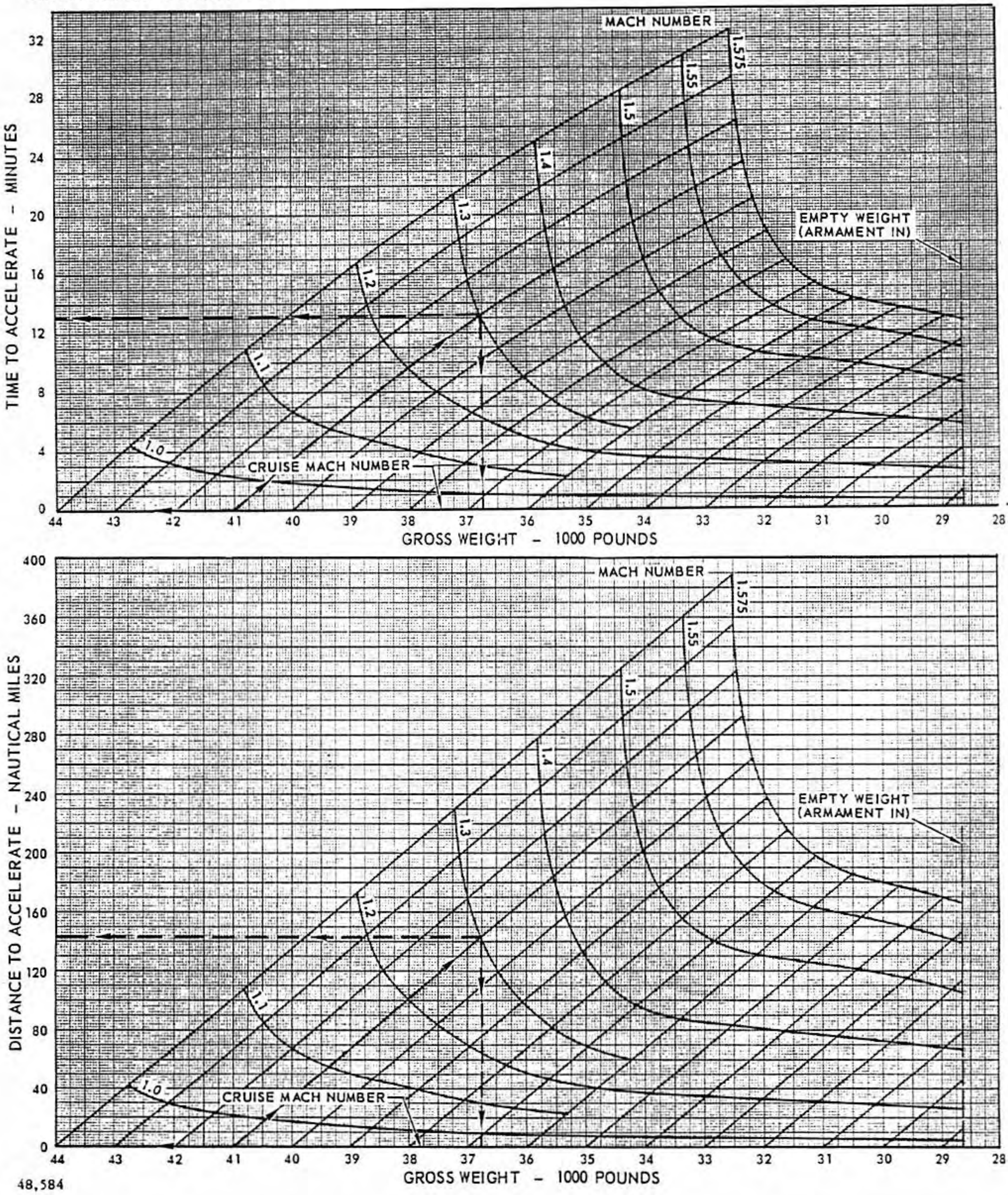


Figure 9-36

SECTION X
ABBREVIATED CHECKLIST PERFORMANCE

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SCOPE OF CHECKLIST PERFORMANCE

The performance charts shown in the Pilots' Abbreviated Flight Crew Checklist, T.O. 1F-106A-1CL-1, replace the MB-8 computer. These charts provide in-flight performance data and are based on the following assumptions:

1. Armament in.
2. Takeoff data based on overload fuel, 2000-foot marker for check speeds, and 8000-foot runway for refusal speeds.
3. 1070 pounds fuel allowance from engine start to climb speed.
4. Cruise data (clean) based on 31,500 pounds gross weight for the F-106A and 32,500 pounds gross weight for the F-106B.
5. Cruise data (360-gallon external tanks) based on 34,000 pounds gross weight for the F-106A and 35,000 pounds gross weight for the F-106B.
6. Cruise conditions: 260 KCAS, optimum range cruise speed, and Mach 0.92.
7. Saunter data based on 3000 pounds of fuel remaining.
8. Descent data based on speed brakes open, 85% rpm and 275 KCAS (not to exceed Mach 0.9).
9. Acceleration data based on 33,000 pounds (clean) and 37,000 pounds (360-gallon external tanks) for standard −10°C, standard, and standard +10°C temperatures.
10. Deceleration data based on 33,000 pounds gross weight for clean configurations and 35,000 pounds gross weight for external tank configurations — speed brakes open and 85% rpm.
11. Landing data based on 2000 pounds of fuel remaining.

The accuracy of these charts when used for weights or conditions other than those for which the data is presented is explained in the discussion of each individual performance phase. Refer to other sections of this Technical Order for data involving flight planning or for weights or conditions other than those presented.

TAKEOFF CHARTS

Takeoff performance is presented for maximum thrust and military thrust takeoffs. The charts are divided into clean and external tanks configurations, with takeoff roll distance, takeoff check speed, and refusal speed information presented on each chart.

TAKEOFF ROLL DISTANCE

Takeoff roll distances are used on full internal fuel condition.

FULL INTERNAL—CLEAN

	Total Fuel	Gross Weight
F-106A	9841 pounds	36,663 pounds
F-106B	9425 pounds	37,552 pounds

FULL INTERNAL + 360-GALLON EXTERNAL TANKS

	Total Fuel	Gross Weight
F-106A	14,495 pounds	41,831 pounds
F-106B	14,079 pounds	42,720 pounds

Distances are valid either with or without armament.

Pressure altitude reads across the top of the chart and ambient temperature reads down the side of the chart. Linear interpolations are valid for temperatures and altitudes between the ones presented. After the takeoff roll distances have been established for the proper temperature and pressure altitude, the wind correction can be made. The wind correction is obtained from the bottom of the chart. Wind corrections are shown for various zero wind takeoff roll distances. Interpolate for winds or roll distances other than those presented. Add or subtract the resulting wind corrections to the zero wind roll distances.

TAKEOFF CHECK SPEED

Takeoff check speeds are valid for the 2000-foot marker only. The takeoff check speed is obtained from the chart exactly the same way the takeoff roll distance was obtained. The charts are corrected for wind by adding the headwind or subtracting the tailwind.

REFUSAL SPEED

Refusal speeds are valid for an 8000-foot runway only. The refusal speed is obtained in the same manner as takeoff roll distance. The charts are corrected for wind by adding the headwind or subtracting the tailwind.

CRUISE CHARTS

Cruise performance is presented for the clean and the external wing tank configurations. The charts show climb, cruise, saunter and descent information.

CLIMB

Climb data are presented for both military and maximum thrust. The same schedule is used for both thrust settings and is as follows:

1. A nominal 10° cabin angle from takeoff to 400 KCAS.
2. 400 KCAS to Mach 0.92.
3. Mach 0.92 to altitude.

Climb data are based on full internal fuel less 1070 pounds; 1070 pounds of fuel are assumed used from engine start to climb speed. The fuel remaining values on the charts reflect this 1070 pounds. To correct these fuel remaining values to allowances other than 1070 pounds, add 1070 pounds to the values, then subtract the preferred allowance. Climb data are based on standard temperatures, and correction factors shown on the climb charts in Section III of this Technical Order should be used for non-standard temperatures.

CRUISE

Cruise data are presented for three speeds. They are:

1. 260 KCAS.
2. Optimum range cruise speed.
3. Mach 0.92.

The optimum range cruise speed values are underlined. Cruise data are based on one gross weight for each of the following configurations:

	F-106A	F-106B
Clean Configuration	31,500 pounds	32,500 pounds
360-Gallon External Tanks	34,000 pounds	35,000 pounds

The optimum range cruise speeds and values of air nautical miles per 1000 pounds presented in the charts are approximate averages for ferry-type missions or for combat missions where the outbound and inbound cruise segments at a given altitude are approximately equal. The amount of error realized in using the checklist values of air nautical miles per 1000 pounds of fuel for either the inbound or outbound cruise segments separately would be approximately 8%. The greatest error would occur in using the data for a short distance cruise where the average gross weight approaches either the full load gross weight or the empty gross weight. In such a case, the error may be as high as 15%. The correction for wind effects is the same as noted on the cruise charts in Section IV of this Technical Order. It is as follows:

$$\text{(nautical miles/1000 pounds [with wind])} = \text{(nautical miles/1000 pounds [no wind])} \times \left(\frac{GS}{TAS}\right)$$

Cruise data are based on standard atmospheric conditions. For ambient temperatures other than standard, fuel flow and airspeed are the only items presented which are not valid. For this reason, Mach or CAS should be used to set up cruise rather than fuel flow. Standard day temperatures are presented under the altitude for reference use only.

SAUNTER (MAXIMUM ENDURANCE)

Saunter data are based on 3000 pounds of fuel remaining (armament in). Saunter data are also valid from 4000 pounds to 1500 pounds of fuel remaining with armament in or from 5500 pounds to 3000 pounds of fuel remaining with armament out. The minutes per 1000-pound values decrease 20% and 30% respectively, and the CAS values increase 3% and 4% respectively for the clean and tanks full fuel conditions.

DESCENT

Descent data are presented for 275 KCAS (not to exceed 0.9 Mach) with speed brakes open and 85% rpm. Descent data are valid for all gross weights.

SUPERSONIC CRUISE CHARTS

Supersonic acceleration, cruise, and deceleration data are shown for the clean airplane and the airplane with external tanks.

ACCELERATION

Acceleration data are presented for altitudes of 35,000, 40,000, and 45,000 feet at three ambient temperature conditions:

Standard −10°C
Standard
Standard +10°C

The standard day temperatures are blocked in on the charts. In each case, the initial acceleration mach number is shown to be 0.9. Negligible error will be introduced in using the data for initial mach numbers of 0.85 or 0.95. The gross weights at the start of acceleration upon which the data are based are as follows:

	F-106A and F-106B
Clean Configuration	33,000 pounds
360-Gallon External Tanks	37,000 pounds

The data may be considered valid for gross weights 1000 pounds above or below these specified values.

CRUISE

Afterburner cruise data for clean and external tanks configurations are based upon the same gross weights as given previously for non-afterburner cruise. It may be noted in the nautical miles per 1000 pounds charts for afterburner cruise given in Part 4 of the appendix that the effects of gross weight at a given cruise speed are negligible at altitudes of 35,000 feet and below. The maximum error in using the checklist cruise values for all gross weights would occur for a cruise in which the average gross weight approaches the full load gross weight of the airplane. This maximum error would be approximately 5% at 40,000 feet and approximately 10% at 45,000 feet. Cruise data are shown for three speeds including maximum speed, minimum afterburner speed, and an intermediate speed between the maximum and minimum afterburner speeds.

