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AN 01-40AVA-1A

Supplement

to

AN 01-40AVA-1

Flight Handbook

NAVY MODEL

A4D-1, A4D-2

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Incorporated in This Revision on Pages Indicated

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FOREWORD

The function of this supplement to the Model A4D-1 Flight Handbook is to incorporate all material classified as Confidential in a separate binding. This will enable all such material to be safeguarded as required by security regulations and will also allow a major portion of the handbook to become declassified.

TABLE OF CONTENTS

SECTION IV
DESCRIPTION AND OPERATION OF AUXILIARY EQUIPMENT

	Page
AERO 18B Armament Control System	1
XASM-N-7 (Bullpup) Guided Missile	2A

SECTION V
OPERATING LIMITATIONS

Introduction	3
Engine Limitations	3
Airspeed Limitations	6
Dive Angle Limitations	6
Maneuvers	6A
Acceleration Limitations	6A
Weight Limitations	6A
Stores	6A
Arresting Decelerations	6B

SECTION VI
FLIGHT CHARACTERISTICS

Introduction	7
General Flight Characteristics	7
Stalls	7
Spins	8
Flight Controls	8
Level Flight Characteristics	9
Maneuvering Flight	9
Diving	12
Flight With External Stores	14

APPENDIX I
OPERATING CHARTS

Introduction	15
Airspeed Corrections	16
Take-off Charts	16
Climb Charts	18
Engine Operating Data	18
Flight Operation Instruction Charts	18
Specific Range Charts	20
Long Range Prediction Charts	21
Maximum Range—Variable Altitude Charts	21
Endurance Charts	22
Descent Charts	23
Landing Chart	24

ILLUSTRATIONS

SECTION IV

Figure *Page*

4-7 LABS Control Panel 1

SECTION V

5-1 Instrument Markings 4
5-2 Operating Flight Strength 5
5-3 External Stores 6

SECTION VI

6-1 Stall Chart 7
6-1A Available Maneuverability 8A
6-2 Stick Forces 8B
6-3 Dive Recovery 10
6-4 Angle of Attack Relationship 13

APPENDIX I

All Configurations

A-1 Aircraft Drag Configurations 25
A-2 Airspeed Correction for Position Error 26
A-3 Mach Number Correction for Position Error 28
A-4 Deleted
A-4A Airspeed vs. Mach Number 31
A-5 Density Altitude Chart 32
A-6 Standard Altitude Table 33
A-7 Take-off Distance 34
A-8 Stopping Distance 36
A-9 Climb Speed vs Altitude 37
A-10 Climb Distance vs Gross Weight 38
A-11 Climb Time vs Gross Weight 39
A-12 Climb Fuel vs Gross Weight 40
A-13 Combat Allowance Chart 41
A-14 Maximum Continuous Power Summary 42

Clean Configuration

A-15 Flight Operation Instruction Charts 45
A-16 Specific Range 48
A-17 Long Range Prediction — Distance 58
A-18 Long Range Prediction — Time 59
A-19 Maximum Range — Variable Altitude 60
A-20 Endurance Prediction 61
A-21 Endurance — Level Flight 62

Basic Attack Configuration

A-22 Flight Operation Instruction Charts 65
A-23 Specific Range 72
A-24 Long Range Prediction — Distance 82
A-25 Long Range Prediction — Time 83
A-26 Maximum Range — Variable Altitude 84
A-27 Endurance Prediction 85
A-28 Endurance — Level Flight 86

SECTION IV

DESCRIPTION AND OPERATION OF AUXILIARY EQUIPMENT

AERO 18B ARMAMENT CONTROL SYSTEM

Later aircraft[1] are equipped with the Aero 18B Armament Control System. The Aero 18B system, hereafter referred to as LABS, provides automatic low altitude bomb release capabilities. Located in the cockpit are several components of the LABS equipment which are of immediate concern to the pilot. A roll-pitch indicator and an interval timer are located on the instrument panel; a LABS indicator light is mounted under the glare shield to the left of the gun sight; a LABS control panel is installed on the left console when the system is to be used. In addition, the function selector switch on the armament panel has a "LABS" position which controls the flow of power to the LABS system.

ROLL-PITCH INDICATOR. The roll-pitch indicator (figure 1–4, sheet 2) is a two-needle instrument which provides yaw-roll, pitch, and acceleration information. Before pull-up, the vertical needle indicates roll through a scale of 9 degrees to the right or left of center, and the horizontal needle indicates pitch through a scale of plus or minus 90 degrees. During pull-up, the vertical needle indicates yaw and roll and the horizontal needle is used to indicate any deviation from the g force setting which has been preset into the LABS system accelerometer. The horizontal needle deflects upward (HI "G") if the g force setting is being exceeded, downward (LO "G") if the g force setting is not being attained.

INTERVAL TIMER. The interval timer (figure 1–4, sheet 2) schedules the time lapse between the identification point and the pull-up point. The timer dial, which can be set either before take-off or while airborne, is indexed in increments of 0.4 second. Between each dial index mark, however, there is a detent which divides in half the time interval between the marks. The timing cycle, therefore, can be set in increments of 0.2 second. To set the timer, the knob should be pulled out and then turned to the desired setting.

CAUTION

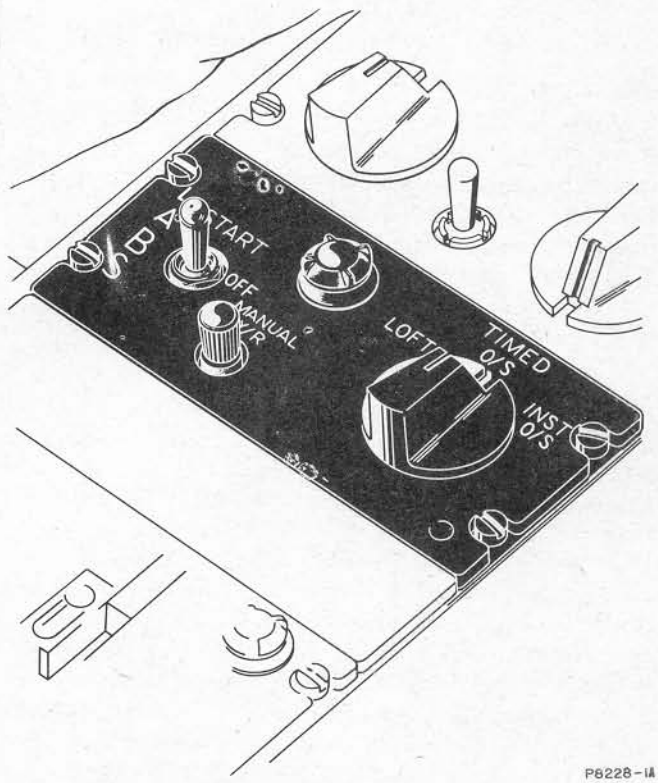
Do not set the timer while the bomb release switch is depressed, as this will cause permanent damage to the timer.

LABS INDICATOR LIGHT. A square red indicator light labeled LABS (figure 1–4, sheet 2) installed under the glare shield to the left of the gun sight, signals the pull-up and release points. The LABS light is first illuminated when the LABS start switch is turned to "START." The light remains on until the bomb release switch is depressed. During the ensuing timing period, the light is out. At the pull-up point the light again is illuminated and remains so until the release point is reached.

Note

The LABS light operates during the INST O/S operation but should be disregarded, since the function of the timer is bypassed.

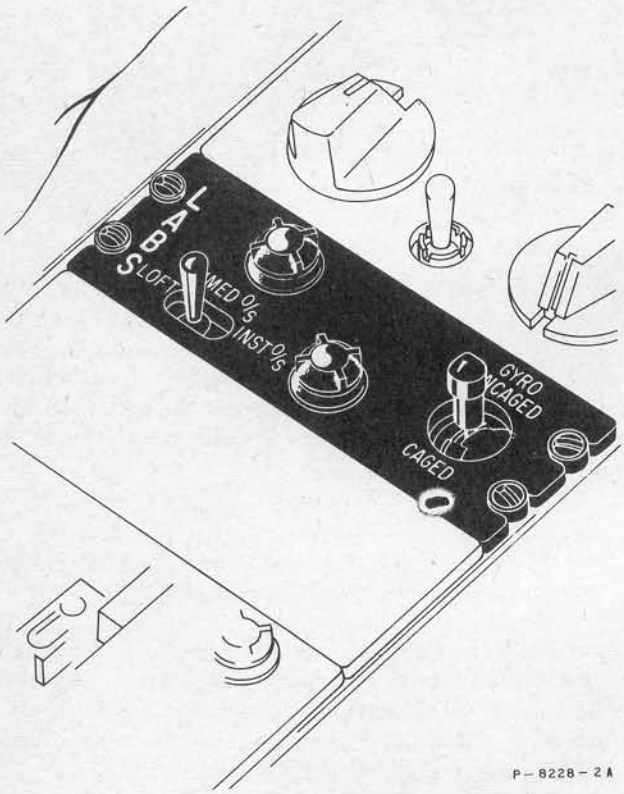
LABS AURAL TONE. In addition to the LABS light an aural tone signal has been incorporated into the LABS system. When the bomb release switch is depressed and during the ensuing timing period that the LABS light is extinguished, the LABS aural tone may be



A4D-1 Airplanes BuNo. 137823 through 137831, 139919 through 139970, 142142 through 142235

Figure 4-7. LABS Control Panel (Sheet 1)

[1] A4D-1 airplanes BuNo. 137823 through 137831, 139919 through 139970, 142142 through 142235, and A4D-2 airplanes.



A4D-2 Airplanes
Figure 4-7. LABS Control Panel (Sheet 2)

heard in the headset as a low hum. At the pull-up point the LABS light will illuminate, and the LABS aural tone will change to a distinct 1200-cycle tone. The LABS light will remain on, and the aural tone will be heard until the release point is reached, or until the bomb switch is released. A tone unit, located in the relay box, provides the tone signal and may be adjusted for volume by the ground crew.

LABS CONTROL PANEL. On earlier versions[3] of the LABS system, the panel (figure 4–7, sheet 1) incorporates three control switches. The toggle switch on the left has two positions, "OFF" and "START." When this switch is placed in the "START" position the LABS indicator light is illuminated and the LABS system vertical gyro is uncaged, as evidenced by the attitude information which is then presented on the roll-pitch indicator. The middle switch on the LABS panel is a push button labeled MANUAL Y/R[1] whose function is to uncage a yaw-roll gyro when yaw-roll and acceleration information is desired before reaching the pull-up point. When this button is held depressed at any time during the timing period before the pull-up point is reached, the roll-pitch indicator will present yaw-roll information on the vertical needle and an acceleration indication on the horizontal needle. A rotary selector switch on the right side of the panel has three positions labeled, respectively, "LOFT," "TIMED O/S," and "INST O/S." This switch is positioned as determined by the requirements of the tactical situation.

Later LABS panels[2] (figure 4–7, sheet 2), require only two switches. The selector toggle switch at left has three positions, "LOFT," "TIMED O/S" and "INST O/S"; it does the same job as does the rotary selector switch on the earlier versions. The right hand switch has two positions, "GYRO UNCAGED" and "CAGED." This lever-lock switch, which locks in the "GYRO UNCAGED" position, serves as an on-off control for the LABS system vertical gyro.

OPERATION OF THE LABS SYSTEM.

a. MASTER ARMAMENT switch. "ON"

b. Function SELECT switch..... "LABS"

Note

The function SELECT switch should be turned to "LABS" at least four to five minutes before beginning the bombing run.

c. CENTER STATION selector switch ..... "READY"

d. Set the interval timer as briefed.

CAUTION

Do not adjust the timer when the bomb release switch is depressed since this will cause permanent damage to the timer.

e. Turn the three-position selector switch on the LABS panel to the position corresponding to the tactical maneuver being performed.

f. LABS start switch[3]..... "START"

or

LABS gyro cage switch[2]... "GYRO UNCAGED"

Note

The LABS vertical gyro should be uncaged before reaching the identification point as established by operating policy.

g. When the aircraft passes the identification point in the maneuver, depress the bomb release switch. It

[1] A4D-1 airplanes BuNo. 137823 through 137831, 139919 through 139938.
[2] A4D-2 airplanes only.
[3] A4D-1 airplanes BuNo. 137823 through 137831, 139919 through 139970, 142142 through 142235.

must remain depressed until the release is made or the run aborted.

Note

A LABS tactical maneuver can be aborted any time before weapon drop by releasing the bomb release switch. If the run is aborted prior to completion of the timing cycle, releasing the bomb release switch recycles the timer and it is only necessary to depress the bomb release switch again when in a position to resume the maneuver. When the maneuver is aborted during the pull-up, it is necessary to turn the LABS start switch "OFF" for about twenty seconds and then to "START" again before beginning another maneuver.

XASM-N-7 (BULLPUP) GUIDED MISSILE WEAPON SYSTEM

Some aircraft[1] are equipped with the XASM-N-7 Guided Missile Weapon System, commonly referred to as "Bullpup." This system provides an air-to-surface missile having as its primary function the destruction of surface targets the importance, small size or disposition of which requires accurate weapons delivery. The missile is propelled by a solid-fuel rocket motor of short thrust duration. When the rocket fuel burns out the missile continues toward the target in a supersonic glide, following a line-of-sight trajectory from the parent airplane to the target. Deviations from the line-of-sight are observed by the pilot of the parent airplane who corrects the flight path of the missile by the use of a radio command link which operates control surfaces on the missile. Observance of the missile is aided by two tracking flares located in the aft end of the missile. A 250-pound warhead is carried in the center section of the missile.

In the pilot's cockpit are several components of the Bullpup system necessary for readying, arming, firing and directing the missile. The MSL transmitter control panel located just forward of the throttle on the left hand console has a three-position toggle switch labeled OFF-STDBY-ON for readying and supplying power to the missile's guidance system. As soon as airborne or catapult launched, and at least 2 minutes prior to firing, the switch is placed in the "STBY" position to warm up the aircraft's transmitter by 28 volt d-c current and the missile's receiver by 115 volt a-c current. Immediately before firing, the switch is placed in the "ON" position which connects the transmitter to the 3-phase of the a-c current.

WARNING

To preclude possible detection by the enemy, the missile transmitter control switch should only be placed in the "ON" position just immediately prior to firing.

[1] Airplanes BuNo. 142085, 142417, 142675, 142680 and 142685.

On the armament panel, located at the bottom of the instrument panel, are located the various switches for firing or jettisoning the missile. These switches are the MASTER ARMAMENT switch, the armament selector (SELECT) switch, the external stores (STATIONS) switches and the emergency jettison (EMER BOMB REL) switch. A novel control stick grip is provided containing a third thumb-button. When this knurled button is depressed and actuated toward one of eight quadrants (e.g.: "down and right") directional signals are transmitted from the parent plane to the missile's receiver and applied to the missile's controls. Experience from limited tests has shown that more accurate hits are obtained by aiming high and "flying the 'bird' down" with the aid of gravity force acting on the missile. At present, there is no information available as to the use of the gunsight with this missile.

NORMAL OPERATION

FIRING ARMED. To fire the missile armed, the following procedure is used:

a. Missile transmitter control (OFF-STBY-ON) switch as soon as airborne and for at least 2 minutes . . . "STBY"
b. Missile transmitter control switch immediately before firing . . . . . "ON"
c. External stores (STATIONS) selection switch for the desired missile . . . . . "READY"
d. Armament selector (SELECT) switch . . . . . "BOMBS"
e. MASTER ARMAMENT switch . . . "ON"
f. Bombs "B"-button . . . . . depress
g. Knurled missile guidance switch . . . actuate as necessary for guidance

The guidance system should be warmed up as soon as possible (i.e., when airborne) and at least 2 minutes prior to firing, by actuating the missile transmitter control switch to "STDBY." The external stores (STATIONS) selector switch for the desired missile at "READY" determines which missile will be fired. The armament selector (SELECT) switch at "BOMBS" arms the missile. The missile's locking pins of *all* the launchers are released when the MASTER ARMAMENT switch is "ON."

WARNING

The MASTER ARMAMENT switch should not be placed into the "ON" position until over enemy territory and until just immediately prior to firing.

(A spring-loaded detent with a force of about 2-G's holds the weight of the missile against deceleration forces, but is overcome by the force of the rocket motor when the missile is fired.)

FIRING UNARMED. The missile is fired from the aircraft when at high speeds by using the same procedure as FIRING ARMED, except for two operations: (1) the missile is fired *un*armed by placing the armament selector (SELECT) switch in the "ROCKET" position, rather than in the "BOMBS" position, and (2) the guns-rocket trigger is depressed rather than the Bombs-"B" button. While there is no guidance using this method, missiles may be fired into open ocean or vacant land areas utilizing the rocket motor.

EMERGENCY JETTISONING

At lower speeds and in a level attitude, the missile is jettisoned by actuating the guarded emergency bomb (EMER BOMB REL) release at the bottom of the instrument panel. This fires a jettisoning "squib" in the launcher which kicks the missile off the aft end of the track. At the present time, it is estimated that this method will not rid the missile from the launcher at high speeds (i.e., above 165 knots). Accordingly it is recommended that the FIRING UNARMED method be used to jettison, when sufficient time and speed are available.

WARNING

All switches must be in the "OFF" position or all missiles jettisoned before landing or joining up with other aircraft.

SECTION V

OPERATING LIMITATIONS

INTRODUCTION

This section contains all important limitations which shall be observed during normal operation of the aircraft. Limits pertaining to specialized phases of operation are covered in other sections of the handbook. Special attention should be given the instrument markings as shown in figure 5-1, as they are not necessarily repeated in the text. It is mandatory that the prescribed limitations be observed at all times, not only for the safety of the pilot but also in order to obtain the most satisfactory operation of the aircraft.

ENGINE LIMITATIONS

Restrictions to be observed in the operation of the engines are based upon the use of fuel as follows:

Approved Fuel		*Emergency Fuel*
Ashore	*Afloat*	
JP-4	JP-5	JET MIX 2:1
JP-3	JET MIX 3:1	AVGAS

MIL-F-5572 fuel, any grade, and jet mix (3:2) may be used in an emergency only, and after such use, a "hot section" inspection must be conducted in accordance with existing instructions.

If the engine rpm exceeds the listed acceleration limit, the engine should be stopped immediately if on the ground, or the aircraft landed as soon as possible if in the air, and the engine should be submitted for a hot section inspection. If the engine rpm exceeds approximately one needlewidth above "ACC" (108% rpm) the engine must be submitted to an overhaul facility. For ground operation and following take off after an acceleration within the normal limits, the exhaust temperature should return to "MIL" within 10 minutes. It may be required at altitudes of approximately 30,000 ft. and above, to retard the throttle to maintain E.G.T. within operating limits. This condition is acceptable providing rpm reduction required is approximately linear from 30,000 ft. to maximum operating altitude and does not exceed normal 96% rpm at maximum operating altitude. Operation at military power following an acceleration is permissible with an overtemperature of 1½ needlewidths above "MIL" for a period not to exceed five minutes.

CAUTION

In order to limit operating time in the region of highest compressor blade vibratory stresses (first three stages) avoid steady state "in-flight" and "ground" operation in the 60-82% RPM range except when required by operational necessity.

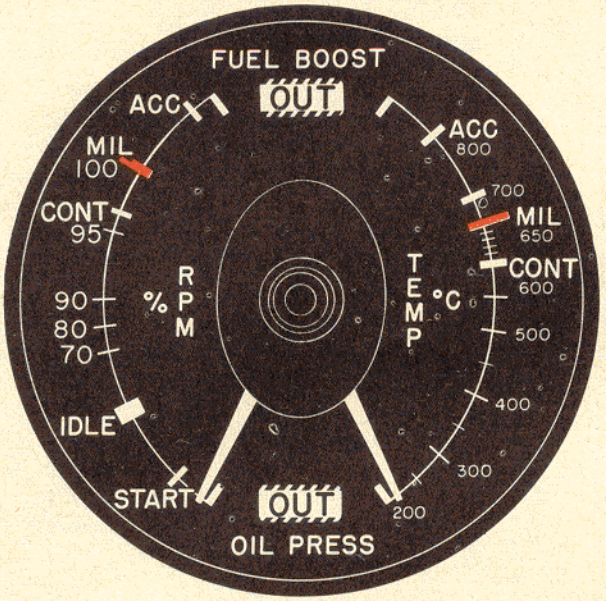
Note

Engines subsequent to serial 611495 or engines incorporating J65 Engine Bulletin 111 are not affected by this limitation.

RPM VARIATION. With a constant throttle setting of "MILITARY," the variation of engine speed over the entire "MIL" block is permissible.

OIL PRESSURE VARIATION. The majority of aircraft will show "NORM" oil pressure at "IDLE" rpm. If oil pressure reads "OUT" at "IDLE" rpm advance throttle to slightly above "IDLE"; if "NORM" oil pressure is not obtained at this higher rpm, shut down the engine and determine the reason for the lack of oil pressure.

OPERATING CONDITION	*RPM*	*TEMP*	*TIME LIMIT*	*OIL PRESS*	*FUEL BOOST*
Military	"MIL"	"MIL"	30 minutes	"NORM"	"NORM"
Normal	"CONT"	"CONT"	continuous	"	"
Acceleration	"ACC"	"ACC"	10 seconds	"	"
Acceleration	"MIL"	1 needlewidth above "MIL""	30 seconds	"	"
Idle	"IDLE"	"MIL"	continuous	"NORM"	"NORM"
Starting	"START"	"ACC"	10 seconds		



ENGINE PERFORMANCE INDICATOR		
RPM		
MAXIMUM STABILIZED (30 MINUTES)	"MIL"	▬
TEMP		
MAXIMUM STABILIZED (30 MINUTES)	"MIL"	▬
FUEL BOOST		
MAXIMUM ALLOWABLE	"NORM"	
OIL PRESS		
MAXIMUM ALLOWABLE	"NORM"	

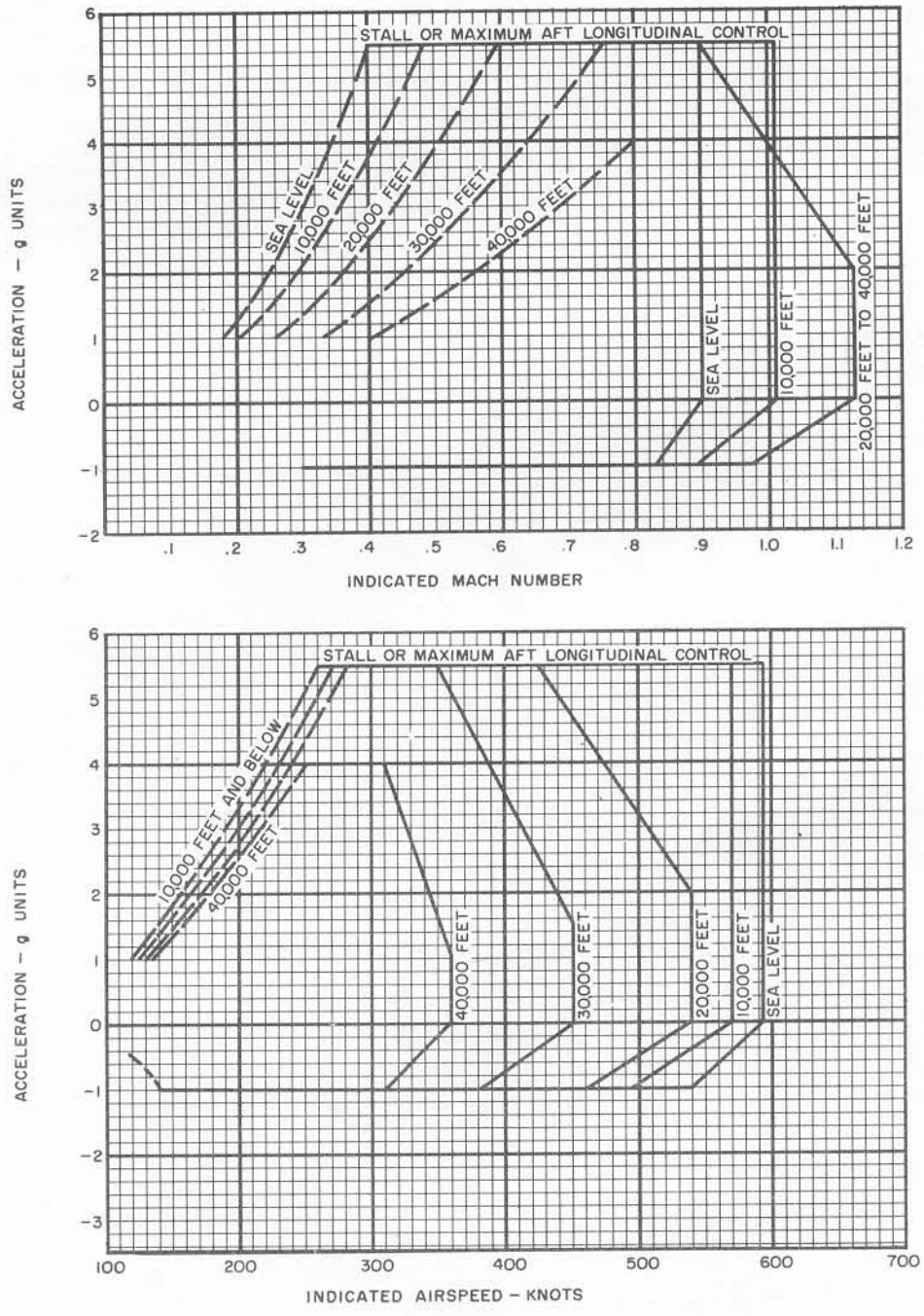
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Figure 5-1. Instrument Markings

OPERATING FLIGHT STRENGTH DIAGRAM

CLEAN CONFIGURATION

GROSS WEIGHT 12,500 POUNDS



DATA AS OF: 1 August 1956
DATA BASIS: Interim Revision No. 1

Figure 5-2. Operating Flight Strength Diagram

AIRSPEED LIMITATIONS

The maximum permissible indicated airspeeds for various airplane configurations are as follows:

a. In severe turbulence . . . . . 260-380 knots IAS is recommended

b. In smooth or moderately turbulent air

(1) With landing gear, flaps, and arresting hook retracted; canopy closed and speedbrakes retracted or extended (Airplanes equipped with lateral control accumulators) . . . . . As shown in figure 5-2

(Airplanes not equipped with lateral control accumulators) . . As shown in figure 5-2, except that the maximum is 0.90 Mach (indicated) below 25,000 feet, varying linearly from 0.90 to 0.96 Mach at 35,000 feet, and is 0.96 at all altitudes above 35,000 feet

(2) With emergency generator extended . . . . . 500 knots or 0.91 Mach, whichever is lower

(3) With landing gear, arresting hook and/or flaps extended . . . . . 225 knots IAS

DIVE ANGLE LIMITATIONS

The maximum permissible dive angles for various airplane configurations in combination with the maximum permissible indicated airspeeds set forth under AIRSPEED LIMITATIONS are as follows:

a. Airplanes equipped with lateral control accumulators:

(1) With speed brakes closed, varies linearly from 25 degrees at 2,000 feet to 45 degrees at 15,000 feet; 45 degrees at altitudes above 15,000 feet.

(2) With speed brakes open, varies linearly from 25 degrees at 2,000 feet to 55 degrees at 20,000 feet. Varies linearly from 55 degrees at 20,000 to 45 degrees at 45,000 feet, and remains 45 degrees at altitudes above 45,000 feet.

b. Airplanes not equipped with lateral control accumulators:

(1) With speed brakes closed, 25 degrees at all altitudes above 2,000 feet.

(2) With speed brakes open, varies linearly from 25 degrees at 2,000 feet to 40 degrees at 15,000 feet; 40 degrees at all altitudes above 15,000 feet.

For indicated airspeed less than 0.90 Mach number, refer to figure 6-3 for permissible dive angles.

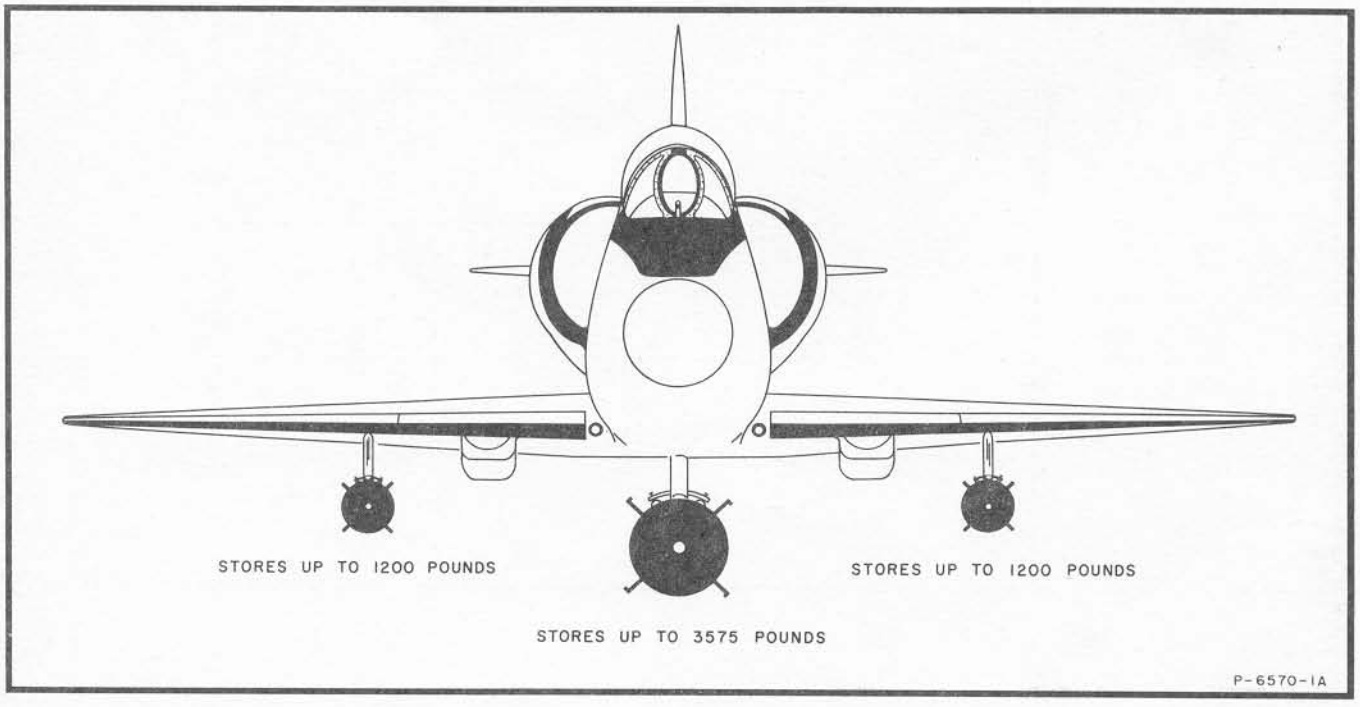


Figure 5-3. External Stores

MANEUVERS

The following maneuvers are permitted:

Inverted flight (not to exceed 10 seconds)

Loop

Aileron roll (not to exceed 360 degrees or a roll rate of 270 degrees/second)

Wing-over

Immelman turn

Chandelle

ACCELERATION LIMITATIONS

Except that moderate buffet shall not be exceeded, the maximum permissible accelerations for flight in smooth air at gross weights of 12,504 pounds or less are as shown in figure 5–2. When flying in conditions of moderate turbulence, it is essential that accelerations because of deliberate maneuvers be limited to 4.3g's at gross weights of 12,504 pounds or less in order to minimize the possibility of overstressing the aircraft as a result of the combined effects of gust and maneuvering loads. As gross weights are increased above 12,504 pounds, the permissible accelerations decrease. To determine the maximum permissible accelerations at gross weights in excess of 12,504 pounds, multiply the accelerations shown in figure 5–2 for smooth air, or that given above for moderate turbulence, by the ratio of 12,504 pounds to the new gross weight. The maximum permissible change in angle of bank during rolling pullouts is 120 degrees.

WEIGHT LIMITATIONS

The recommended maximum gross weights are as follows:

Field take-off	20,000 pounds
Field landing	16,000 pounds
Catapulting	20,000 pounds
Carrier landing	12,000 pounds

STORES

External stores of weights not greater than those indicated in figure 5–3 may be carried and released singly and in combination under the same restrictions on flight, catapulting and arresting, that apply without such stores, except as follows:

a. Two 150-gallon auxiliary external fuel tanks on wing pylons and one NAVPAC on the centerline rack may be carried and released singly and in combination to a maximum of 0.90 Mach or 500 knots, whichever is lower, to a maximum normal acceleration of 3.0g.

b. Two MK-83 bombs on wing pylons and one MK-84 bomb on the centerline pylon may be carried and released singly and in combination to a maximum of 0.90 Mach (indicated) or 500 knots (indicated airspeed), whichever is lower, and a maximum normal acceleration of 5.0 g to 10,000 feet. Carrying these stores at higher altitudes the normal acceleration is decreased 1.0 g for every 10,000 feet increase in elevation.

c. With or without two 150-gallon auxiliary external fuel tanks on wing pylons, one T-63, T-65, or T-66 store on the centerline pylon may be carried and released singly and in combination to a maximum indicated of 0.90 Mach or 500 knots, whichever is lower, and a maximum normal acceleration of 4.5 g.

d. Aero 6A (7-shot) rocket packages may be carried singly or in combination to the following limits:

(1) Accelerations up to 4.0 g at altitudes below 30,000 feet; 2.5 g at altitudes greater than 30,000 feet.

(2) Maximum indicated Mach number of 0.70 at sea level, varying linearly to 0.85 Mach at 10,000 feet. Maximum indicated Mach number of 0.85 at 10,000 feet varying linearly to 0.95 at 30,000 feet. Maximum indicated Mach number of 0.95 at altitudes greater than 30,000 feet.

(3) Deliberate slipping or skidding is prohibited.

e. Four MK-76 practice bombs installed on the Aero X3B bomb rack adapters suspended from both the centerline and wing stations may be carried and released to a maximum of 0.85 Mach or 500 knots IAS, whichever is lower, and a maximum normal acceleration of 4.5 g.

f. Three MK-81, MK-82, or a combination of low drag bombs, suspended on the ejector racks may be carried and released singly or in combination to a maximum indicated of 0.85 Mach or 500 knots IAS, whichever is lower, and a maximum normal acceleration of 4.5 g.

g. The fire bomb external store configuration or one Aero-14B spray tank installed on the centerline station may be carried and released to a maximum indicated Mach number of 0.90 or 550 knots, whichever is lower, and a maximum normal acceleration of 2.5 g.

h. The Aero-5A bomb container may be carried and released to a maximum indicated Mach number of 0.65 or 400 knots, whichever is lower, and a maximum normal acceleration of 2.5 g.

i. Guns are not to be fired when stores are carried on the centerline station.

Arrested landings with full or partially full auxiliary fuel tanks prohibited. Catapult launchings and arrested landings are not permitted with unsymmetrical loadings.

Airplanes BuNo. 137812 to 137831 inclusive are limited to a maximum 500-pound store on each wing rack for the listed maneuvers in this section. If these store weights for wing racks are exceeded for airplanes with the above bureau numbers, the angle of bank shall not exceed 90 degrees. Centerline store weights are as set forth in the foregoing limitations.