DECELERATION

Deceleration data are shown for various constant altitudes for clean and external tanks configurations based on engine operation at 85% rpm and with speed brakes open. In each case, the terminating mach number is 0.9 and the highest initial mach number shown corresponds to design limit speed for the particular configuration. The data are based on a gross weight of 33,000 pounds for the clean airplane configurations and 35,000 pounds for each of the external tanks configurations. Small errors would result in using the data over a wide range of airplane gross weights.

LANDING CHARTS

Landing data are presented exactly as shown in Section VIII of this Technical Order. Refer to Section VIII for a discussion of chart use and a demonstration of procedures used in a sample problem.

MAXIMUM ABORT SPEED CHARTS

The maximum abort speeds are presented exactly as shown in Section II of this Technical Order. Refer to Section II for a discussion of chart use and a demonstration of procedures used in a sample problem.

SECTION XI
MISSION PLANNING

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MISSION PLANNING

The charts presented in Section I through X provide performance necessary to plan many different types of missions. The following sample problem illustrates how the performance charts may be integrated to form a complete mission. The sample problem utilizes the F-106A for a military thrust climb to 40,000 feet; a 40,000-foot cruise at 0.9 Mach, dropping external tanks when empty; descent to a combat altitude of 35,000 feet at 275 KCAS and 85% rpm; acceleration at maximum thrust to Mach 1.8 at 35,000 feet; a combat allowance of two minutes at maximum thrust at 35,000 feet; retain armament; return climb to 40,000 feet at military thrust; a 40,000-foot cruise at 0.9 Mach; a maximum range descent at 250 KCAS idle thrust to base; and land with 1500 pounds of fuel remaining. The mechanics of mission planning can be learned by working the sample problem. This sample mission could be flown by the pilot to check the performance of his airplane, or the pilot may wish to construct a new mission that would possibly reflect the local airplane usage. The pilot may wish to climb at maximum thrust and cruise supersonic; retain tanks and descend to 25,000 feet or 20,000 feet; have a combat allowance of three minutes, and climb back to cruise altitude at military thrust; return cruise at military thrust, etc. This mission could be constructed and plotted, then flown by the pilot, just as any mission the pilot could conceive, construct and plot, can be flown. By using the charts in this manual to construct a mission, the pilot should become better acquainted with the performance of the F-106A and F-106B airplanes. The pilot who knows the performance of his airplane is better equipped to carry out the over-all mission of his command.

NOTE

The following sample problem is an exercise in the use of performance charts. It is not intended to reflect actual or proposed missions employing this airplane.

NEED FOR MISSION PLANNING

Because of the many types of missions capable of being flown, operation of the airplane may cover a wide altitude and speed range. This wide range of performance variables make pre-mission planning a necessity. The most important results of mission planning are:

1. Combat radius available for a given combat time and reserve fuel.
2. Reserves available as a function of combat radius for a given combat time.
3. Combat time available as a function of combat radius for a given reserve fuel.
4. Familiarization with charts used to obtain performance data.

The first step in obtaining these results is establishing a mission. A mission is defined here as a series of performance phases combined in a particular order. A simple example of a mission would be:

1. Takeoff.
2. Climb.
3. Combat.
4. Descend.
5. Land.

A particular mission may call for maximum thrust accelerations or supersonic cruises. In this case the rate of fuel consumption is high and does not allow much margin for error. Any delay in breaking off from one of these phases can seriously deplete the planned fuel reserves or reduce the combat time or radius available. As an example, two minutes of supersonic cruise at 40,000 feet is equivalent to approximately 22 minutes or 190 nautical miles at optimum cruise speed and altitude. It is therefore apparent that accurate mission planning and constant checking of progress against the flight plan becomes necessary.

Sample Problem

Objective: To plan and plot a simple mission using the airplane gross weight as a function of distance flown.

Configuration: Clean airplane plus two 360-gallon external wing tanks.

850 pounds of fuel used prior to gear up.

Fuel loading: 9841 pounds or 1514 gallons internal, 4654 pounds or 716 gallons external.

Fully loaded gross weight: 41,831 pounds.

Zero fuel weight (armament in) : 27,336 pounds; (external tanks dropped) : 26,822 pounds.

Supplemental Data

1. Local weather at takeoff: 20°F ambient temperation, 3000-foot pressure altitude, 10-knot wind from 015°.

2. Takeoff runway: 0°, 9300-foot length. Fair braking conditions exist.

3. Enroute weather outbound: standard day conditions with a 40-knot headwind at cruise altitude.

4. Enroute weather inbound: standard day conditions with a 10-knot tailwind at cruise altitude.

5. Local weather at landing: 30°F ambient temperature, 3000-foot pressure altitude, 32-knot wind from 036°.

6. Landing Runway: 0°, 9300-foot length, good braking conditions (dry hard runway, good tires and brakes and a practiced braking technique).

Mission is assumed to be as follows:

1. Engine start, warmup, taxi, maximum thrust takeoff, and acceleration to climb speed.

2. Military thrust climb to 40,000 feet.

3. Outbound cruise at 40,000 feet and 0.9 Mach number. Drop external tanks when empty.

4. Descend to combat altitude of 35,000 feet at 275 KCAS and 85% rpm.

5. Accelerate with maximum thrust to attack Mach number of 1.8 at 35,000 feet.

6. Combat allowance: two minutes in maximum thrust at 35,000 feet. Retain armament.

7. Climb back to 40,000 feet with military thrust.

8. Inbound cruise at 40,000 feet and 0.9 Mach number.

9. Descend at maximum range descent speed (250 KCAS) and idle thrust to base.

10. Land with 1500 pounds of fuel remaining.

Takeoff

Takeoff speed is obtained from figure 2-3. Enter this chart with an ambient temperature and pressure altitude. Proceed to the right until the correct fuel remaing line is intersected. Then read down for takeoff speed.

KNOWN:

Ambient temperature is 20°F.

Pressure altitude is 3000 feet.

Fuel remaining is maximum fuel with two 360-gallon external tanks.

FROM CHART:

Takeoff speed is 184 KCAS.

Next, obtain the headwind and crosswind components of the wind from figure 2-10 by entering the chart with wind velocity and wind angle. Read the headwind component on the left of the chart and the crosswind component at the bottom of the chart. Determine nosewheel liftoff speed requirements by noting the area of the chart in which the crosswind component falls. If the color of the area is green, no increase above the recommended nosewheel liftoff speed is required. If the color is yellow or light red, the nosehweel liftoff speed must be determined from the table on the chart. Further, a check must be made to see whether the minimum nosewheel liftoff speed exceeds the previously determined takeoff speed. If it does, the takeoff speed must be increased to correspond to the minimum nosewheel liftoff speed.

KNOWN:

The wind velocity is 10 knots.

The wind direction is 15° off the nose.

FROM CHART:

The headwind component is 9.6 knots.

The crosswind component is 2.7 knots.

No increase in recommended nosewheel liftoff speed is required since the crosswind component falls in the green area of the chart. Consequently, the previously computed takeoff speed is valid.

Check to see if the tire limit speed shown in Section V, (figure 5-3, T.O. 1F-106A-1) is exceeded.

KNOWN:

Ambient temperature is 20°F.

Pressure altitude is 3000 feet.

Takeoff speed is 184 KCAS.

FROM CHART:

Tire limit speed would not be exceeded unless there was a tail wind greater than 30 knots.

Takeoff distance can now be obtained from figure 2-3. Enter this chart with ambient temperature and pressure altitude. Proceed to the right to intersect with the correct fuel remaining line. Then read vertically down to obtain zero wind ground roll distance. Then parallel the nearest guide line to read the ground roll for half of the reported headwind. Then proceed vertically down until an intersection is made with proper base line for total distance. Then proceed horizontally to the left and read total distance over a 50-foot obstacle. These distances would be incorrect if the takeoff speed was obtained from the crosswind chart.

KNOWN:

Ambient temperature is 20°F.

Pressure altitude is 3000 feet.

Maximum fuel aboard with two 360-gallon external tanks.

Half of the reported headwind is 4.8 knots.

FROM CHART:

Takeoff ground roll is 4200 feet.

Total takeoff distance over a 50-foot obstacle is 6000 feet.

Maximum refusal speed and distance can be obtained from figure 2-1. Enter the chart with takeoff gross weight and proceed horizontally to the pressure altitude line. From this intersection, move down to intersect the proper ambient temperature line, then proceed horizontally to intersect the correct available runway length. From this intersection, proceed vertically down and read refusal speed (zero wind). This is, of course, the maximum speed which the airplane attains, then has to abort, and still is able to stop in the remaining available distance. To correct for wind, add headwind or subtract tailwind. The refusal distance is obtained by continuing horizontally from the available runway line intersection to the right until an intersection with the refusal speed (corrected for wind) is accomplished. The check marker is the prior even 1000-foot marker. The line check speed is obtained by reading vertically down from the check marker intersection.

KNOWN:

Takeoff gross weight is 41,831 pounds.

Pressure altitude is 3000 feet.

Ambient temperature is 20°F.

Available runway is 9300 feet.

One-half of the reported headwind is 4.8 knots.

FROM CHART:

Refusal speed for zero wind is 161 KCAS.

Refusal speed corrected for wind is 165.8 KCAS.

Refusal distance is 3300 feet.

Line check speed at the 3000-foot marker is 156 KCAS.

The landing, approach and prior to flare speeds for a landing immediately after takeoff are found from the table on the landing distance chart (figure 8-3) as a function of fuel remaining.

KNOWN:

Fuel remaining is maximum fuel with two 360-gallon external tanks.

FROM CHART:

Approach speed is 208 KCAS.

Prior to flare speed is 193 KCAS.

Touchdown speed is 173 KCAS.

Landing distances for a landing immediately after takeoff are obtained from figures 8-1 and 8-3. Enter these charts with ambient temperature and pressure altitude. Then proceed horizontally to the right and intersect the fuel remaining line. From this intersection, move down and read the zero wind ground roll for fair braking conditions. Then parallel the nearest guide line to half of the reported headwind and read the ground roll distance with headwind. Then move down and read the total landing distance over a 50-foot obstacle.

KNOWN:

Ambient temperature is 20°F.

Pressure altitude is 3000 feet.

Maximum fuel with two 360-gallon external tanks.

Fair braking conditions exist, RCR-15.

Half of the reported wind is 4.8 knots.

No increase in recommended touchdown speed.

FROM CHARTS:

Ground roll distance with speed brakes open and drag chute deployed is 8250 feet.

Total distance over a 50-foot obstacle is 9700 feet.

Ground roll distance with speed brakes open is 9200 feet.

Total distance over a 50-foot obstacle is 10,650 feet.

Takeoff fuel allowance for this mission was assumed to be 1070 pounds. This allowance is assumed to account for engine start and warmup, taxi, maximum thrust takeoff and acceleration to climb speed. No distance is assumed made good, but three minutes are assumed to have elapsed from engine start. The external fuel tanks do not start feeding until the gear is retracted. The fuel system uses 454 pounds from the #1 tanks, then uses fuel from the "T" tanks. The external tanks will replenish the fuel in the #1 tanks only after the gear is retracted. Therefore it is necessary to log both the internal and the external fuel used when more than 454 pounds of fuel is used prior to gear retraction.

The breakdown of takeoff allowance is as follows:

KNOWN:

The takeoff allowance = 1070 pounds.
Fuel used to gear up = 850 pounds.
Internal fuel used = 454 pounds.

CALCULATED:

External fuel transferred to #1 tanks after gear up (850 − 454) = 396 pounds.
External fuel depleted by the time climb speed is reached (1070 − 454) = 616 pounds.
Total internal fuel remaining at climb speed (9841 − 454) = 9387 pounds.
Total external fuel remaining at climb speed (4654 − 616) = 4038 pounds.

A plot of gross weight versus distance will be constructed to show graphically how the different phases fit together to establish a mission radius. Figure 11-1 depicts the initial fuel consumption of 1070 pounds. See figure 11-2 for an over-all picture of the mission.

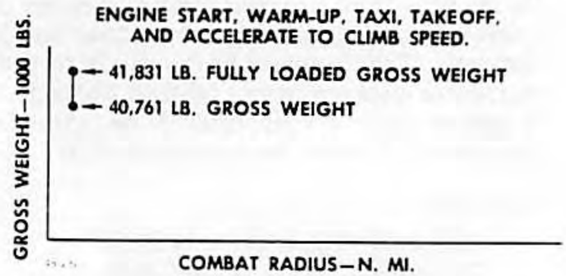


Figure 11-1

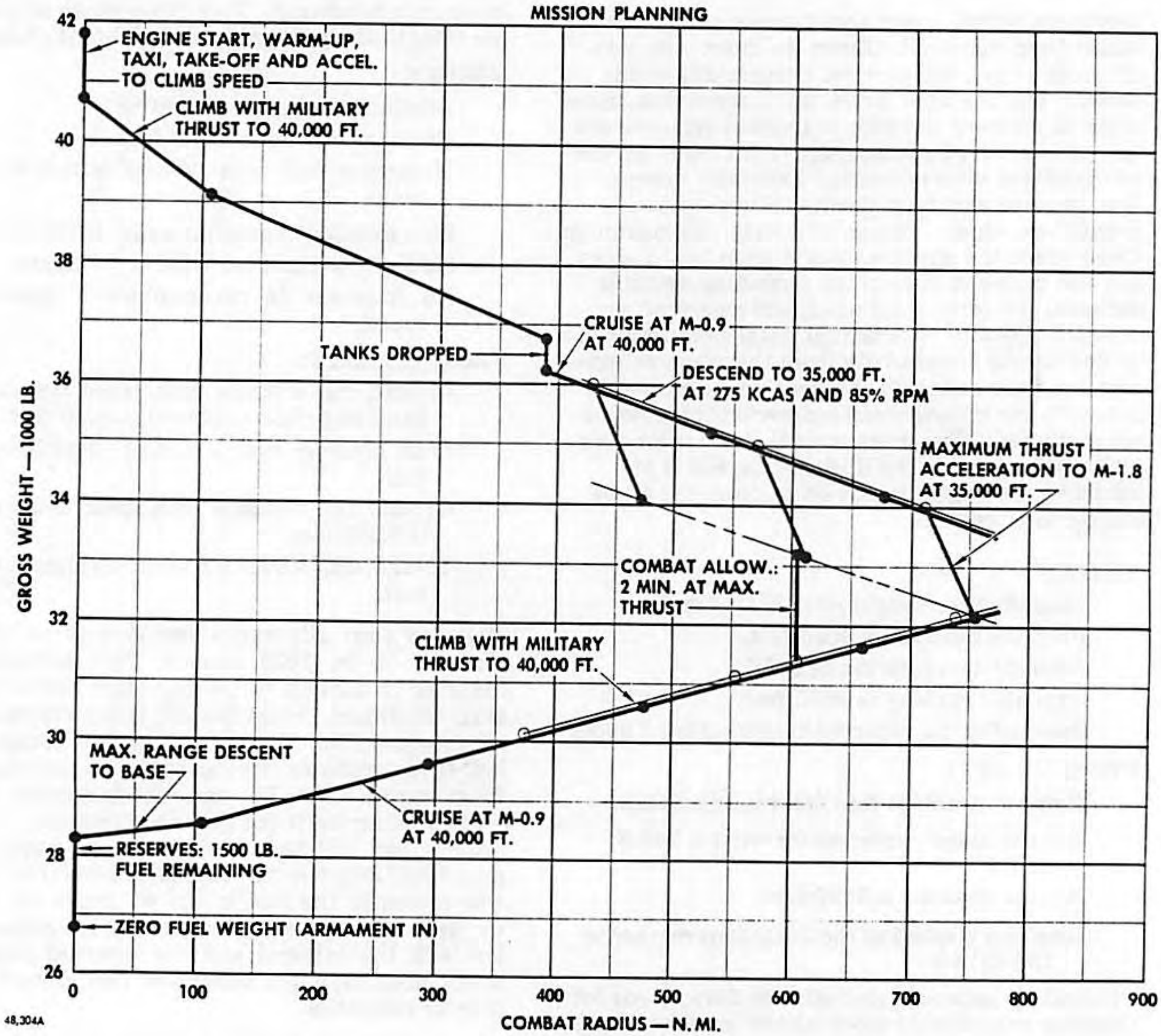


Figure 11-2

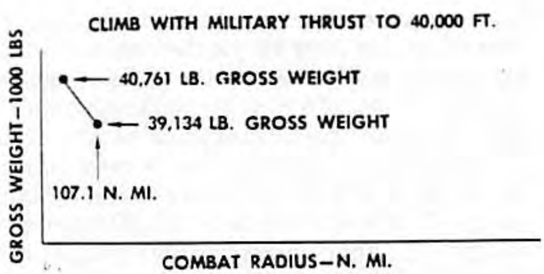


Figure 11-3

Climb

The data for a military thrust climb with two 230-gallon external fuel tanks is presented on figure 3-7. Enter this chart with initial gross weight and pressure altitude. Parallel the nearest climb guide line until an intersection of the final altitude is accomplished. From this intersection, proceed vertically down and read gross weight upon reaching altitude. Fuel used is obtained by subtracting the final weight from the initial weight. Next, proceed to the left and read final time and distance to climb. Also, proceed horizontally to the left from the initial altitude and read initial time and distance. To obtain the actual time and distance in climb, subtract the initial values from the final values. See figure 11-3 for climb plots.

KNOWN:

Initial pressure altitude is 3000 feet.
Initial gross weight is 40,761 pounds.
Final altitude is 40,000 feet.

FROM CHART:

Final gross weight is 39,134 pounds.
Fuel used is 40,761 − 39,134 = 1627 pounds.
Initial distance is 7.2 nautical miles.
Final distance is 114.3 nautical miles.
Distance covered is 114.3 − 7.2 = 107.1 nautical miles.
Initial time is 1.4 minutes.
Final time is 13.8 minutes.
Time elapsed is 13.8 − 1.4 = 12.4 minutes.

Outbound Cruise

At this stage of mission planning the length of the cruise phase is not known. The recommended procedure is to construct a cruise line which will terminate at approximately 50% of fuel used. The outbound cruise must be divided into two phases. The first phase ends when the tanks are dropped, the second phase begins with the clean configuration and continues to approximately 50% of fuel used. A simple form (figure 11-4) can be used to retain the essential information.

Outbound Cruise With External Tanks

Data known: altitude 40,000 feet, configuration two 360-gallon external tanks, cruise Mach 0.9, headwind 40 knots. The data for a 40,000-foot cruise with external tanks is found on figure 4-40.

The initial gross weight is 39,134 pounds. The initial fuel used is 2243 pounds. The external tank capacity is 4654 pounds, so the assumed total fuel used in this segment of cruise will be 2411 pounds (4654 pounds − 2243 pounds). Subtracting the 2411 pounds from the initial gross weight leaves 36,723 pounds gross weight at the end of the first phase. This is an average gross weight of 37,928 pounds. Enter the chart with the cruise Mach (0.9) and move vertically up until an intersection with the average gross weight during cruise is reached. Interpolate and read EPR (2.55). Move horizontally to the left and read nautical miles per 1000 pounds (128). Return to Mach number (0.9) and read vertically down to obtain TAS and CAS (516 knots and 277 knots). Calculate GS (476 knots) by subtracting the headwind from TAS. Calculate fuel flow (4030 pounds per hour) by dividing TAS by nautical miles per 1000 pounds and multiplying the result by 1000. Then calculate time (.598 hours) by dividing fuel used in the phase by fuel flow. Finally, calculate the phase distance (284.6 nautical miles) by multiplying GS by time. By adding this phase distance (284.6 nautical miles) to the initial distance (107.1 nautical miles), a total of 391.7 nautical miles is reached. At 391.7 nautical miles the tanks are dropped. The weight of the tanks (514 pounds) is subtracted from the final gross weight of the last segment (36,723 pounds). See figure 11-4 for the plotting of this phase.

Outbound Cruise, Clean Configuration

The initial gross weight for the remaining phase of cruise is then 36,209 pounds. The initial fuel used to this point is 5108 pounds. From this point (36,209 pounds gross weight and 391.7 nautical miles) on the mission planning chart, a 40,000-foot cruise line can be constructed. Assume 1000-pound increments of fuel is used to cruise an unknown distance. The gross weight at this new point will then be 35,209 pounds, or an average gross weight of 35,709 pounds. Enter the chart, figure 4-39, with the cruise Mach (0.9) and move vertically up until an intersection with the average gross weight during cruise is reached. Proceed to extract the essential information from the chart,as was done when calculating 40,000-foot cruise, with tanks. A change in EPR (2.37) and fuel flow (3380) will be noted. The essential information derived from the chart will be that the airplane has traveled 140.9 nautical miles during this phase; a

TABULAR CRUISE REFERENCE CHART

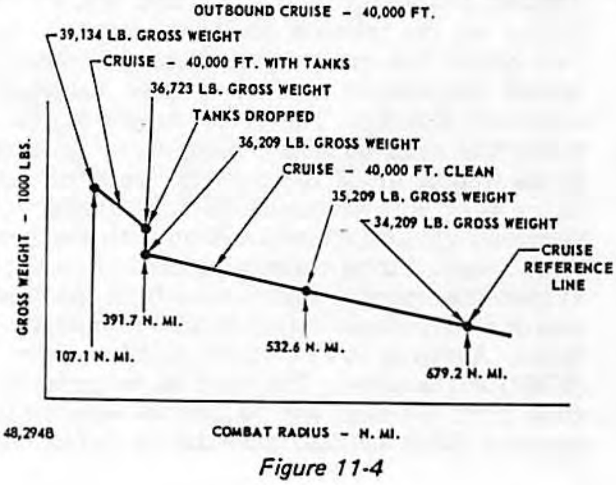
ALTITUDE: 40,000 FT.

CONFIGURATION: TWO 360-GALLON EXTERNAL TANKS UNTIL EMPTY THEN CLEAN

WIND: 40 KT. HEADWIND • SPEED: 0.9 MACH

ITEM	1ST PHASE			TANKS DROPPED (514 LB)	2ND PHASE			3RD PHASE		
	INITIAL	PHASE	FINAL		INITIAL	PHASE	FINAL	INITIAL	PHASE	FINAL
(1) GROSS WEIGHT (KNOWN)	39,134	37,928	36,723		36,209	35,709	35,209	35,209	34,709	34,209
(2) EXTERNAL FUEL USED (ASSUMED)	2243	2411	4654		4654	0	4654	4654	0	4654
(3) INTERNAL FUEL USED (ASSUMED)	454	0	454		454	1000	1454	1454	1000	2454
(4) EPR (FROM CHART)		2.55				2.37			2.31	
(5) CAS (FROM CHART)		277				277			277	
(6) N. MI/ 1000 LB (FROM CHART)		128				152			159	
(7) TAS (FROM CHART)		516				516			516	
(8) FUEL FLOW (7) ÷ (6) × 1000		4030				3380			3245	
(9) GS (7) ± WIND		476				476			476	
(10) TIME (2) ÷ (8)		.598				.296			.308	
(11) DISTANCE (9) × (10)	107.1	284.6	391.7		391.7	140.9	532.6	532.6	146.6	679.2

OUTBOUND CRUISE – 40,000 FT.