ARRESTING DECELERATIONS

Maximum permissible arresting hook load is 59,500 pounds.

Maximum permissible longitudinal deceleration is 5.62 g.

The maximum recommended engaging speed into a Mk 7 barricade rigged to a Mk 7 arresting engine is 105 knots, the nose gear to be on the deck, off-center position not to exceed 15 feet, without external stores, and with wing detents installed. Barrier landings are not permitted.

SECTION VI
FLIGHT CHARACTERISTICS

INTRODUCTION

The flight characteristics of the aircraft as described in this section are based, wherever possible, on actual flight test information. In some instances, however, the results of extensive wind tunnel tests and data from flight tests of similar aircraft are used. Although additional information will be submitted periodically in the form of revisions to this handbook, the latest service directives and technical orders concerning this aircraft should be consulted regularly to keep abreast of pertinent information.

GENERAL FLIGHT CHARACTERISTICS

The airplane has the excellent slow flying characteristics usually found in aircraft designed for carrier operations. Positive stability over the normal operating speed range insures the maintenance of a given trimmed condition without use of the flight controls. Elevator control forces on airplanes equipped with a boosted elevator[1] become heavy at high diving speeds; this may be seen in figure 6–2, sheet 1. Speeds should be decreased by the use of speedbrakes, so that elevator forces will not be so heavy. Elevator control forces remain fairly normal at high speeds when a powered elevator[2] is used. (See figure 6–2, sheet 2).

STALLS

Stalling characteristics are normal in all configurations and conventional techniques should be used to recover from a stalled condition. Warning of an impending stall occurs in the form of light buffeting of the aircraft, increasing in intensity as the stall is approached. The characteristics of a stall are a mild nose-down pitching accompanied by light directional and lateral oscillation. If the stall is reached when a high power setting is used, the nose down pitch is very mild. Any tendency for a wing to drop can be effectively counteracted by application of opposite rudder.

[1] A4D-1 airplanes only.
[2] A4D-2 airplanes only.

STALLING SPEEDS

CONFIGURATION	ANGLE OF BANK (Degrees)	IDLE POWER			MILITARY POWER		
		GROSS WEIGHT – POUNDS					
		10,000	15,000	20,000	10,000	15,000	20,000
GEAR UP FLAPS UP	0	98	121	139	88	108	125
	30	106	130	150	95	116	135
	45	117	144	166	105	129	149
GEAR DOWN FLAPS DOWN	0	88	108	125	80	98	116
	30	95	116	135	86	105	125
	45	105	129	149	95	117	138
		INDICATED AIRSPEED – KNOTS					

P-6571-1

DATA AS OF: 1 March 1955
DATA BASIS: Wind tunnel tests and calculations

Figure 6-1. Stall Chart

ACCELERATED STALLS. Accelerated stalls are preceded by adequate stall warning occurring in the form of general airframe buffeting. Recovery is easily accomplished by employing normal procedures. When making turns where the load factor developed establish the aerodynamic requirements permitting the slats to open, a light buffet will occur just prior to slat opening. After the slats open the buffeting disappears until the airspeed decreases to the accelerated stall warning speed, at which time the buffeting manifests itself again. Occasionally, at low altitudes, the slats do not open at precisely the same instant, causing a small abrupt roll in a direction opposite to the side on which the first slat opened. At high altitudes the slats generally will not open during turns approaching an accelerated stall. Occasionally, when near the accelerated stall at high altitude, the aircraft will go off into a spin. Recovery from this spin can generally be accomplished simply by returning the controls to the neutral position.

SPINS

All spins performed indicate that spin characteristics are satisfactory in all configurations. The nature of the spin is generally oscillatory in pitch for the first turn, being in a slightly inverted attitude at the completion of one-half turn. The second turn is generally quite oscillatory in yaw and becomes noticeably less oscillatory in pitch.

WARNING

Intentional spins are prohibited pending completion of flight tests.

SPIN RECOVERY. Recovery from spins in the clean configuration can be accomplished by brisk application of full rudder in the direction opposite to the spin followed by movement of the control stick forward to neutral. In an erect spin, the use of ailerons into the spin may be an effective aid in recovery; however, the use of ailerons in a clean configuration is neither required nor recommended, since rudder control is adequate. If external stores are carried, full aileron should be applied in the direction of the spin in addition to the normal recovery procedure.

CAUTION

If ailerons are used in spin recovery, they must be applied *in the direction of the spin,* or recovery will be either prevented or delayed.

Recovery with external stores aboard will be slower than when in the clean condition. If recovery attempts are unsuccessful with stores aboard, jettison the external stores and use the normal recovery techniques.

FLIGHT CONTROLS

AILERONS

Aileron control forces are light at all subsonic speeds when the aileron power control system is operative. In the transonic region and above, however, the air loads on the ailerons may become large enough to require the total output of the power control system to deflect the ailerons beyond a certain point. A hydraulic accumulator is installed in the aileron control section of single hydraulic system airplanes, so that in the event of hydraulic failure it is possible to make several partial throws of the ailerons after such failure. When the accumulator is nearly depleted an increase in aileron stick force will occur. In the event of hydraulic failure at supersonic speeds, the speed should be decreased to subsonic before the accumulator is depleted in order to have adequate control to correct for the wing heaviness which occurs in the transonic region when on manual control. Such an accumulator is not required in the tandem hydraulic system. When the ailerons are disconnected from the hydraulic system or systems, or when no hydraulic pressure is available to power the ailerons, the aileron stick forces will be greatly increased. Adequate control will be available, however, for flight at subsonic speeds.

ELEVATORS

During take-offs, landings, or slow flight, if the horizontal stabilizer is moved to the nose-up position, the elevator bungee will provide additional nose-up trim. The control stick will move slightly aft, and the force required to move the control stick fully back to stall the aircraft will be somewhat decreased.

With the elevator system inoperative or disconnected, elevator stick forces will be increased, but for flight at subsonic speeds adequate control will be available. When operating under manual control, it is possible to attain 3.0g with the control stick extended and the application of 120 pound elevator stick force, at the maximum level flight speed at 5,000 feet.

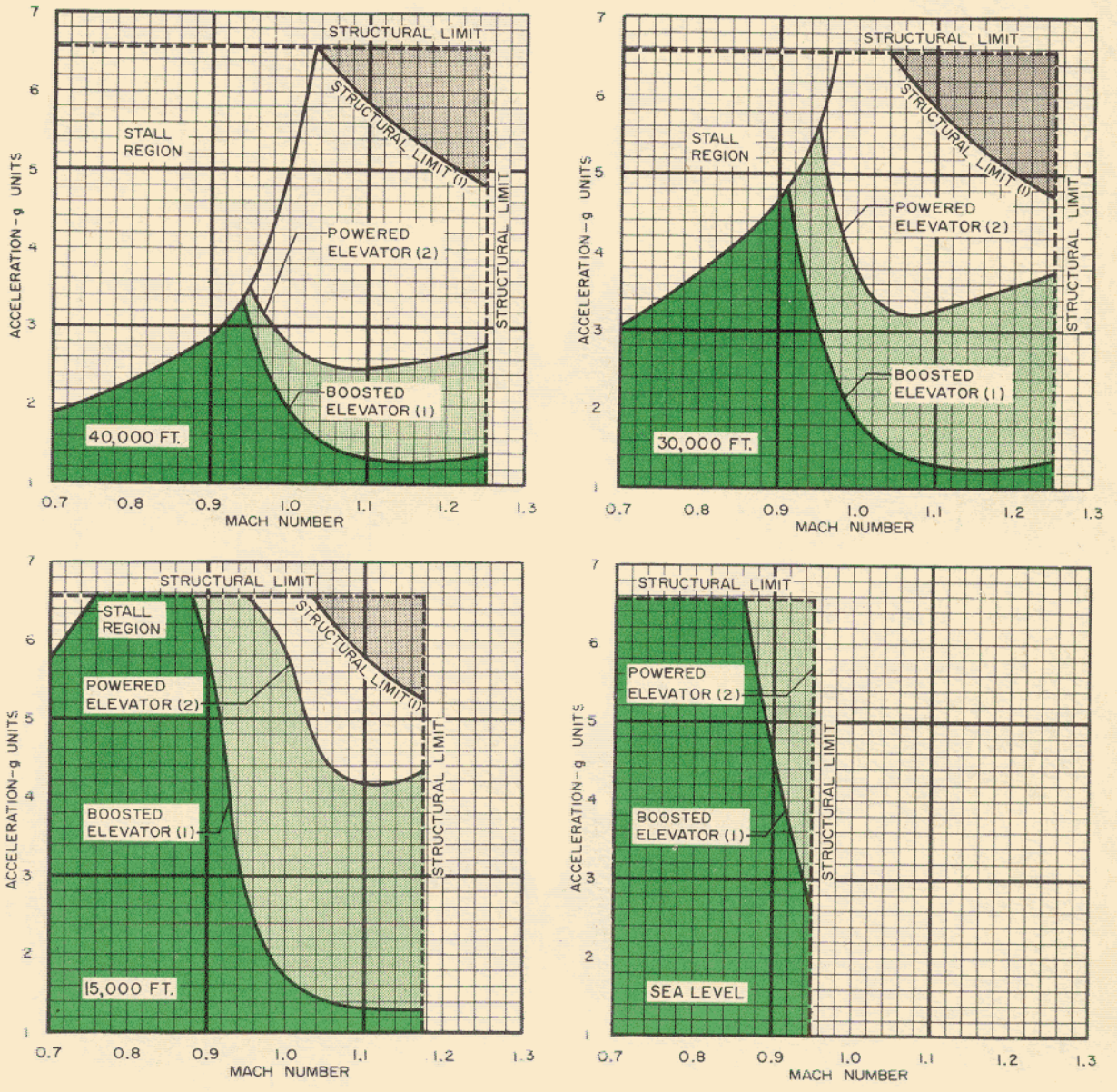
The powered elevator of the tandem hydraulic system is not at all like the boosted elevator of the single hydraulic system, with respect to control effectiveness and capability. It is recommended that figures 6-1A, 6-2 and 6-3 be studied carefully so that the difference in performance of the two elevators will be clearly recognized and remembered.

(BOOSTED ELEVATOR)

The elevator boost system provides good elevator control at most subsonic speeds. Above Mach 0.90, however, the maneuvering forces become quite high. It is recommended that speedbrakes be used during maneuvers that require diving, to keep speed in the range where elevator forces are lighter. Refer to DIVING in this section, and see sheet 1 of figure 6-2 for a diagram of stick forces encountered with the boosted elevator.

AVAILABLE MANEUVERABILITY

GROSS WEIGHT 13,316 POUNDS



(1) GROUP A, B, C AND D AIRPLANES (2) GROUP E AIRPLANES

P9240-1A

REMARKS:

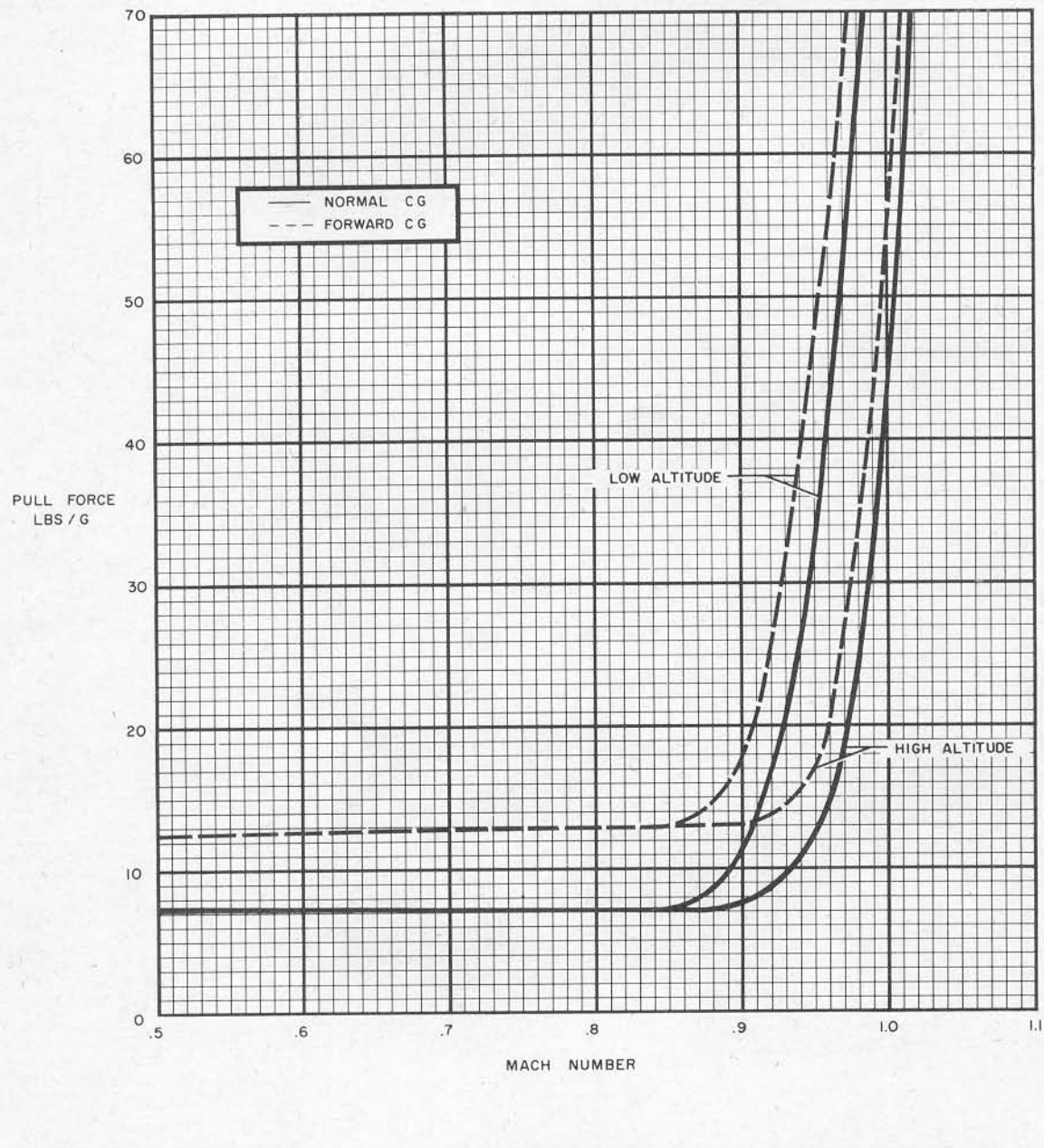
Airplane trimmed for 1 g
C.G. @ 22.6% M.A.C

DATA AS OF: 15 August 1956

DATA BASIS: Wind tunnel tests and contractor's flight tests

Figure 6-1A. Available Maneuverability

STICK FORCES DIAGRAM

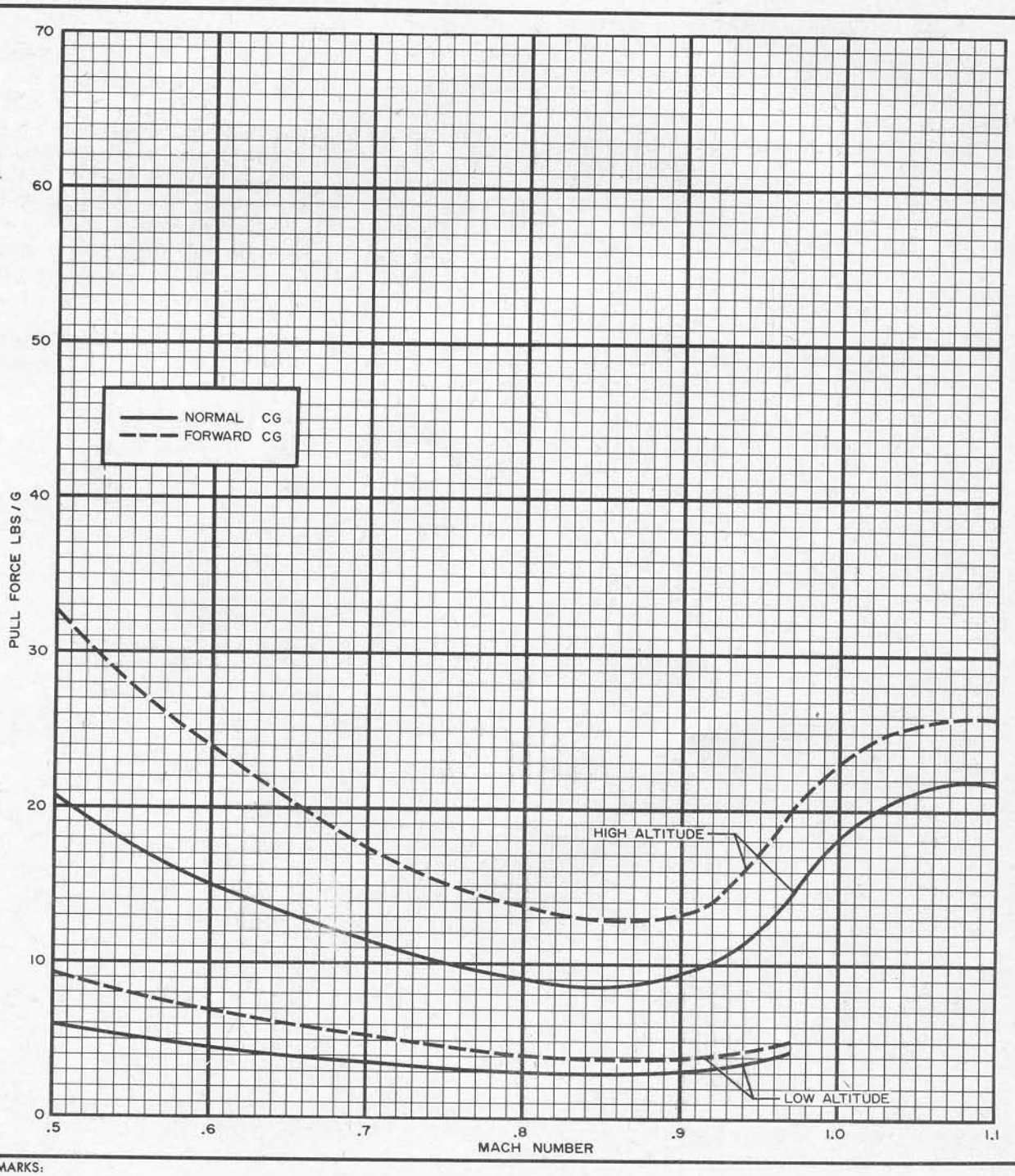


REMARKS:
Pull force is the pilot effort required to produce 1g change in load factor.

DATA AS OF: 1 March 1956
DATA BASIS: Wind tunnel tests and contractor's flight tests

A4D-1 Airplanes Only
Figure 6-2. Stick Forces (Sheet 1)

STICK FORCES DIAGRAM



REMARKS:

Pull force is the pilot effort required to produce 1g change in load factor.

DATA AS OF: 1 August 1956

DATA BASIS: Calculations

P6572–2

A4D-2 Airplanes Only

Figure 6-2. Stick Forces (Sheet 2)

Note

If the POWER BOOST REL handle is pulled inadvertently or for scheduled training purposes while the hydraulic system is operating normally, a "jolt" will be felt through the control stick during longitudinal displacements. This "jolt" will manifest itself only when the stick is moved from a nose-down position to a nose-up position, and vice versa. This condition is due to piston motion within the elevator power boost valve feeding back to the control stick, and does not adversely effect control of the aircraft.

(POWERED ELEVATOR)

The powered elevator provides good control at all speeds, and stick forces are much lighter than those required by the boosted elevator. See figure 6-2, sheet 2, for a powered elevator stick forces diagram.

RUDDER

The rudder power system provides good rudder control at all airspeeds. In the event of hydraulic failure, rudder pedal forces will increase with airspeed, but very little effort is required at approach and landing speeds.

TRIM SURFACES

The aircraft trimming surfaces are capable of reducing stick forces to zero for all stabilized level flight conditions except in airplanes where longitudinal trim limiting switches are installed.(1) In these airplanes, when flying at very high angles of attack (very high altitude or very low airspeed) with the landing gear retracted, it will be necessary to hold a slight back pressure on the control stick to maintain level flight. It is possible to obtain a trimmed condition under these circumstances through use of the stabilizer manual override control.

(1) A4D-1 airplanes only.

The horizontal stabilizer will require almost constant repositioning during rapid acceleration and deceleration encountered during take-off and the approach to the landing. During full stall landings, full nose-up horizontal stabilizer trim will be required. If the stabilizer actuator should fail while the aircraft is trimmed for high speed flight, a landing can be accomplished by flying the aircraft onto the runway with the flaps retracted, at an airspeed which assures adequate control. Landing with the flaps retracted is recommended due to the nose down trim change which occurs when the flaps are extended. Since the inoperative stabilizer cannot be moved to correct for this trim change, the elevator would have to be employed, in effect reducing the amount of elevator travel remaining to accomplish the landing.

Normally, retrimming of the rudder will not be necessary except when asymmetrical drag configurations are encountered, such as would occur if two large stores were being carried on the wing racks and one were dropped.

When the aircraft is laterally retrimmed, the aileron trim system actuator relocates the neutral position of the control stick through the aileron power control system. If the power control system fails or is disconnected, the follow-up tab provides sufficient trim for all flight conditions as long as electrical power is supplied.

SLATS

The wing slats open automatically under various flight conditions to improve airflow characteristics over the wing. Because the two slats operate independently, one may occasionally open slightly in advance of the other. When this occurs, there may be a slight lateral displacement of the aircraft, which can be adequately controlled, however, at all times.

WING FLAPS AND LANDING GEAR

Lowering the wing flaps or landing gear causes a nose-down trim change, while a nose-up trim change results from raising either or both. These trim changes are slight and are overcome easily through use of the control surfaces or by retrimming.

SPEEDBRAKES

Operation of the speedbrakes results in changes in trim characterized by a nose-up pitch when opened and a nose-down pitch when closed. To counter this characteristic a speedbrake-elevator interconnect is installed which physically displaces the elevator when the speedbrakes are operated. This interconnect mechanism pulls the control stick forward when the speedbrakes are opened, and returns the stick to its original position when the speedbrakes are closed, thus alleviating the nose-up and nose-down pitching. Some trim change will occur when the speedbrakes are operated. The degree of this trim change will be a function of airspeed. For further information on use of the speedbrakes, refer to DIVING in this section.

LEVEL FLIGHT CHARACTERISTICS

SLOW FLIGHT

Control is good during slow flight at approach and landing speeds; with wing flaps lowered, however, a light lateral-directional oscillation is present in rough air or at the stall.

CRUISING

Level flight cruising characteristics are normal and satisfactory trim and control forces are available. At high altitudes and cruising airspeeds, a lateral-directional oscillation occurs in rough air, which may be counteracted by application of control surfaces. Longitudinal stability is weak to neutral at aft center of gravity positions.

HIGH SPEED FLIGHT

At airspeeds up to Mach 0.89 no unusual tendencies are exhibited and stick forces are low to moderate. A mild nose-down trim change occurs at Mach 0.89 and increases slightly up to Mach 0.98. This trim change can be counteracted by applying approximately one-half unit nose-up stabilizer trim. From 0.98 to 1.02 Mach number the trim change increases sharply, nose up. It is this trim change which is difficult to overcome in a recovery from a trimmed supersonic dive. Refer to DIVING in this section. At 1.02 Mach number a very light nose-up tendency appears which increases gradually up to the maximum permissible speed. Up to 0.90 Mach number the longitudinal stick forces are normal and control is good. Above 0.90 Mach number, the elevator effectiveness drops appreciably. Concurrently with this decrease there is an increase in the stick force gradient which continues up to the maximum permissible speed. This stick force gradient increase is more pronounced and much more abrupt with the boosted elevator than with the powered elevator. (See figure 6-2, sheets 1 and 2). During recoveries from dives at supersonic speeds, a marked pitch-up will occur when slowing through 0.98 Mach number in powered elevator aircraft.[1] This "transonic pitch-up" is primarily due to the rapid increase in elevator effectiveness and is more pronounced for full aft stick recoveries than for partial stick recoveries. In a typical case, at an altitude of 25,000 feet, the airplane will pitch up to approximately 6.0g from approximately 3.5g as the Mach number drops below 0.98; although when corrective action is applied promptly by moving the stick forward, this trim change is readily overcome. A pronounced buffet will be felt at 3.0g or more when decelerating from 0.96 to 0.93 Mach numbers (between 20,000 and 30,000 feet). This is not apparent in boosted elevator airplanes[2] because of control limits.

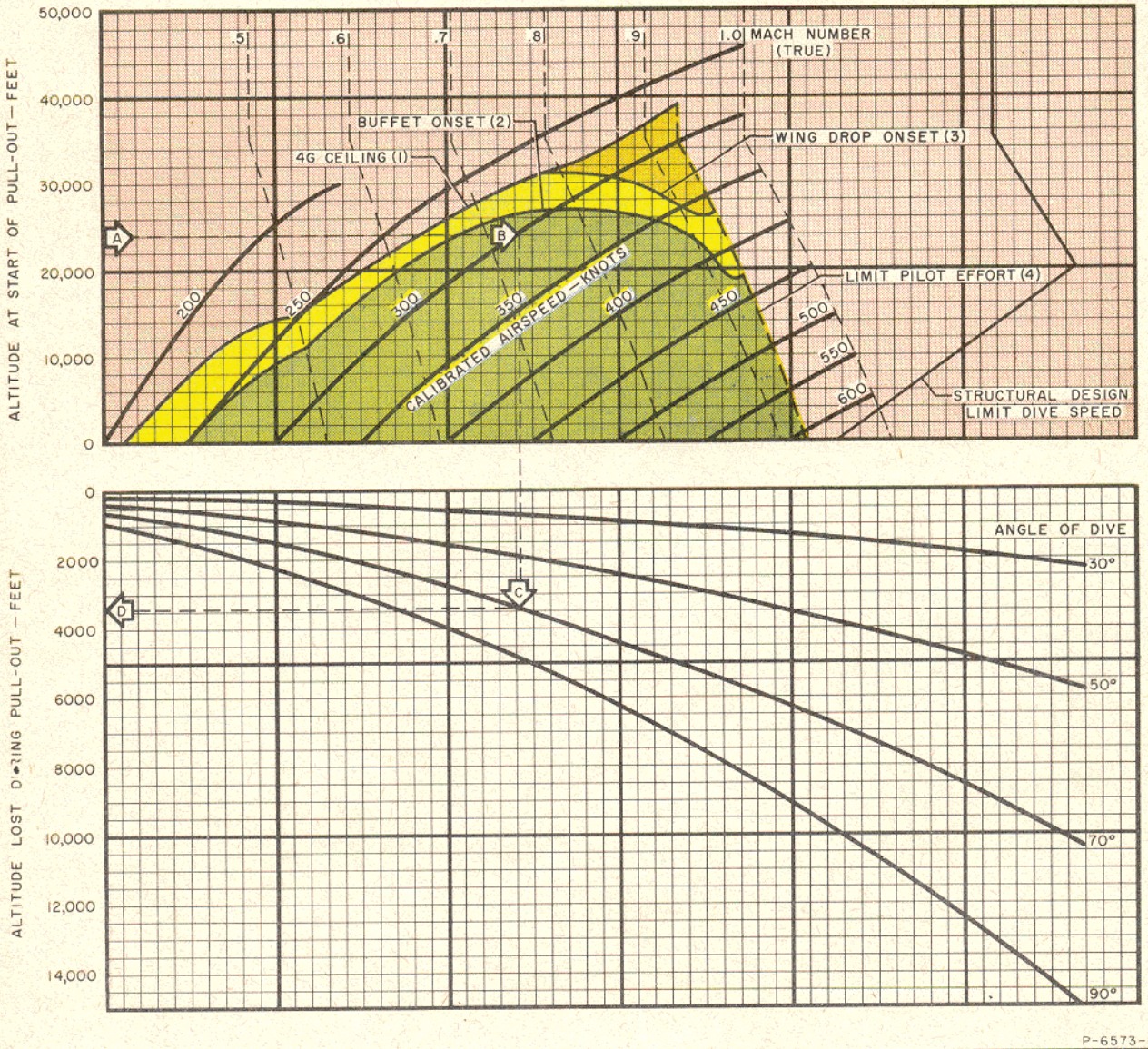
MANEUVERING FLIGHT

Very rapid rates of roll are possible with this aircraft. The aircraft is subject to a pitch-down during and on termination of aileron rolls and rolling pushovers in

[1] A4D-2 airplanes.
[2] A4D-1 airplanes.

DIVE RECOVERY CHART

ALTITUDE LOSS DURING A CONSTANT
4G
PULL-OUT



P-6573-1A

REMARKS:

(1) The 4G CEILING line indicates the maximum altitude at which 4g may be obtained at a given airspeed without stalling.

(2) The BUFFET ONSET line indicates the altitude above which buffeting will occur at a given airspeed and 4g acceleration. Pull-outs may be initiated above the buffet onset altitude without damage to the aircraft.

(3) The WING DROP ONSET line indicates the altitude above which wing drop will occur at a given airspeed and 4g acceleration. Controllable trim changes will be encountered when pull-outs are initiated above wing drop altitudes.

(4) The LIMIT PILOT EFFORT line corresponds to airspeeds and altitudes at which maximum pilot effort is required to attain 4g acceleration.

EXAMPLE:

A — Enter the chart at altitude at start of pull-out (24,000 feet).

B — Move horizontally to indicated airspeed at start of pull-out (300 knots).

C — Proceed vertically down to dive angle from which recovery is to be made (70°).

D — Move horizontally to the left and read altitude lost during pull-out (3400 feet).

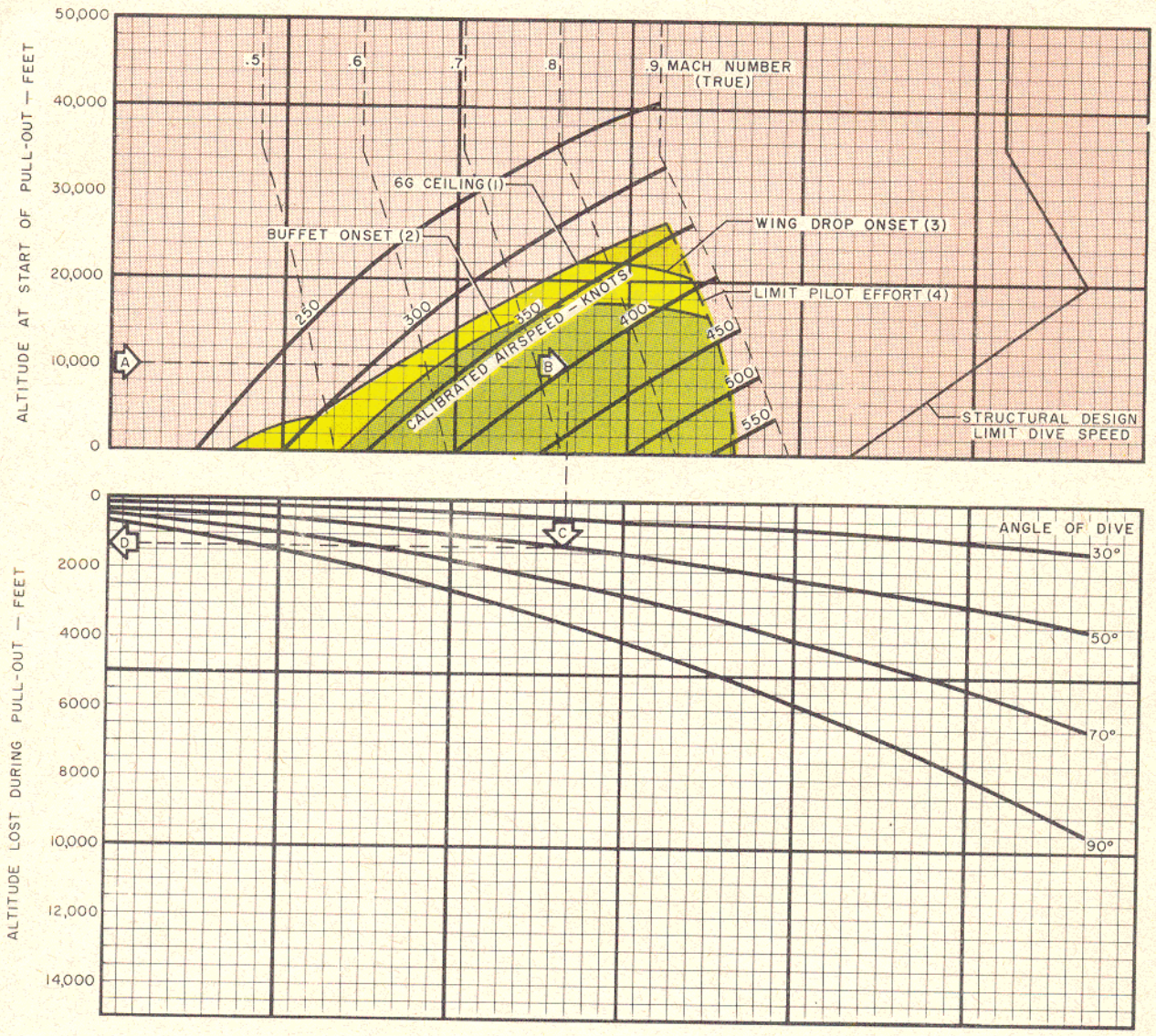
DATA AS OF: 15 February 1955
DATA BASIS: Calculations

A4D-1 Airplanes Only

Figure 6-3. Dive Recovery (Sheet 1)

DIVE RECOVERY CHART

ALTITUDE LOSS DURING A CONSTANT
6G
PULL-OUT



P-6573-2A

REMARKS:

(1) The 6G CEILING line indicates the maximum altitude at which 6g may be obtained at a given airspeed without stalling.

(2) The BUFFET ONSET line indicates the altitude above which buffeting will occur at a given airspeed and 6g acceleration. Pull-outs may be initiated above the buffet onset altitude without damage to the aircraft.

(3) The WING DROP ONSET line indicates the altitude above which wing drop will occur at a given airspeed and 6g acceleration. Controllable trim changes will be encountered when pull-outs are initiated above wing drop altitudes.

(4) The LIMIT PILOT EFFORT line corresponds to airspeeds and altitudes at which maximum pilot effort is required to attain 6g acceleration.

EXAMPLE:

(A) Enter the chart at altitude at start of pull-out (10,000 feet).

(B) Move horizontally to indicated airspeed at start of pull-out (400 knots).

(C) Proceed vertically down to dive angle from which recovery is to be made (50°).

(D) Move horizontally to the left and read altitude lost during pull-out (1300 feet).

DATA AS OF: 15 February 1955
DATA BASIS: Calculations

A4D-1 Airplanes Only

Figure 6-3. Dive Recovery (Sheet 2)

which large aileron deflections are used at high subsonic speeds at low altitude. This pitching tendency is a result of inertia coupling and is noticeable only a high rolling rates. The use of large aileron deflections in high speed rolling maneuvers should be avoided. Other maneuvering characteristics are good, except that single hydraulic system (boosted elevator) airplanes exhibit heavy elevator control forces at speeds above Mach 0.90. A random wing-heaviness condition, controllable with the ailerons, appears during turns and pull-ups at high altitudes and Mach numbers (see figure 6–3). This wing-heaviness is accompanied by general airframe buffeting which increases in intensity if the load factor is increased during the turn or pull-up.