48,294B

Figure 11-4

total distance traveled of 532.6 nautical miles. A new point can now be plotted on the mission planning chart, at 35,209 pounds gross weight and 532.6 nautical miles. To plot an accurate cruise reference line, one more point should be plotted. Assume another 1000 pounds of fuel is used and calculate, as before, a new point on the mission planning chart. This point will be at 34,209 pounds gross weight (35,209 pounds — 1000 pounds) and at a distance of 679.2 nautical miles. The cruise reference line can now be completed. See figure 11-4.

Descent

The descent data for 275 KCAS and 85% rpm is shown on figure 7-1. Enter this chart with initial and final altitudes. Read initial and final times, distances and fuels used. Calculate time, distance and fuel used by subtracting the final values from the initial values. See figure 11-5.

KNOWN:

- Descent speed is 275 KCAS.
- Thrust setting is 85% rpm.
- Initial altitude is 40,000 feet.
- Final altitude is 35,000 feet.

FROM CHART:

- Initial fuel is 529 pounds.
- Final fuel is 495 pounds.
- Fuel used is 529 − 495 = 34 pounds.
- Initial distance is 63 nautical miles.
- Final distance is 55 nautical miles.
- Distance covered is 63 − 55 = 8 nautical miles.
- Initial time is 10.45 minutes.
- Final time is 9.45 minutes.
- Time elapsed is 10.45 − 9.45 = 1 minute.

These values can be used at any gross weight because gross weight has a negligible effect on descent performance.

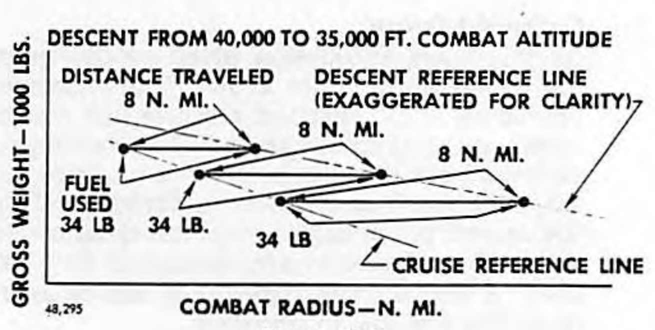


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Figure 11-5

ASSUMED

ITEM	UNITS			
1. INITIAL GROSS WEIGHT	LB	36,000	35,000	34,000

KNOWN

ITEM	UNITS			
2. INITIAL MACH NUMBER		0.81	0.81	0.81
3. FINAL MACH NUMBER		1.8	1.8	1.8

FROM CHART

ITEM	UNITS			
4. FINAL GROSS WEIGHT	LB.	34,070	33,160	32,230
5. FUEL USED (4—1)	LB.	1930	1840	1770
6. INITIAL DISTANCE	N. MI.	0.0	0.0	0.0
7. FINAL DISTANCE	N. MI.	44.0	41.8	40.0
8. DISTANCE COVERED (7—6)	N. MI.	44.0	41.8	40.0
9. INITIAL TIME	MIN.	0.0	0.0	0.0
10. FINAL TIME	MIN.	3.35	3.18	3.07
11. TIME ELAPSED (10—9)	MIN.	3.35	3.18	3.07

MAXIMUM THRUST ACCELERATION TO M-1.8 AT 35,000 FT.

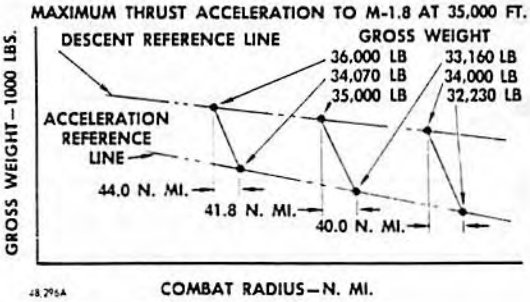

Figure 11-6

Acceleration

Acceleration data for 35,000 feet is found on figure 9-1. Enter this chart with initial gross weight and initial Mach number. Parallel the nearest gross weight guide line to the final Mach number. Read initial and final time and distance corresponding to initial and final Mach numbers on the left side of the chart. Read down for final gross weight. To find the actual time and distance, subtract the initial conditions from the final conditions. To find the fuel used during acceleration, subtract the final gross weight from the initial gross weight. The initial weight is not known at this stage of mission planning. It is recommended that a parameter of initial gross weight be used. It might be noted at this point that any phase of flight could be handled in exactly the same manner as this acceleration. See figure 11-6. It would now be convenient for

FUEL RESERVES

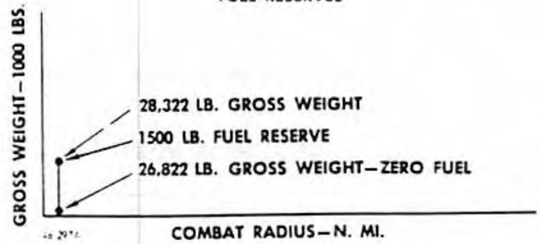

Figure 11-7

mission planning purposes to compute the descent to base, return cruise and climb phases of the mission.

Reserves

Prior to adding the descent to base phase to the mission plot, the reserves are added. In some instances these reserves may be calculated from (1) a performance chart (figure 5-1); (2) a certain percentage of initial fuel; (3) a given amount of time at a certain thrust setting and altitude, or, (4) a certain amount of fuel remaining as required from an operational standpoint. In this example the latter case is chosen, namely a flat 1500 pounds of fuel remaining. See figure 11-7.

Descend To Base

The data for a 250 KCAS maximum range descent at idle thrust is found on figure 6-3. Enter this chart with initial and final pressure altitudes. Read initial and final times, distances and fuel used. Calculate time, distance, and fuel used by subtracting the final values from the initial values. See figure 11-8.

KNOWN:

Initial altitude is 40,000 feet.

Final altitude is 3000 feet.

FROM CHART:

Initial fuel is 397 pounds.

Final fuel is 27 pounds.

Fuel used is 397 − 27 = 370 pounds.

Initial distance is 112 nautical miles.

Final distance is 6 nautical miles.

Distance covered is 112 − 6 = 106 nautical miles.

Initial time is 19.2 minutes.

Final time is 1.4 minutes.

Time elapsed is 19.2 − 1.4 = 17.8 minutes.

RETURN CRUISE

As was the case with outbound cruise, the return cruise distance is unknown at this stage of mission

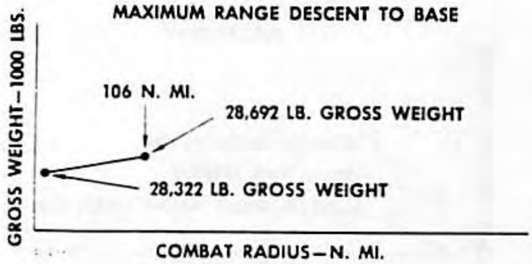

Figure 11-8

planning. The recommended procedure is to construct a cruise phase to terminate at approximately 40% of the fuel remaining. A simple form (figure 11-9) can be used to retain the essential information. Data known: altitude 40,000 feet, configuration clean, cruise Mach 0.9, tailwind 10 knots. Data for a 40,000-foot cruise in the clean configuration is found on figure 4-39. The gross weight prior to descent is 28,692 pounds at a distance of 106 nautical miles. Assume 1000 pounds of fuel is needed to cruise an unknown distance. The gross weight at this new point on the mission planning chart will then be 29,692 pounds, or an average gross weight of 29,192 pounds. Enter the chart, figure 4-39, with the cruise Mach (0.9) and proceed to extract the essential information from the chart as was done when calculating the outbound cruise. Note the EPR (2.14) and the fuel flow (2790). The essential information derived from the chart will be that the airplane has traveled a distance of 188.3 nautical miles during this phase and is now 294.3 nautical miles out. A new point can now be plotted on the mission planning chart at 29,692 pounds gross weight and 294.3 nautical miles. To plot an accurate return cruise reference line, plot two more points. Assume another 1000 pounds of fuel is needed and calculate, as before, a new point on the mission planning chart. This point will be at 30,692 pounds gross weight and 478.9 nautical miles out. Assume another 1000 pounds of fuel is needed and plot another point. This point will be at 31,692 pounds gross weight and 659.8 nautical miles out. The return cruise reference line can now be completed. See figure 11-9.

Return Climb

At this stage of mission planning the initial or final conditions of the return climb are unknown. It is therefore recommended that a parameter of final gross weight upon reaching cruise altitude be assumed. The data for this climb can be found on figure 3-3. Enter this chart with final altitude and gross weight. Parallel the nearest climb guide line to initial altitude. At this intersection proceed horizontally to the left and read initial time and distance. Also, from this intersection, read vertically

TABULAR CRUISE REFERENCE CHART

CONFIGURATION: CLEAN

ALTITUDE: 40,000 FT. • WIND: 10 KT. HEADWIND • SPEED: 0.9 MACH

ITEM	1ST PHASE			2ND PHASE			3RD PHASE		
	INITIAL	PHASE	FINAL	INITIAL	PHASE	FINAL	INITIAL	PHASE	FINAL
GROSS WEIGHT (KNOWN)	28,692	29,192	29,692	29,692	30,192	30,692	30,692	31,192	31,692
FUEL USED (ASSUMED)	1870	1000	2870	2870	1000	3870	3870	1000	4870
EPR (FROM CHART)		2.14			2.17			2.19	
CAS (FROM CHART)		277			277			277	
N. MI./ 1000 LB (FROM CHART)		185			181			177	
TAS (FROM CHART)		516			516			516	
FUEL FLOW (6) + (5) × 1000		2790			2850			2910	
GS (6) ± (WIND)		526			526			526	
TIME (2) + (7)		.358			.351			.344	
DISTANCE (8) × (9)	106	188.3	294.3	294.3	184.6	478.9	478.9	180.9	659.8

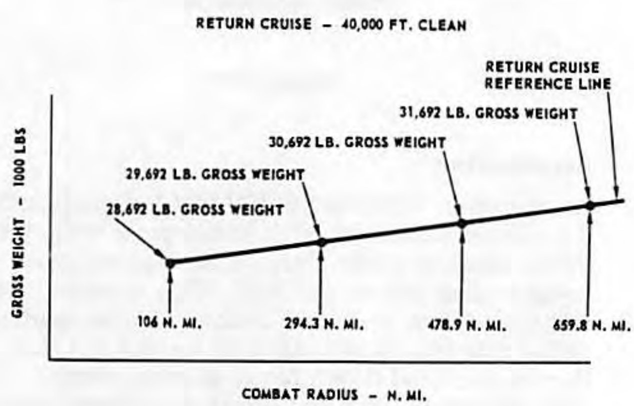

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Figure 11-9

ASSUMED

ITEM	UNITS			
1. FINAL GROSS WEIGHT	LB	32,000	31,000	30,000

KNOWN

ITEM	UNITS			
2. FINAL ALTITUDE	FT	40,000	40,000	40,000
3. INITIAL ALTITUDE	FT	35,000	35,000	35,000

FROM CHART

ITEM	UNITS			
4. INITIAL GROSS WEIGHT	LB	32,156	31,145	30,135
5. FUEL USED (4—1)	LB	156	145	135
6. FINAL DISTANCE	N. MI.	66.4	63.2	60.2
7. INITIAL DISTANCE	N. MI.	50.5	48.5	46.6
8. DISTANCE COVERED (6—7)	N. MI.	15.9	14.7	13.6
9. FINAL TIME	MIN.	8.17	7.79	7.45
10. INITIAL TIME	MIN.	6.36	6.11	5.89
11. TIME ELAPSED (9—10)	MIN.	1.81	1.68	1.56

RETURN CLIMB FROM 35,000 FT. TO 40,000 FT.