Pitch-up may be encountered during maneuvering flight at high angles of attack when flying at extreme aft center of gravity locations (aft of 27% MAC). This pitch-up is normally preceded by buffet onset and a build-up of buffet intensity, followed by a decreasing stick force gradient on boosted elevator airplanes. The buffet onset and build-up are *not* followed by a decreasing stick force gradient with the powered elevator, however, and therefore more care should be exercised when maneuvering these airplanes[1] at extreme aft center of gravity locations. The pitch-up manifests itself by an increase in load factor with no change in stick position. At altitudes above 30,000 feet the airplane limit load factor will not be exceeded if pitch-up is encountered. At low altitudes (below 15,000 feet) and high speeds (above 0.80 Mach number) longitudinal control limits preclude the boosted elevator airplane from encountering pitch-up. At intermediate altitudes (15,000 to 30,000 feet) the pitch up can cause the limit load factor to be exceeded. However, even though the elevator effectiveness is drastically reduced under these conditions, the severity of the pitch-up can be lessened appreciably by full forward stick movement. When flying with an extreme aft center of gravity location, the buffet onset and ensuing build-up in intensity of the buffet, serve as a warning that the pitch-up boundary is being approached.

During rolling pull-outs where high roll rates (above 200 degrees/second) can be attained, large sideslip angles can be developed due to pitch-roll coupling and adverse yaw characteristics. A marked reduction in directional stability near the stall aggravates this characteristic. At low altitudes the airplane exhibits normal characteristics and no problem exists other than the high roll rates which can be developed. At high altitudes it is much easier to approach an accelerated stall and coupling of the factors mentioned above can develop extremely high angles of attack and sideslip, and may even place the aircraft into a spin. Rolling pull-outs are more critical at extreme aft center of gravity locations where pitch-up may occur. Application of more than half lateral stick throw with large amounts of aft stick should be made with caution.

[1] A4D-2 airplanes only.
[2] A4D-1 airplanes only.

DIVING

The diving characteristics of the aircraft are normal, except when steep clean dives are conducted from high altitudes where airspeeds increase into the supersonic range. Under these conditions, the elevator effectiveness will be reduced and the aircraft basic stability will become high, and it will be necessary to retrim with the stabilizer in order to dive the airplane supersonically. These factors result in a considerable increase in the stick force necessary to effect a safe recovery from the dive in the case of boosted elevator airplanes;[2] stick forces will remain at a more reasonable level in powered elevator airplanes.[1] Refer to figure 6-3 for dive recovery data.

These factors combined with the pronounced nose-down trim change occurring on deceleration from approximately 1.02 to 0.98 Mach number results in a considerable increase in stick force required to effect a safe recovery from the dive in boosted elevator airplanes.

Note

The Dive Recovery charts (figure 6-3) do not include data for powered elevator airplanes.[1] This information will be added when it becomes available. Dive recovery in these airplanes will, however, be totally within the envelopes given for boosted elevator airplanes.

CAUTION

Care should be taken not to position the stabilizer so that a pull force is required to maintain the dive, as pilot effort using *boosted elevator* control will not be sufficient to overcome the stabilizer in the recovery from the dive.

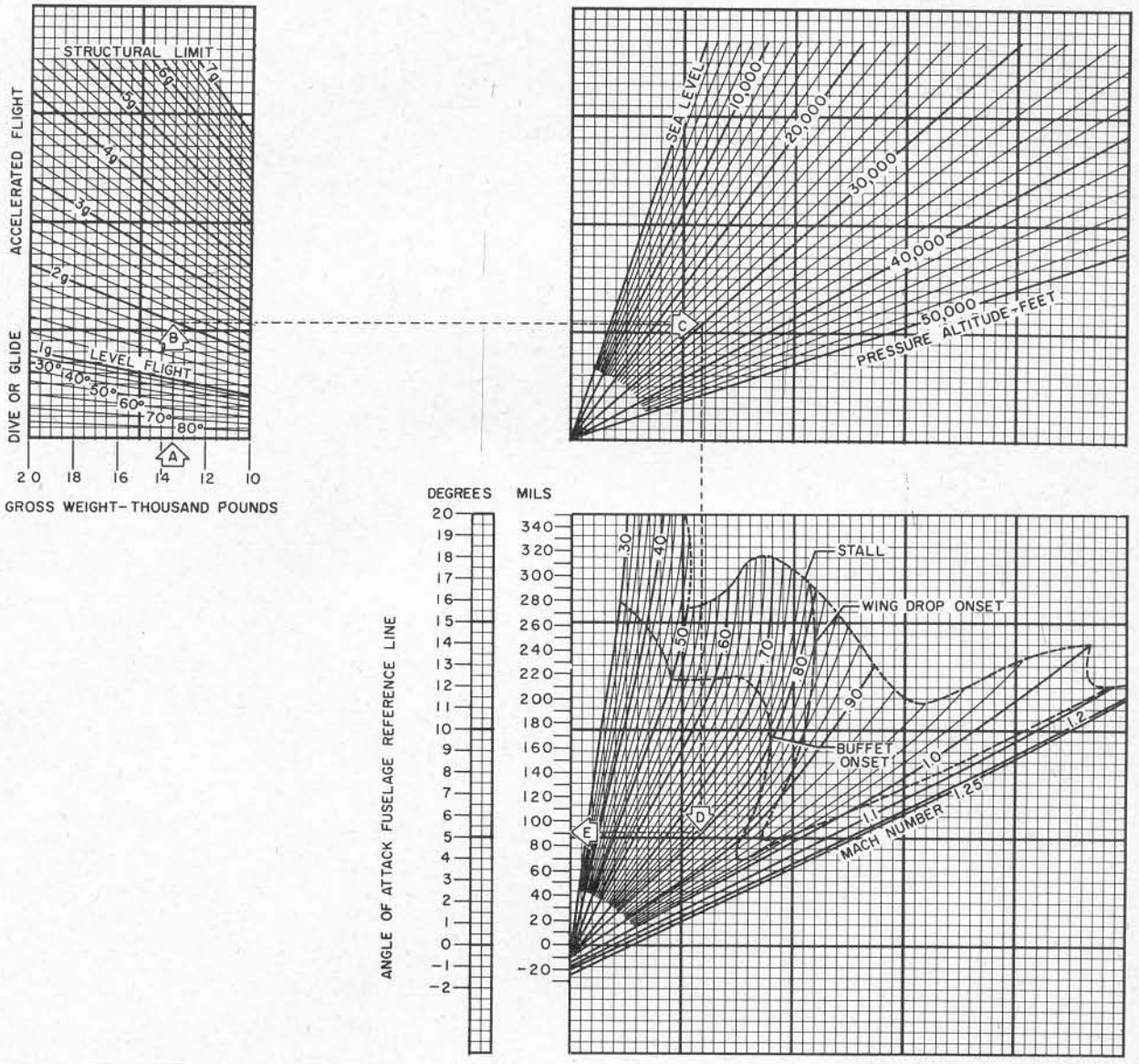
The accelerometer should be referred to immediately upon initiating a pull-out from a supersonic dive to insure that enough load factor is being developed to recover. If difficulty is experienced in recovering from the dive, the speedbrakes should be opened immediately and the throttle retarded in an effort to reduce airspeed. If the elevator system should fail during a supersonic dive the stick force required for recovery will be so high as to prohibit normal recovery procedures. Use of airplane nose up stabilizer trim will then become mandatory to effect recovery and, if the elevator is of the boosted type,[2] stabilizer travel will be limited to 3 degrees airplane nose up (1½ units). In this case, the stabilizer manual override switch should not be used to obtain more nose up trim than 3 degrees in order to avoid over-stressing the airplane.

CAUTION

Do not use the horizontal stabilizer as a dive recovery device except in an emergency, as a strong pitch-up will result as the airspeed drops below Mach 0.90.

ANGLE OF ATTACK RELATIONSHIP

SPEEDBRAKES CLOSED



REMARKS:

Subtract 1° (17.5 Navy mils) to obtain angle of attack of armament datum line.

EXAMPLE:

Assume an airplane weight of 13,500 pounds, a load factor of 2g, and an airspeed of .80 Mach number at an altitude of 30,000 feet.

(1) Enter the chart with a weight of 13,500 pounds (A)
(2) Proceed vertically up to a load factor of 2g (B)
(3) Move horizontally to the right to an altitude of 30,000 feet (C)
(4) Proceed vertically down to .80 Mach number (D)
(5) Move horizontally to the left and read the angle of attack of the fuselage reference line = 91 Navy mils (5.2°) (E)
(6) Subtract 17.5 Navy mils (1°).

Thus, the angle of attack of the armament datum line is 91 — 17.5 = 73.5 Navy mils (4.2°)

DATA AS OF: 15 March 1955
DATA BASIS: Calculations

Figure 6-4. Angle of Attack Relationship

Trim settings for diving should be established on the basis of experience and a knowledge of the individual aircraft, as each different aircraft will require somewhat different trim settings for a given flight condition. It is usually considered preferable to trim the aircraft so that a moderate push force is required to maintain the dive just prior to the pullout.

If the speedbrakes are used prior to entering the dive, airspeeds will be limited to lower values where the increase in stick forces will not be severe. The speedbrakes should not be closed until the recovery has been completed to prevent an increase in stick forces resulting from the combined effects of the build-up in airspeed and the characteristic nose-down trim change that accompanies closing of the speedbrakes. The control stick forces required to produce one g change in load factor at various Mach numbers are presented in figure 6–2.

FLIGHT WITH EXTERNAL STORES

Flight characteristics with external stores aboard are satisfactory. Take-offs will generally require a horizontal stabilizer setting of full nose-up because of the lowered center of gravity. Adequate control is available to hold the wings level during landing with an unsymmetrical loading up to 1000 pounds on either wing. Wing heaviness and/or random wing drop may be encountered at medium altitudes (20,000 to 25,000 feet) and high subsonic speeds (between 0.94 and 1.0 Mach numbers) when carrying certain stores, or in braked dives.

APPENDIX I

OPERATING DATA CHARTS

INTRODUCTION

The operating data charts contained in this appendix are included to provide the pilot with information enabling him to realize the maximum performance capabilities of the aircraft. Use of the chart material for pre-flight planning and application of the prescribed operating procedures will result in optimum effectiveness of the aircraft. Data on take-off, climb, cruise, descent, and landing conditions are included, together with various airspeed correction charts and standard altitude data. Descriptive information and general instructions on usage of the charts are given throughout the text to facilitate utilization of the charts in question.

Note

- All performance data are based on the use of grade JP-4 fuel with a density of 6.5 pounds per gallon, and under standard sea level atmospheric conditions, unless otherwise specified.
- All performance charts are based on a thrust rating of 7800 pounds at "MILITARY" rpm. Since calculation of this data, the manufacturer has de-rated the engine to 7700 pounds at "MILITARY" rpm. Consequently, all data regarding specific range at military thrust settings, as now published, contain a conservatism factor since the given fuel flows and airspeeds are too high.

ABBREVIATIONS AND SYMBOLS. Although most of the abbreviations and symbols used throughout the appendix will be quite familiar, the meanings of some may not be immediately apparent. For the sake of accuracy, a complete listing and identification of those employed follows:

CAS or V_c	= Calibrated airspeed = IAS corrected for position error
EAS	= Equivalent airspeed = CAS corrected for compressibility error
IAS	= Indicated airspeed = instrument reading corrected for instrument error
M	= Mach number
OAT	= Outside air temperature
TAS or V	= True airspeed
a/a_o	= Ratio of speed of sound at altitude to speed of sound at sea level
ρ	= Density of air at any altitude in slugs/cubic foot
ρ_o	= Density of atmosphere at sea level in slugs/cubic foot
ρ/ρ_o or σ	= Ratio of density of atmosphere at altitude to density of atmosphere at sea level
p	= Atmospheric pressure at any altitude
p_o	= Atmospheric pressure at sea level = 29.921 inches of Hg on standard day
Δ	= "Change in" (e.g., Δ gross weight)

AIRCRAFT CONFIGURATIONS

The Navy Model A4D-1, -2 Skyhawk has the desirable capability of carrying many combinations of external stores, thus increasing its versatility. Since the total drag produced by these items varies considerably from one combination to another, aircraft performance varies also. Those combinations whose drag items are identical, or close enough to allow performance data computations to fall within certain tolerances, are grouped together; those whose drag values cause performance to differ too greatly from the previous are separated into another group. When all combinations are thus compiled, each group is given a name. For the A4D-1, -2, these names are Clean, Basic Attack, Long Range Attack, and Ferry, and are listed with their applicable external load items in figure A-1, Aircraft Drag Configurations. The names derived may seem rather alien when compared with the stores listed for each configuration, but in general they enjoy a relationship sufficiently close to justify their application. For instance, consider the name "Ferry." This name may seem inappropriate when it is noted that one of the loadings specified for the configuration includes a 19-shot rocket package. Who can deny the incongruity of suspending a weapon from the aircraft when the sole purpose of the flight—if the name of the configuration is taken literally—is to ferry the airplane from one facility to another? On the other hand, consider the other loading in the Ferry configuration—three external fuel tanks. With this loading, what else

can be done but transport the aircraft from one point to another? Don't, therefore, take the names of the configurations too literally; they are designed primarily for conveniently grouping certain loadings in order to facilitate pre-flight mission planning by affording easy reference to the operating data charts. Since all the operating data charts are grouped and sub-titled according to the configuration for which they were computed, use of the Aircraft Drag Configurations chart to determine the applicable name for the external loadings aboard for the mission will serve as the key to the proper charts to use for pre-flight planning.

EXAMPLE. Assume that the proposed mission specifies an external stores loading of one 1000-pound MK 83 bomb and two 500-pound MK 82 bombs.

a. Turn to the Aircraft Drag Configurations chart, figure A-1, and find the proposed loading of external stores.

b. Opposite this loading will be the name of the configuration, which is, in this instance, "Basic Attack."

c. Now turn to those Operating Data Charts which bear either the configuration name or are valid for all configurations, and all necessary performance data will be available for pre-flight planning of the mission.

AIRSPEED CORRECTIONS

Several corrections must be made to the airspeed indicator reading to obtain the true airspeed of the airplane. The first is a correction for instrument error. This correction must be determined for each individual airspeed indicator, since it is primarily a result of manufacturing tolerances. The airspeed indicator reading, so corrected, is indicated airspeed.

The second correction is for the error which develops from the airspeed indicating system installation. This is known as position error and has not yet been calibrated for the airplane. When known, the correction for position error is applied to indicated airspeed to obtain calibrated airspeed.

The effect of compressibility, altitude and ambient temperature necessitates another correction to obtain true airspeed. This correction may be obtained from figure A-4A, Airspeed vs Mach Number.

EXAMPLE. Assume the airplane is at a pressure altitude of 25,000 feet with an airspeed indicator reading of 360 knots and an ambient temperature of +10°C. The true airspeed, assuming zero instrument error and zero position error, is obtained with the following method:

Airspeed indicator reading	360 knots
Correction for instrument error	0 knots (assumed)
Indicated airspeed	360 knots
Correction for position error	0 knots (assumed)
Calibrated airspeed	360 knots
True airspeed (from figure A-4A)	556 knots

TAKE-OFF CHARTS

TAKE-OFF DISTANCE

The take-off information presented in this section provides, as an end result, the ground roll necessary to become airborne from a standing start on a hard surfaced runway. Two charts are included which encompass all variables affecting take-off distance: power setting, position of wing flaps, gross weight, ambient temperature, airfield altitude, lift-off airspeed, headwind velocity, and type of runway surface. Conditions for both a normal field take-off and a minimum run take-off are given, and the data is valid for all loading

configurations of the aircraft. An example for the use of the Take-off Distance charts, figure A-7, is presented on each chart.

EXAMPLE. Assume that a take-off is planned from an airfield at a pressure altitude of 2000 feet. The take-off gross weight is computed at 18,000 pounds; the outside air temperature is 25°C and there is no wind. Determine the distance required to take off during a normal field run using half flaps.

a. Turn to figure A-7 (sheet 1) and enter the density altitude graph at 25°C.

b. Move vertically to the 2000 foot pressure altitude line.

c. Move horizontally right to 18,000 pounds.

d. Proceed downward, following the guide lines on the temperature chart, to 25°C.

e. Directly below on the distance scale, read the take-off distance of *4100 feet.*

For the purpose of illustrating the effect of wind, assume all the previous factors remain the same except there is now a 15-knot headwind.

f. On entering the headwind chart, follow the guide lines to 15 knots.

g. Directly below on the distance scale, read the take-off distance of *3400 feet.*

STOPPING DISTANCE

The Stopping Distance chart, figure A-8, is included primarily for use if the take-off should be aborted. The distances published on the chart are governed by almost the same variables affecting take-off distance, however, braking action enters as a primary factor in deceleration of the aircraft. Distances are based on the application of maximum braking effort *without skidding the tires.* It should be noted that with the engine windmilling, the use of either half flaps or no flaps will result in the same stopping distance. Contrarily, full flaps lengthen the distance required to stop the airplane, as the total decelerating force achieved with a combination of full flaps and maximum braking effort is less than that produced by maximum braking effort with flaps retracted. The additional lift provided by the use of full flaps reduces the weight of the aircraft on the tires; less friction between the tires and the runway results, appreciably lengthening the stopping distance. Therefore, if full flaps are used for the take-off and abortion becomes necessary, they should be retracted immediately to obtain the shortest possible stopping distance. As the Stopping Distance chart provides data for only two gross weights, the minimum and maximum expected weights for normal operation, it is readily apparent that when the aircraft is loaded to some weight falling between the two, the required stopping distance will vary accordingly.

EXAMPLE. A minimum run take-off is planned from an airfield which has a 5000-foot runway and is situated at sea level. Take-off gross weight is 14,000 pounds, and NACA Standard Day conditions prevail. Determine whether the take-off can be safely aborted at lift-off airspeed within the remaining runway distance.

a. From the minimum run Take-off Distance chart, figure A-7 (sheet 2), it is found that 1000 feet are required to take off, and that the lift-off airspeed is 105 knots CAS.

Note

As no stopping distance graph is provided for a weight of 14,000 pounds, the distance must be interpolated.

b. Enter the 12,000 pound graph on the Stopping Distance chart, figure A-8, at 105 knots CAS and move horizontally right to intersect the Sea Level altitude line.

c. Move vertically down to the distance scale and read stopping distance = *2400 feet.*

d. Perform an identical procedure on the 20,000 pound graph, and note that the stopping distance = *2300 feet.*

e. To determine the stopping distance for 14,000 pounds gross weight, use the following formula for interpolation:

$$\left(\frac{W - W_b}{W_a - W_b}\right)(D_a - D_b) + D_b = D$$

where, W = Actual take-off gross weight
W_a = 20,000 pounds
W_b = 12,000 pounds
D = Actual stopping distance
D_a = Stopping distance for W_a
D_b = Stopping distance for W_b

Applying the formula:

$$\left(\frac{14{,}000 - 12{,}000}{20{,}000 - 12{,}000}\right)(2300 - 2400) + 2400 = D$$

$$\left(\frac{2000}{8000}\right)(-100) + 2400 = D$$

$$-25 + 2400 = D$$

$$2375 = D$$

Since the available stopping distance is 5000 − 1000 = 4000 feet, the required stopping distance of 2375 feet permits the take-off to be aborted at lift-off airspeed with ample runway distance (4000 − 2375 = 1625 feet) remaining for a safety margin.

CLIMB CHARTS

The climb data charts contain complete information necessary to establish airspeeds to be used, distance covered, time required, and fuel consumed in a climb to a desired altitude. The results are obtained as functions of gross weight, and the charts embody computations for incremental gross weights ranging from the minimum to the maximum which might be encountered during normal operation. As the data presented in the charts are compiled for standard atmospheric conditions, and since atmospheric conditions are seldom standard, correction charts are also provided for each separate climb chart to give greater accuracy in the extraction of desired information.

It should be noted that the performance given in the charts is independent of the number of external drag items for a given gross weight, since the effect on fuel consumption, elapsed time, and distance traveled during the climb is relatively small. The effects of increased drag with an increase in gross weight from the addition of externally carried items has been incorporated into the data.

All climbs should be conducted with the engine operating at military power, as less time and less fuel will be required to climb to a given altitude than when using less power. This power setting can be used to climb to any altitude up to cruise ceiling at any gross weight, without exceeding the operating time limit for military power.

Examples which illustrate the use of the various climb data charts are included on their respective charts. Charts provided are: Climb Speed Vs Altitude, figure A-9; Climb Distance Vs Gross Weight, figure A-10; Climb Time Vs Gross Weight, figure A-11; and Climb Fuel Vs Gross Weight, figure A-12.

EXAMPLE. Assume a gross weight of 15,000 pounds at the start of a climb from sea level to a pressure altitude of 35,000 feet on an NACA Standard Day. Find the climbing airspeed, distance covered, time required, and fuel used in the climb.

a. Enter the Climb Speed Vs Altitude chart, figure A-9, and note the climbing airspeed schedule for 15,000 pounds: *380 knots CAS at sea level, decreasing 3 knots per 1000 feet up to 25,000 feet, then decreasing 5 knots per 1000 feet. At 35,000 feet, the CAS should be 260 knots.*

b. Enter the Climb Distance Vs Gross Weight chart, figure A-10, at 15,000 pounds, and proceed parallel to the guide lines on the chart until the 35,000 foot pressure altitude line is reached.

c. Move horizontally left and read climb distance = *45 nautical miles.*

d. Perform an identical procedure on both the Climb Time Vs Gross Weight chart, figure A-11, and the Climb Fuel Vs Gross Weight chart, figure A-12. From these charts will be found, respectively, that climb time = *6 minutes,* and that climb fuel = *500 pounds.*

ENGINE OPERATING DATA

COMBAT ALLOWANCE CHART

Engine fuel consumption rates for both Military Power and Normal Power are presented in the Combat Allowance chart, figure A-13. Fuel flows are tabulated in pounds per minute for each 5000-foot altitude level from sea level to 50,000 feet.

MAXIMUM CONTINUOUS POWER SUMMARY

The Maximum Continuous Power Summary, figure A-14, presents for each of the four configurations a tabulation of fuel flows, calibrated airspeeds, and true airspeeds for various altitudes when operating at maximum continuous (Normal) power. The gross weights given are the average weights for their respective configurations; however, since fuel flow is indirectly dependent on gross weight, deviations from the listed weight will result in slight changes in fuel consumption if all other factors remain constant.

FLIGHT OPERATION INSTRUCTION CHARTS

The Flight Operation Instruction charts are presented in tabular form to furnish range data and operating instructions for obtaining that range for level flight cruising at various gross weights, altitudes, and drag configurations. A separate series of charts is provided for each of the aircraft drag configurations, and each chart in the series encompasses an operating weight bracket. The chart is further divided into two sheets, one for operation at low altitudes (sea level through 20,000 feet), the other for high altitudes (25,000 feet through 45,000 feet).

USE OF THE CHARTS

Although instructions and an example for use are included on each chart, certain facets of usage should be

thoroughly understood to enjoy complete and correct utilization of the Flight Operation Instruction charts. When the weight of the airplane decreases, through fuel consumption or release of stores, so that the weight no longer falls within the weight bracket or configuration for which the chart is valid, a new chart which includes the existing airplane weight and configuration must be entered. Enter the new chart at the same cruise altitude for which the previous chart was being used, and if the new chart specifies a climb to a new optimum altitude, climb immediately to obtain the maximum range. It should also be remembered that the charts do not include a climb to the initial cruise altitude, but do include a climb from the initial to the optimum altitude and a maximum range descent to sea level.

EXAMPLE.

MISSION: You are required to ferry the airplane to a distant point carrying a Radio Navigation Package and two 150-gallon external fuel tanks. Compute the maximum range attainable so that the first stopping point can be determined.

GIVEN:

a. Gross weight: 16,227 pounds (Handbook of Weight and Balance Data, AN 01-1B-40).

b. Usable fuel: 7150 pounds (Fuel Quantity Data Table, figure 1-6).

c. Fuel allowance for starting, taxiing, take-off, and acceleration to best climbing speed: 490 pounds (based on static sea level operation at Normal Power for five minutes).

d. Fuel allowance for landing and other contingencies: 1500 pounds (or as established by the policy of the operating command).

e. Effective wind: 20-knot headwind up to 20,000 feet pressure altitude, and a 40-knot headwind above 20,000 feet.

FIND: (1) The maximum range which can be obtained by cruising at the recommended optimum altitude, and

(2) The maximum range which can be obtained by cruising at the highest altitude where the lesser headwind prevails.

Note

It would seem from the word "optimum" that operation at that particular altitude only will result in obtaining maximum range. Because of the high wind at the optimum altitude, however, a lower altitude where the wind is less severe might be more advantageous.

SOLUTION I.

a. Initial climb weight is 16,227 minus 490 equals *15,737 pounds.*

b. Fuel available for climb, cruise, and descent is 7150 minus 490 minus 1500 equals *5160 pounds.*

c. As the Aircraft Drag Configurations chart, figure A-1, shows that the external stores loading is known as the Long Range Attack configuration, the applicable Flight Operation Instruction charts will be found in figure A-29. Select the chart containing the weight bracket encompassing 15,737 pounds (sheet 2), and determine the optimum altitude (30,000 feet) by looking opposite the fuel available for cruise to the "If You Are At S.L." (initial altitude) column. The range value found in the column labeled "By Cruising At Optimum Altitude" will include the military climb distance from sea level to 30,000 feet as well as the maximum range idle descent distance from 30,000 feet back to sea level at the end of the cruise leg of the flight. Because the values listed in the "Fuel" column are not the same as the available cruise fuel, interpolation must be employed to determine the exact range. This can be accomplished by using the following formula:

$$\left(\frac{F - F_b}{F_a - F_b}\right)(R_a - R_b) + R_b = R$$

where, F = Actual cruise fuel available
F_a = Nearest chart fuel value higher than actual fuel available
F_b = Nearest chart fuel value lower than actual fuel available
R = Maximum range for actual fuel available
R_a = Maximum range for chart fuel value F_a
R_b = Maximum range for chart fuel value F_b

Applying the formula:

$$\left(\frac{5160 - 5000}{5500 - 5000}\right)(1105 - 1000) + 1000 = R$$

$$\left(\frac{160}{500}\right)(105) + 1000 = R$$

$$1034 = R$$

From figure A-29 (sheet 2) in the column labeled "Cruising At 30,000′," the range factor for a 40-knot headwind is found to be .90. The range under this condition is a product of the range factor and the nautical air miles, as follows:

$$1034 \times .90 = 931 \textit{ nautical miles}$$

SOLUTION II.

a. In calculating the maximum range for the lower altitude (20,000 feet) with the lesser wind velocity (20 knots), it is necessary to find the climb distance and climb fuel from figure A-10, Climb Distance Vs Gross Weight, and figure A-12, Climb Fuel Vs Gross Weight, respectively. The distance covered in a military climb from sea level to 20,000 feet, following the climbing airspeed schedule shown in figure A-9, Climb Speed Vs Altitude, is 20 nautical miles. The fuel used in the climb is 300 pounds. Using the standard allowance for starting, taxiing, et cetera, of 490 pounds of fuel, and for landing, 1500 pounds, the fuel available for cruise and an idle power descent from 20,000 feet to sea level is 7150 minus 490 minus 1500 minus 300 equals *4860 pounds.* Initial cruise gross weight is 16,227 minus 490 minus 300 equals *15,437 pounds.*

b. On the Flight Operation Instruction chart with the proper weight bracket for 15,437 pounds (figure A-29, sheet 2), the range at 20,000 feet (no wind), including an idle power maximum range descent to sea level, is interpolated for 4860 pounds of available cruise fuel. Using the formula presented in Solution I, interpolate as follows:

$$\left(\frac{4860 - 4500}{5000 - 4500}\right)(885 - 800) + 800 = R$$

$$\left(\frac{360}{500}\right)(85) + 800 = R$$

$$861 = R$$

From figure A-29 (sheet 2) in the column labeled "Cruising At 20,000'," the range factor for a 20-knot headwind (as interpolated) is found to be .95. The maximum range is computed by multiplying the nautical miles by the range factor:

$$861 \times .95 = 818 \text{ nautical miles.}$$

Including the distance covered in the climb to 20,000, which was not included in the range value shown on the Flight Operation Instruction Chart, the total range is $818 + 20 = 838$ *nautical miles.*

Note

In a problem of this type in which there is an appreciable change in effective wind with altitude, the lower altitude may have the greater range value, even though less specific range is obtainable. As shown in this example, however, the increase in specific range by operating at the higher altitude was enough to overcome the adverse wind condition when compared with the range obtainable by cruising at a lower altitude where specific range was less but the wind was less adverse.

SPECIFIC RANGE CHARTS

At a given altitude, specific range in level flight depends primarily on airspeed (or Mach number) and momentary gross weight. This relationship is shown in the Specific Range charts, figures A-16, A-23, A-30, and A-37, a separate series being included for each of the four configurations. Each series consists of an individual chart for each 5000-foot pressure altitude level from sea level to 45,000 feet. Superimposed on the specific range curves are lines of recommended airspeeds for maximum endurance and for maximum range. The former is presented on the Specific Range charts for convenience only, as more elaborate endurance data can be extracted from the Endurance charts in this Appendix. The line of recommended airspeed for maximum range is based on the higher of two airspeeds which are known to result in 99% of the maximum obtainable specific range. Following this recommendation allows a substantial increase in cruising airspeed with a subsequent loss of only 1% in range. Also superimposed on the specific range curves are lines of power settings and fuel flows. These are the approximate engine speeds and resultant fuel consumption rates necessary to produce the calibrated airspeeds on which they fall. Subscales on each chart show the relationship between CAS, TAS, and Mach number for an NACA Standard Day.

EXAMPLE.

MISSION: To escort another aircraft, which is maintaining 300 knots CAS at 25,000 feet pressure altitude, to the beach which is 175 nautical miles distant, and return to the carrier with at least 1500 pounds of fuel remaining aboard.

GIVEN:

Altitude—25,000 feet
Airspeed—300 knots CAS
Gross weight—12,500 pounds
Fuel available for cruise (excluding reserve)—2000 pounds
Configuration—Clean
Wind—None

FIND: Total maximum range under the given conditions, time and fuel required to perform the assigned mission, and power setting and resultant fuel flow.

SOLUTION.

a. Enter the 25,000-foot Specific Range chart for the Clean configuration, figure A-16 (sheet 6), at 300 knots CAS.

b. Since the initial cruising gross weight is 12,500 pounds and the final cruising weight is 10,500 pounds (12,500 pounds minus the 2000 pounds of available cruise fuel), the average cruising weight is 11,500 pounds. Use this weight for determining the average specific range for the flight.

c. Move vertically from 300 knots CAS to intersect the 11,500 pound gross weight line and note that the average RPM is 83.5% and that average fuel flow is *1750 pounds.*

d. Proceed horizontally left and read that specific range is 25 nautical miles per 100 pounds of fuel. To determine the total range, multiply this specific range value by the available cruise fuel in hundreds of pounds: $25 \times 20 = 500$ *nautical miles.* As the distance to the beach and back is 350 nautical miles (175×2), the mission is well within the range capabilities of the airplane.

e. On the subscale below 300 knots CAS, note that the TAS (GS, since there is no wind) is 430 knots. Thus, the time required to perform the mission is

$$\frac{350}{430} = .8 \text{ hour or } 48 \text{ minutes.}$$

f. Total fuel requirements can be found by multiplying the time in hours by the fuel flow:

$$.8 \times 1750 = 1400 \text{ pounds.}$$

LONG RANGE PREDICTION CHARTS

LONG RANGE PREDICTION — DISTANCE

For convenience in determining the maximum range at a given altitude for an established quantity of available cruise fuel, the Long Range Prediction — Distance charts are provided. These charts are valid only for operation at a constant pressure altitude using the recommended airspeed for maximum range. Range is calculated by taking the *difference* between the distance shown at the initial gross weight and the distance shown at the final gross weight (initial weight minus the weight of the available cruise fuel). This difference is the actual range for the quantity of fuel available for cruise. When the flight requires cruising at more than one altitude level, the range should be calculated separately for the portion of the cruise at each altitude, then the sum of the portions taken. Allowances should be made for the enroute climbs or descents from one altitude to another. As separate Long Range Prediction — Distance charts, figures A-17, A-24, A-31 and A-38, are provided for each aircraft drag configuration, the name of the configuration should be known (see figure A-1) before attempting to predict the range.

LONG RANGE PREDICTION — TIME

The Long Range Prediction — Time charts are similar to, and are used in conjunction with, the Long Range Prediction — Distance charts to determine the elapsed cruise time corresponding to the cruise distance prediction. As in the distance charts, when cruising at different altitude levels during the flight, the time should be calculated by taking the sum of the constant altitude cruise segments and then adding the time required for any enroute climbs or descents between altitudes.

EXAMPLE. Assume 13,800 pounds gross weight in the Basic Attack configuration with 1800 pounds of fuel available for cruise at 10,000 feet. Find the available range and the time required to fly that distance.

DISTANCE.

a. Enter figure A-24 at 13,800 pounds and move vertically to 10,000 feet.

b. Move horizontally to the left and read 760 nautical miles.

c. Re-enter the chart at weight after cruise (13,800 minus 1800) = 12,000 pounds, and move vertically to intersect the 10,000 foot line.

d. Move horizontally left and read 500 nautical miles.

e. Maximum range at 10,000 feet with 1800 pounds of fuel is the difference between the two distances (760 − 500) = *260 nautical miles.*

TIME.

a. Enter figure A-25 at 13,800 pounds and move vertically to 10,000 feet.

b. Move horizontally left and read 125 minutes.

c. Re-enter the chart at weight after cruise (13,800 minus 1800) = 12,000 pounds, and move vertically to intersect 10,000 feet.

d. Move horizontally left and read 85 minutes.

e. The time required to cover the 260 nautical miles at 10,000 feet with 1800 pounds of fuel is

(125 − 85) = *40 minutes.*

MAXIMUM RANGE—VARIABLE ALTITUDE CHARTS

The absolute maximum obtainable cruise distance is shown in the Maximum Range — Variable Altitude charts, figures A-19, A-26, A-33, and A-40. The recommended procedure to obtain the performance data shown in these charts allows the pilot to take advantage of the increase in specific range which can be made possible by correlating the optimum altitude with the gross weight. Optimum altitude for cruising flight varies inversely with gross weight: the lighter the weight, the higher the optimum altitude. During cruising flight, the aircraft weight continuously decreases as fuel is consumed, thus the optimum altitude is continuously increasing. If one were to remain at the initial optimum cruising altitude while the weight decreased, a substantial loss in range would result; by climbing to the optimum altitude for each momentary gross weight, the ultimate in range will be realized. As the weight is continuously decreasing and the altitude is continuously increasing, the cruising portion of this type of flight will be a continuous gentle climb of approximately 35 feet per minute. The proper procedure is to climb to the initial optimum cruise altitude for the initial cruising gross weight (take-off gross weight minus the weight of the fuel used in the climb to the initial optimum altitude). Once this altitude is reached, establish the Mach number and rpm as recommended by the particular chart. *Maintain this Mach number and power setting throughout the entire cruise portion of the mission.* The altitude will gradually increase (the CAS will gradually decrease) as the aircraft weight diminishes with fuel consumption. The Mach number and rpm are such that the rate of climb resulting from the decreasing gross weight places the airplane at the optimum altitude at all times.

EXAMPLE. Assume 14,400 pounds gross weight in the Clean configuration with 2000 pounds of fuel available for cruise.

a. Enter figure A-19 at 14,400 pounds and move vertically to intersect the Distance line, Time line, and Calibrated Airspeed line.

b. Move left on the respective graphs and read:
Range—1950 nautical miles
Initial optimum altitude—36,000 feet
Initial calibrated airspeed—260 knots.

c. Re-enter the charts at weight after cruise 14,400 − 2000 = 12,400 pounds, and again move vertically to intersect the Range line, Altitude line, and Calibrated Airspeed line.

d. Move left on the respective lines and read:

Range—1400 nautical miles
Final optimum altitude—39,000 feet
Final calibrated airspeed—240 knots.

e. Maximum range is 1950 − 1400 = *550 nautical miles* if .79 Mach number and 87% RPM are maintained.

ENDURANCE CHARTS

ENDURANCE PREDICTION

Data needed for predetermination of the maximum endurance at a given altitude with an established quantity of fuel is presented in the Endurance Prediction charts, figures A-20, A-27, A-34, and A-41. As a separate chart is provided for each aircraft drag configuration, the external loading should be established before attempting to predict endurance. These charts are particularly valuable when it is known that the planned mission will require remaining on station for a considerable length of time. The Endurance Prediction charts are quite simple to use, but it should be remembered that they should be used for incremental times only. In other words, two values must be obtained from the chart and the *difference,* or increment, between the two values is the endurance time in minutes.

EXAMPLE. The assigned mission includes orbiting on station at 20,000 feet after an attack for as long as possible before returning to base. No external stores will be aboard and the gross weight will be 11,400 pounds. Excluding fuel needed for the return trip and landing, 600 pounds of fuel are to be available for loiter. Determine the length of time it is possible to remain on station.

a. Enter figure A-20 at 11,400 pounds and move vertically to 20,000 feet.

b. Move horizontally left and read 120 minutes.

c. Re-enter the chart at the weight after loiter (11,400 − 600 = 10,800 pounds) and move vertically to 20,000 feet.

d. Move horizontally left and read 100 minutes.

e. Total loiter time is 120 − 100 = *20 minutes.*

ENDURANCE — LEVEL FLIGHT

Specific endurance in terms of minutes per 100 pounds of fuel is presented in the Endurance — Level Flight charts, figures A-21, A-28, A-35, and A-42. Specific endurance is plotted versus gross weight for various altitudes, and a separate chart is included for each configuration. Calibrated airspeeds, which are the recommended airspeeds for maximum endurance shown on the appropriate Specific Range charts, are also included on these endurance charts.

EXAMPLE. Assume an operating gross weight of 14,000 pounds in the Ferry configuration with 2000 pounds of fuel available for loiter at a pressure altitude of 20,000 feet. Determine endurance.

a. Enter figure A-42 at 14,000 pounds and move vertically to intersect the 20,000 foot pressure altitude line and the calibrated airspeed line.

b. Move left on the respective graphs and read: specific endurance = 3.6 minutes per hundred pounds of fuel, and the calibrated airspeed = 220 knots.

c. To find the total endurance time, multiply the specific endurance value by the total fuel available for loiter in hundreds of pounds:

$$3.6 \times 20 = 72 \textit{ minutes.}$$

FOULED DECK ENDURANCE

The occasion arises only too often during carrier operations wherein the deck becomes fouled and aircraft can no longer be taken aboard until the malady is cured. In these instances it is desirable for both the pilots and the Air Officer to be aware of the endurance capabilities of the unrecovered aircraft in order that an immediate decision can be made concerning the proper course of action. Should the estimated "clear deck" time be beyond the endurance time of the aircraft, then they must either depart immediately for the beach, or land aboard the ready deck of another carrier—if available. However, if it is either desirable or mandatory that the aircraft orbit until the deck is clear, it is necessary that the pilots fully understand the proper procedure to obtain the ultimate in performance with the available fuel.

The Fouled Deck Endurance chart, figure A-45, tabulates the endurance times for various quantities of fuel aboard at both the initial altitude and the optimum altitude. The endurance values are given in minutes, and for the optimum altitudes, include the time required for a military climb to that altitude and a maximum rate descent to sea level with 300 pounds of fuel remaining for one approach to a landing. The endurance times for the initial altitude naturally include only the descent time as no climb is required. Climbing airspeeds and recommended airspeeds for maximum endurance are included on the chart together with descent instructions. The time at which the descent should be started is given in terms of fuel aboard, which includes the 300 pounds necessary for landing.

For pilots' convenience, certain "rules of thumb" may be used in determining whether to initiate a climb immediately upon learning of a fouled deck condition. These are:

a. At 10,000 feet and below, do not attempt to climb if fuel on board is less than 800 pounds.

b. At 15,000 feet, don't climb if available fuel is less than 900 pounds.

c. At 20,000 feet, do not climb if you have less than 1000 pounds of fuel.

DESCENT CHARTS

MAXIMUM RANGE DESCENT

IDLE POWER. Graphical data are presented in figure A-43 (sheets 1 and 2) for a long range descent using idle power. From sheet 1 can be found the fuel required and the CAS to be used in a descent from any altitude to sea level, or from any given altitude to another lower intermediate altitude. In sheet 2 is shown the distance covered and the time required for the descent. The descent curves are plotted as functions of gross weight, and they encompass the minimum and maximum probable descent weights. When computing for a descent from a given altitude to an intermediate altitude, the charts should be used incrementally, as shown in the example on the charts. When used for determining performance for a descent from a particular altitude to sea level, only one step is necessary, as shown in the following example.

EXAMPLE. Assume an altitude of 30,000 feet while operating at a weight of 14,000 pounds. Descend to sea level.

a. Enter figure A-43 (sheet 1) at 30,000 feet and move vertically to intersect the 14,000 pound gross weight line on both the Fuel chart and the Calibrated Airspeed chart. Move left and read on the respective charts: fuel = *320 pounds*, and calibrated airspeed = *220 knots* for all practical purposes at both 30,000 feet and at sea level.

b. Enter figure A-43 (sheet 2) at 30,000 feet and move vertically to intersect the 14,000 pound gross weight lines on the Time chart and the Distance chart. Move left and read on the respective charts: time = *19 minutes,* and the distance covered = *88 nautical miles.*

ENGINE WINDMILLING. Performance data for a power-off (engine windmilling) descent from all altitudes is presented in figure A-43 (sheet 3). From the chart can be read distance covered, time required, and recommended CAS in the descent. The chart is valid for all configurations at gross weights up to 16,000 pounds. This chart is provided for emergency use and can be employed in conjunction with the Flame-out Landing Pattern Diagram, figure 3-1A, in the Flight Handbook.

EXAMPLE. Assume that a flame-out occurs at a pressure altitude of 35,000 feet. Determine the maximum gliding distance obtainable if a descent is made to 9000 feet, the initial altitude for performing a flame-out landing (see figure 3-1A).

a. Enter figure A-43 (sheet 3) at 35,000 feet and move vertically to intersect the Distance line, Time line, and Calibrated Airspeed line.

b. Move horizontally left on the respective graphs and read:

Distance—58 nautical miles
Time—13 minutes
Initial calibrated airspeed—205 knots

c. Re-enter the chart at 9000 feet and again move vertically to intersect the Distance line, Time line, and Calibrated Airspeed line.

d. Move horizontally left on the respective graphs and read:

Distance—13 nautical miles
Time—4 minutes
Final calibrated airspeed—200 knots

e. Maximum gliding distance from 35,000 to 9000 feet is 58 − 13 = *45 nautical miles*; gliding time is 13 − 4 = *9 minutes;* and calibrated airspeed is from *205 to 200 knots.*

MAXIMUM RATE DESCENT

A practical letdown in which a maximum rate of descent, consistent with good control, is achieved, can be performed by using the Maximum Rate Descent chart, figure A-44. This chart not only shows the fuel used, time required, and distance covered, but also establishes the proper Mach number and dive angle for the descent. Two dive angles are given: 30 degrees and 40 degrees. The angles form an "optimum" band, because dives of less than 30 degrees will seriously lessen the rate of descent, while dives in excess of 40 degrees will result in airspeeds where control effectiveness is reduced and where buffeting might be encountered. In addition, steep dives require early initiation of a pull-out and cause higher airspeeds after recovery.

The procedure for conducting a maximum rate descent is as follows: At level flight cruising speeds, retard the throttle to "IDLE" and open the speedbrakes. Push over gradually to attain .9 Mach number. Increase the dive angle as necessary to maintain .9 Mach number or until the desired dive angle is reached. After reaching the proper dive angle, maintain this angle throughout the remainder of the descent.

EXAMPLE. You are returning to base at a pressure altitude of 30,000 feet. It is desired to perform a 40° maximum rate descent to 2000 feet, which is the required pressure altitude over the point of entry into the traffic pattern. Determine the distance away from the entry point at which to start the descent, and in addition, the time required and fuel used in the descent.

a. Enter figure A-44 at 30,000 feet and move vertically to intersect the 40° dive angle line on the fuel, time, and distance graphs.

b. Move horizontally left and read from the respective graphs:

Fuel—22 pounds
Time—1.2 minutes
Distance—9.5 nautical miles

c. Re-enter the chart at 2000 feet and again move vertically to intersect the 40° dive angle line on each graph.

d. Move horizontally left and read from the respective graphs:

Fuel—2 pounds
Time—.1 minute
Distance—.5 nautical mile

e. The point at which to begin the descent is 9.5 − .5 = *9 nautical miles* from the pattern entry point, the time required is 1.2 − .1 = *1.1 minute,* and the fuel used in the descent is 22 − 2 = *20 pounds.*

LANDING CHART

The landing ground roll of the aircraft is dependent on five factors: airport altitude, outside air temperature, gross weight of the airplane, the force of the headwind, and the braking action. The ground roll distance as given is predicated on maximum braking action without skidding the tires on a smooth dry surface, such as a paved runway, and on retraction of the wing flaps immediately after touch-down. In figure A-46, Landing Distance, the ground roll distance can be obtained for various gross weights ranging from the minimum to the maximum expected landing weights, for ambient temperatures from 29°C above to 43°C below standard temperature (15°C at sea level), and for headwinds as high as 40 knots. The chart also presents the maximum distance required to clear a 50 foot obstacle, descend, touchdown and brake to a stop. This distance is measured horizontally from the obstacle to the end of the roll-out, and is computed by multiplying the ground roll distance by a factor which can be obtained from a small graph on the chart. The existence or non-existence of an object has no effect on the actual ground roll distance but can affect the point of touchdown. The further away from the landing end of the runway is the obstacle, the closer to the landing end is the point of touchdown. Conversely, if the obstacle is close to the landing end, the touchdown must take place further down the runway. Therefore, prior to deciding whether a safe landing can be made over a 50 foot obstacle on a particular runway, the distance of the obstacle from the runway should be known. Obviously if the obstacle is situated at a distance from the runway which is greater than the ground distance required to descend from fifty feet, it will have no effect on the usable runway length, for in this instance a touchdown can be made directly on the end of the runway. On the other hand, if the obstacle were very near the runway, the portion of runway length used in the descent from fifty feet might not leave enough distance to brake to a stop. An example for the use of the various graphs within the Landing Distance chart is presented in figure A-46.

EXAMPLE. While operating at a gross weight of 10,000 pounds, a landing is to be made on an airfield whose pressure altitude is 1000 feet. The ambient temperature at the airfield is 25°C and there is a 25-knot headwind. Determine the ground roll resulting from maintaining clearance over a 50-foot obstacle at the landing end of the runway.

a. Enter the density altitude graph on the Landing Distance chart at 25°C, and move vertically to intersect the 1000-foot pressure altitude line.

b. Proceed horizontally right into the gross weight graph and intersect the 10,000 pound line. Note that the recommended approach speed is 105 knots IAS.

c. Move vertically down and, upon entering the headwind graph, follow the guide lines until reaching 25 knots. Directly below, read on the distance scale: landing ground roll = *1350 feet.*

d. Enter the obstacle clearance ratio graph at 10,000 pounds, and move vertically to 25 knots headwind.

e. Move horizontally left and read obstacle clearance factor = 1.5.

f. Total distance (measured from the obstacle) to clear a 50-foot obstacle is 1350 × 1.5 = *2025 feet.*

AIRCRAFT DRAG CONFIGURATIONS

A4D-1

CLEAN

Configuration includes a centerline pylon and two wing pylons.

BASIC ATTACK

Configuration includes a centerline pylon, two wing pylons and one of the following combinations.

1. One 2000-pound Mk 84 bomb and two 1000-pound Mk 83 bombs.
2. One 2000-pound Mk 84 bomb.
3. Any combination of the following stores:
   - 1000-pound Mk 83 bomb
   - 500-pound Mk 82 bomb
   - 250-pound Mk 81 bomb
   - Rocket Launcher Package Aero 6A (seven 2.75-inch rockets)
4. One Rocket Launcher Package Aero X10A (four 5.0-inch rockets) in combination with any two stores in "3."
5. Two Rocket Launcher Packages Aero X10A (four 5.0-inch rockets).
6. One 150-gallon Aero 1A drop tank.
7. One Radio Navigation Package.
8. One Mk 12 store.
9. One Mk 91 store.
10. One Mk 28 store.

LONG RANGE ATTACK

Configuration includes a centerline plyon, two wing pylons, and one of the following combinations:

1. One 300-gallon Aero 1A drop tank and two 1000-pound Mk 83 bombs.
2. Three 150-gallon Aero 1A drop tanks.
3. One 300-gallon Aero 1A drop tank.
4. Two 150-gallon Aero drop tanks alone or in combination with one of the following stores:
   - 2000-pound Mk 84 bomb
   - 1000-pound Mk 83 bomb
   - Radio Navigation Package
5. One 150-gallon Aero 1A drop tank and two of the following stores:
   - 1000-pound Mk 83 bomb
   - Rocket Launcher Package Aero 6A (seven 2.75-inch rockets)
6. Three Rocket Launcher Packages Aero X10A (four 5.0-inch rockets).
7. One Rocket Launcher Package Aero 7A (nineteen 2.75-inch rockets).
8. One Mk 12 store and two 150-gallon Aero 1A drop tanks.
9. One Mk 91 store and two 150-gallon Aero 1A drop tanks.
10. One Mk 28 store and two 150-gallon Aero 1A drop tanks.
11. One Mk 7 store (for one Mk 7 store and two 150-gallon Aero 1A drop tanks, use Ferry configuration data).

FERRY

Configuration includes a centerline pylon, two wing pylons, and one of the following combinations:

1. One 300-gallon Aero 1A drop tank and two 150-gallon Aero 1A drop tanks.
2. One Rocket Launcher Package Aero 7A (nineteen 2.75-inch rockets) and two 150-gallon Aero 1A drop tanks.
3. One Mk 7 store and two 150-gallon Aero 1A drop tanks.

P-8373-1A

Figure A-1

TO BE ADDED WHEN INFORMATION BECOMES AVAILABLE

Figure A-2 (Sheet 1)

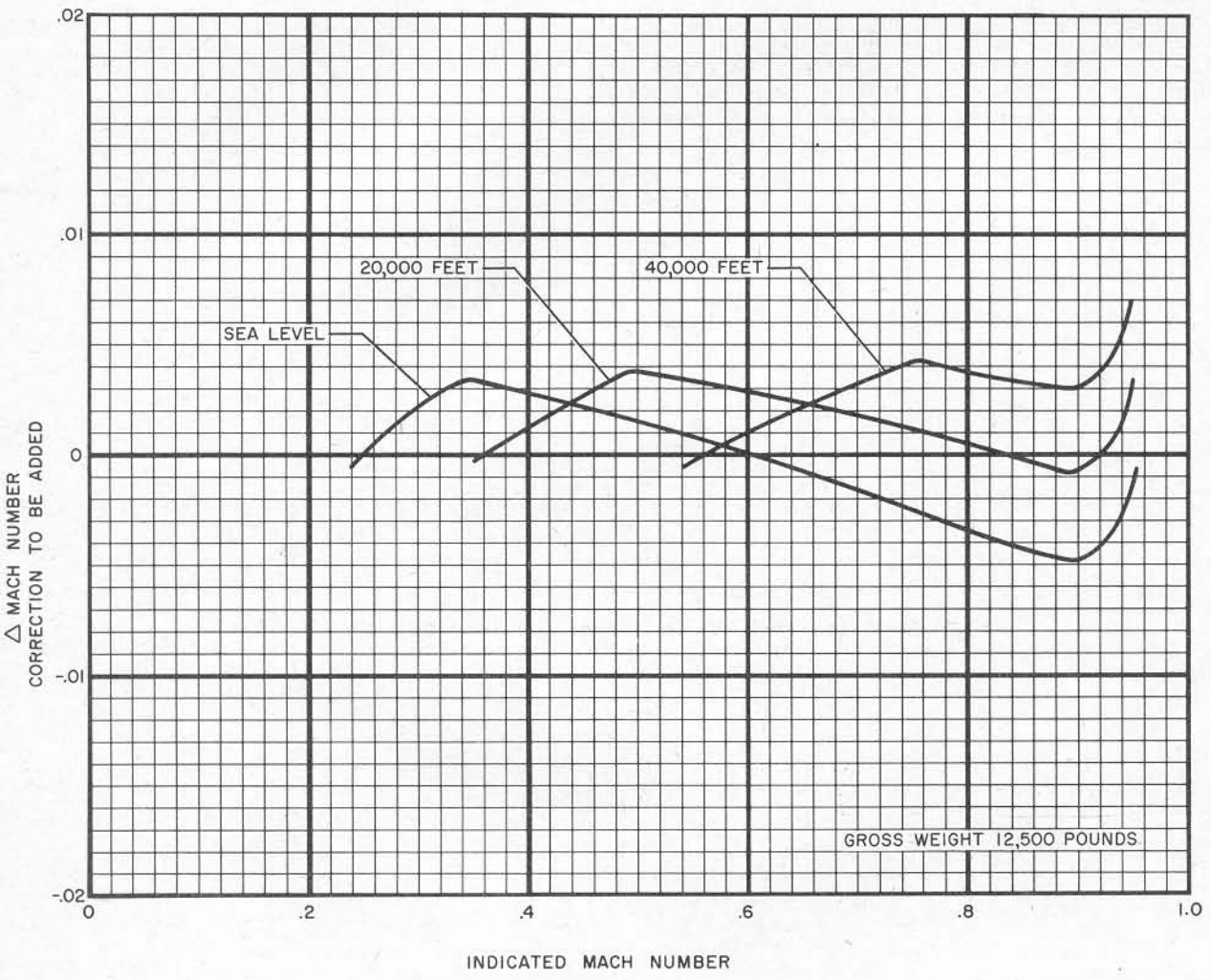
TO BE ADDED WHEN INFORMATION BECOMES AVAILABLE

Figure A-2 (Sheet 2)

CORRECTION FOR POSITION ERROR

MACH NUMBER

MODEL: A4D-1 (Correction to be added) ENGINE: J65-W-4



P10100-1

REMARKS:

1. IMN = Instrument reading corrected for instrument error.
2. Add correction to IMN to obtain the Mach number.

EXAMPLE:

Assume IMN = .6 at 20,000 feet.

Position error = + .0028.

True Mach number = .6028.

DATA AS OF: 1 April 1957

DATA BASIS: Calculations

FUEL GRADE: JP-4

FUEL DENSITY: 6.5 LB/gal.

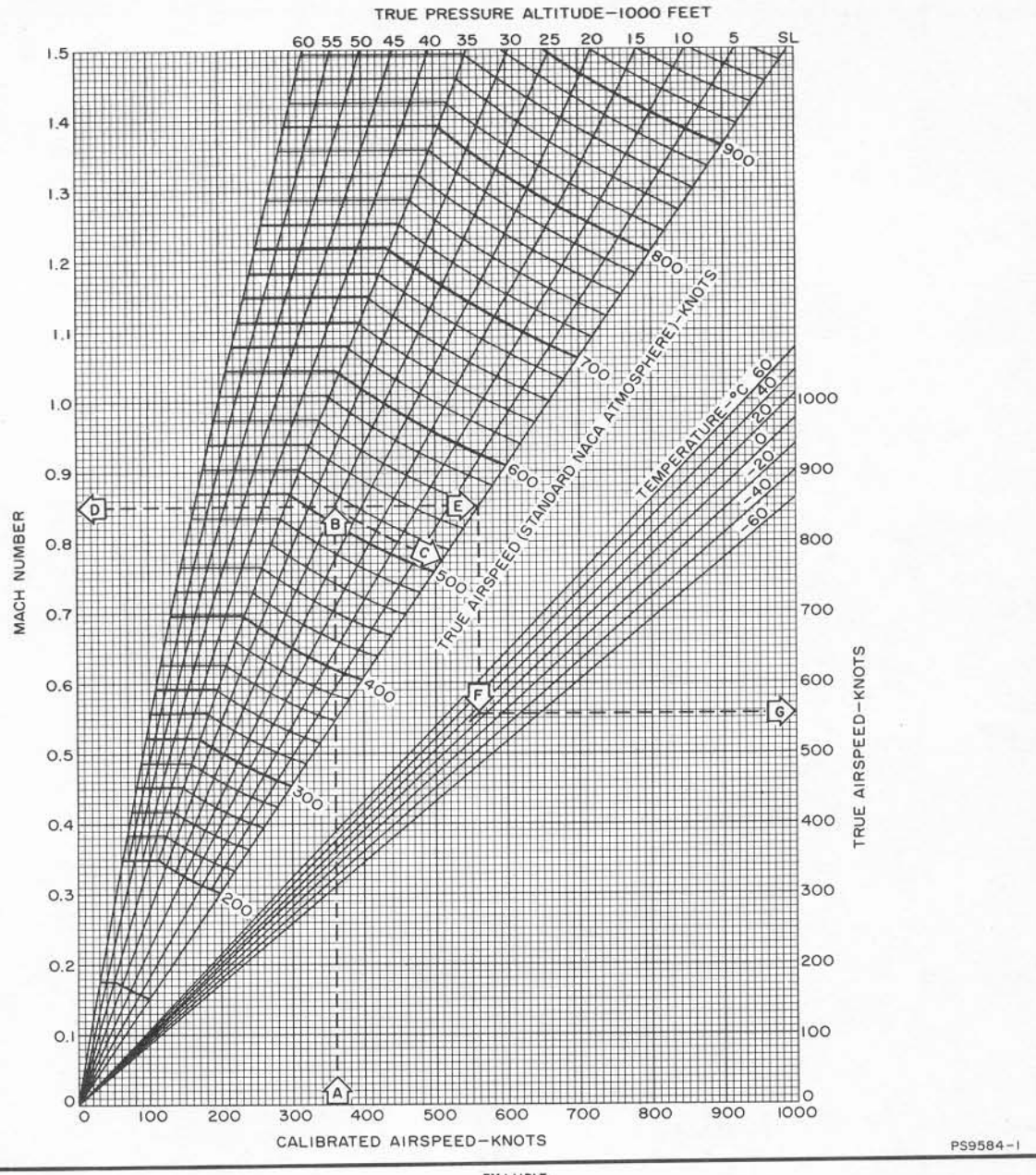
Figure A-3 (Sheet 1)

TO BE ADDED WHEN INFORMATION BECOMES AVAILABLE

Figure A-3 (Sheet 2)

Figure A-4 (Deleted)

AIRSPEED VS MACH NUMBER



EXAMPLE:

Assume airspeed is 360 knots CAS and pressure altitude is 25,000 feet.

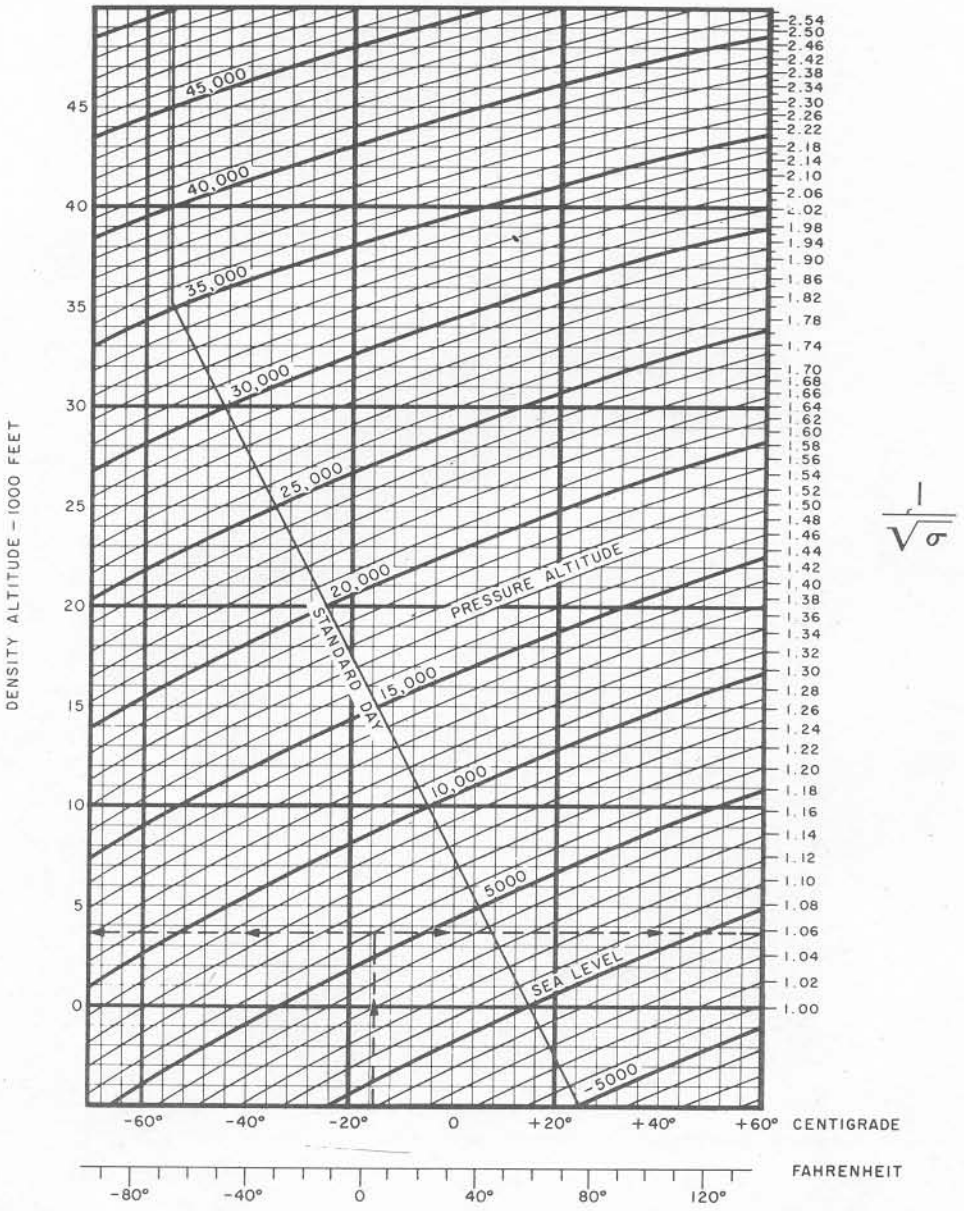
(1) Enter chart at 360 knots (A). Sight upward to the 25,000 foot curve (B). Move right, paralleling closest guide line, and read TAS for standard day = 511 knots (C)

(2) To determine TMN, sight left horizontally from point (B) and read scale = .85 (D)

(3) To determine TAS for non-standard day (e.g. t = +10° C at 25,000 feet), sight right horizontally to sea level curve (reference only) (E). Sight downward vertically to the +10° C curve (interpolate) (F). Sight right horizontally and read scale = 556 knots (G)

Figure A-4A

DENSITY ALTITUDE CHART



EXAMPLE:

If ambient temperature is –15°C and pressure altitude is 6000 feet, the density altitude is 3700 feet and $\frac{1}{\sqrt{\sigma}}$ is 1.058.

Figure A-5

STANDARD ALTITUDE TABLE

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

PS-6721-1A

REMARKS:

(1) One in. of Hg = 70.732 lb per sq ft = 0.4912 lb per sq in.

(2) Standard Sea Level Air
$t_o = 15°C$
$p_o = 29.92$ in. of Hg
$a_o = 660.8$ knots
$\rho o = .002378$ slugs per cu ft

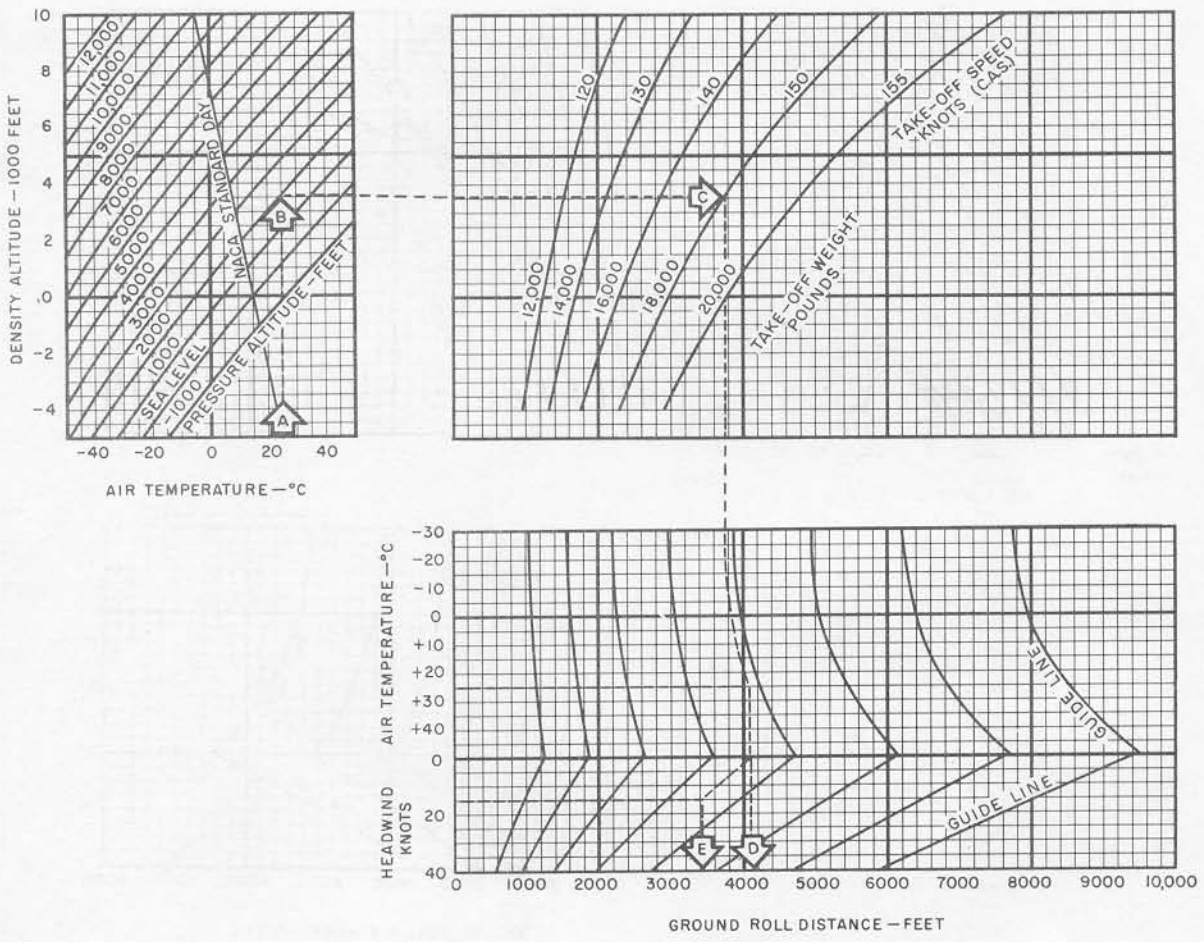
DATA BASIS: NACA Technical Report No. 218

Figure A-6

TAKE-OFF DISTANCE

NORMAL FIELD RUN HALF FLAPS

MODEL: A4D-1 ENGINE: J65-W-4



P7013-1

REMARKS:

(1) Take-off distances are based on engine operating at military power.
(2) Wing flaps half down (25°).
(3) Lift off at airspeeds shown on chart.
(4) For take-off over a 50 foot obstacle, multiply ground roll by 1.1.

EXAMPLE:

Assume 18,000 lb gross weight, air temperature of 25°C, pressure altitude of 2000 feet, and zero headwind.

(1) Enter density altitude chart at 25°C (A).
(2) Move vertically to 2000 feet (B).
(3) Move horizontally right to 18,000 lb (C).
(4) Move downward, following guide lines on temperature chart, to 25°C; directly below on distance scale, read take-off distance = 4100 feet (D).
(5) For the added condition of a 15-knot headwind, follow guide lines on entering the headwind chart to 15 knots; directly below on the distance scale, read take-off distance = 3400 feet (E).

DATA AS OF: 16 May 1955
DATA BASIS: Calculations

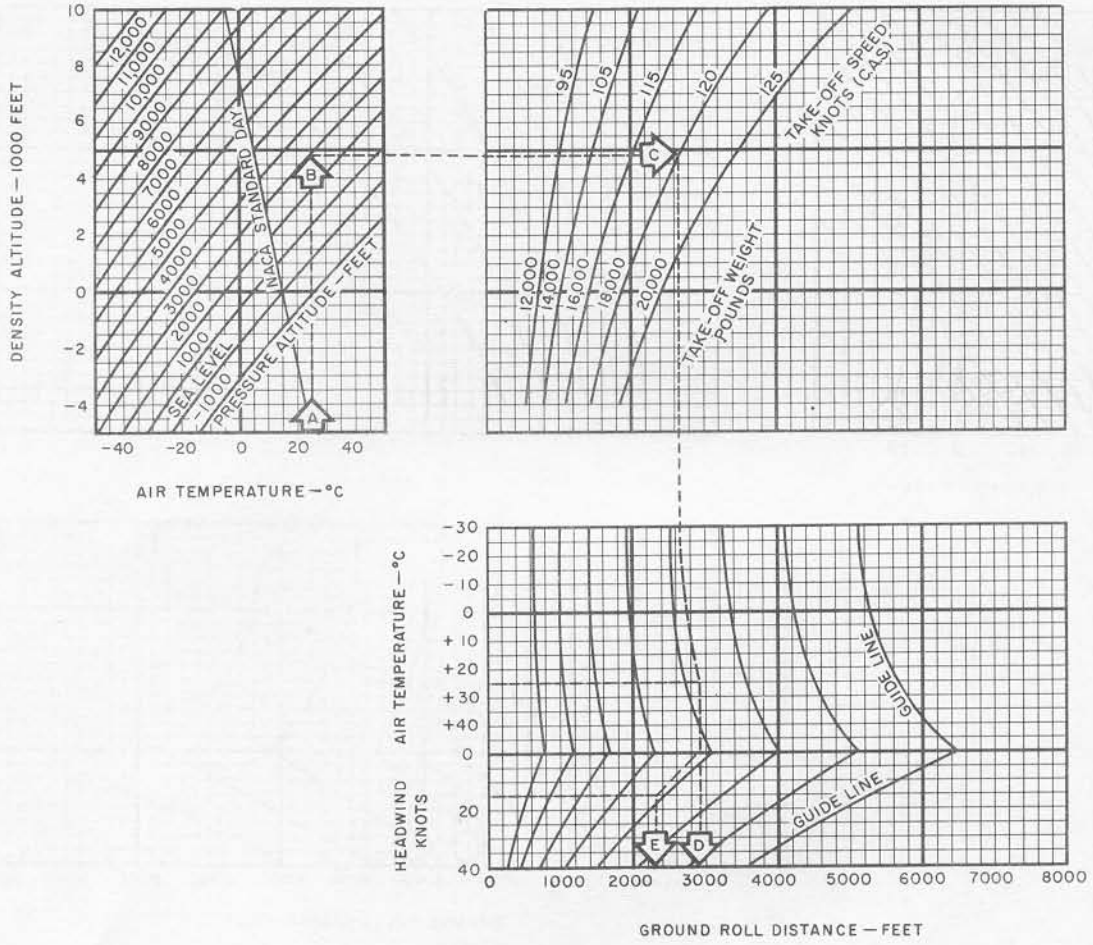
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal.