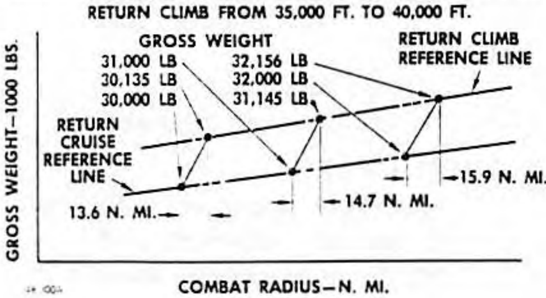


Figure 11-10

down to obtain initial weight. The final time and distance values are obtained similarly to the initial time and distance. To obtain time and distance, subtract the initial conditions from the final conditions. To obtain the fuel used, subtract the final gross weight from the initial gross weight. See figure 11-10.

Combat

At this stage of mission planning, it is possible to calculate an alternate mission. One could calculate, (A) the maximum radius for any given combat time (primary example shown); (B) the available combat time for any combat radius, or, (C) the fuel available for additional reserves or any other operational use at a given radius and combat time. The primary and alternate missions will be discussed after the explanation is given for combat fuel allowance. Fuel allowance for com-

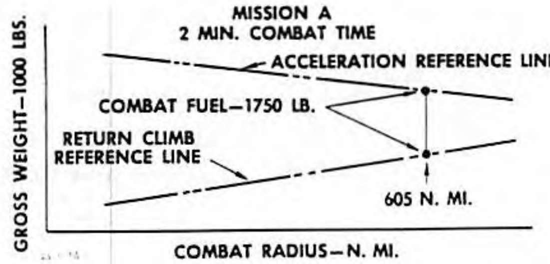


Figure 11-11

bat can be obtained from figure 5-9. Enter this chart with combat time and altitude. Interpolate between the constant fuel lines for fuel used.

KNOWN:

Combat altitude is 35,000 feet.

Combat thrust setting is maximum.

Combat time is two minutes.

FROM CHART:

Combat fuel is 1750 pounds.

The resulting maximum combat radius is 605 nautical miles. See figure 11-11.

Consider alternate mission "B" (available combat time for a given radius) for a radius of 250 nautical miles. See figure 11-12.

KNOWN:

Combat radius is 4500 nautical miles.

Combat altitude is 35,000 feet.

Combat fuel is 4900 pounds (from Mission Planning Chart, figure 11-2).

FROM CHART:

Combat fuel flow is 890 lb./min.

Combat time available will have to be calculated from the fuel flow since chart does not go as high as the fuel available for combat.

$$\text{Combat time (minutes)} = \frac{\text{Combat fuel}}{\text{Fuel Flow}} =$$

$$\frac{3600}{890} = 4.0 \text{ minutes}$$

Consider alternate mission "C" (additional reserves for a given combat time and radius) for a combat radius of 450 nautical miles and a combat time of two minutes. See figure 11-13).

KNOWN:

Combat radius is 450 nautical miles.

Combat time is two minutes.

Fuel remaining at 450 nautical miles is 3600 pounds.

Figure 11-12

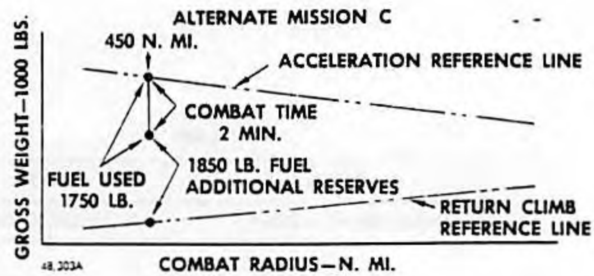


Figure 11-13

CALCULATED:

Additional reserves = Fuel remaining − Combat fuel = 3600 − 1750 = 1850 pounds.

See figure 11-2 for the completed mission planning chart.

Total Mission And Cruise Phase Time

If it is necessary to know total mission or cruise phase time, one could calculate them after the cruise distances are known.

Cruise phase times can be calculated from the familiar relationship:

Cruise Time (minutes)

$$= \frac{\text{Cruise Distance (n.mi.)}}{\text{GS (knots)}} \times 60.$$

Total mission time can be calculated by summing the individual phases of the mission in this example:

Phase	Phase Time (min.)	Total Time (min.)
Engine start, warm-up, taxi, takeoff and accelerate to climb speed	3.0	3.0
Climb to 40,000 feet	12.4	15.4
Cruise outbound $\frac{448 \times 60}{476} =$	56.5	71.9
Descend to combat altitude	1.0	72.9
Accelerate to combat Mach number	3.18	76.08
Combat at 35,000 feet	2.0	78.08
Return climb to 40,000 feet	1.7	79.78
Return cruise $\frac{484 \times 60}{526} =$	55.2	135.0
Descend to base & total mission time	17.8	152.8

Landing

Landing speed and distances at the termination of the mission are obtained from figures 7-1 and 8-3. Figure 2-10 is also used to obtain the headwind component of the wind and to check whether the recommended touchdown speed needs to be increased due to crosswind. Consider the crosswind chart first. Enter this chart with wind and wind angle. Read the headwind component on the left of the chart and the crosswind component at the bottom of the chart. Determine touchdown speed requirements by noting the area of the chart in which the crosswind component falls. Compute the touchdown speed using the method prescribed for the color coding of the chart.

KNOWN:

Wind is 32 knots.
Wind angle from the nose is 36°.

FROM CHART:

Headwind component is 26 knots.
Crosswind component is 19 knots.
Minimum touchdown speed is 164 KCAS.

The recommended landing approach, prior to flare, and touchdown speeds are found from the table on the landing distance charts as a function of fuel remaining.

KNOWN:

1500 pounds of fuel remaining.

FROM CHART:

Approach speed is 180 KCAS.
Prior to flare speed is 167 KCAS.
Touchdown speed is 148 KCAS.

These values will be valid only if the recommended touchdown speed is not increased due to a high crosswind. Since the touchdown speed has to be increased for the example shown the approach and prior to flare speeds shown are not valid. Enter the landing distance charts with ambient temperature and pressure altitude. Then proceed horizontally to the right until an intersection with the proper fuel remaining curve is accomplished. Next move vertically down to the braking condition base line (fair) and parallel the nearest guide line to the reported braking condition. Then continue down to the zero wind line and then parallel the nearest guide line until one-half of the reported headwind is intersected. Now move vertically down until the zero increase in recommended touchdown speed line is intersected. Next, parallel the nearest guide line until an intersection with the proper increase in recommended touchdown speed is accomplished.

KNOWN:

Ambient temperature is 30°F.

Pressure altitude is 3000 feet.

Fuel remaining is 1500 pounds.

Braking conditions are "good" (RCR = 23).

Half of the headwind is 13 knots.

Increase in recommended touchdown speed is 164 − 148 = 16 knots.

FROM CHARTS:

Ground roll with speed brakes open and drag chute deployed is 3700 feet.

Ground roll with speed brakes open is 4700 feet.

Total distance with speed brakes open and drag chute deployed is 5130 feet.

Total distance with speed brakes open is 6130 feet.

AIR REFUELING MISSION PLANNING

Many of the elements involved in planning a mission with air refueling are the same as utilized in planning a mission without air refueling. For this reason, reference is made to the previous section on mission planning for a discussion of basic concepts and a detailed coverage of procedures followed in planning takeoff, climb, cruise, descent, accelerate to combat speed, combat, and landing. The basic purpose of this section is to show how mission planning may be expanded to include air refueling using the data presented in Section VI.

NOTE

The following sample problem is an exercise in the use of performance charts. It is not intended to reflect actual or proposed missions employing this airplane.

Sample Problem

Objective: To plan and plot a mission involving air refueling using the airplane gross weight as a function of distance flown.

Configuration: F-106A airplane with two 360-gallon external wing tanks (retained when empty), 215-knot tires installed.

Fuel loading: 9841 pounds or 1514 gallons internal, 4654 pounds or 716 gallons external.

Fully loaded gross weight: 41,831 pounds.

Zero fuel weight (armament in and external tanks retained): 27,336 pounds.

Supplemental Data

1. Local weather at takeoff: 59°F ambient temperature, sea level pressure altitude, 20-knot wind from 010°.
2. Takeoff runway: 0°, 8500 feet, good braking conditions exist (RCR = 23).
3. Enroute weather outbound: Standard atmospheric conditions with zero wind at cruise altitude.
4. Enroute weather inbound: Standard atmospheric conditions with zero wind at cruise altitude.
5. Local weather at landing: 59°F ambient temperature, sea level pressure altitude, 35 knot wind from 031°.
6. Landing runway: 0°, 8500 feet, fair braking conditions (RCR = 15).

Mission Assumptions

1. Engine start, warm-up, taxi, maximum thrust takeoff and acceleration to climb speed.
2. Military thrust climb to 35,000 feet.
3. Outbound cruise at 35,000 feet to a distance 300 nautical miles from the point of takeoff.
4. Loiter for 1 hour and 45 minutes at 35,000 feet at Mach 0.8 (no distance credit).
5. Descend to refueling altitude of 30,000 feet at Mach 0.8 and 85% engine rpm (no distance credit).
6. Refuel to full capacity at Mach 0.8 (304 KCAS) and 30,000 feet from a KC-135A tanker weighing 200,000 pounds. The fuel transfer rate is 2,000 pounds per minute (no distance credit).
7. Loiter at 30,000 feet and Mach 0.74 for 30 minutes (no distance credit).
8. Maximum thrust climb to 35,000 feet.
9. Accelerate with maximum thrust to attack mach number of 1.8 at 35,000 feet.
10. Afterburner cruise toward target at 35,000 feet and Mach 1.8.
11. Combat allowance: Two minutes with maximum thrust at 35,000 feet. Retain armament.
12. Military thrust climb to 40,000 feet.
13. Inbound cruise at 40,000 feet and Mach 0.9.
14. Descend at maximum range descent speed (250 KCAS) and idle thrust to base.
15. Land with 1500 pounds of fuel remaining.

Takeoff

Obtain the takeoff speed from figure 2-3.

KNOWN:

Ambient temperature is 59°F (or 15°C).

Pressure altitude is sea level.

Fuel remaining is maximum fuel with two 360-gallon external tanks.

FROM CHART:

Takeoff speed is 184 KCAS.

Next, enter takeoff and landing crosswind chart, figure 2-10, to determine headwind and crosswind components of the wind velocity; also, to find whether an increase in takeoff speed is required.

KNOWN:

Wind velocity is 20 knots.

Wind direction is 10° off the nose.

FROM CHART:

The headwind component is 19.7 knots.

The crosswind component is 3.5 knots.