Figure A-7 (Sheet 1)

TAKE-OFF DISTANCE

MINIMUM RUN FULL FLAPS

MODEL: A4D-1 ENGINE: J65-W-4



P7013-2

REMARKS:

(1) Take-off distances are based on the engine operating at military power.
(2) Wing flaps full down (50°).
(3) Lift off at airspeeds shown on chart.

EXAMPLE:

Assume 18,000 lb gross weight, air temperature of 25°C, pressure altitude of 3000 feet, and zero headwind.

(1) Enter density altitude chart at 25°C (A).
(2) Move vertically to 3000 feet (B).
(3) Move horizontally right to 18,000 lb (C).
(4) Move downward, following guide lines on temperature chart, to 25°C; directly below on the distance scale, read take-off distance = 2900 feet (D).
(5) For the added condition of a 15 knot headwind, follow guide lines on entering the headwind chart to 15 knots; directly below on the distance scale, read take-off distance = 2300 feet (E).

DATA AS OF: 16 May 1955
DATA BASIS: Calculations

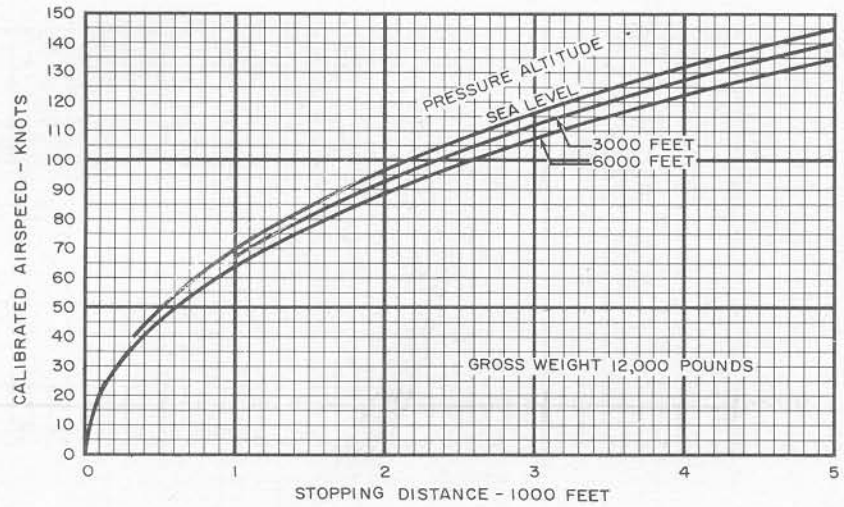
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

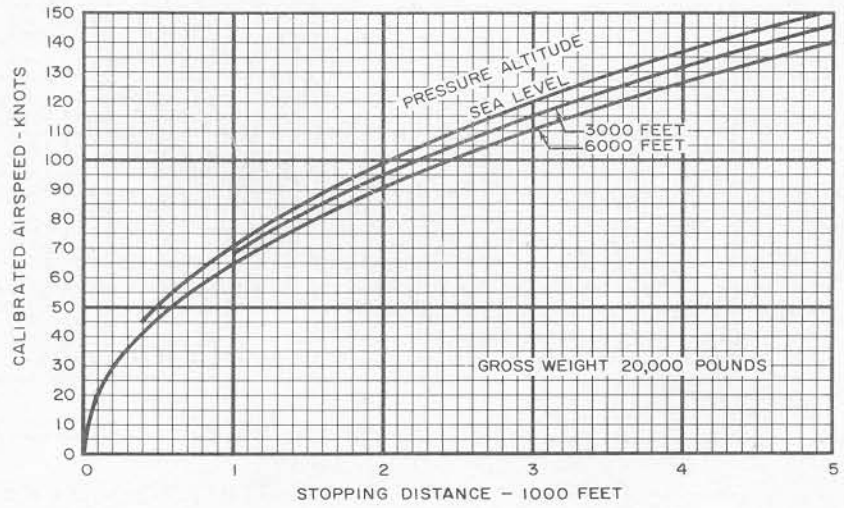
Figure A-7 (Sheet 2)

STOPPING DISTANCE

HALF FLAPS IDLE RPM

MODEL: A4D-1 STANDARD DAY ENGINE: J65-W-4





P-7014-1

REMARKS:

(1) Distances are valid for a hard surface runway.
(2) Chart values are also valid for engine windmilling with either half flaps or flaps retracted.
(3) Apply maximum braking action without skidding.

DATA AS OF: 29 April 1955
DATA BASIS: Calculations

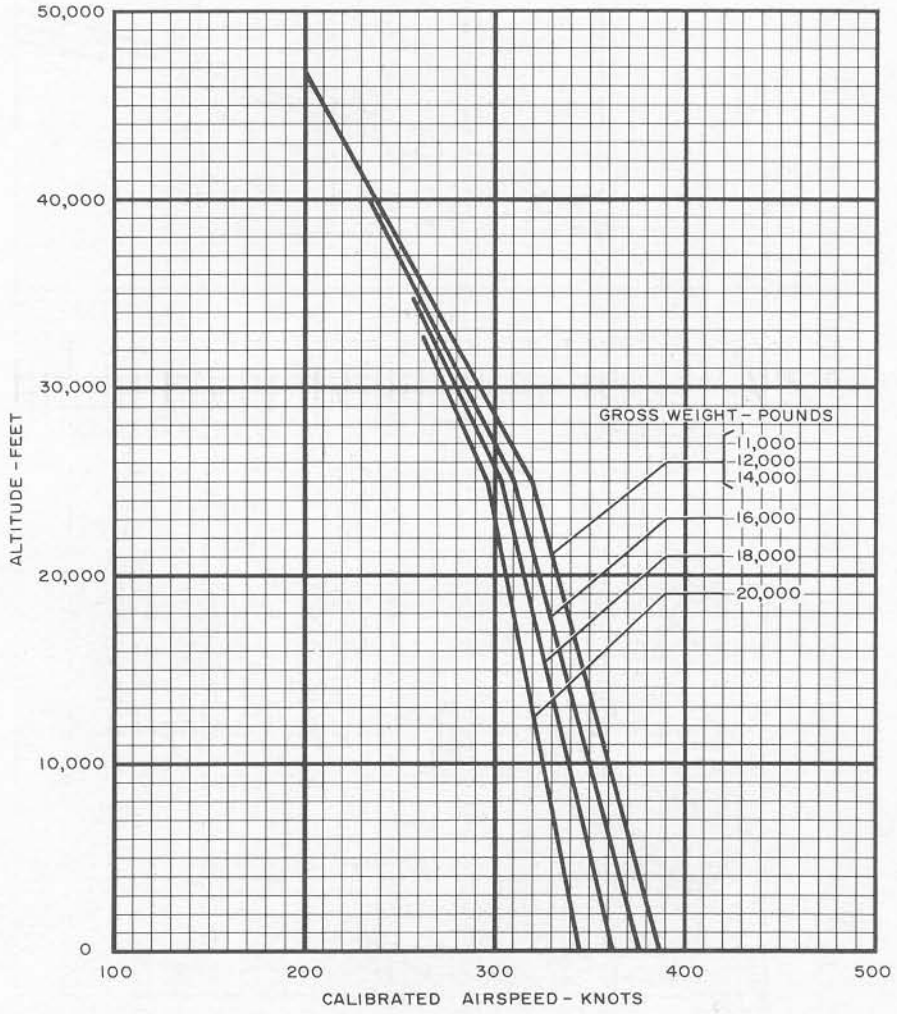
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal.

Figure A-8

CLIMB SPEED VS ALTITUDE

MILITARY POWER STANDARD DAY

MODEL: A4D-1 ENGINE: J65-W-4



P-7015-1

REMARKS:

(1) Chart is valid for all configurations.
(2) Airspeeds shown are for maximum rates of climb.

DATA AS OF: 12 April 1955
DATA BASIS: Calculations

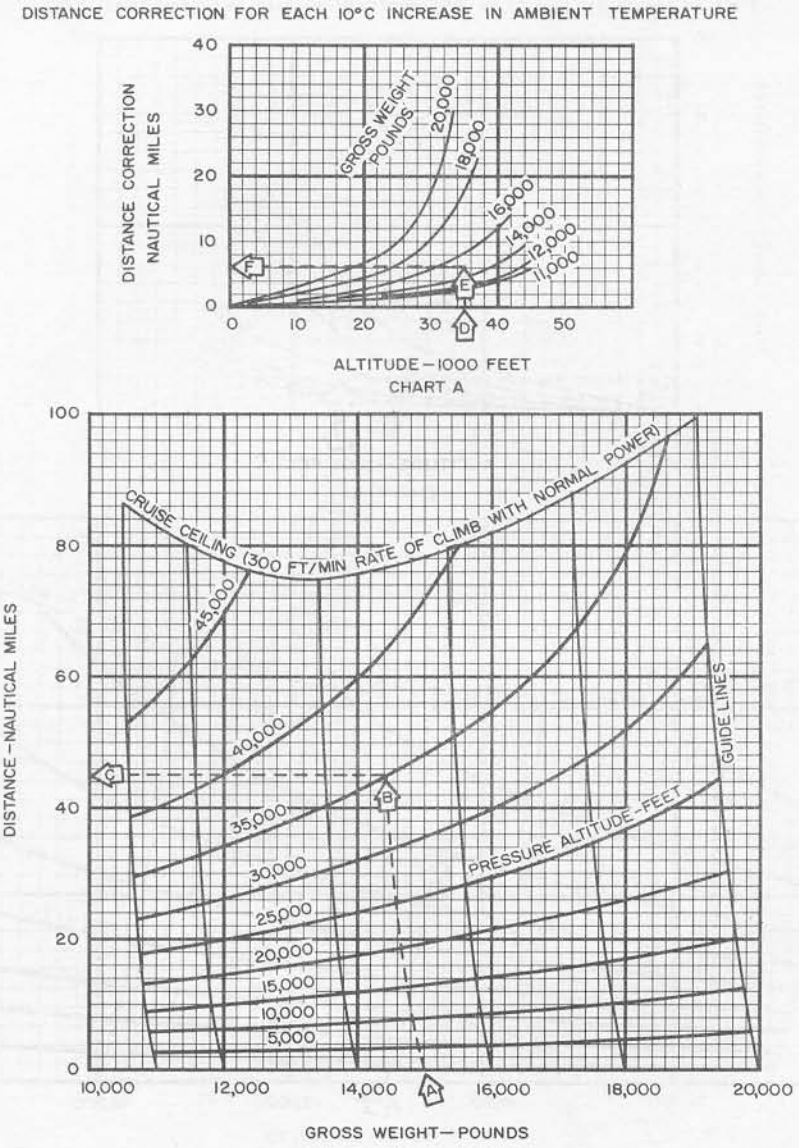
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

Figure A-9

CLIMB DISTANCE VS GROSS WEIGHT

MILITARY POWER

MODEL: A4D-1 ENGINE: J65-W-4



REMARKS:

(1) Chart is valid for all configurations.
(2) Obtain climb speeds from figure A-9.
(3) For each 10°C increase in temperature, add the distance correction from Chart A to the chart value for a standard day.

DATA AS OF: 30 April 1955
DATA BASIS: Calculations

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

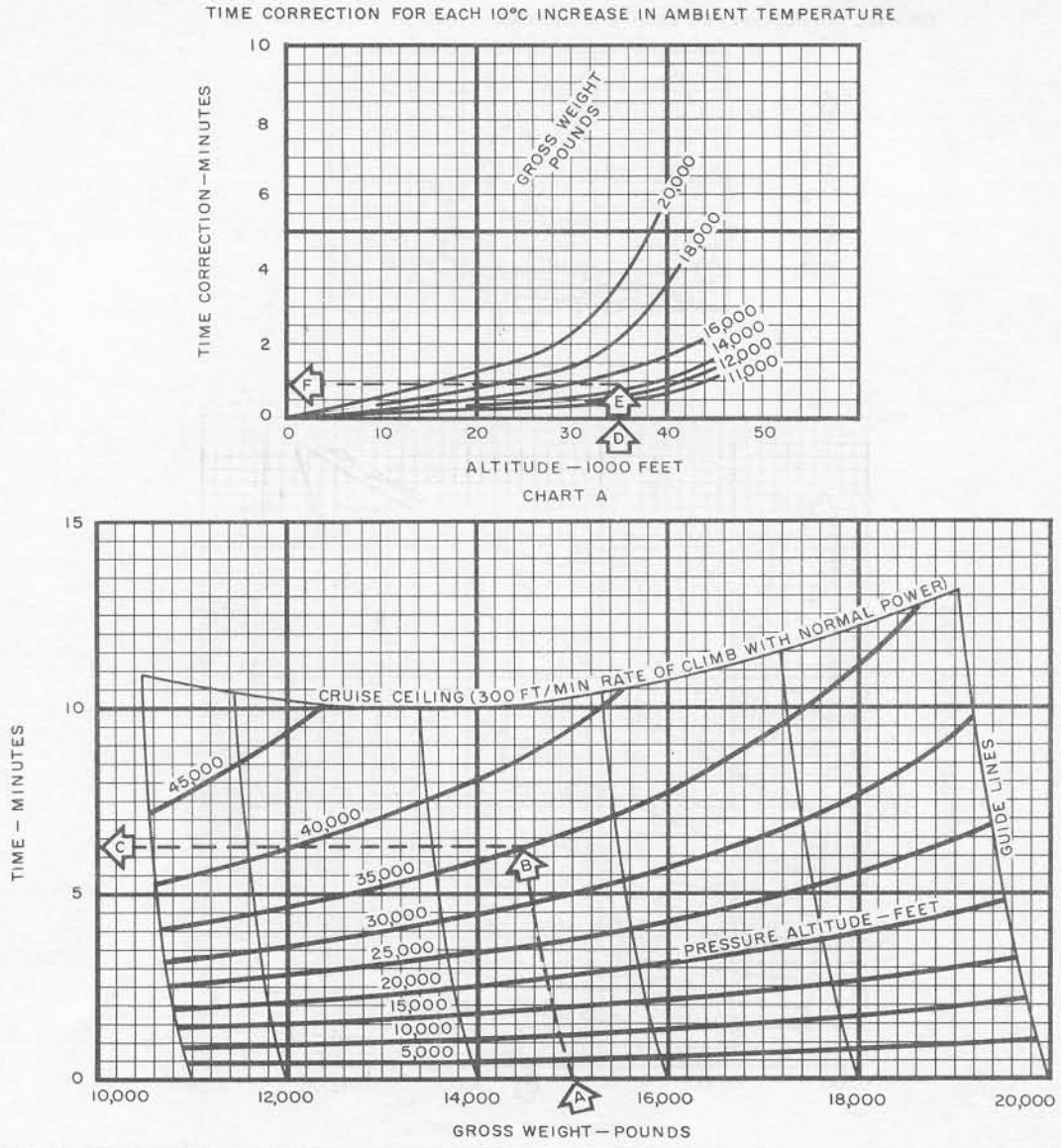
Figure A-10

CLIMB TIME VS GROSS WEIGHT

MILITARY POWER

MODEL: A4D-1

ENGINE: J65-W-4



REMARKS:

(1) Charts are valid for all configurations.
(2) Obtain climb speeds from figure A-9.
(3) For each 10°C increase in temperature, add the time correction from Chart A to the chart value for a standard day.

DATA AS OF: 30 April 1955
DATA BASIS: Calculations

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

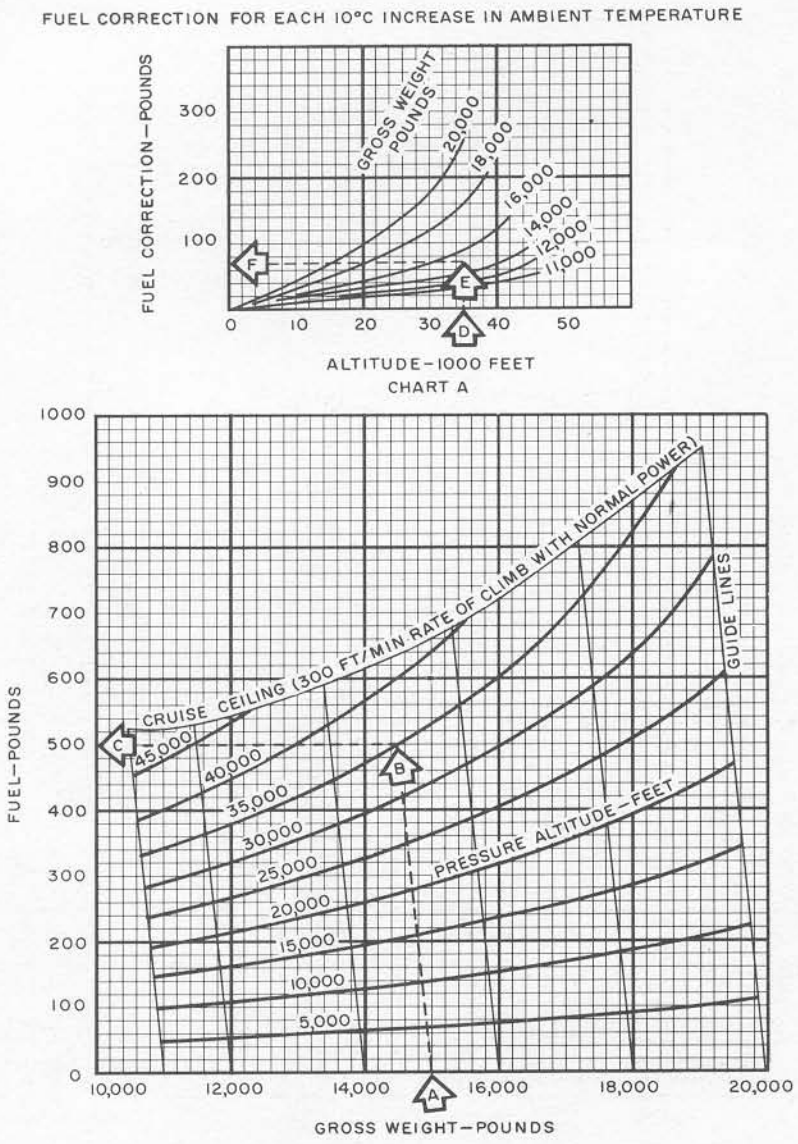
Figure A-11

CLIMB FUEL VS GROSS WEIGHT

MILITARY POWER

MODEL: A4D-1

ENGINE: J65-W-4



REMARKS:

(1) Charts are valid for all configurations.
(2) Obtain climb speeds from figure A-9.
(3) For each 10°C increase in temperature, add the time correction from Chart A to the chart value for a standard day.

DATA AS OF: 30 April 1955
DATA BASIS: Calculations

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

Figure A-12

COMBAT ALLOWANCE CHART

MODEL: A4D-1 ENGINE: J65-W-4

AT ALTITUDE FEET	FUEL REQUIRED POUNDS PER MINUTE	
	"NORM" (96.4%) RPM NORMAL POWER (MAXIMUM CONTINUOUS)	"MIL" (100%) RPM MILITARY POWER (30 MINUTE LIMIT)
SEA LEVEL	130	160
5000	120	140
10,000	105	125
15,000	90	110
20,000	80	95
25,000	70	80
30,000	60	65
35,000	50	55
40,000	40	45
45,000	30	35
50,000	25	25

P8376-1

REMARKS:

(1) Chart is valid for all configurations.
(2) Maximum allowable turbine outlet temperature:
a. Military power (30 minute limit) = "MIL" (650°C)
b. Normal power (maximum continuous) = "NORM" (595°C)

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

Figure A-13

MAXIMUM CONTINUOUS POWER SUMMARY

MODEL: A4D-1 ENGINE: J65-W-4

CLEAN CONFIGURATION WEIGHT: 12,000 LBS					BASIC ATTACK CONFIGURATION WEIGHT: 13,000 LBS			
APPROXIMATE			%RPM	PRESSURE ALTITUDE FEET	%RPM	APPROXIMATE		
LB/HR	TAS KNOTS	CAS KNOTS				CAS KNOTS	TAS KNOTS	LB/HR
7750	570	570	96.4	SEA LEVEL	96.4	555	555	7650
6950	570	535	96.4	5000	96.4	520	555	6900
6200	570	500	96.4	10,000	96.4	490	555	6150
5450	565	465	96.4	15,000	96.4	450	550	5400
4700	555	425	96.4	20,000	96.4	410	540	4650
4050	545	385	96.4	25,000	96.4	380	535	4000
3450	535	350	96.4	30,000	96.4	340	525	3450
2900	525	315	96.4	35,000	96.4	300	510	2900
2250	510	270	96.4	40,000	96.4	260	495	2250
1750	490	230	96.4	45,000	96.4	—	—	—

LONG RANGE ATTACK CONFIGURATION WEIGHT: 15,000 LBS					FERRY CONFIGURATION WEIGHT: 16,000 LBS			
APPROXIMATE			%RPM	PRESSURE ALTITUDE FEET	%RPM	APPROXIMATE		
LB/HR	TAS KNOTS	CAS KNOTS				CAS KNOTS	TAS KNOTS	LB/HR
7550	540	540	96.4	SEA LEVEL	96.4	525	525	7500
6850	540	505	96.4	5000	96.4	495	530	6750
6100	540	475	96.4	10,000	96.4	465	530	6050
5350	535	440	96.4	15,000	96.4	435	530	5300
4600	530	405	96.4	20,000	96.4	395	520	4550
3950	520	370	96.4	25,000	96.4	360	510	3900
3400	520	335	96.4	30,000	96.4	325	505	3350
2850	500	295	96.4	35,000	96.4	290	485	2800
2150	470	245	96.4	40,000	96.4	—	—	—
—	—	—	96.4	45,000	96.4	—	—	—

P-8377-1

REMARKS:

For all combinations of external stores included in each configuration, see figure A-1.

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

Figure A-14

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AIRCRAFT MODEL: A4D-1

ENGINE: J65-W-4

FLIGHT OPERATION INSTRUCTION CHART

STANDARD DAY

CHART WEIGHT LIMITS: 13,600 TO 11,000 POUNDS

EXTERNAL LOAD ITEMS
CLEAN CONFIGURATION

NUMBER OF ENGINES OPERATING: ONE

INSTRUCTIONS FOR USING CHART: (A) IN FLIGHT. Select figure in fuel column equal to or less than fuel available for cruise (fuel on board minus allowance for reserve, combat, navigational error, formation flight, etc.). Move horizontally right or left to section according to present altitude and read total range available (no wind) by cruising at that altitude or by climbing to another altitude of maximum range. For a flight at initial altitude, operating instructions are given directly below. For a flight at higher altitude, climb immediately to desired altitude and read cruising instructions in appropriate cruising altitude section. (B) FLIGHT PLANNING. From initial fuel on board subtract fuel for takeoff and climb to desired altitude and all other necessary allowances. Then use chart as for IN FLIGHT above, adding initial climb distance to range values.

NOTES: Ranges shown at optimum altitudes are maximum. In order to obtain maximum range on flights requiring more than one chart (due to external configuration or gross weight changes), it is necessary to observe the optimum cruising altitude on each chart; i.e., when changing charts, a climb may be required to obtain a maximum range. All range values include allowances for descent distance and fuel. Climb distance and fuel are included where climbs are indicated.

DATA BELOW CONTAIN NO FUEL RESERVE FOR LANDING

LOW ALTITUDE

IF YOU ARE AT S.L. — RANGE IN AIRMILES			FUEL	IF YOU ARE AT 5000′ — RANGE IN AIRMILES			IF YOU ARE AT 10,000′ — RANGE IN AIRMILES			IF YOU ARE AT 15,000′ — RANGE IN AIRMILES			FUEL	IF YOU ARE AT 20,000′ — RANGE IN AIRMILES		
BY CRUISING AT S.L.	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	LBS.	BY CRUISING AT 5000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	BY CRUISING AT 10,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	BY CRUISING AT 15,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	LBS.	BY CRUISING AT 20,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL)																
(590)	35	(1390)	5000	(695)	35	(1415)	(815)	35	(1435)	(940)	35	(1460)	5000	(1085)	35	(1475)
530	35	1240	4500	625	35	1265	735	35	1285	845	35	1305	4500	975	35	1320
470	35	1090	4000	555	35	1115	660	35	1130	755	35	1150	4000	865	35	1165
415	35	640	3500	485	35	960	570	35	980	660	35	990	3500	755	35	1015
355	35	790	3000	415	35	810	490	35	825	565	35	848	3000	650	35	860
295	35	640	2500	345	35	660	405	35	675	470	35	690	2500	540	35	710
235	35	490	2000	275	35	505	325	35	525	375	35	540	2000	430	35	555

CRUISING AT S.L.						EFFECTIVE WIND	CRUISING AT 5000′						CRUISING AT 10,000′						CRUISING AT 15,000′						EFFECTIVE WIND	CRUISING AT 20,000′					
	APPROXIMATE							APPROXIMATE						APPROXIMATE						APPROXIMATE						APPROXIMATE				
C.A.S.	MACH NO.	LBS/ HR/ ENG.	G.S.	R.F.	LET DOWN DIST.		C.A.S.	MACH NO.	LBS/ HR/ ENG.	G.S.	R.F.	LET DOWN DIST.	C.A.S.	MACH NO.	LBS/ HR/ ENG.	G.S.	R.F.	LET DOWN DIST.	C.A.S.	MACH NO.	LBS/ HR/ ENG.	G.S.	R.F.	LET DOWN DIST.		C.A.S.	MACH NO.	LBS/ HR/ ENG.	G.S.	R.F.	LET DOWN DIST.
						120 HW													355	.70	2450	315	.65	15	120 HW	330	.71	2100	320	.70	25
						80 HW							350	.63	2600	325	.75	10	340	.67	2250	340	.75	20	80 HW	310	.67	1950	330	.75	35
370	.56	3200	330	.85	0	40 HW	350	.58	2700	335	.85	5	340	.61	2450	350	.85	15	325	.64	2150	360	.85	30	40 HW	305	.67	1900	325	.85	50
350	.52	3000	350	1.00	0	0	335	.55	2600	355	1.00	10	320	.58	2300	370	1.00	25	310	.61	2100	385	1.00	40	0	300	.65	1850	395	1.00	60
330	.50	2800	370	1.10	0	40 TW	325	.53	2500	375	1.10	10	310	.56	2200	395	1.10	30	295	.59	1950	410	1.10	50	40 TW	290	.63	1800	425	1.10	75
						80 TW							295	.53	2050	420	1.25	35	285	.56	1850	435	1.20	55	80 TW	285	.61	1750	460	1.12	85
						120 TW													275	.54	1800	460	1.35	65	120 TW	275	.60	1700	490	1.30	100

P-8378-1

HIGH ALTITUDE

IF YOU ARE AT 25,000′ RANGE IN AIRMILES: BY CRUISING AT 25,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	FUEL LBS.	IF YOU ARE AT 30,000′ RANGE IN AIRMILES: BY CRUISING AT 30,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	IF YOU ARE AT 35,000′ RANGE IN AIRMILES: BY CRUISING AT 35,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	IF YOU ARE AT 40,000′ RANGE IN AIRMILES: BY CRUISING AT 40,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	FUEL LBS.	IF YOU ARE AT 45,000′ RANGE IN AIRMILES: BY CRUISING AT 45,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL)																
(1230)	35	(1490)	5000	(1385)	35	(1510)	(1510)	35	(1510)	(1515)	40	(1515)	5000			
1105	35	1335	4500	1245	35	1355	1355	35	1355	1360	40	1360	4500			
985	35	1185	4000	1105	35	1205	1205	35	1205	1210	40	1210	4000			
860	35	1030	3500	965	35	1045	1050	35	1050	1055	40	1055	3500			
735	35	875	3000	825	35	895	895	35	895	905	40	900	3000			
610	35	720	2500	685	35	740	745	35	745	755	40	755	2500			
485	35	570	2000	545	35	585	590	35	590	600	40	600	2000			

CRUISING AT 25,000′ C.A.S.	APPROX. MACH NO.	APPROX. LBS/HR/ENG.	APPROX. G.S.	APPROX. R.F.	APPROX. LET DOWN DIST.	EFFECTIVE WIND	CRUISING AT 30,000′ C.A.S.	APPROX. MACH NO.	APPROX. LBS/HR/ENG.	APPROX. G.S.	APPROX. R.F.	APPROX. LET DOWN DIST.	CRUISING AT 35,000′ C.A.S.	APPROX. MACH NO.	APPROX. LBS/HR/ENG.	APPROX. G.S.	APPROX. R.F.	APPROX. LET DOWN DIST.	CRUISING AT 40,000′ C.A.S.	APPROX. MACH NO.	APPROX. LBS/HR/ENG.	APPROX. G.S.	APPROX. R.F.	APPROX. LET DOWN DIST.	EFFECTIVE WIND	CRUISING AT 45,000′ C.A.S.	APPROX. MACH NO.	APPROX. LBS/HR/ENG.	APPROX. G.S.	APPROX. R.F.	APPROX. LET DOWN DIST.
315	.74	1900	330	.70	40	120 HW	290	.77	1700	335	.70	60	265	.78	1500	325	.70	90	245	.81	1500	345	.70	130	120 HW							
305	.72	1850	355	.80	55	80 HW	285	.76	1650	365	.80	85	260	.77	1450	365	.80	120	240	.80	1500	385	.80	165	80 HW							
295	.70	1750	385	.85	75	40 HW	280	.74	1600	400	.90	110	260	.76	1450	400	.90	155	240	.80	1500	420	.90	205	40 HW							
285	.68	1700	410	1.00	95	0	270	.71	1500	420	1.00	135	255	.75	1450	430	1.00	185	240	.79	1500	455	1.00	240	0							
280	.67	1600	440	1.10	110	40 TW	270	.72	1550	460	1.10	155	255	.75	1450	470	1.10	215	240	.79	1500	495	1.05	280	40 TW							
270	.65	1550	470	1.20	130	80 TW	265	.71	1500	495	1.20	180	250	.74	1400	510	1.20	245	235	.79	1450	535	1.15	351	80 TW							
265	.64	1550	505	1.30	145	120 TW	260	.70	1500	530	1.30	205	245	.73	1350	545	1.30	275	235	.78	1450	570	1.25	355	120 TW							

SPECIAL NOTES

(1) Climb at military power.

(2) Descend at idle power.

(3) Make additional allowance for landing, reserve fuel, combat, et cetera, as required.

(4) Read lower half of chart opposite effective wind only.

(5) For all combinations of external stores included in this configuration, see figure A-1.

EXAMPLE

If you are at 25,000 feet with 4000 pounds of available fuel, you can fly 985 nautical air miles by holding 285 knots CAS (no wind). However, you can fly 1185 nautical air miles by immediately climbing to 35,000 feet using "MIL" (100%) RPM. At 35,000 feet, cruise at 255 knots CAS and start letdown 185 nautical miles from destination. With an 80-knot headwind, the range at 35,000 feet would be .8 x 1185 or 945 nautical miles. Cruise at 260 knots CAS with this wind and start letdown 120 nautical miles from destination.

LEGEND

HW –Headwind in knots
TW –Tailwind in knots
R.F. –Range factor; ratio of ground distance to air miles for corresponding winds
G.S. –Ground speed in knots
C.A.S. –Calibrated airspeed in knots
LB/HR/ENG. –Fuel consumption in pounds per hour per engine
Range –Nautical miles
( ) –Range in parentheses for interpolation purposes only

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

P-8378-2

Figure A-15 (Sheet 1)

AIRCRAFT MODEL: A4D-1

ENGINE: J65-W-4

FLIGHT OPERATION INSTRUCTION CHART

STANDARD DAY

CHART WEIGHT LIMITS: 11,000 TO 9000 POUNDS

EXTERNAL LOAD ITEMS

CLEAN CONFIGURATION

NUMBER OF ENGINES OPERATING: ONE

INSTRUCTIONS FOR USING CHART: (A) IN FLIGHT. Select figure in fuel column equal to or less than fuel available for cruise (fuel on board minus allowance for reserve, combat, navigational error, formation flight, etc.). Move horizontally right or left to section according to present altitude and read total range available (no wind) by cruising at that altitude or by climbing to another altitude of maximum range. For a flight at initial altitude, operating instructions are given directly below. For a flight at higher altitude, climb immediately to desired altitude and read cruising instructions in appropriate cruising altitude section. (B) FLIGHT PLANNING. From initial fuel on board subtract fuel for takeoff and climb to desired altitude and all other necessary allowances. Then use chart as for IN FLIGHT above, adding initial climb distance to range values.

NOTES: Ranges shown at optimum altitudes are maximum. In order to obtain maximum range on flights requiring more than one chart (due to external configuration or gross weight changes), it is necessary to observe the optimum cruising altitude on each chart; i.e., when changing charts, a climb may be required to obtain a maximum range. All range values include allowances for descent distance and fuel. Climb distance and fuel are included where climbs are indicated.

DATA BELOW CONTAIN NO FUEL RESERVE FOR LANDING

LOW ALTITUDE

IF YOU ARE AT S.L. — RANGE IN AIRMILES			FUEL	IF YOU ARE AT 5000′ — RANGE IN AIRMILES			IF YOU ARE AT 10,000′ — RANGE IN AIRMILES			IF YOU ARE AT 15,000′ — RANGE IN AIRMILES			FUEL	IF YOU ARE AT 20,000′ — RANGE IN AIRMILES		
BY CRUISING AT S.L.	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	LBS.	BY CRUISING AT 5000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	BY CRUISING AT 10,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	BY CRUISING AT 15,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	LBS.	BY CRUISING AT 20,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL)																
(305) 240	45 45	(740) 560	2500 2000	(355) 285	45 45	(755) 575	(425) 340	45 45	(770) 590	(490) 395	45 45	(785) 610	2500 2000	(565) 450	45 45	(800) 620
180 120	45 30	380 205	1500 1000	215 140	40 35	400 225	255 170	40 35	415 240	295 195	40 35	425 250	1500 1000	335 220	40 35	440 265
60	15	75	500	70	20	80	85	20	90	95	20	100	500	105	25	105

CRUISING AT S.L.						EFFECTIVE WIND	CRUISING AT 5000′						CRUISING AT 10,000′						CRUISING AT 15,000′						EFFECTIVE WIND	CRUISING AT 20,000′					
	APPROXIMATE							APPROXIMATE						APPROXIMATE						APPROXIMATE						APPROXIMATE				
C.A.S.	MACH NO.	LBS/ HR/ ENG.	G.S.	R.F.	LET DOWN DIST.		C.A.S.	MACH NO.	LBS/ HR/ ENG.	G.S.	R.F.	LET DOWN DIST.	C.A.S.	MACH NO.	LBS/ HR/ ENG.	G.S.	R.F.	LET DOWN DIST.	C.A.S.	MACH NO.	LBS/ HR/ ENG.	G.S.	R.F.	LET DOWN DIST.		C.A.S.	MACH NO.	LBS/ HR/ ENG.	G.S.	R.F.	LET DOWN DIST.
						120 HW													350	.69	2350	110	.65	15	120 HW	325	.71	2000	315	.65	25
						80 HW							340	.62	2400	180	.75	10	330	.65	2150	130	.75	20	80 HW	310	.67	1850	330	75	35
360	.54	3050	280	.85	0	40 HW	345	.57	2650	265	.85	5	325	.59	2250	245	.85	15	305	.61	1950	225	.85	30	40 HW	295	.64	1750	355	.85	50
340	.52	2850	340	1.00	0	0	325	.53	2450	345	1.00	10	310	.56	2150	355	1.10	25	290	.58	1850	365	1.00	40	0	285	.62	1700	380	1.00	60
320	.48	2650	400	1.10	0	40 TW	300	.51	2250	380	1.10	10	295	.54	2000	375	1.10	30	275	.55	1700	355	1.10	50	40 TW	270	.59	1600	405	1.10	75
						80 TW							280	.51	1900	440	1.25	35	265	.53	1650	425	1.25	55	80 TW	260	.57	1550	430	1.25	85
						120 TW													260	.51	1650	500	1.35	65	120 TW	255	.55	1500	460	1.35	100

P-8378-3

HIGH ALTITUDE

IF YOU ARE AT 25,000′ RANGE IN AIRMILES: BY CRUISING AT 25,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	FUEL LBS.	IF YOU ARE AT 30,000′ RANGE IN AIRMILES: BY CRUISING AT 30,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	IF YOU ARE AT 35,000′ RANGE IN AIRMILES: BY CRUISING AT 35,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	IF YOU ARE AT 40,000′ RANGE IN AIRMILES: BY CRUISING AT 40,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	FUEL LBS.	IF YOU ARE AT 45,000′ RANGE IN AIRMILES: BY CRUISING AT 45,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL)																
(640) 510	40 40	(810) 635	2500 2000	(725) 575	40 40	(825) 645	(805) 640	40 40	(835) 655	(845) 665	40 40	(845) 665	2500 2000	(855) 675	45 45	(855) 675
375 245	40 35	455 280	1500 1000	425 270	40 40	465 290	465 295	40 40	475 300	490 310	40 40	490 310	1500 1000	495 315	45 45	495 315
115	25	115	500													

CRUISING AT 25,000′ C.A.S.	APPROXIMATE MACH NO.	LBS/HR/ENG.	G.S.	R.F.	LET DOWN DIST.	EFFECTIVE WIND	CRUISING AT 30,000′ C.A.S.	APPROXIMATE MACH NO.	LBS/HR/ENG.	G.S.	R.F.	LET DOWN DIST.	CRUISING AT 35,000′ C.A.S.	APPROXIMATE MACH NO.	LBS/HR/ENG.	G.S.	R.F.	LET DOWN DIST.	CRUISING AT 40,000′ C.A.S.	APPROXIMATE MACH NO.	LBS/HR/ENG.	G.S.	R.F.	LET DOWN DIST.	EFFECTIVE WIND	CRUISING AT 45,000′ C.A.S.	APPROXIMATE MACH NO.	LBS/HR/ENG.	G.S.	R.F.	LET DOWN DIST.
305	.73	1750	315	.65	40	120 HW	285	.75	1550	325	.70	60	260	.76	1350	320	.70	90	240	.80	1300	340	.70	130	120 HW	220	.81	1350	345	.70	160
290	.70	1650	340	.75	55	80 HW	280	.74	1550	355	.80	85	255	.76	1300	360	.80	120	235	.79	1250	375	.80	165	80 HW	220	.81	1350	385	.80	220
280	.67	1550	365	.90	75	40 HW	270	.72	1450	385	.85	110	255	.75	1300	390	.90	155	235	.78	1250	410	.90	205	40 HW	215	.80	1300	425	.90	245
270	.65	1500	390	1.00	95	0	260	.69	1350	405	1.00	135	245	.73	1250	425	1.00	185	230	.77	1250	445	1.00	204	0	215	.80	1300	460	1.00	290
265	.64	1450	425	1.10	110	40 TW	260	.69	1400	445	1.10	155	245	.73	1250	460	1.10	215	230	.77	1250	480	1.10	280	40 TW	215	.79	1300	495	1.05	330
255	.61	1400	450	1.20	130	80 TW	255	.68	1350	480	1.20	180	240	.72	1200	495	1.20	245	230	.76	1250	520	1.15	315	80 TW	210	.79	1250	535	1.15	375
245	.59	1350	480	1.35	145	120 TW	250	.67	1300	515	1.30	205	240	.71	1200	530	1.30	275	225	.76	1200	555	1.25	355	120 TW	210	.79	1250	570	1.25	420

SPECIAL NOTES

(1) Climb at military power.

(2) Descend at idle power.

(3) Make additional allowance for landing, reserve fuel, combat, et cetera, as required.

(4) Read lower half of chart opposite effective wind only.

(5) For all combinations of external stores included in this configuration, see figure A-1.

EXAMPLE

If you are at 25,000 feet with 2000 pounds of available fuel, you can fly 510 nautical air miles by holding 270 knots CAS (no wind). However, you can fly 635 nautical air miles by immediately climbing to 40,000 feet using "MIL" (100%) RPM. At 40,000 feet, cruise at 230 knots CAS and start letdown 240 nautical miles from destination. With an 80-knot tailwind, the range at 40,000 feet would be 1.15 x 635 or 730 nautical miles. Cruise at 230 knots CAS with this wind and start letdown 315 nautical miles from destination.

LEGEND

HW – Headwind in knots
TW – Tailwind in knots
R.F. – Range factor; ratio of ground distance to air miles for corresponding winds
G.S. – Ground speed in knots
C.A.S. – Calibrated airspeed in knots
LB/HR/ENG. – Fuel consumption in pounds per hour per engine
Range – Nautical miles
( ) – Range in parentheses for interpolation purposes only

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

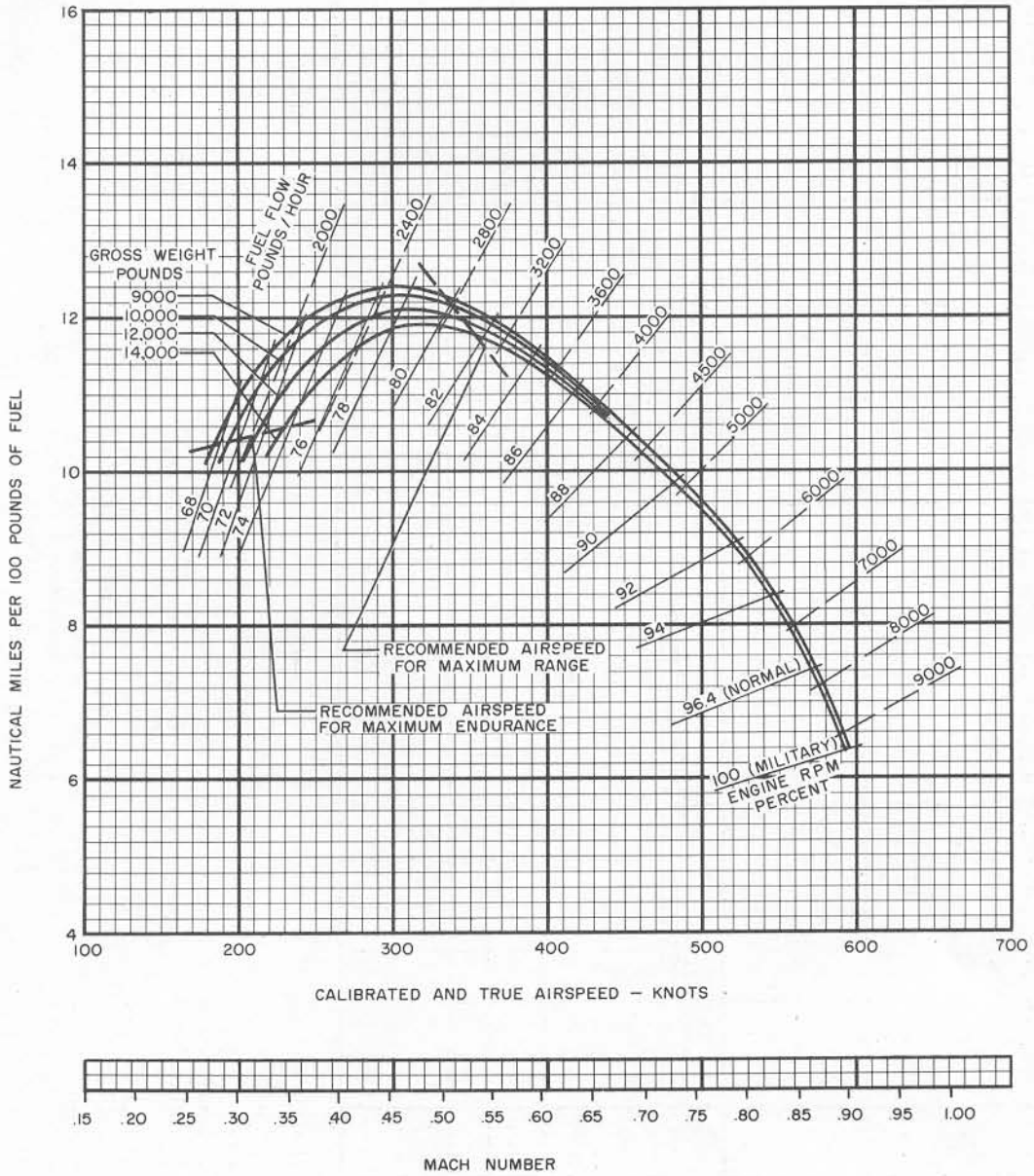
P-8378-4

Figure A-15 (Sheet 2)

SPECIFIC RANGE

CLEAN CONFIGURATION SEA LEVEL

MODEL: A4D-1 ENGINE: J65-W-4



REMARKS:

Configuration includes a centerline pylon and two wing pylons only.

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

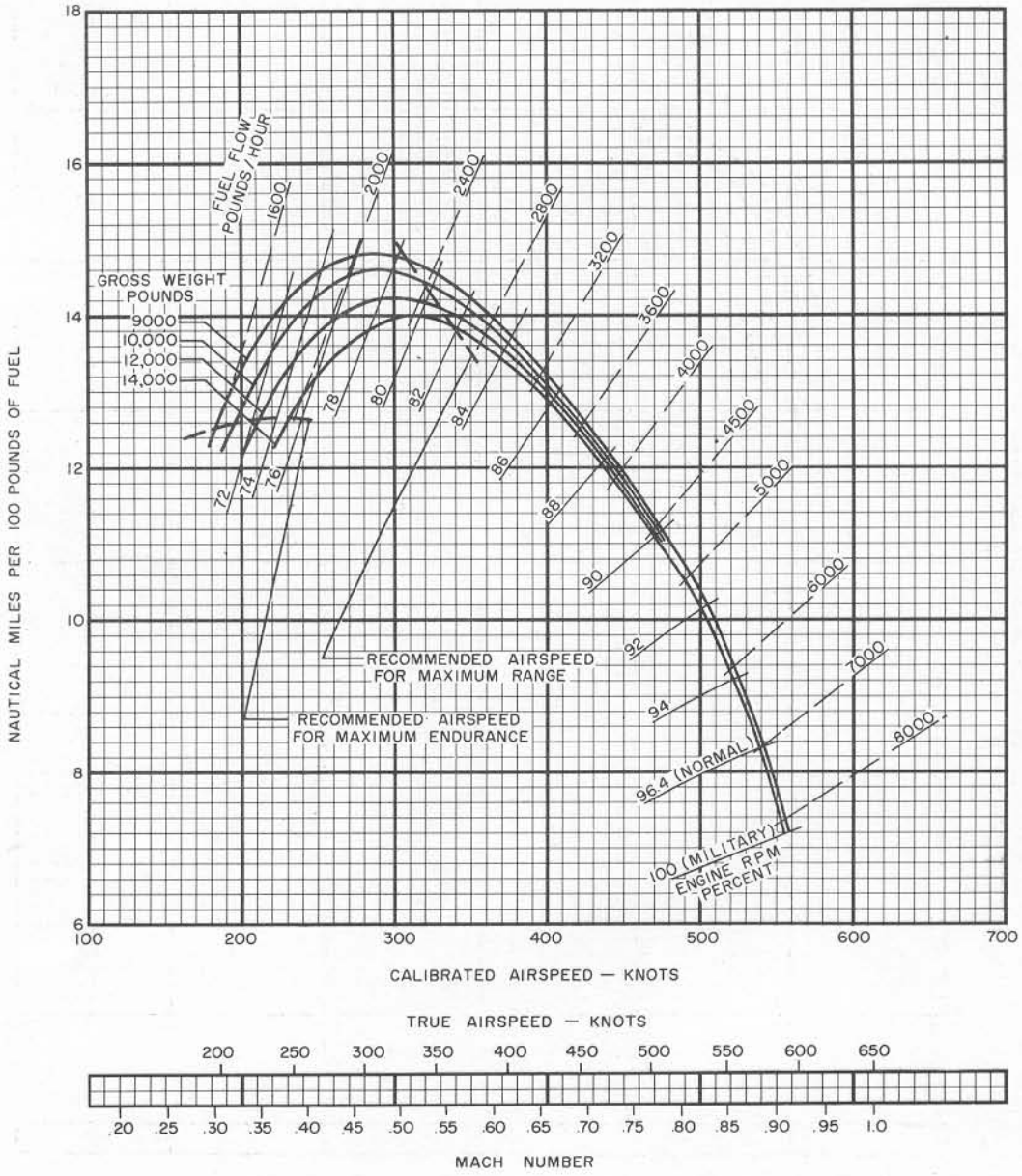
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

Figure A-16 (Sheet 1)

SPECIFIC RANGE

CLEAN CONFIGURATION 5000 FEET

MODEL: A4D-1 ENGINE: J65-W-4



P8379-2

REMARKS:

Configuration includes a centerline pylon and two wing pylons only.

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

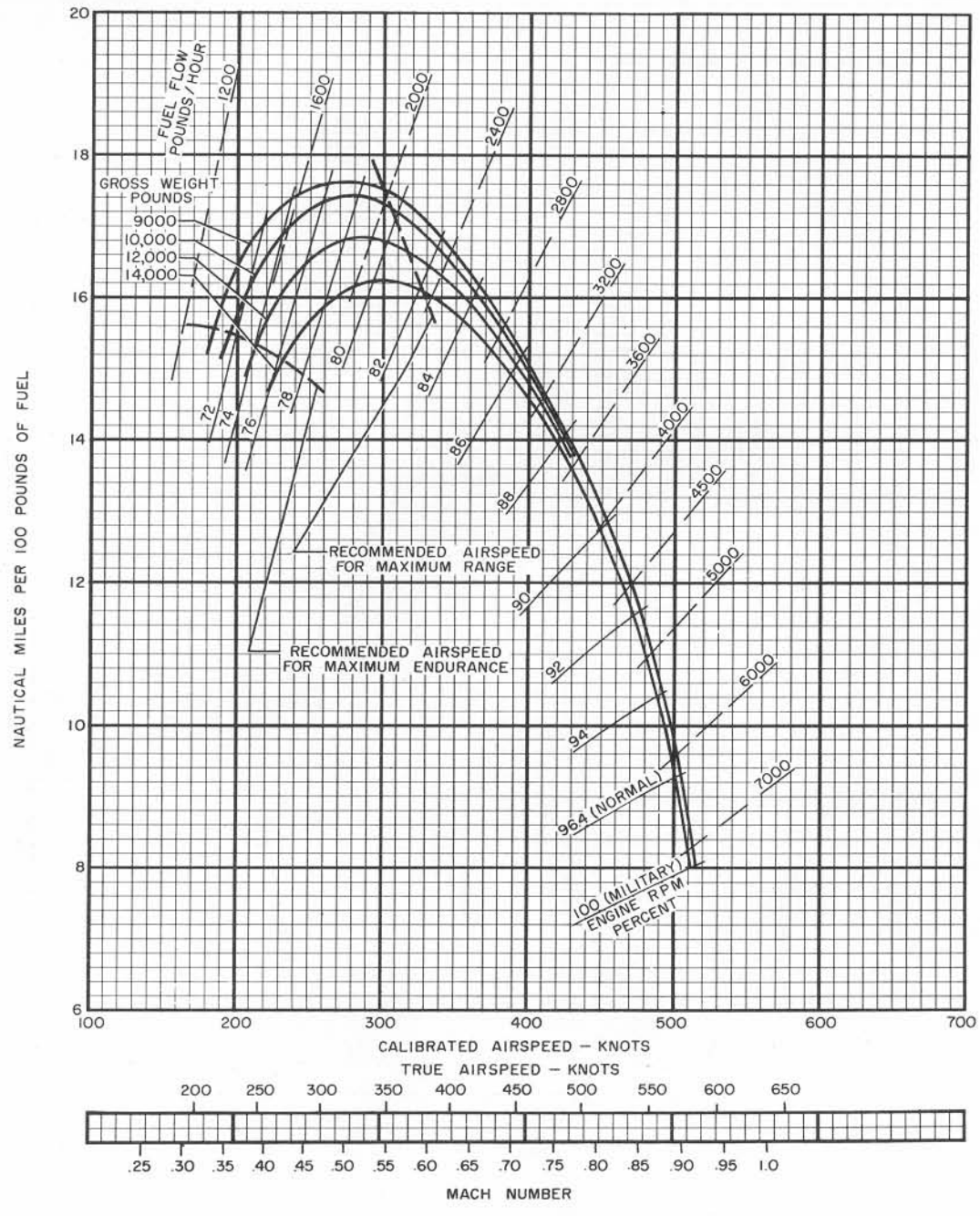
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

Figure A-16 (Sheet 2)

SPECIFIC RANGE

CLEAN CONFIGURATION 10,000 FEET

MODEL: A4D-1 ENGINE: J65-W-4



P8379-3

REMARKS:

Configuration includes a centerline pylon and two wing pylons only.

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

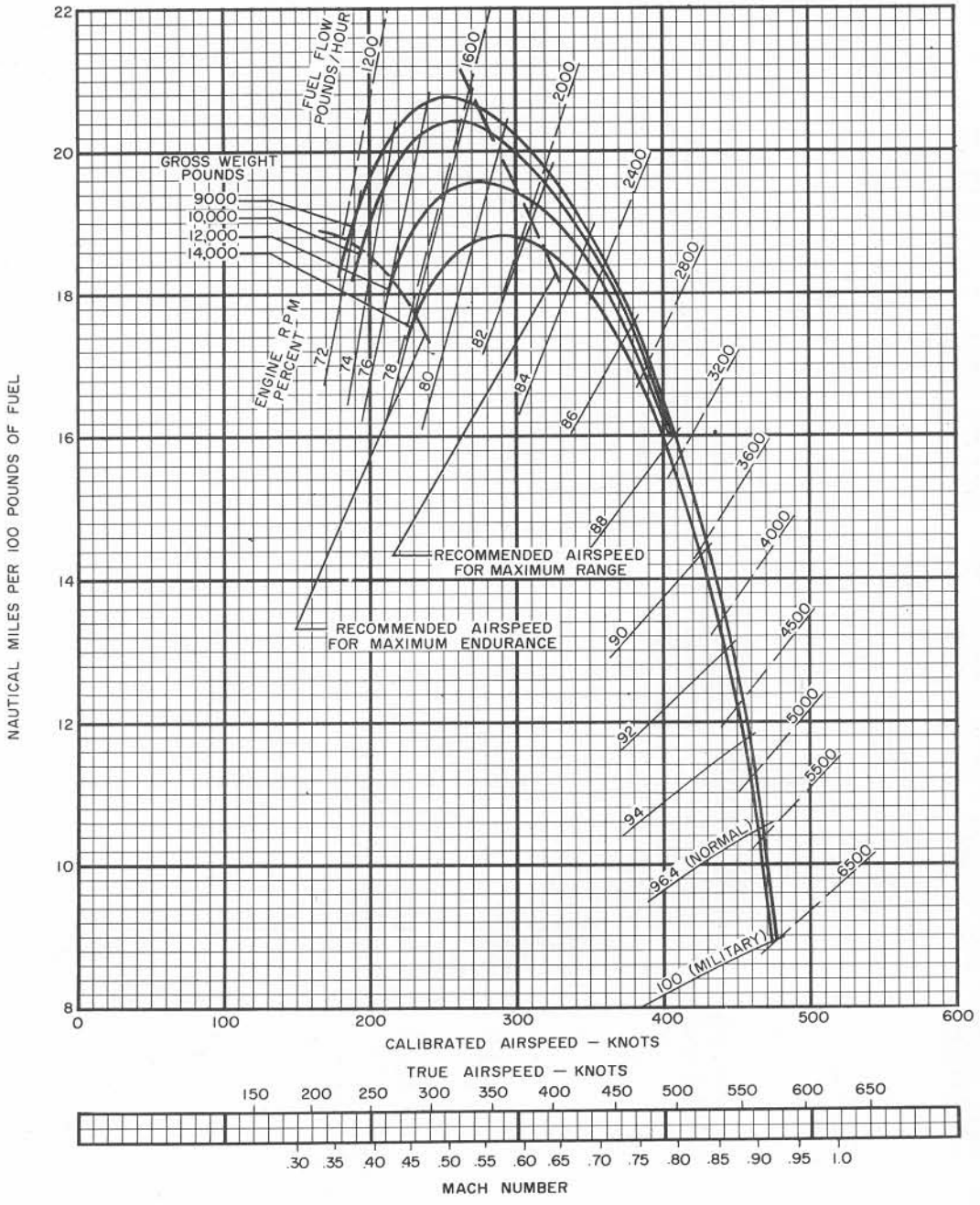
Figure A-16 (Sheet 3)

SPECIFIC RANGE

CLEAN CONFIGURATION 15,000 FEET

MODEL: A4D-1

ENGINE: J65-W-4



REMARKS:

Configuration includes a centerline pylon and two wing pylons only.

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

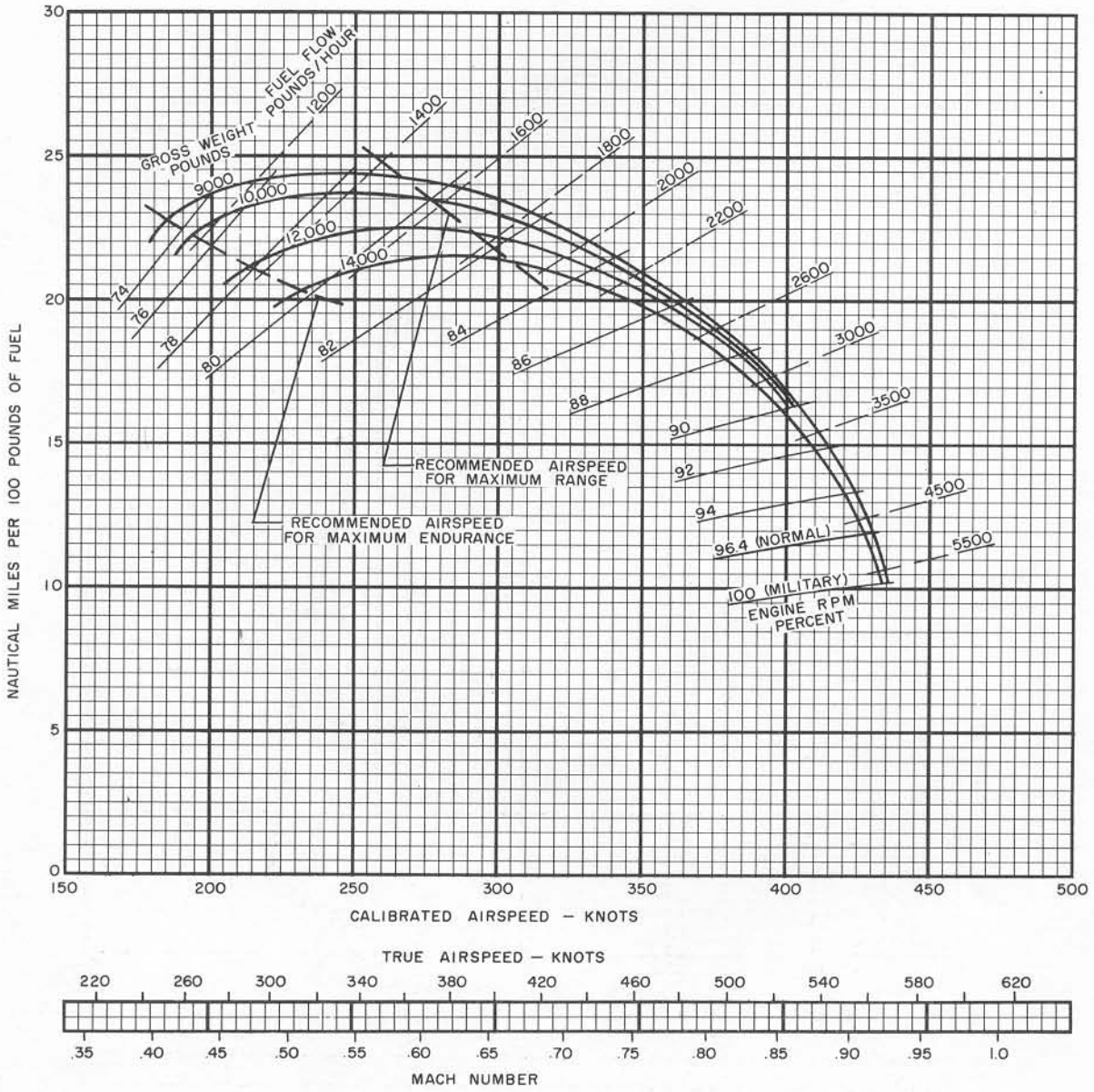
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

Figure A-16 (Sheet 4)

SPECIFIC RANGE

CLEAN CONFIGURATION 20,000 FEET

MODEL: A4D-1 ENGINE: J65-W-4



REMARKS:

Configuration includes a centerline pylon and two wing pylons only.

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

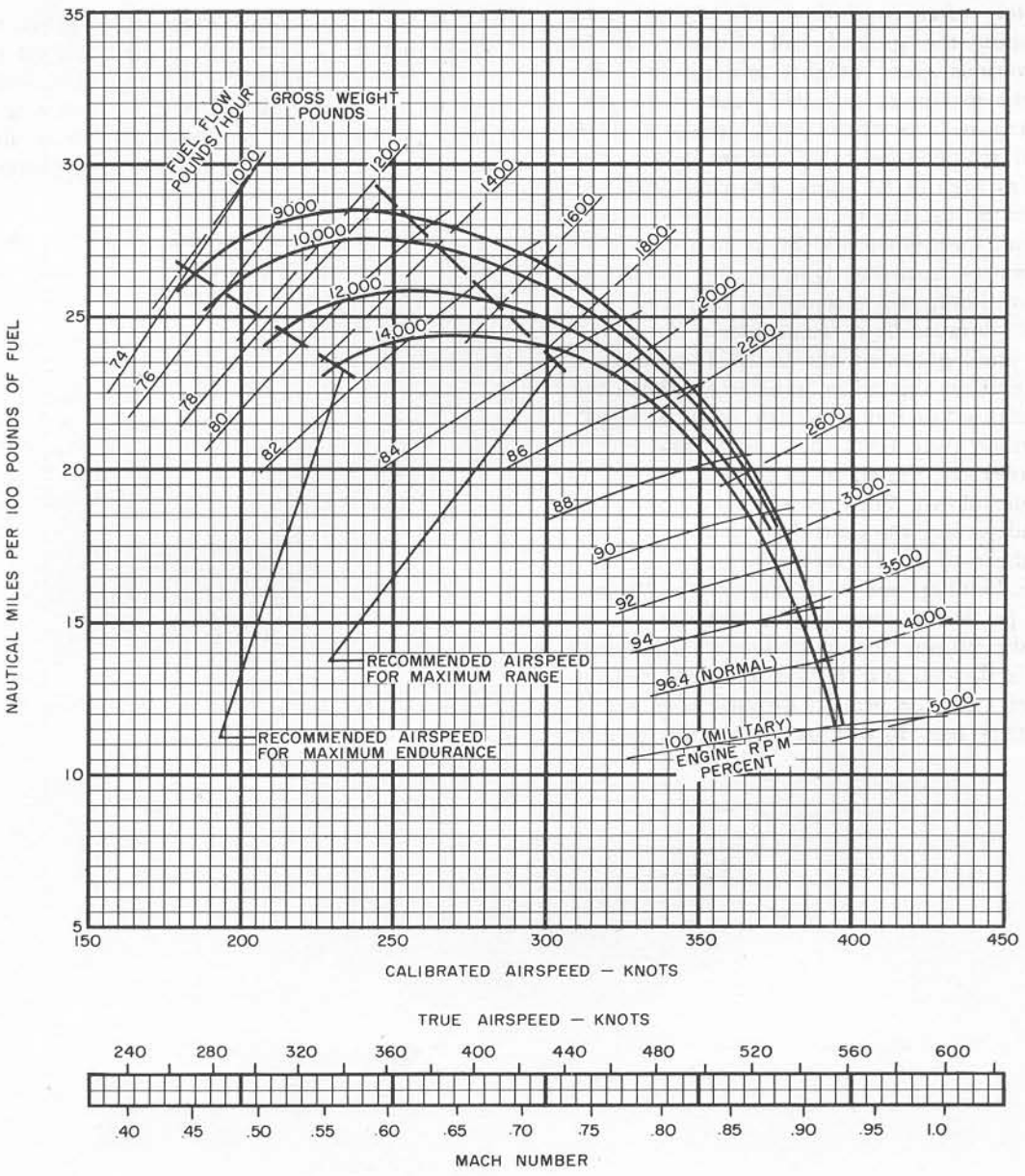
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

Figure A-16 (Sheet 5)

SPECIFIC RANGE

CLEAN CONFIGURATION 25,000 FEET

MODEL: A4D-1 ENGINE: J65-W-4



REMARKS:

Configuration includes a centerline pylon and two wing pylons only.

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

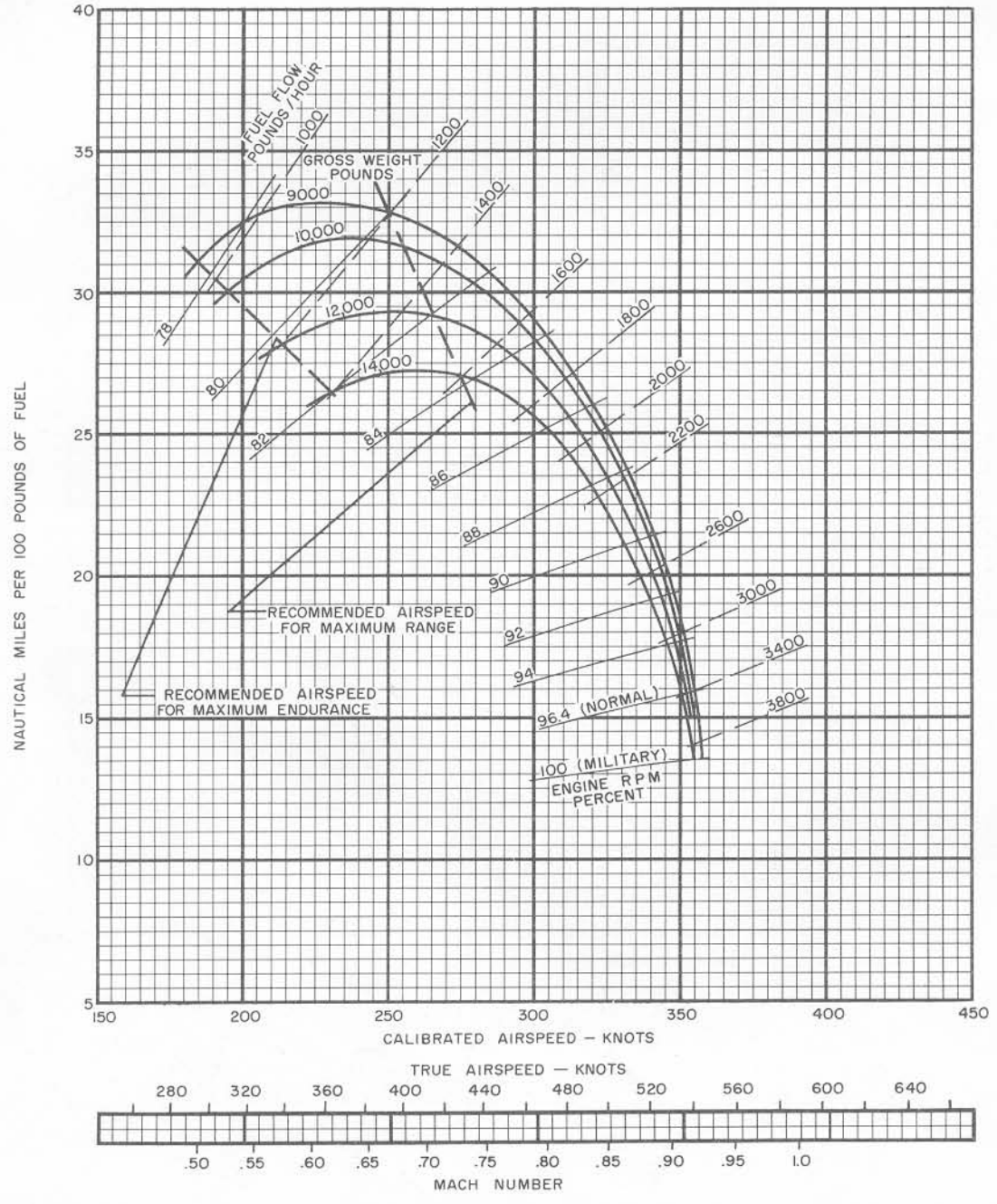
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

Figure A-16 (Sheet 6)

SPECIFIC RANGE

CLEAN CONFIGURATION 30,000 FEET

MODEL: A4D-1 ENGINE: J65-W-4



REMARKS:

Configuration includes a centerline pylon and two wing pylons only.