No increase in nosewheel liftoff speed is required (crosswind component falls in the green area of the chart) hence the takeoff speed of 184 KCAS is valid.

Check to see if the tire limit speed shown in Section V, figure 5-3, T.O. 1F-106A-1, is exceeded.

KNOWN:

Ambient temperature is 59°F.

Pressure altitude is sea level.

Takeoff speed is 184 KCAS.

FROM CHART:

Tire limit speed would not be exceeded unless there was a tailwind greater than 30 knots.

Takeoff distance can now be obtained from figure 2-3.

KNOWN:

Ambient temperature is 59°F.

Pressure altitude is sea level.

Maximum fuel aboard with two 360-gallon external tanks.

Half of the reported headwind is 9.8 knots.

FROM CHART:

Takeoff ground roll is 3700 feet.

Total takeoff distance over a 50-foot obstacle is 5500 feet.

Maximum refusal speed and distance can be obtained from figure 2-1.

KNOWN:

Takeoff gross weight is 41,831 pounds.

Pressure altitude is sea level.

Ambient temperature is 59°F.

Available runway is 8500 feet.

One-half of the reported headwind is 9.8 knots.

FROM CHART:

Refusal speed for zero wind is 156 KCAS.

Refusal speed corrected for wind is 165.8 KCAS.

Refusal distance is 3200 feet.

Line check speed at the 3000-foot marker is 162 KCAS.

The landing, approach, and prior to flare speeds for a landing immediately after takeoff are obtained from the table given in figure 8-1.

KNOWN:

Fuel remaining is maximum fuel with two 360-gallon tanks.

FROM CHART:

Approach speed is 208 KCAS.

Prior to flare speed is 193 KCAS.

Touchdown speed is 173 KCAS.

Landing distances for a landing immediately after takeoff are obtained from figures 8-1 and 8-3.

KNOWN:

Ambient temperature is 59°F.

Pressure altitude is sea level.

Maximum fuel with two 360-gallon external tanks.

Good braking conditions exist, RCR = 23.

Half of the reported headwind is 9.8 knots.

No increase in recommended touchdown speed.

FROM CHARTS:

Ground roll distance with speed brakes open and drag chute deployed is 5500 feet.

Total distance over a 50-foot obstacle is 6930 feet.

Ground roll distance with speed brakes open is 6500 feet.

Total distance over a 50-foot obstacle is 7930 feet.

Takeoff fuel allowance for this mission was assumed to be the same as used in the sample problem for mission planning without air refueling, 1070 pounds. This allowance is assumed to account for engine start and warmup, taxi, maximum thrust

MISSION PLANNING WITH AIR REFUELING

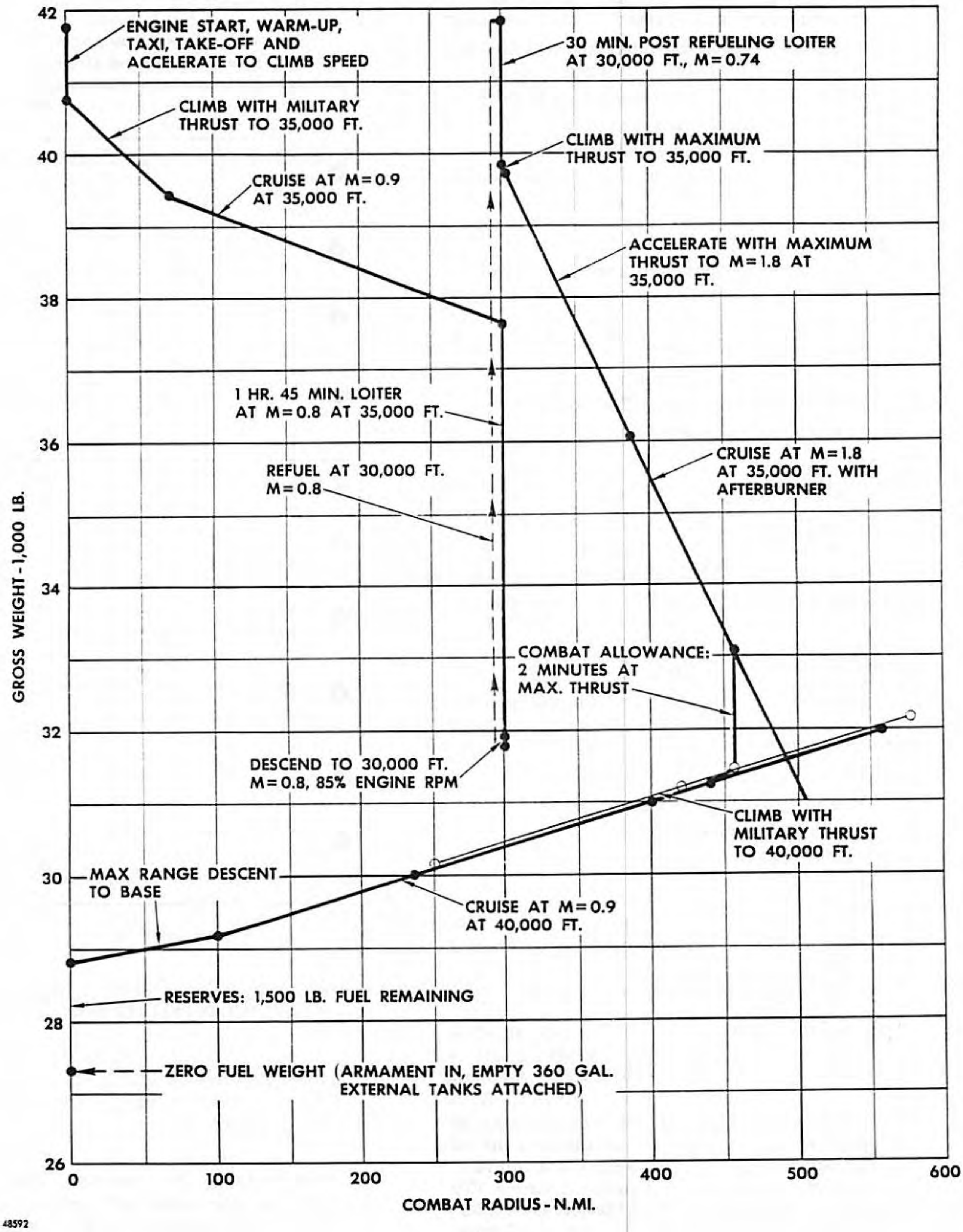


Figure 11-14

takeoff, and acceleration to climb speed. As before, no distance is assumed made good and three minutes are assumed to have elapsed from engine start.

A plot of gross weight versus distance will not be constructed (see completed plot, figure 11-14).

The takeoff segment is constructed as follows:

Distance is 0 nautical miles.
Initial gross weight is 41,831 pounds.
Fuel used (takeoff allowance) is 1070 pounds.
Final gross weight is 40,761 pounds.

Climb To Cruise Altitude

The data for military thrust climb with two 360-gallon external fuel tanks is presented in figure 3-7.

KNOWN:

Initial pressure altitude is sea level.
Initial gross weight is 40,761 pounds.
Final altitude is 35,000 feet.

FROM CHART:

Final gross weight is 39,410 pounds.
Fuel used is 40,761 − 39,410 = 1351 pounds.
Initial distance is 4.2 nautical miles.
Final distance is 75.2 nautical miles.
Distance covered is 75.2 − 4.2 = 71.0 nautical miles.
Initial time is 0.9 minutes.
Final time is 9.3 minutes.
Time elapsed is 9.3 − 0.9 = 8.4 minutes.

Outbound Cruise

KNOWN:

Cruise altitude is 35,000 feet.
Cruise mach number is 0.9.
Standard atmosphere.
Zero wind.

Cruise distance is 229 nautical miles (300 nautical miles minus distance covered in climb, 71 nautical miles).

Initial gross weight is 39,410 pounds.

The same procedure followed in the sample problem for mission planning without refueling may be used to compute the outbound cruise segment. Using the cruise data for 35,000 ft. given in figure 4-38, the values are recorded and computations are made as shown in figure 11-15. By plotting the calculated distances against gross weight it is found that the gross weight upon reaching a distance 300 nautical miles from the point of takeoff is 37,656 pounds (see figure 11-14). The following information is obtained:

TABULAR CRUISE REFERENCE CHART
(OUTBOUND CRUISE)
CONFIGURATION: TWO 360-GALLON EXTERNAL TANKS
ALTITUDE: 35,000 FEET • ZERO WIND • SPEED: MACH 0.9

ITEM	1ST PHASE			2ND PHASE		
	INITIAL	PHASE	FINAL	INITIAL	PHASE	FINAL
(1) GROSS WEIGHT (KNOWN)	39410	39910	38410	38410	38910	37410
(2) FUEL USED (ASSUMED)	2421	1000	3421	3421	1000	4421
(3) EPR (FROM CHART)		2.29			2.26	
(4) CAS (FROM CHART)		310			310	
(5) N. MI/1000 LB (FROM CHART)		127			130	
(6) TAS (FROM CHART)		519			519	
(7) FUEL FLOW (6) ÷ (5) × 1000		4090			3990	
(8) GS (6) ± WIND		519			519	
(9) TIME (2) ÷ (7)		.245			.251	
(10) DISTANCE (8) × (9)	71	127	198	198	130	328

48,562

Figure 11-15

Fuel used is 1754 pounds (initial cruise gross weight minus final cruise gross weight).

Cruise distance is 229 nautical miles (300 nautical miles minus 71 nautical miles covered in climb).

Cruise time is 26.5 minutes (distance, 229 nautical miles divided by ground speed, 519 knots, and multiplied by 60 to obtain time in minutes).

Pre-Refueling Loiter

The mission plan includes a pre-refueling loiter of one hour and forty five minutes at a distance 300 nautical miles from the point of takeoff. Endurance data is obtained from figure 4-38.

KNOWN:

- Initial gross weight is 37,626 pounds.
- Loiter altitude is 35,000 feet.
- Loiter speed is Mach 0.8.
- Standard atmosphere.
- No distance made good.

A computational procedure similar to that used for the cruise segment is used to determine loiter time, see figure 11-16. The only difference is that ground speed and distance are omitted from the calculation since distance from the point of takeoff remains constant at 300 nautical miles. Also, increments in fuel used have been increased to 2000 pounds to reduce the number of phases in the computation.

After determining the tabular data as presented in figure 11-16, the next step is to construct a plot of loiter time versus gross weight as shown in the bottom portion of the same figure. Enter the horizontal scale at the desired loiter time and proceed vertically until the loiter time versus gross weight line is intersected, then proceed horizontally to the left to read the gross weight at the end of loiter. For a loiter time of 1.75 hours, the gross weight at end of loiter is found to be 31,720 pounds. The following information is then obtained:

- Fuel used for loiter = 5906 pounds (initial loiter weight minus final loiter weight).
- Fuel used from engine start = 10,111 pounds (takeoff weight minus final loiter weight).
- Fuel remaining at end of loiter = 4384 pounds (total fuel minus fuel used, 14,495 pounds − 10,111 pounds).

Descent to Refueling Altitude

Descent data (recommended descent) for the configuration with external tanks is given in figure 7-3.