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

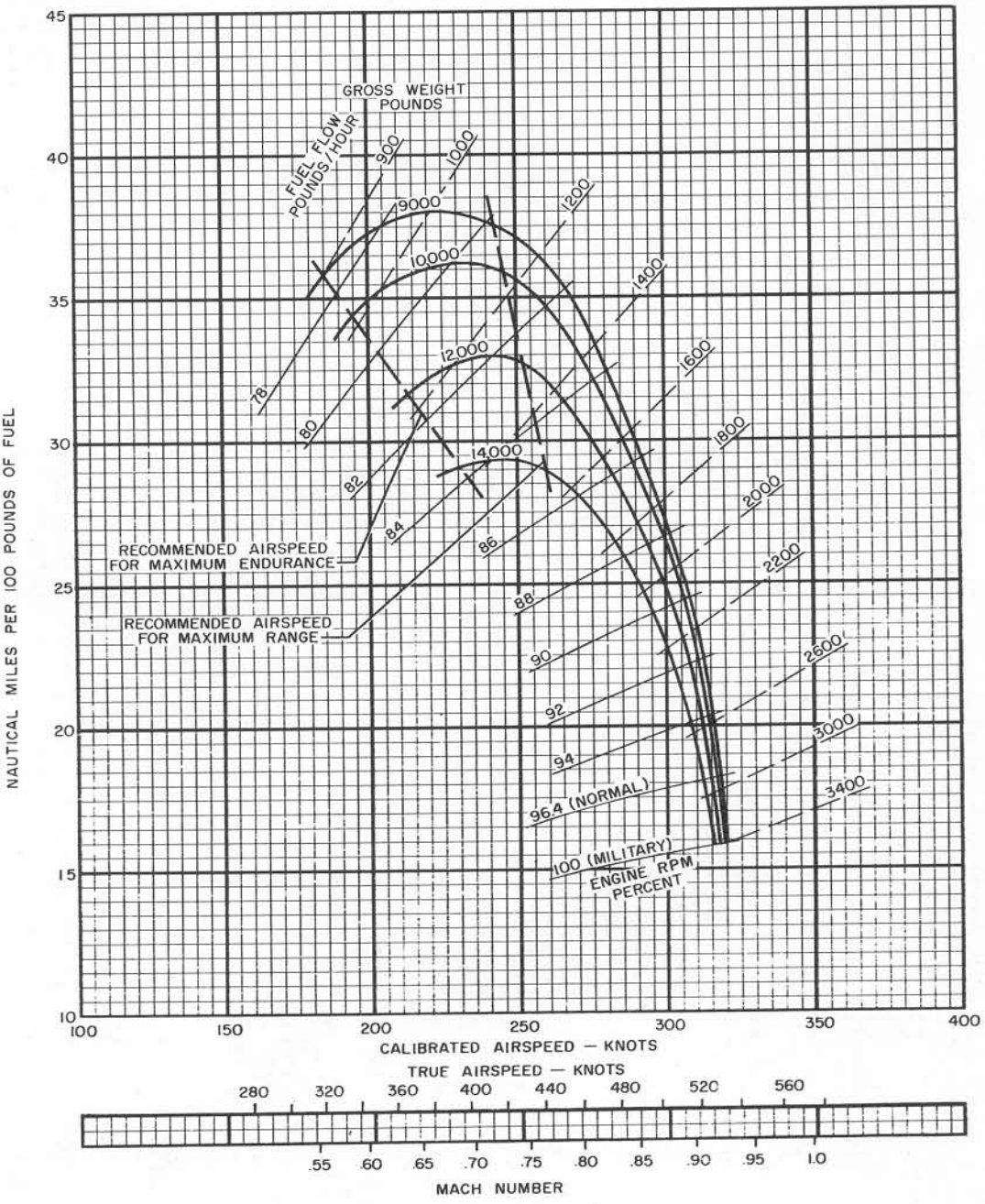
Figure A-16 (Sheet 7)

SPECIFIC RANGE

CLEAN CONFIGURATION 35,000 FEET

MODEL: A4D-1

ENGINE: J65-W-4



REMARKS:

Configuration includes a centerline pylon and two wing pylons only.

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

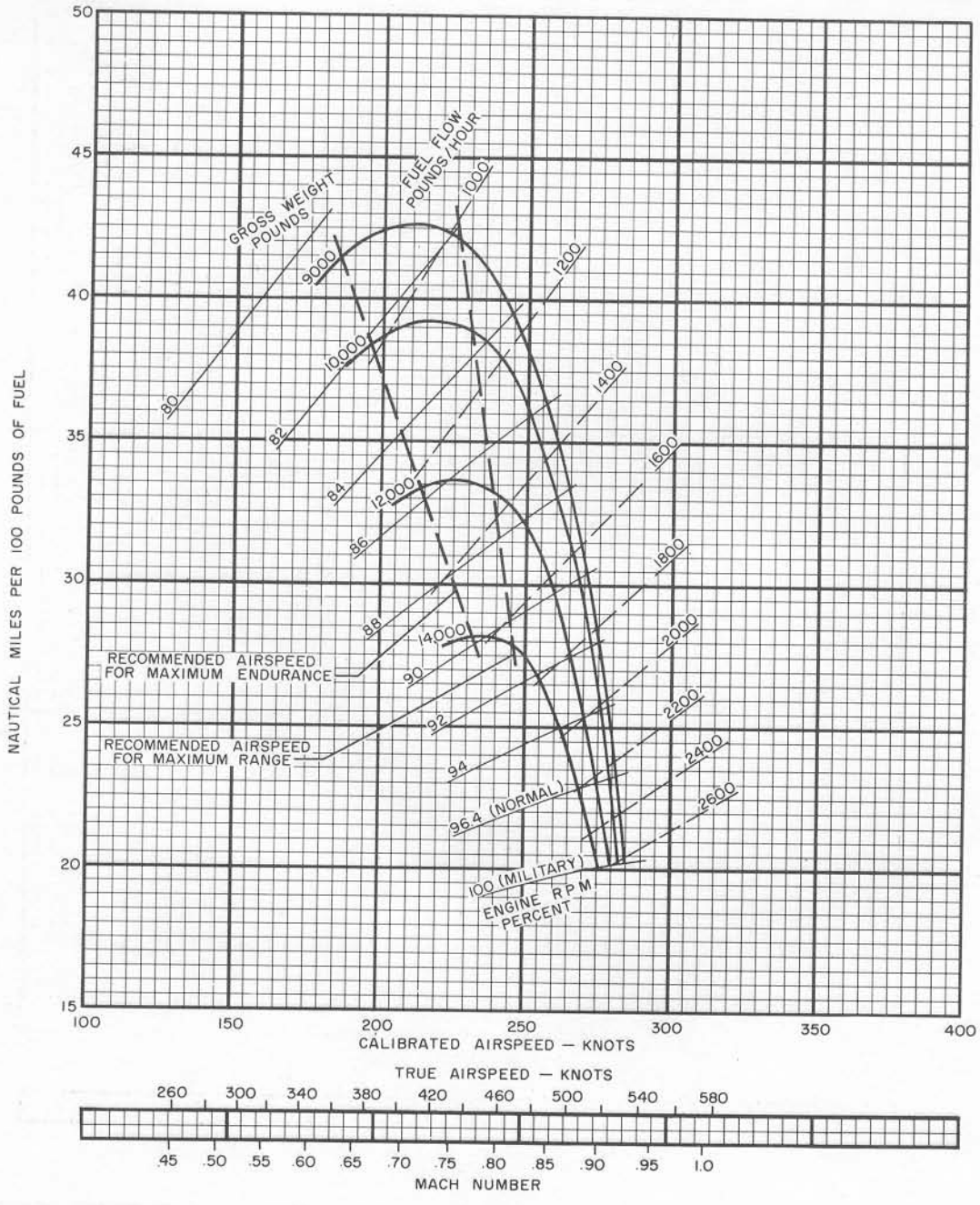
Figure A-16 (Sheet 8)

SPECIFIC RANGE

CLEAN CONFIGURATION 40,000 FEET

MODEL: A4D-1

ENGINE: J65-W-4



P8379-9

REMARKS:

Configuration includes a centerline pylon and two wing pylons only.

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

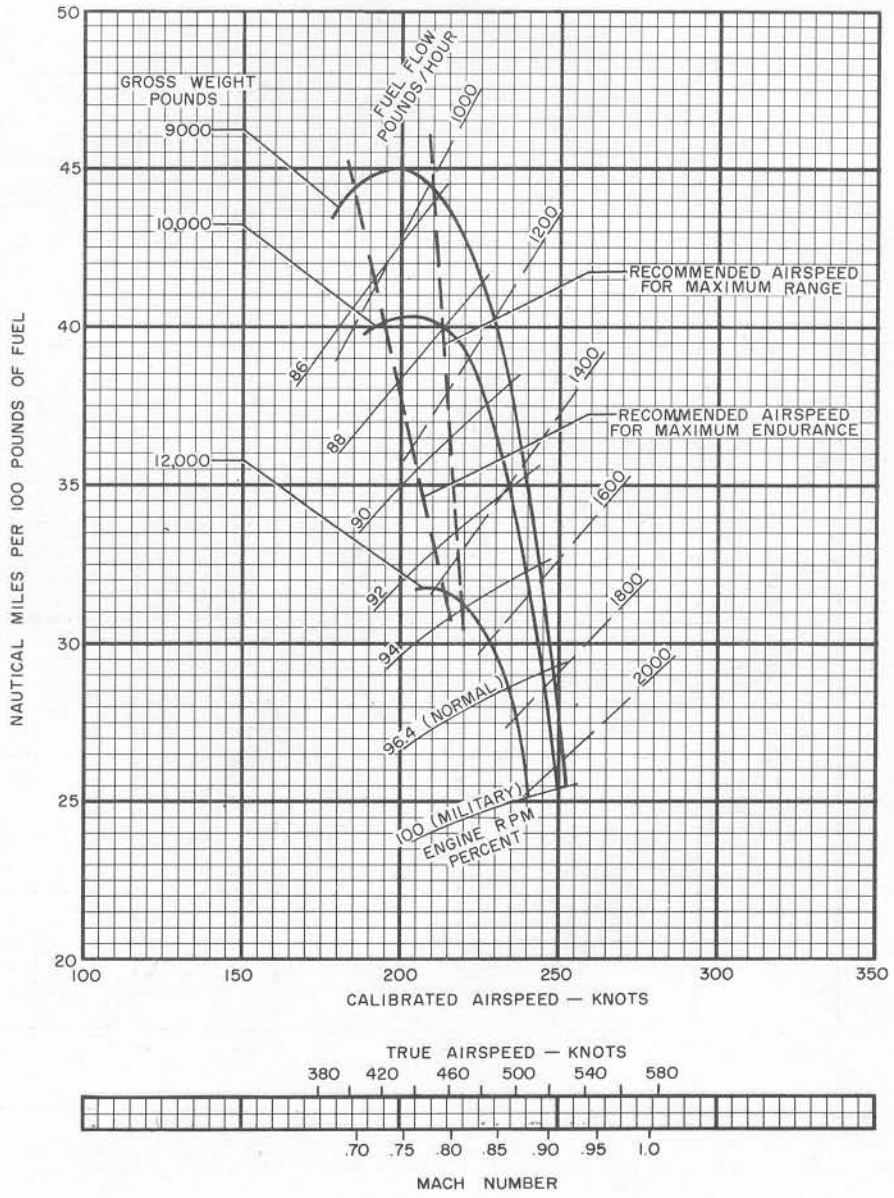
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

Figure A-16 (Sheet 9)

SPECIFIC RANGE

CLEAN CONFIGURATION 45,000 FEET

MODEL: A4D-1 ENGINE: J65-W-4



P8379-10

REMARKS:

Configuration includes a centerline pylon and two wing pylons only.

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

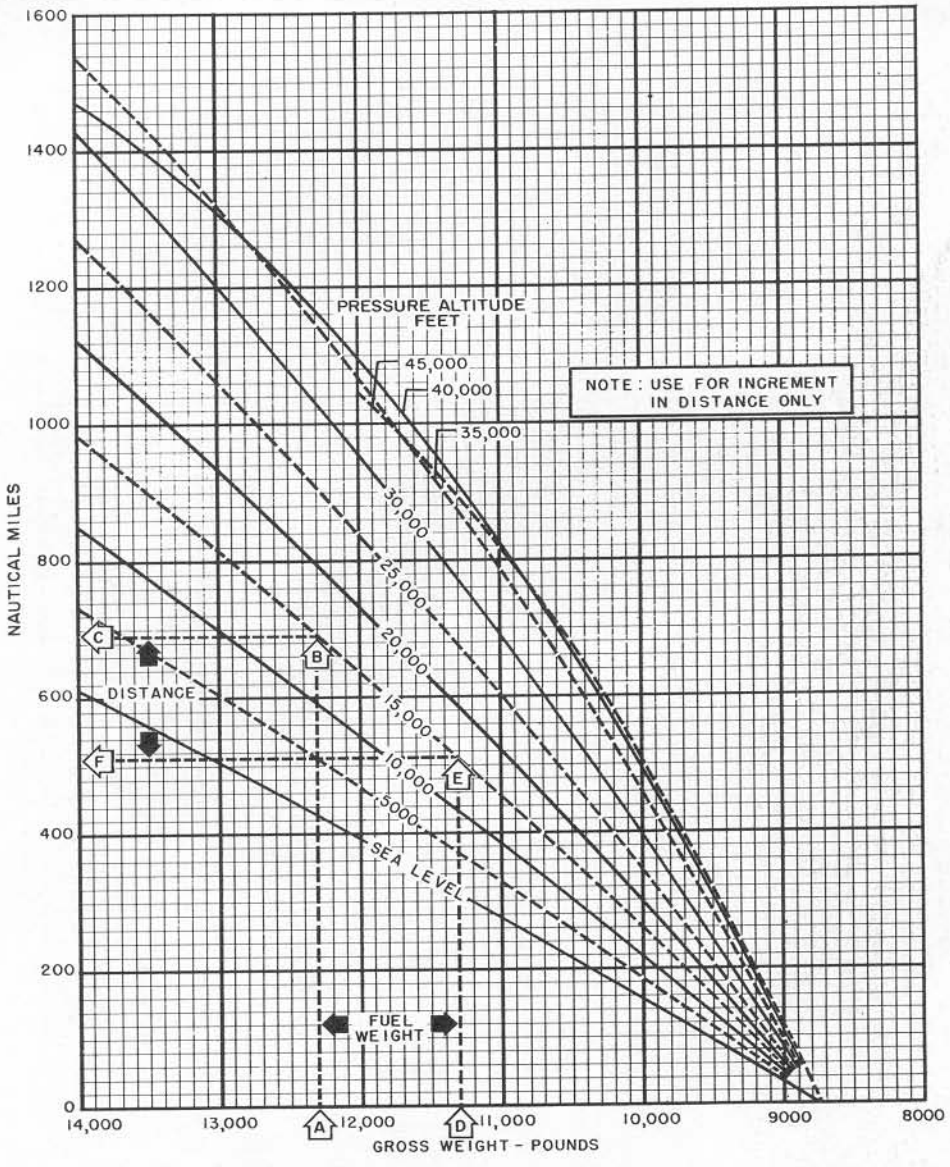
Figure A-16 (Sheet 10)

LONG RANGE PREDICTION — DISTANCE

CLEAN CONFIGURATION

MODEL: A4D-1

ENGINE: J65-W-4



REMARKS:

(1) Configuration includes a centerline pylon and two wing pylons.

(2) For recommended airspeeds for maximum range, see figure A-16.

EXAMPLE:

Assume 12,300 pounds gross weight with 1000 pounds of fuel available for cruise at 15,000 feet altitude:

(1) Enter chart at 12,300 pounds (A) and move vertically to 15,000 feet (B)

(2) Move horizontally left and read 690 nautical miles (C).

(3) Re-enter chart at weight after cruise (12,300–1000) = 11,300 pounds (D) and move vertically to 15,000 feet (E).

(4) Move horizontally left and read 510 nautical miles (F).

Maximum range at 15,000 feet with 1000 pounds of fuel is 650–510 = 180 nautical miles.

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

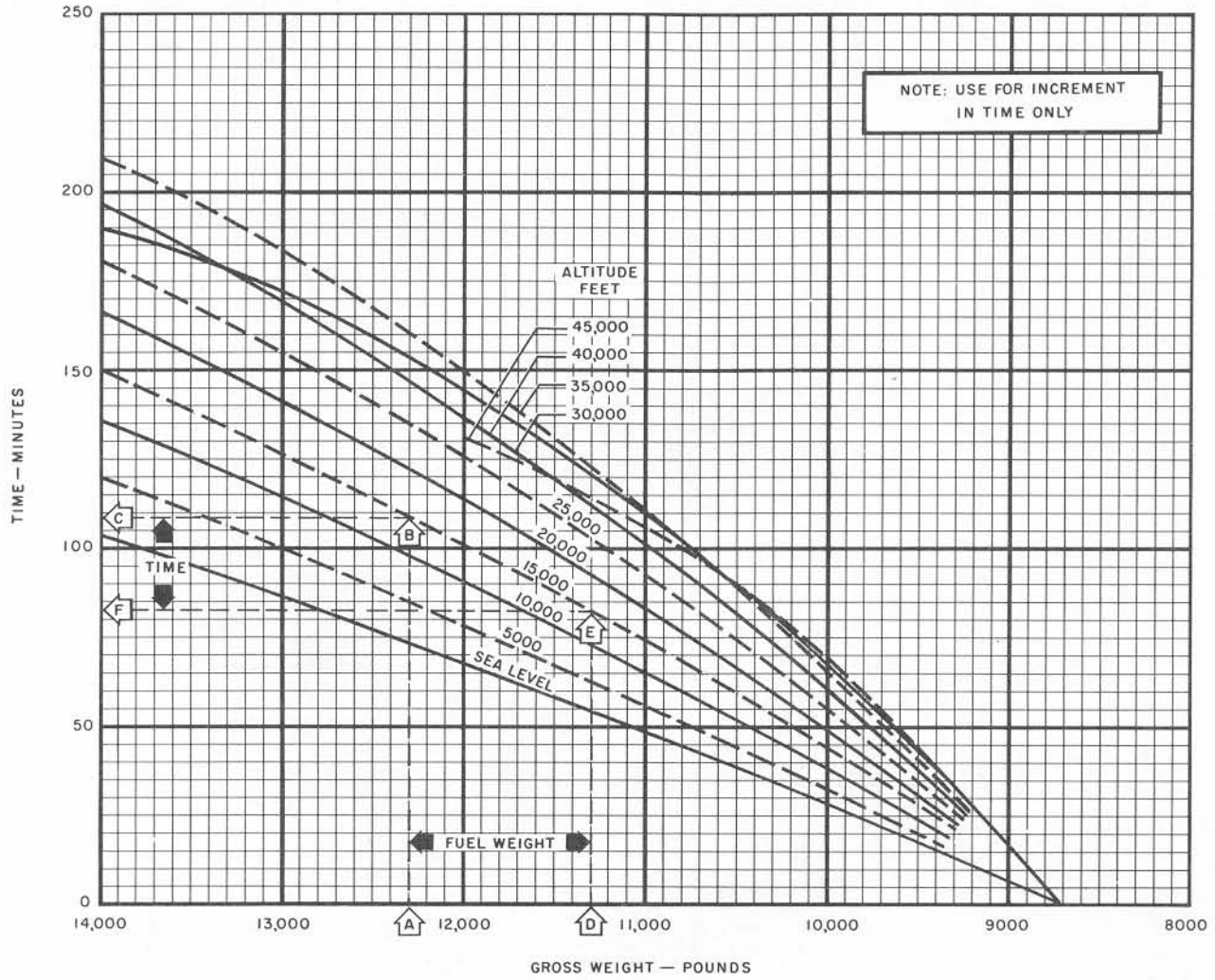
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

Figure A-17

LONG RANGE PREDICTION—TIME

CLEAN CONFIGURATION

MODEL: A4D-1 ENGINE: J65-W-4



REMARKS:

(1) Configuration includes a centerline pylon and two wing pylons.

(2) For recommended airspeeds for maximum range, see figure A-16.

EXAMPLE:

Assume 12,300 pounds gross weight with 1000 pounds of fuel available for cruise at 15,000 feet altitude:

(1) Enter chart at 12,300 pounds (A) and move vertically to 15,000 feet (B).

(2) Move horizontally left and read 110 minutes (C).

(3) Re-enter chart at weight after cruise (12,300–1000) = 11,300 pounds (D) and move vertically to 15,000 feet (E).

(4) Move horizontally left and read 85 minutes (F).

Cruise time at airspeed for maximum range at 15,000 feet with 1000 pounds of fuel is 110–85 = 25 minutes.

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

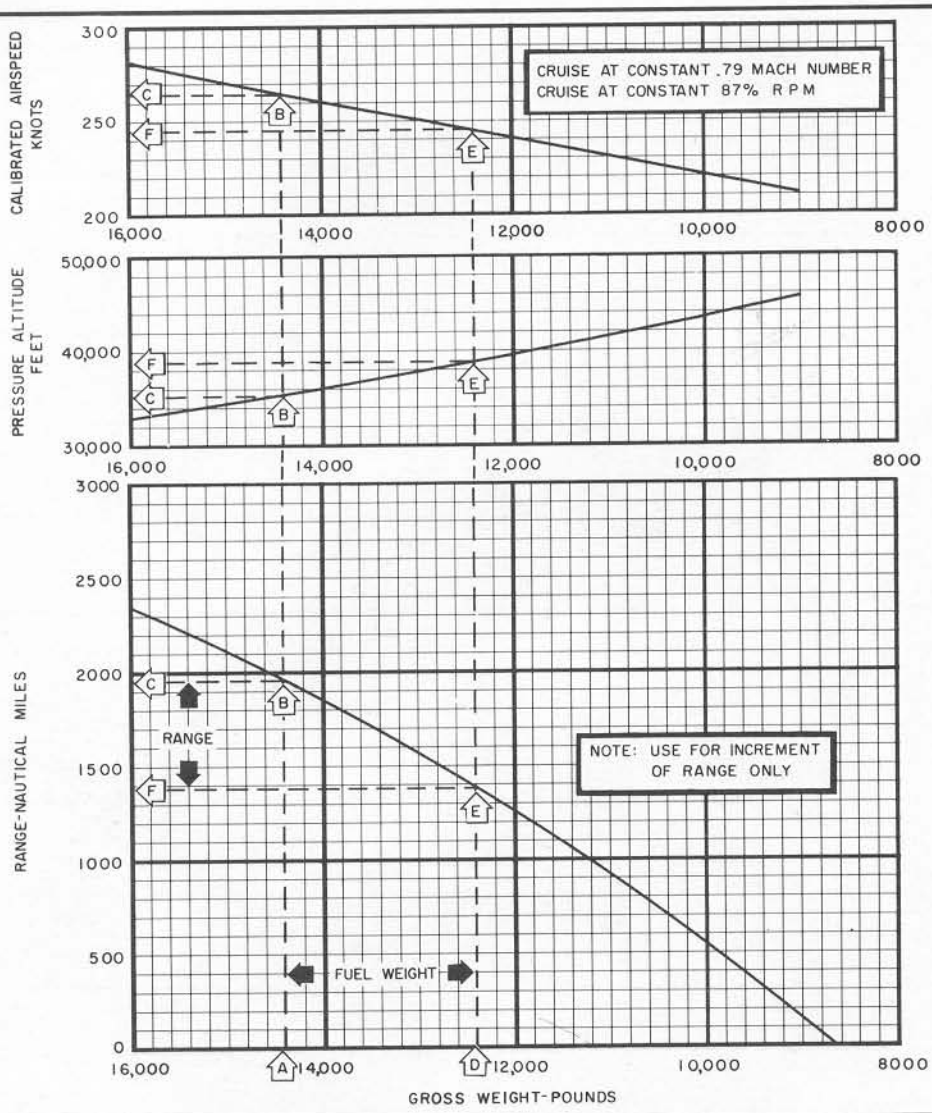
Figure A-18

MAXIMUM RANGE—VARIABLE ALTITUDE

CLEAN CONFIGURATION

MODEL: A4D-1

ENGINE: J65-W-4



REMARKS:

Configuration includes a centerline pylon and two wing pylons.

EXAMPLE:

Assume an initial gross weight of 14,400 pounds with 2000 pounds of fuel available for cruise:

(1) Enter charts at a weight of 14,400 pounds (A) and move vertically to intersect the Range line, Altitude line, and Calibrated Airspeed line (B) ; move left on the respective charts and read:

a. Range – 1950 nautical miles (C)

b. Initial optimum cruise altitude – 36,000 feet (C)

c. Initial calibrated airspeed – 265 knots (C)

(2) Re-enter charts at a weight of (14,400–2000)= 12,400 pounds (D) and move vertically to intersect the Range line, Altitude line and Calibrated Airspeed line (E) ; move left on the respective charts and read:

a. Range – 1400 nautical miles (F)

b. Final optimum cruise altitude – 39,000 feet (F)

c. Final calibrated airspeed – 245 knots (F)

A maximum range of (1950–1400) = 550 nautical miles will be covered by flying at a constant .79 Mach number using a constant engine rpm of 87%.

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

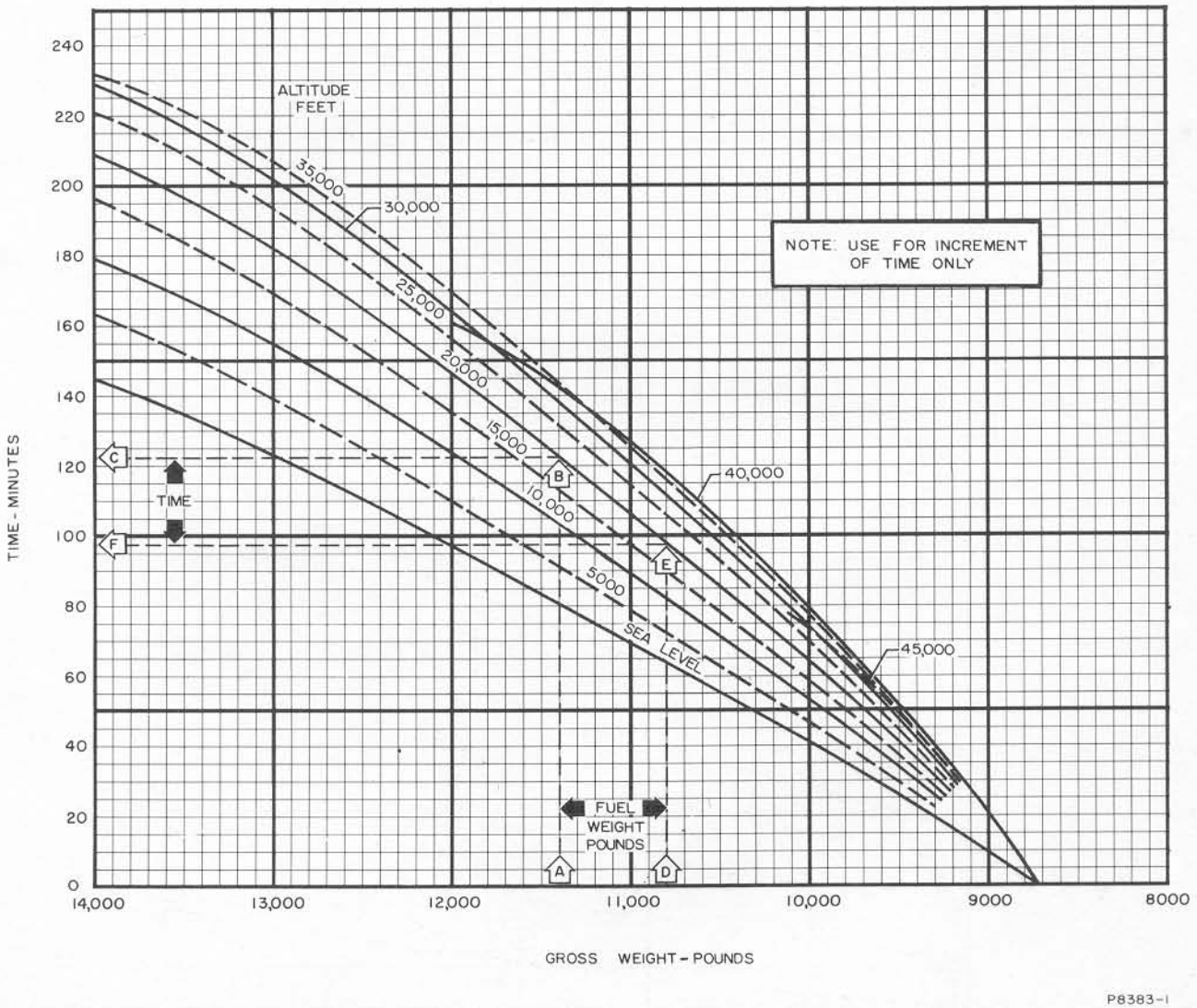
Figure A-19

ENDURANCE PREDICTION

CLEAN CONFIGURATION

MODEL: A4D-1

ENGINE: J65-W-4



REMARKS:

(1) Configuration includes a centerline pylon and two wing pylons.

(2) For recommended airspeeds for maximum endurance, see figure A-16.

EXAMPLE:

Assume an initial weight of 11,400 pounds with 600 pounds of fuel for loiter at 20,000 feet:

(1) Enter chart at 11,400 pounds (A) and move vertically to 20,000 feet (B).

(2) Move horizontally left and read 120 minutes (C).

(3) Re-enter chart at weight after loiter (11,400–600) = 10,800 pounds (D) and move vertically to 20,000 feet (E).

(4) Move horizontally left and read 100 minutes (F).

Total loiter time is (120–100) = 20 minutes.

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

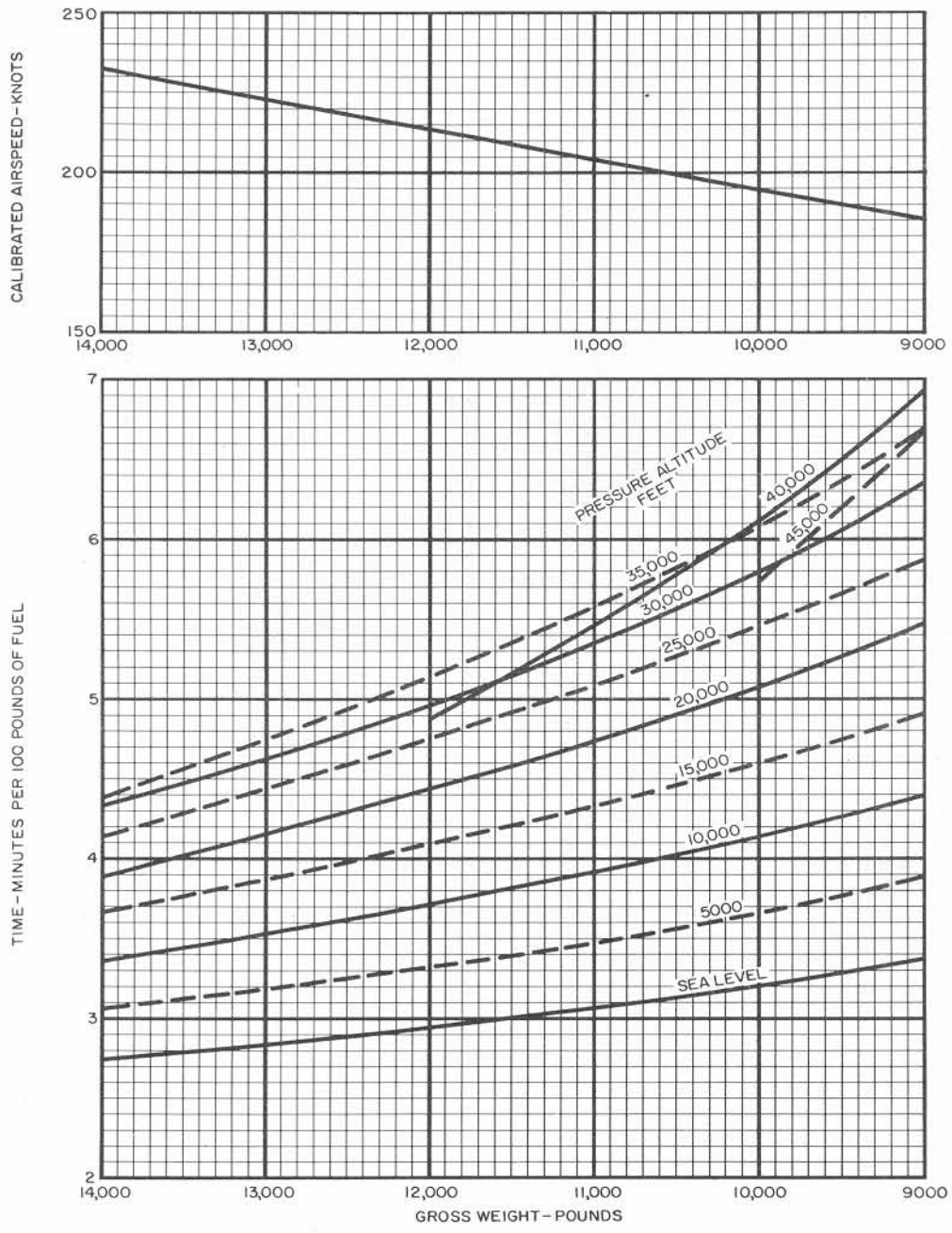
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

Figure A-20

ENDURANCE-LEVEL FLIGHT

CLEAN CONFIGURATION

MODEL: A4D-1 ENGINE: J65-W-4



REMARKS:

(1) Configuration includes a centerline pylon and two wing pylons only.

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

Figure A-21

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AIRCRAFT MODEL: A4D-1

ENGINE: J65-W-4

FLIGHT OPERATION INSTRUCTION CHART

STANDARD DAY

CHART WEIGHT LIMITS: 17,600 TO 15,000 POUNDS

EXTERNAL LOAD ITEMS

BASIC ATTACK CONFIGURATION

NUMBER OF ENGINES OPERATING: ONE

INSTRUCTIONS FOR USING CHART: (A) IN FLIGHT. Select figure in fuel column equal to or less than fuel available for cruise (fuel on board minus allowance for reserve, combat, navigational error, formation flight, etc.). Move horizontally right or left to section according to present altitude and read total range available (no wind) by cruising at that altitude or by climbing to another altitude of maximum range. For a flight at initial altitude, operating instructions are given directly below. For a flight at higher altitude, climb immediately to desired altitude and read cruising instructions in appropriate cruising altitude section. (B) FLIGHT PLANNING. From initial fuel on board subtract fuel for takeoff and climb to desired altitude and all other necessary allowances. Then use chart as for IN FLIGHT above, adding initial climb distance to range values.

NOTES: Ranges shown at optimum altitudes are maximum. In order to obtain maximum range on flights requiring more than one chart (due to external configuration or gross weight changes), it is necessary to observe the optimum cruising altitude on each chart; i.e., when changing charts, a climb may be required to obtain a maximum range. All range values include allowances for descent distance and fuel. Climb distance and fuel are included where climbs are indicated.