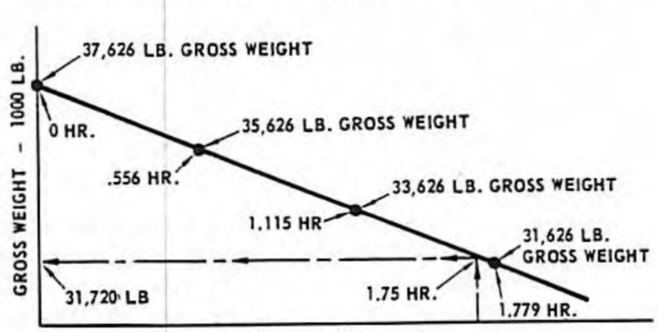
KNOWN:

- Initial gross weight is 31,720 pounds.
- Initial altitude is 35,000 feet.
- Final altitude is 30,000 feet.
- Descent speed is 290 KCAS (average for Mach 0.8).
- Thrust setting is 85% rpm.
- No credit for distance covered.

TABULAR ENDURANCE REFERENCE CHART
(PRE-REFUELING LOITER)
CONFIGURATION: TWO 360-GALLON EXTERNAL TANKS
ALTITUDE: 35,000 FEET ZERO WIND SPEED: MACH 0.8

ITEM	1ST PHASE			2ND PHASE			3RD PHASE		
	INITIAL	PHASE	FINAL	INITIAL	PHASE	FINAL	INITIAL	PHASE	FINAL
1 GROSS WEIGHT (KNOWN)	37626	36626	35626	35626	34626	33626	33626	32626	31626
2 FUEL USED (ASSUMED)	4195	2000	6195	6195	2000	8195	8195	2000	10195
3 EPR (FROM CHART)		2.29			2.22			2.15	
4 CAS (FROM CHART)		272			272			272	
5 N. MI/1000 LB (FROM CHART)		128			137			145	
6 TAS (FROM CHART)		461			461			461	
7 FUEL FLOW (6) ÷ (5) × 1000		3600			3370			3180	
8 LOITER TIME (2) ÷ (7)	0	.556	.556	.556	.594	1.150	1.150	.629	1.779

LOITER TIME – 35,000 FT. WITH 360-GALLON EXTERNAL TANKS



48,585

Figure 11-16

FROM CHART:

Initial fuel is 393 pounds.

Final fuel is 353 pounds.

Fuel used is 393 − 353 = 40 pounds.

Initial time is 7.5 minutes.

Final time is 6.5 minutes.

Time elapsed is 7.5 − 6.5 = 1.0 minute.

The following information is developed:

Final gross weight is 31,680 pounds (initial weight minus fuel used).

Fuel used from engine start is 10,151 pounds (takeoff weight minus final weight).

Fuel remaining is 4344 pounds (total fuel minus fuel used).

Refueling

The first item to consider in planning the refueling operation is receiver/tanker formating speed—altitude capabilities as shown in figure 6-3.

KNOWN:

Post refueling gross weight of receiver is 41,831 pounds.

Gross weight of tanker is 200,000 pounds.

Refueling altitude is 30,000 feet.

Refueling speed is Mach 0.8 (304 KCAS).
Standard atmosphere.

Enter the chart at recommended mach number for refueling and proceed vertically until intersection is made with the receiver maximum altitude line corresponding to the post-refueling gross weight. Then proceed along maximum receiver altitude line to the right or to the left until intersection is made with tanker maximum speed line corresponding to the appropriate tanker gross weight.

FROM CHART:

Maximum receiver altitude at Mach 0.8 is 33,600 feet.

Maximum receiver/tanker formating speed and altitude is Mach 0.82 at 34,000 feet.

Maximum tanker speed at 30,000 feet is Mach 0.83.

From the above information, it is concluded that the complete refueling operation can be accomplished at the scheduled speed and altitude.

Time to refuel is found by dividing the net amount of fuel transferred by the net fuel transfer rate, where the net fuel transfer rate is the difference between the actual transfer rate and the receiver fuel flow during refueling. Receiver fuel flows are given in figure 6-5.

KNOWN:

Refueling altitude is 30,000 feet.

Refueling speed is 304 KCAS.

Initial receiver gross weight is 31,680 pounds.

Final receiver gross weight is 41,831 pounds.

Net amount of fuel to be transferred is 10,151 pounds.

Actual fuel transfer rate is 2000 pounds per minute.

Since the fuel transfer time is small, it would be permissible in this example to use an average between the initial and final fuel flow values for determining the net fuel transfer rate and the amount of fuel consumed by the receiver. The amount of error would be negligible. However, in instances where the transfer time is extended, it would be advisable to calculate the transfer time and fuel required using two or more weight segments as illustrated below. Thus, in addition to finding the receiver fuel consumption for the initial gross weight of 31,680 pounds and the final gross weight of 41,831 pounds, the fuel consumption is obtained for the mid-refueling gross weight, 36,755 pounds.

FROM CHART:

Receiver fuel consumption at initial gross weight is 67 pounds per minute.

Receiver fuel consumption at mid-refueling gross weight is 74.0 pounds per minute.

Receiver fuel consumption at final gross weight is 82.0 pounds per minute.

During the first computational phase, the receiver gross weight increases from 31,680 pounds to 36,755 pounds, an increase of 5075 pounds which corresponds to the net amount of fuel transferred. Since the actual transfer rate is 2000 pounds per minute and the fuel flow for the receiver at the start of refueling is 67 pounds per minute, the net transfer rate at the start of refueling is 2000 − 67 = 1933 pounds per minute. At the end of the phase the receiver fuel consumption is 74 pounds per minute and the net transfer rate is 1926 pounds per minute. Thus, the average receiver fuel consumption for the phase is 70.5 pounds per minute and the average net fuel transfer rate is 1929.5 pounds per minute. The time is found by dividing the net amount of fuel transferred by the average net transfer rate, 5075 ÷ 1929.5 = 2.63 minutes. The actual amount of fuel transferred from the tanker is 2000 × 2.63 = 5260 pounds and the amount consumed by the receiver is 70.5 × 2.63 = 185 pounds.

Utilizing the same procedure as above, the following values are obtained for the second phase of the computation:

Average receiver fuel consumption is 78 pounds per minute.

Average net transfer rate is 1922 pounds per minute.

Transfer time is 2.641 minutes.

Actual amount of fuel transferred from tanker is 5282 pounds.

Fuel consumed by the receiver is 206 pounds.

By summing the values from the two phases the following values are obtained for the total refueling operation:

Transfer time is 2.63 + 2.64 = 5.27 minutes.

Total fuel transferred from tanker is 5260 + 5282 = 10,542 pounds.

Fuel consumed by the receiver is 185 + 206 = 391 pounds.

The above computations may be performed and information retained in tabular form as shown in figure 11-17.

TABULAR REFUELING REFERENCE CHART

CONFIGURATION: TWO 360-GALLON EXTERNAL TANKS

ALTITUDE: 30,000 FEET • ZERO WIND • SPEED: MACH 0.8

ITEM	1ST PHASE			2ND PHASE		
	INITIAL	PHASE	FINAL	INITIAL	PHASE	FINAL
1 GROSS WEIGHT (KNOWN)	31680		36755	36755		41831
2 NET FUEL TRANSFERRED (ASSUMED)		5075			5076	
3 ACTUAL FUEL TRANSFER RATE (KNOWN)	2000	2000	2000	2000	2000	2000
4 RECEIVER FUEL FLOW (FROM CHART)	67	70.5	74	74	78	82
5 NET FUEL TRANSFER RATE (3) − (4)	1933	1929.5	1926	1926	1922.0	1918
6 TRANSFER TIME (2) ÷ (5)		2.630			2.641	
7 FUEL TRANSFERRED FROM TANKER (3) × (6)		5260			5282	
8 FUEL CONSUMED BY RECEIVER (4) × (6)		185			206	

48,586

Figure 11-17

Post-Refueling Loiter

Data for the 30-minute post refueling loiter is obtained from figure 4-36.

KNOWN:

Loiter altitude is 30,000 feet.

Loiter speed is Mach 0.74.

Initial gross weight is 41,831 pounds.

Standard atmosphere.

No distance made good.

The procedure used to determine the variation of loiter time with gross weight is given in figure 11-18. It may be noted that the steps followed parallel the pre-refueling computations given in figure 11-16.

After constructing the plot of loiter time versus gross weight as shown in the bottom portion of figure 11-18 determine the gross weight at end of loiter as follows: Enter the horizontal scale at the desired loiter time and proceed vertically until the loiter time versus gross weight line is intersected, then proceed horizontally to the left to read the gross weight at the end of loiter. The gross weight at the end of 30 minutes loiter is found to be 39,860 pounds.

Climb to Acceleration Altitude

The maximum thrust climb data for the configuration with two 360-gallon external tanks is given in figure 3-5.

KNOWN:

Initial pressure altitude is 30,000 feet.

Initial gross weight is 39,860 pounds.

Final altitude is 35,000 feet.

FROM CHART:

Final gross weight is 39,660 pounds.

Fuel used is 39,860 − 39,660 = 200 pounds.

Initial distance is 19.2 nautical miles.

Final distance is 23.3 nautical miles.

Distance covered is 23.3 − 19.2 = 4.1 nautical miles.

Initial time is 2.0 minutes.

Final time is 3.1 minutes.

Time elapsed is 3.1 − 2.0 = 1.1 minutes.

Since the climb was started at a point 300 nautical miles from the point of takeoff, the distance at the

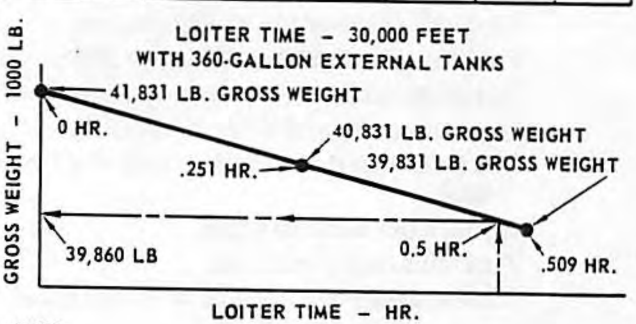
TABULAR ENDURANCE REFERENCE CHART

(POST-REFUELING LOITER)

CONFIGURATION: TWO 360-GALLON EXTERNAL TANKS

ALTITUDE: 35,000 FEET • ZERO WIND • SPEED: MACH 0.74

ITEM	1ST PHASE			2ND PHASE		
	INITIAL	PHASE	FINAL	INITIAL	PHASE	FINAL
1 GROSS WEIGHT (KNOWN)	41831	41331	40831	40831	40331	39831
2 FUEL USED (ASSUMED)	0	1000	1000	1000	1000	2000
3 EPR (FROM CHART)		2.21			2.18	
4 CAS (FROM CHART)		279			279	
5 N. MI/ 1000 LB (FROM CHART)		107			110	
6 TAS (FROM CHART)		427			427	
7 FUEL FLOW (6) ÷ (5) × 1000		3990			3880	
8 LOITER TIME (2) ÷ (7)	0	.251	.251	.251	.258	.509



48,587

Figure 11-18

end of climb to 35,000 feet is 300 + 4.1 = 304.1 nautical miles.

Acceleration

Maximum thrust acceleration data for the configuration with two 360-gallon external tanks at 35,000 feet with standard atmosphere is given in figure 9-19.

KNOWN:

Initial gross weight is 39,660.
Initial mach number is 0.92.
Final mach number is 1.80.

FROM CHART:

Final gross weight is 36,030.
Fuel used is 39,660 − 36,030 = 3630 pounds.
Initial distance is 0 nautical miles.
Final distance is 82.8 nautical miles.
Distance covered is 82.8 − 0 = 82.8 nautical miles.
Initial time is 0 minutes.
Final time is 6.1 minutes.
Time elapsed is 6.1 − 0 = 6.1 minutes.

The distance at the end of acceleration to Mach 1.8 is 304.1 + 82.8 = 386.9 nautical miles.

Afterburner Cruise

The final outbound segment prior to combat is a cruise with afterburner at 1.8 mach number. Nautical miles per pound data with two 360-gallon external tanks is given in figure 4-21.

KNOWN:

Cruise altitude is 35,000 feet.
Cruise mach number is 1.8.
Initial gross weight is 36,030 pounds.
Zero wind.

From the chart it is noted that the variation of nautical miles per 1000 pounds for 35,000 feet is extremely small. A value of 23.5 nautical miles per 1000 pounds may be considered valid for the complete range of weights possible for this phase of the mission. The true airspeed is 1038 knots.

Since the exact point for terminating the afterburner cruise cannot be determined until the combat and inbound segments of the mission have been established, the procedure is to extend the cruise line to a gross weight which corresponds to approximately 75% fuel used.

The calculation procedure for afterburner cruise, figure 11-19, is similar to that used for the non-afterburner cruise segment (figure 11-15). Since

TABULAR CRUISE REFERENCE CHART

(AFTERBURNER CRUISE)

CONFIGURATION: TWO 360-GALLON EXTERNAL TANKS

ALTITUDE: 35,000 FEET • ZERO WIND • SPEED: MACH 1.8

ITEM	INITIAL	PHASE	FINAL
1 GROSS WEIGHT (KNOWN)	36030		31030
2 FUEL USED (ASSUMED)	5801	5000	10801
3 N. MI/1000 LB (FROM CHART)		23.5	
4 TAS (FROM CHART)		1038	
5 FUEL FLOW (4) ÷ (3) × 1000		44170	
6 GS (5) ± WIND		1038	
7 TIME (2) ÷ (5)		.113	
8 DISTANCE (6) × (7)	386.9	117.3	504.2

48,588

Figure 11-19

nautical miles per 1000 pounds is considered constant for the entire gross weight range under consideration it will not be necessary to divide the computation into two phases as before. Further, the afterburner cruise portion of gross weight versus distance plot (figure 11-14) is constructed by drawing a straight line between the initial and final cruise points, 386.9 nautical miles at 36,030 pound pounds gross weight and 504.2 nautical miles at 31,030 pounds gross weight.

It is now convenient for mission planning purposes to compute the descent to base, return cruise, and climb phases of the mission.

Reserves

The reserve fuel is the same as used for the sample problem presented in the section on mission planning without refueling — 1500 pounds.

Final gross weight is 27,336 pounds.

Initial gross weight is 28,836 pounds.

Descent to Base

The data for a 250 KCAS maximum range descent at idle thrust for the configuration with two 360-gallon external tanks appears in figure 7-4.

KNOWN:

Initial altitude is 40,000 feet.

Final altitude is sea level.

Final gross weight is 28,836 pounds.

FROM CHART:

Initial fuel is 354 pounds.

Final fuel is 0 pounds.

Fuel used is 354 − 0 = 354 pounds.

Initial distance is 101 nautical miles.

Final distance is 0 nautical miles.

Distance covered is 101 − 0 = 101 nautical miles.

Initial time is 17.3 minutes.

Final time is 0 minutes.

Time elapsed is 17.3 − 0 = 17.3.

Thus, the gross weight at start of descent is 28,836 + 354 = 29,190 pounds and the distance is 101 nautical miles.

Return Cruise

As in the case of afterburner cruise, the exact point for terminating the cruise line cannot be determined until other segments of the mission have been established. The recommended procedure is to construct the line for a weight range which extends from the final cruise weight to a weight corresponding to approximately 30% fuel remaining. (See figure 11-14.) The cruise data is given in figure 4-40.

KNOWN:

Cruise altitude is 40,000 feet.

Cruise mach number is 0.9.

Standard atmosphere.

Zero wind.

Final gross weight is 29,190 pounds.

Computations for the variation of cruise distance with gross weight are given in figure 11-20. It may be noted that the procedure is the same as used for the outboard cruise in figure 11-15.

TABULAR CRUISE REFERENCE CHART
(RETURN CRUISE)
CONFIGURATION: TWO 360-GALLON EXTERNAL TANKS
ALTITUDE: 40,000 FEET • ZERO WIND • SPEED: MACH 0.9

ITEM	1ST PHASE			2ND PHASE			3RD PHASE		
	INITIAL	PHASE	FINAL	INITIAL	PHASE	FINAL	INITIAL	PHASE	FINAL
1 GROSS WEIGHT (KNOWN)	29190	29690	30190	30190	30690	31190	31190	31690	32190
2 FUEL USED (ASSUMED)	1854	1000	1954	1954	1000	2954	2954	1000	3954
3 EPR (FROM CHART)		2.26			2.28			2.31	
4 CAS (FROM CHART)		277			277			277	
5 N. MI/1000 LB (FROM CHART)		167			163			159	
6 TAS (FROM CHART)		516			516			516	
7 FUEL FLOW (6) ÷ (5) × 1000		3090			3165			3245	
8 GS (6) ± WIND		516			516			516	
9 TIME (2) ÷ (7)		.324			.316			.308	
10 DISTANCE (8) × (9)	101	167	268	268	163	431	431	159	590

48,589

Figure 11-20

Return Climb

The procedure followed in determining time, distance, and fuel for the climb from combat altitude to return cruise altitude is the same as given for the sample problem in the section on mission planning without air refueling. Several values of gross weight at the end of climb are assumed and the climb chart given on figure 3-7 is used to obtain the essential climb information. The data thus obtained is shown in figure 11-14.

The return distance after reaching 40,000 feet at a given gross weight may be obtained from the distance versus gross weight line determined in the foregoing return cruise computations. Values for assumed gross weights of 32,000 pounds, 31,000 pounds and 30,000 pounds are found to be 560 nautical miles, 400 nautical miles, and 236 miles respectively. By adding to these distances the corresponding climb distance from figure 11-21 data are available for establishing a line on the gross weight versus distance plot which represents the initial climb conditions at 35,000 feet. The resulting values are shown in figure 11-22.

ASSUMED

ITEM	UNITS			
1. FINAL GROSS WEIGHT	LB	32,000	31,000	30,000

KNOWN

ITEM	UNITS			
2. FINAL ALTITUDE	FT	40,000	40,000	40,000
3. INITIAL ALTITUDE	FT	35,000	35,000	35,000

FROM CHART

ITEM	UNITS			
4. INITIAL GROSS WEIGHT	LB	32,180	31,170	30,160
5. FUEL USED (4 – 1)	LB	180	170	160
6. FINAL DISTANCE	N. MI.	74.6	70.8	67.4
7. INITIAL DISTANCE	N. MI.	56.0	53.7	51.5
8. DISTANCE COVERED (6 – 7)	N. MI.	18.6	17.1	15.9
9. FINAL TIME	MIN.	9.1	8.7	8.3
10. INITIAL TIME	MIN.	7.0	6.7	6.5
11. TIME ELAPSED (9 – 10)	MIN.	2.1	2.0	1.8

RETURN CLIMB FROM 35,000 FT. TO 40,000 FT.

48,590

Figure 11-21

RETURN CLIMB DISTANCE SUMMARY

ITEM	UNITS			
1. GROSS WEIGHT AT 40,000 FT.	LB	32,000	31,000	30,000
2. RETURN DISTANCE UPON REACHING 40,000 FEET (FIG. 11-14)	N. MI.	560	400	236
3. DISTANCE COVERED IN CLIMB, 35,000 FT TO 40,000 FT (FIG. 11-21)	N. MI.	18.6	17.1	15.9
4. RETURN DISTANCE AT START OF CLIMB FROM 35,000 FT (2 3)	N. MI.	578.6	417.1	251.9
5. GROSS WEIGHT AT 35,000 FT (FIG. 11-21)	LB	32,180	31,170	30,160

48,591

Figure 11-22

Combat

The combat allowance data for the configuration with two 360-gallon external tanks is given in figure 5-10.

KNOWN:

Combat altitude is 35,000 feet.

Combat thrust setting is maximum.

Combat time is two minutes.

FROM CHART:

Combat fuel is 1700 pounds.

It is now possible to complete the mission planning chart by finding the distance at which the gross weight difference between the Mach 1.8 cruise line and the return climb line is equal to the combat allowance of 1700 pounds. The distance which satisfies this condition is found to be 455 nautical miles. The gross weight at the start of combat is 33,130 pounds and at the end of combat, 31,430 pounds (armament retained).

NOTE

Refer to the section on mission planning without refueling for a discussion of alternate combat allowances.

Total Mission and Cruise Phase Time

After the cruise distances are known it is possible to compute time elapsed by the following relationship:

$$\text{Cruise Time (minutes)} = \frac{\text{Cruise distance (N. mi)}}{\text{GS (Knots)}} \times 60$$

Total mission time is found by summing the time increments of the various mission phases.

Phase	Phase Time (Min.)	Total Time (Min.)
Engine start, warm-up taxi, takeoff and accelerate to climb speed	3.0	3.0
Climb to 35,000 feet	8.4	11.4
Outbound cruise to 300 N.mi. from base	26.5	37.9
Pre-refueling loiter	105.0	142.9
Descend to refueling altitude	1.0	143.9
Refuel at 30,000 feet	5.3	149.2
Post refueling loiter	30.0	179.2
Climb to acceleration altitude	1.1	180.3
Accelerate to Mach 1.8 at 35,000 feet	6.1	186.4
Afterburner cruise at Mach 1.8 $\frac{68 \times 60}{1038} =$	3.9	190.3
Combat at 35,000 feet	2.0	192.3
Return climb to 40,000 feet	2.0	194.3
Return cruise $\frac{337 \times 60}{516} =$	39.2	233.5
Descend to base	17.3	250.8

Landing

Landing speed and distance at the termination of the mission are obtained from figures 8-1 and 8-3. Figure 2-10 is also used to obtain the headwind component of the wind and to check whether the recommended touchdown speed needs to be increased due to crosswind. Consider the crosswind first.

KNOWN:

The wind velocity is 35 knots.

The wind direction is 31° off the nose.

FROM CHART:

The headwind component is 30 knots.

The crosswind component is 18 knots.

Minimum touchdown speed is 163 KCAS.

The recommended approach, prior to flare, and touchdown speeds are found in the table on the landing distance charts as a function of fuel remaining.

KNOWN:

1500 pounds of fuel remaining.

FROM CHART:

Approach speed is 180 KCAS.

Prior to flare speed is 167 KCAS.

Touchdown speed is 148 KCAS.

These values will be valid only if the recommended touchdown speed is not increased due to crosswind conditions. Since the touchdown speed has to be increased, the approach and prior to flare speeds shown above are not valid for the example under consideration. Corrections for the effects of increased landing speed on landing distance are included in the use of the charts.

KNOWN:

Ambient temperature is 59°F.

Pressure altitude is sea level.

Fuel remaining is 1500 pounds.

Braking conditions are "fair" (RCR = 15).

Half of the reported headwind is 15 knots.

Increase in recommended touchdown speed is 163 − 148 = 15 knots.

FROM CHARTS:

Ground roll with speed brakes open and drag chute deployed is 4020 feet.

Ground roll with speed brakes open is 5020 feet.

Total distance with speed brakes open and drag chute deployed is 5450 feet.

Total distance with speed brakes open is 6450 feet.

Alphabetical Index

*The Symbol * Indicates An Illustration*

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