DATA BELOW CONTAIN NO FUEL RESERVE FOR LANDING

LOW ALTITUDE

IF YOU ARE AT S.L. — RANGE IN AIRMILES			FUEL	IF YOU ARE AT 5000′ — RANGE IN AIRMILES			IF YOU ARE AT 10,000′ — RANGE IN AIRMILES			IF YOU ARE AT 15,000′ — RANGE IN AIRMILES			FUEL	IF YOU ARE AT 20,000′ — RANGE IN AIRMILES		
BY CRUISING AT S.L.	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	LBS.	BY CRUISING AT 5000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	BY CRUISING AT 10,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	BY CRUISING AT 15,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	LBS.	BY CRUISING AT 20,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL)																
(535)	30	(1020)	5000	(625)	35	(1035)	(725)	35	(1060)	(830)	35	(1085)	5000	(935)	35	(1100)
485	30	910	4500	565	35	930	655	35	950	750	35	975	4500	845	35	890
430	30	800	4000	500	35	820	580	35	845	665	35	865	4000	750	35	880
375	30	695	3500	440	35	710	510	35	735	585	35	755	3500	660	35	770
320	30	585	3000	375	35	605	435	35	625	500	35	645	3000	565	35	660
265	30	480	2500	315	35	495	365	35	515	420	35	535	2500	470	35	550
215	30	370	2000	250	35	390	290	35	405	335	35	425	2000	380	35	435

CRUISING AT S.L. — APPROXIMATE						EFFECTIVE WIND	CRUISING AT 5000′ — APPROXIMATE						CRUISING AT 10,000′ — APPROXIMATE						CRUISING AT 15,000′ — APPROXIMATE						EFFECTIVE WIND	CRUISING AT 20,000′ — APPROXIMATE					
C.A.S.	MACH NO.	LBS/ HR/ ENG.	G.S.	R.F.	LET DOWN DIST.		C.A.S.	MACH NO.	LBS/ HR/ ENG.	G.S.	R.F.	LET DOWN DIST.	C.A.S.	MACH NO.	LBS/ HR/ ENG.	G.S.	R.F.	LET DOWN DIST.	C.A.S.	MACH NO.	LBS/ HR/ ENG.	G.S.	R.F.	LET DOWN DIST.		C.A.S.	MACH NO.	LBS/ HR/ ENG.	G.S.	R.F.	LET DOWN DIST.
						120 HW																			120 HW	345	.74	2600	335	.70	25
						80 HW							365	.66	3000	335	.75	10	345	.68	2650	345	.75	20	80 HW	335	.73	2450	365	.80	30
370	.56	3500	330	.85	0	40 HW	365	.60	3200	350	.85	5	350	.63	2850	360	.85	15	335	.66	2500	370	.85	25	40 HW	330	.71	2400	400	.90	40
355	.53	3300	355	1.00	0	0	345	.57	3000	370	1.00	10	335	.60	2700	385	1.00	20	325	.64	2450	400	1.00	35	0	320	.69	2300	425	1.00	50
340	.51	3100	380	1.10	0	40 TW	330	.55	2800	395	1.10	10	320	.58	2550	405	1.10	25	315	.63	2350	430	1.10	40	40 TW	310	.67	2200	455	1.10	60
						80 TW							305	.55	2400	430	1.20	30	310	.61	2300	465	1.20	45	80 TW	305	.66	2200	485	1.20	65
						120 TW																			120 TW	295	.64	2100	515	1.30	75

P-8385-1

HIGH ALTITUDE

IF YOU ARE AT 25,000' RANGE IN AIRMILES BY CRUISING AT 25,000'	IF YOU ARE AT 25,000' RANGE IN AIRMILES OPT. ALT. 1000 FT	IF YOU ARE AT 25,000' RANGE IN AIRMILES BY CRUISING AT OPT. ALT.	FUEL LBS.	IF YOU ARE AT 30,000' RANGE IN AIRMILES BY CRUISING AT 30,000'	IF YOU ARE AT 30,000' RANGE IN AIRMILES OPT. ALT. 1000 FT	IF YOU ARE AT 30,000' RANGE IN AIRMILES BY CRUISING AT OPT. ALT.	IF YOU ARE AT 35,000' RANGE IN AIRMILES BY CRUISING AT 35,000'	IF YOU ARE AT 35,000' RANGE IN AIRMILES OPT. ALT. 1000 FT	IF YOU ARE AT 35,000' RANGE IN AIRMILES BY CRUISING AT OPT. ALT.	IF YOU ARE AT 40,000' RANGE IN AIRMILES BY CRUISING AT 40,000'	IF YOU ARE AT 40,000' RANGE IN AIRMILES OPT. ALT. 1000 FT	IF YOU ARE AT 40,000' RANGE IN AIRMILES BY CRUISING AT OPT. ALT.	FUEL LBS.	IF YOU ARE AT 45,000' RANGE IN AIRMILES BY CRUISING AT 45,000'	IF YOU ARE AT 45,000' RANGE IN AIRMILES OPT. ALT. 1000 FT	IF YOU ARE AT 45,000' RANGE IN AIRMILES BY CRUISING AT OPT. ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL)																	
(1050)	35	(1120)	5000	(1130)	35	(1145)	(1155)	35	(1155)								
945	35	1010	4500	1020	35	1030	1040	35	1040								
840	35	900	4000	910	35	915	930	35	930								
735	35	785	3500	795	35	805	815	35	815								
635	35	675	3000	685	35	690	705	35	705								
530	35	565	2500	575	35	580	590	35	590								
425	35	455	2000	460	35	465	475	35	475								

CRUISING AT 25,000' C.A.S.	APPROXIMATE MACH NO.	APPROXIMATE LBS/HR/ENG.	APPROXIMATE G.S.	APPROXIMATE R.F.	APPROXIMATE LET DOWN DIST.	EFFECTIVE WIND	CRUISING AT 30,000' C.A.S.	APPROXIMATE MACH NO.	APPROXIMATE LBS/HR/ENG.	APPROXIMATE G.S.	APPROXIMATE R.F.	APPROXIMATE LET DOWN DIST.	CRUISING AT 35,000' C.A.S.	APPROXIMATE MACH NO.	APPROXIMATE LBS/HR/ENG.	APPROXIMATE G.S.	APPROXIMATE R.F.	APPROXIMATE LET DOWN DIST.	CRUISING AT 40,000' C.A.S.	APPROXIMATE MACH NO.	APPROXIMATE LBS/HR/ENG.	APPROXIMATE G.S.	APPROXIMATE R.F.	APPROXIMATE LET DOWN DIST.	EFFECTIVE WIND	CRUISING AT 45,000' C.A.S.	APPROXIMATE MACH NO.	APPROXIMATE LBS/HR/ENG.	APPROXIMATE G.S.	APPROXIMATE R.F.	APPROXIMATE LET DOWN DIST.
320	.76	2300	340	.70	35	120 HW	300	.79	2200	345	.70	50	270	.80	2050	345	.70	65							120 HW							
315	.75	2200	370	.80	45	80 HW	295	.78	2100	380	.80	60	270	.80	2050	380	.80	80							80 HW							
310	.74	2150	405	.90	60	40 HW	290	.77	2050	410	.90	75	270	.79	2050	420	.90	95							40 HW							
305	.73	2100	435	1.00	70	0	290	.76	2050	445	1.00	90	265	.79	2000	455	1.00	115							0							
300	.72	2100	470	1.10	80	40 TW	285	.75	2000	480	1.05	105	265	.79	2000	495	1.05	130							40 TW							
295	.70	2050	505	1.20	90	80 TW	280	.74	1950	515	1.15	120	265	.78	2000	530	1.15	145							80 TW							
290	.69	2050	540	1.30	100	120 TW	275	.73	1900	550	1.25	130	260	.78	1950	565	1.25	165							120 TW							

SPECIAL NOTES

(1) Climb at military power.

(2) Descend at idle power.

(3) Make additional allowance for landing, reserve fuel, combat, et cetera, as required.

(4) Read lower half of chart opposite effective wind only.

(5) For all combinations of external stores included in this configuration, see figure A-1.

EXAMPLE

If you are at 5000 feet with 4000 pounds of available fuel, you can fly 500 nautical air miles by holding 345 knots CAS (no wind). However, you can fly 820 nautical air miles by immediately climbing to 35,000 feet using "MIL" (100%) RPM. At 35,000 feet, cruise at 265 knots CAS and start letdown 115 nautical miles from destination. With an 80-knot headwind, the range at 35,000 feet would be .8 x 820 or 655 nautical miles. Cruise at 270 knots CAS with this wind and start letdown 80 nautical miles from destination.

LEGEND

HW –Headwind in knots
TW –Tailwind in knots
R.F. –Range factor; ratio of ground distance to air miles for corresponding winds
G.S. –Ground speed in knots
C.A.S. –Calibrated airspeed in knots
LB/HR/ENG. –Fuel consumption in pounds per hour per engine
Range –Nautical miles
( ) –Range in parentheses for interpolation purposes only

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

Figure A-22 (Sheet 1)

AIRCRAFT MODEL: A4D-1

ENGINE: J65-W-4

FLIGHT OPERATION INSTRUCTION CHART

STANDARD DAY

CHART WEIGHT LIMITS: 15,000 TO 13,000 POUNDS

EXTERNAL LOAD ITEMS

BASIC ATTACK CONFIGURATION

NUMBER OF ENGINES OPERATING: ONE

INSTRUCTIONS FOR USING CHART: (A) IN FLIGHT. Select figure in fuel column equal to or less than fuel available for cruise (fuel on board minus allowance for reserve, combat, navigational error, formation flight, etc.). Move horizontally right or left to section according to present altitude and read total range available (no wind) by cruising at that altitude or by climbing to another altitude of maximum range. For a flight at initial altitude, operating instructions are given directly below. For a flight at higher altitude, climb immediately to desired altitude and read cruising instructions in appropriate cruising altitude section. (B) FLIGHT PLANNING. From initial fuel on board subtract fuel for takeoff and climb to desired altitude and all other necessary allowances. Then use chart as for IN FLIGHT above, adding initial climb distance to range values.

NOTES: Ranges shown at optimum altitudes are maximum. In order to obtain maximum range on flights requiring more than one chart (due to external configuration or gross weight changes), it is necessary to observe the optimum cruising altitude on each chart; i.e., when changing charts, a climb may be required to obtain a maximum range. All range values include allowances for descent distance and fuel. Climb distance and fuel are included where climbs are indicated.

DATA BELOW CONTAIN NO FUEL RESERVE FOR LANDING

LOW ALTITUDE

IF YOU ARE AT S.L. — RANGE IN AIRMILES			FUEL LBS.	IF YOU ARE AT 5000′ — RANGE IN AIRMILES			IF YOU ARE AT 10,000′ — RANGE IN AIRMILES			IF YOU ARE AT 15,000′ — RANGE IN AIRMILES			FUEL LBS.	IF YOU ARE AT 20,000′ — RANGE IN AIRMILES		
BY CRUISING AT S.L.	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.		BY CRUISING AT 5000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	BY CRUISING AT 10,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	BY CRUISING AT 15,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.		BY CRUISING AT 20,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL)																
(665)	35	(1450)	6000	(775)	35	(1465)	(905)	35	(1480)	(1045)	35	(1490)	6000	(1170)	35	(1505)
610	35	1320	5500	710	35	1335	830	35	1350	955	35	1365	5500	1075	35	1375
555	35	1195	5000	650	35	1210	755	35	1225	870	35	1240	5000	975	35	1250
500	35	1070	4500	585	35	1085	680	35	1095	785	35	1110	4500	880	35	1125
445	35	940	4000	520	35	955	605	35	970	695	35	985	4000	785	35	995
385	35	815	3500	455	35	830	530	35	840	610	35	855	3500	685	35	870
330	35	685	3000	390	35	700	455	35	715	525	35	730	3000	540	35	740
275	35	560	2500	325	35	575	380	35	590	440	35	600	2500	490	35	615
220	35	430	2000	260	35	445	305	35	460	350	35	475	2000	395	35	485
165	35	305	1500	195	35	320	230	35	335	265	35	345	1500	295	35	360
110	30	175	1000	130	35	195	155	35	205	180	35	220	1000	200	35	230
55	15	65	500	65	10	75	80	15	85	90	20	95	500	100	20	100

CRUISING AT S.L. — APPROXIMATE						EFFECTIVE WIND	CRUISING AT 5000′ — APPROXIMATE						CRUISING AT 10,000′ — APPROXIMATE						CRUISING AT 15,000′ — APPROXIMATE						EFFECTIVE WIND	CRUISING AT 20,000′ — APPROXIMATE					
C.A.S.	MACH NO.	LBS/ HR/ ENG.	G.S.	R.F.	LET DOWN DIST.		C.A.S.	MACH NO.	LBS/ HR/ ENG.	G.S.	R.F.	LET DOWN DIST.	C.A.S.	MACH NO.	LBS/ HR/ ENG.	G.S.	R.F.	LET DOWN DIST.	C.A.S.	MACH NO.	LBS/ HR/ ENG.	G.S.	R.F.	LET DOWN DIST.		C.A.S.	MACH NO.	LBS/ HR/ ENG.	G.S.	R.F.	LET DOWN DIST.
						120 HW																			120 HW	335	.73	2400	325	.70	25
						80 HW							355	.64	2800	330	.75	15	340	.67	2500	340	.75	25	80 HW	325	.71	2300	355	.80	35
365	.55	3400	325	.85	0	40 HW	355	.59	3000	345	.85	5	335	.61	2600	350	.85	20	325	.64	2350	365	.90	30	40 HW	320	.69	2250	385	.90	45
345	.52	3150	345	1.0	0	0	335	.55	2800	360	1.0	10	320	.58	2500	370	1.0	25	315	.61	2250	385	1.0	40	0	305	.67	2100	410	1.0	60
330	.50	3000	370	1.10	0	40 TW	320	.52	2650	380	1.10	10	310	.56	2350	395	1.10	30	305	.60	2200	415	1.10	45	40 TW	300	.65	2050	440	1.10	70
						80 TW							295	.53	2250	420	1.25	35	295	.58	2100	445	1.20	55	80 TW	290	.63	2000	465	1.20	80
						120 TW																			120 TW	280	.61	1900	495	1.30	90

P-8385-3

HIGH ALTITUDE

IF YOU ARE AT 25,000′ RANGE IN AIRMILES: BY CRUISING AT 25,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	FUEL LBS.	IF YOU ARE AT 30,000′ RANGE IN AIRMILES: BY CRUISING AT 30,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	IF YOU ARE AT 35,000′ RANGE IN AIRMILES: BY CRUISING AT 35,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	IF YOU ARE AT 40,000′ RANGE IN AIRMILES: BY CRUISING AT 40,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	FUEL LBS.	IF YOU ARE AT 45,000′ RANGE IN AIRMILES: BY CRUISING AT 45,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL)																
(1330)	35	(1520)	6000	(1460)	35	(1528)	(1540)	35	(1540)							
1220	35	1390	5500	1340	35	1400	1410	35	1410							
1110	35	1265	5000	1215	35	1275	1285	35	1285							
1000	35	1135	4500	1095	35	1145	1155	35	1155							
890	35	1010	4000	975	35	1020	1030	35	1030							
780	35	880	3500	850	35	890	900	35	900							
665	35	755	3000	730	35	765	775	35	775							
555	35	625	2500	610	35	635	645	35	645							
445	35	500	2000	490	35	510	520	35	520							
335	35	370	1500	365	35	380	395	35	395							
225	35	245	1000	245	35	255	265	35	265							
115	25	115	500	125	30	125	—	—	—							

CRUISING AT 25,000′ C.A.S.	APPROX. MACH NO.	APPROX. LBS/HR/ENG.	APPROX. G.S.	APPROX. R.F.	APPROX. LET DOWN DIST.	EFFECTIVE WIND	CRUISING AT 30,000′ C.A.S.	APPROX. MACH NO.	APPROX. LBS/HR/ENG.	APPROX. G.S.	APPROX. R.F.	APPROX. LET DOWN DIST.	CRUISING AT 35,000′ C.A.S.	APPROX. MACH NO.	APPROX. LBS/HR/ENG.	APPROX. G.S.	APPROX. R.F.	APPROX. LET DOWN DIST.	CRUISING AT 40,000′ C.A.S.	APPROX. MACH NO.	APPROX. LBS/HR/ENG.	APPROX. G.S.	APPROX. R.F.	APPROX. LET DOWN DIST.	EFFECTIVE WIND	CRUISING AT 45,000′ C.A.S.	APPROX. MACH NO.	APPROX. LBS/HR/ENG.	APPROX. G.S.	APPROX. R.F.	APPROX. LET DOWN DIST.
315	.75	2150	330	.70	40	120 HW	290	.78	1900	335	.70	55	270	.79	1850	335	.70	75							120 HW						
305	.73	2050	360	.80	55	80 HW	285	.76	1850	370	.80	75	265	.79	1800	370	.80	100							80 HW						
300	.71	2000	390	.90	70	40 HW	280	.75	1800	400	.90	90	265	.78	1800	410	.90	125							40 HW						
295	.70	1950	420	1.0	85	0	280	.74	1800	435	1.0	110	260	.77	1750	445	1.0	150							0						
285	.69	1850	455	1.10	95	40 TW	275	.74	1800	475	1.10	130	260	.77	1750	485	1.10	170							40 TW						
280	.68	1800	485	1.20	110	80 TW	275	.73	1800	505	1.20	150	260	.76	1750	520	1.15	195							80 TW						
275	.66	1750	520	1.30	125	120 TW	265	.71	1700	540	1.30	165	255	.75	1700	555	1.25	205							120 TW						

SPECIAL NOTES

(1) Climb at military power.

(2) Descend at idle power.

(3) Make additional allowance for landing, reserve fuel, combat, et cetera, as required.

(4) Read lower half of chart opposite effective wind only.

(5) For all combinations of external stores included in this configuration, see figure A-1.

EXAMPLE

If you are at 20,000 feet with 3500 pounds of available fuel, you can fly 685 nautical air miles by holding 305 knots CAS (no wind). However, you can fly 870 nautical air miles by immediately climbing to 35,000 feet using "MIL" (100%) RPM. At 35,000 feet, cruise at 260 knots CAS and start letdown 150 nautical miles from destination. With an 80-knot headwind, the range at 35,000 feet would be .8 x 870 or 695 nautical miles. Cruise at 265 knots CAS with this wind and start letdown 100 nautical miles from destination.

LEGEND

HW –Headwind in knots

TW –Tailwind in knots

R.F. –Range factor; ratio of ground distance to air miles for corresponding winds

G.S. –Ground speed in knots

C.A.S. –Calibrated airspeed in knots

LB/HR/ENG. –Fuel consumption in pounds per hour per engine

Range –Nautical miles

( ) –Range in parentheses for interpolation purposes only

DATA AS OF: 1 August 1955

DATA BASIS: Calculations

FUEL GRADE: JP-4

FUEL DENSITY: 6.5 lb/gal

Figure A-22 (Sheet 2)

AIRCRAFT MODEL: A4D-1

ENGINE: J65-W-4

FLIGHT OPERATION INSTRUCTION CHART

STANDARD DAY

CHART WEIGHT LIMITS: 13,000 TO 11,000 POUNDS

EXTERNAL LOAD ITEMS
BASIC ATTACK CONFIGURATION

NUMBER OF ENGINES OPERATING: ONE

INSTRUCTIONS FOR USING CHART: (A) IN FLIGHT. Select figure in fuel column equal to or less than fuel available for cruise (fuel on board minus allowance for reserve, combat, navigational error, formation flight, etc.). Move horizontally right or left to section according to present altitude and read total range available (no wind) by cruising at that altitude or by climbing to another altitude of maximum range. For a flight at initial altitude, operating instructions are given directly below. For a flight at higher altitude, climb immediately to desired altitude and read cruising instructions in appropriate cruising altitude section. (B) FLIGHT PLANNING. From initial fuel on board subtract fuel for takeoff and climb to desired altitude and all other necessary allowances. Then use chart as for IN FLIGHT above, adding initial climb distance to range values.

NOTES: Ranges shown at optimum altitudes are maximum. In order to obtain maximum range on flights requiring more than one chart (due to external configuration or gross weight changes), it is necessary to observe the optimum cruising altitude on each chart; i.e., when changing charts, a climb may be required to obtain a maximum range. All range values include allowances for descent distance and fuel. Climb distance and fuel are included where climbs are indicated.

DATA BELOW CONTAIN NO FUEL RESERVE FOR LANDING

LOW ALTITUDE

IF YOU ARE AT S.L. — RANGE IN AIRMILES			FUEL	IF YOU ARE AT 5000′ — RANGE IN AIRMILES			IF YOU ARE AT 10,000′ — RANGE IN AIRMILES			IF YOU ARE AT 15,000′ — RANGE IN AIRMILES			FUEL	IF YOU ARE AT 20,000′ — RANGE IN AIRMILES		
BY CRUISING AT S.L.	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	LBS.	BY CRUISING AT 5000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	BY CRUISING AT 10,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	BY CRUISING AT 15,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	LBS.	BY CRUISING AT 20,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL)																
(500)	40	(1215)	4500	(595)	40	(1225)	(700)	40	(1240)	(815)	40	(1255)	4500	(920)	40	(1265)
450	40	1065	4000	530	40	1080	625	40	1095	724	40	1110	4000	820	40	1120
395	40	920	3500	465	40	940	545	40	950	635	40	965	3500	715	40	975
335	40	780	3000	395	40	795	470	40	805	545	40	820	3000	615	40	830
280	40	635	2500	330	40	650	390	40	660	453	40	675	2500	515	40	685
225	40	490	2000	265	40	505	315	40	515	365	40	530	2000	410	40	540
170	40	345	1500	200	40	360	235	40	370	275	40	385	1500	305	40	395
110	35	195	1000	135	35	210	155	35	225	185	40	240	1000	205	40	250
55	15	70	500	65	20	80	80	20	90	95	25	100	500	100	25	105

CRUISING AT S.L. — APPROXIMATE						EFFECTIVE WIND	CRUISING AT 5000′ — APPROXIMATE						CRUISING AT 10,000′ — APPROXIMATE						CRUISING AT 15,000′ — APPROXIMATE						EFFECTIVE WIND	CRUISING AT 20,000′ — APPROXIMATE					
C.A.S.	MACH NO.	LBS/HR/ENG.	G.S.	R.F.	LET DOWN DIST.		C.A.S.	MACH NO.	LBS/HR/ENG.	G.S.	R.F.	LET DOWN DIST.	C.A.S.	MACH NO.	LBS/HR/ENG.	G.S.	R.F.	LET DOWN DIST.	C.A.S.	MACH NO.	LBS/HR/ENG.	G.S.	R.F.	LET DOWN DIST.		C.A.S.	MACH NO.	LBS/HR/ENG.	G.S.	R.F.	LET DOWN DIST.
						120 HW																			120 HW	325	.71	2200	315	.70	25
						80 HW							350	.62	2700	320	.75	15	335	.65	2400	335	.75	25	80 HW	315	.68	2100	340	.75	35
355	.53	3200	315	.85	0	40 HW	350	.57	2900	335	.85	5	325	.59	2550	335	.85	20	320	.62	2250	350	.85	30	40 HW	305	.66	2000	365	.90	45
335	.51	3000	335	1.0	0	0	325	.54	2650	350	1.0	10	310	.56	2350	360	1.0	25	300	.59	2100	370	1.0	40	0	295	.64	1950	395	1.0	60
320	.48	2800	360	1.10	0	40 TW	310	.50	2500	370	1.10	10	300	.54	2200	380	1.10	30	290	.57	2000	400	1.10	45	40 TW	285	.61	1850	415	1.10	70
						80 TW							285	.51	2100	410	1.25	35	280	.55	1950	425	1.25	55	80 TW	275	.59	1800	445	1.20	80
						120 TW																			120 TW	265	.57	1750	470	1.35	90

P-8385-5

HIGH ALTITUDE

IF YOU ARE AT 25,000′ RANGE IN AIRMILES: BY CRUISING AT 25,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	FUEL LBS.	IF YOU ARE AT 30,000′ RANGE IN AIRMILES: BY CRUISING AT 30,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	IF YOU ARE AT 35,000′ RANGE IN AIRMILES: BY CRUISING AT 35,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	IF YOU ARE AT 40,000′ RANGE IN AIRMILES: BY CRUISING AT 40,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	FUEL LBS.	IF YOU ARE AT 45,000′ RANGE IN AIRMILES: BY CRUISING AT 45,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL)																
(1055)	40	(1275)	4500	(1185)	40	(1290)	(1280)	40	(1295)	(1310)	40	(1310)	4500			
935	40	1130	4000	1055	40	1145	1135	40	1155	1165	40	1165	4000			
820	40	985	3500	920	40	1000	995	40	1005	1020	40	1020	3500			
705	40	840	3000	785	40	855	850	40	860	875	40	875	3000			
585	40	695	2500	655	40	705	710	40	720	730	40	730	2500			
470	40	550	2000	520	40	565	565	40	570	585	40	585	2000			
350	40	405	1500	390	40	420	420	40	430	440	40	440	1500			
230	40	260	1000	255	40	275	280	40	285	295	40	295	1000			
115	25	115	500	125	30	125							500			

CRUISING AT 25,000′ C.A.S.	APPROX. MACH NO.	APPROX. LBS/HR/ENG.	APPROX. G.S.	APPROX. R.F.	APPROX. LET DOWN DIST.	EFFECTIVE WIND	CRUISING AT 30,000′ C.A.S.	APPROX. MACH NO.	APPROX. LBS/HR/ENG.	APPROX. G.S.	APPROX. R.F.	APPROX. LET DOWN DIST.	CRUISING AT 35,000′ C.A.S.	APPROX. MACH NO.	APPROX. LBS/HR/ENG.	APPROX. G.S.	APPROX. R.F.	APPROX. LET DOWN DIST.	CRUISING AT 40,000′ C.A.S.	APPROX. MACH NO.	APPROX. LBS/HR/ENG.	APPROX. G.S.	APPROX. R.F.	APPROX. LET DOWN DIST.	EFFECTIVE WIND	CRUISING AT 45,000′ C.A.S.	APPROX. MACH NO.	APPROX. LBS/HR/ENG.	APPROX. G.S.	APPROX. R.F.	APPROX. LET DOWN DIST.
310	.73	2000	320	.70	40	120 HW	285	.76	1750	325	.70	55	265	.77	1650	330	.70	75	245	.80	1650	345	.70	100	120 HW							
295	.71	1850	350	.80	55	80 HW	280	.74	1700	355	.80	75	260	.77	1600	365	.80	100	240	.80	1550	380	.80	130	80 HW							
290	.69	1800	380	.90	70	40 HW	270	.72	1600	385	.90	90	260	.76	1600	400	.90	125	240	.79	1550	415	.90	160	40 HW							
280	.67	1750	405	1.0	85	0	265	.71	1600	420	1.0	110	255	.75	1550	435	1.0	150	240	.79	1550	455	1.0	185	0							
275	.66	1700	435	1.10	95	40 TW	265	.70	1600	455	1.10	130	250	.74	1500	470	1.10	170	240	.78	1550	495	1.05	215	40 TW							
265	.64	1650	465	1.20	110	80 TW	260	.69	1550	490	1.20	150	250	.73	1500	505	1.20	195	235	.78	1550	530	1.15	240	80 TW							
260	.62	1600	495	1.30	125	120 TW	255	.68	1500	525	1.30	165	245	.72	1450	540	1.30	220	235	.77	1550	565	1.25	270	120 TW							

SPECIAL NOTES

(1) Climb at military power.

(2) Descend at idle power.

(3) Make additional allowance for landing, reserve fuel, combat, et cetera, as required.

(4) Read lower half of chart opposite effective wind only.

(5) For all combinations of external stores included in this configuration, see figure A-1.

EXAMPLE

If you are at 10,000 feet with 2000 pounds of available fuel, you can fly 310 nautical air miles by holding 310 knots CAS (no wind). However, you can fly 515 nautical air miles by immediately climbing to 40,000 feet using "MIL" (100%) RPM. At 40,000 feet, cruise at 240 knots CAS and start letdown 185 nautical miles from destination. With a 120-knot headwind, the range at 40,000 feet would be .7 x 515 or 360 nautical miles. Cruise at 245 knots CAS with this wind and start letdown 100 nautical miles from destination.

LEGEND

HW – Headwind in knots

TW – Tailwind in knots

R.F. – Range factor; ratio of ground distance to air miles for corresponding winds

G.S. – Ground speed in knots

C.A.S. – Calibrated airspeed in knots

LB/HR/ENG. – Fuel consumption in pounds per hour per engine

Range – Nautical miles

( ) – Range in parentheses for interpolation purposes only

DATA AS OF: 1 August 1955

DATA BASIS: Calculations

FUEL GRADE: JP-4

FUEL DENSITY: 6.5 lb/gal

Figure A-22 (Sheet 3)

AIRCRAFT MODEL: A4D-1

ENGINE: J65-W-4

FLIGHT OPERATION INSTRUCTION CHART

STANDARD DAY

CHART WEIGHT LIMITS: 11,000 TO 9000 POUNDS

EXTERNAL LOAD ITEMS

BASIC ATTACK CONFIGURATION

NUMBER OF ENGINES OPERATING: ONE

INSTRUCTIONS FOR USING CHART: (A) IN FLIGHT. Select figure in fuel column equal to or less than fuel available for cruise (fuel on board minus allowance for reserve, combat, navigational error, formation flight, etc.). Move horizontally right or left to section according to present altitude and read total range available (no wind) by cruising at that altitude or by climbing to another altitude of maximum range. For a flight at initial altitude, operating instructions are given directly below. For a flight at higher altitude, climb immediately to desired altitude and read cruising instructions in appropriate cruising altitude section. (B) FLIGHT PLANNING. From initial fuel on board subtract fuel for takeoff and climb to desired altitude and all other necessary allowances. Then use chart as for IN FLIGHT above, adding initial climb distance to range values.

NOTES: Ranges shown at optimum altitudes are maximum. In order to obtain maximum range on flights requiring more than one chart (due to external configuration or gross weight changes), it is necessary to observe the optimum cruising altitude on each chart; i.e., when changing charts, a climb may be required to obtain a maximum range. All range values include allowances for descent distance and fuel. Climb distance and fuel are included where climbs are indicated.

DATA BELOW CONTAIN NO FUEL RESERVE FOR LANDING

LOW ALTITUDE

IF YOU ARE AT S.L. RANGE IN AIRMILES			FUEL LBS.	IF YOU ARE AT 5000′ RANGE IN AIRMILES			IF YOU ARE AT 10,000′ RANGE IN AIRMILES			IF YOU ARE AT 15,000′ RANGE IN AIRMILES			FUEL LBS.	IF YOU ARE AT 20,000′ RANGE IN AIRMILES		
BY CRUISING AT S.L.	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.		BY CRUISING AT 5000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	BY CRUISING AT 10,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	BY CRUISING AT 15,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.		BY CRUISING AT 20,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL)																
(285)	40	(730)	2500	(340)	40	(740)	(405)	40	(755)	(470)	40	(770)	2500	(540)	40	(780)
230	40	555	2000	270	40	570	325	40	585	375	40	595	2000	430	40	610
170	40	385	1500	205	40	400	245	40	415	285	40	430	1500	320	40	440
115	35	215	1000	135	40	230	165	40	245	190	40	255	1000	215	40	270
55	15	75	500	70	20	85	85	20	90	95	25	100	500	105	25	110

CRUISING AT S.L.						EFFECTIVE WIND	CRUISING AT 5000′						CRUISING AT 10,000′						CRUISING AT 15,000′						EFFECTIVE WIND	CRUISING AT 20,000′					
	APPROXIMATE							APPROXIMATE						APPROXIMATE						APPROXIMATE						APPROXIMATE				
C.A.S.	MACH NO.	LBS/ HR/ ENG.	G.S.	R.F.	LET DOWN DIST.		C.A.S.	MACH NO.	LBS/ HR/ ENG.	G.S.	R.F.	LET DOWN DIST.	C.A.S.	MACH NO.	LBS/ HR/ ENG.	G.S.	R.F.	LET DOWN DIST.	C.A.S.	MACH NO.	LBS/ HR/ ENG.	G.S.	R.F.	LET DOWN DIST.		C.A.S.	MACH NO.	LBS/ HR/ ENG.	G.S.	R.F.	LET DOWN DIST.
						120 HW																			120 HW	320	.69	2100	305	.65	25
						80 HW							340	.61	2550	310	.75	15	320	.64	2200	320	.75	25	80 HW	305	.66	950	325	.75	35
345	.52	3050	305	.85	0	40 HW	340	.56	2750	320	.85	5	320	.57	2350	325	.85	20	305	.60	2050	335	.85	30	40 HW	290	.63	800	345	.85	45
330	.50	2900	330	1.0	0	0	320	.53	2500	340	1.0	10	300	.54	2150	345	1.0	25	290	.57	1950	355	1.0	40	0	280	.61	750	375	1.0	60
310	.47	2700	350	1.10	0	40 TW	295	.48	2300	355	1.10	10	285	.51	2000	370	1.10	30	270	.54	1800	375	1.10	45	40 TW	265	.58	650	395	1.10	70
						80 TW							270	.49	1900	395	1.25	35	260	.52	1700	405	1.25	55	80 TW	255	.55	550	420	1.25	80
						120 TW																			120 TW	245	.53	500	450	1.35	90

P-8385-7

HIGH ALTITUDE

IF YOU ARE AT 25,000′ RANGE IN AIRMILES: BY CRUISING AT 25,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	FUEL LBS.	IF YOU ARE AT 30,000′ RANGE IN AIRMILES: BY CRUISING AT 30,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	IF YOU ARE AT 35,000′ RANGE IN AIRMILES: BY CRUISING AT 35,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	IF YOU ARE AT 40,000′ RANGE IN AIRMILES: BY CRUISING AT 40,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	FUEL LBS.	IF YOU ARE AT 45,000′ RANGE IN AIRMILES: BY CRUISING AT 45,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL)																
(615)	40	(795)	2500	(695)	40	(805)	(775)	40	(815)	(825)	40	(825)	2500			
490	40	625	2000	555	40	635	615	40	645	655	40	655	2000			
365	40	455	1500	410	40	465	455	40	475	485	40	485	1500			
240	40	280	1000	270	40	295	295	40	305	315	40	315	1000			
115	25	115	500	125	30	125							500			

CRUISING AT 25,000′ C.A.S.	APPROXIMATE MACH NO.	LBS/HR/ENG.	G.S.	R.F.	LET DOWN DIST.	EFFECTIVE WIND	CRUISING AT 30,000′ C.A.S.	MACH NO.	LBS/HR/ENG.	G.S.	R.F.	LET DOWN DIST.	CRUISING AT 35,000′ C.A.S.	MACH NO.	LBS/HR/ENG.	G.S.	R.F.	LET DOWN DIST.	CRUISING AT 40,000′ C.A.S.	MACH NO.	LBS/HR/ENG.	G.S.	R.F.	LET DOWN DIST.	EFFECTIVE WIND	CRUISING AT 45,000′ C.A.S.	MACH NO.	LBS/HR/ENG.	G.S.	R.F.	LET DOWN DIST.
300	.72	1800	315	.70	40	120 HW	280	.74	1600	320	.70	55	260	.76	1450	320	.70	75	235	.79	1350	330	.70	100	120 HW						
290	.69	1700	340	.75	55	80 HW	270	.72	1500	345	.80	75	255	.75	1400	355	.80	100	235	.78	1350	365	.80	130	80 HW						
280	.67	1650	365	.90	70	40 HW	265	.70	1500	375	.90	90	250	.74	1350	385	.90	125	230	.77	1300	400	.90	160	40 HW						
270	.65	1600	390	1.0	85	0	260	.69	1450	405	1.0	110	245	.73	1350	420	1.0	150	230	.76	1300	440	1.0	185	0						
260	.62	1500	415	1.10	95	40 TW	255	.68	1400	440	1.10	130	240	.72	1300	455	1.10	170	230	.76	1300	475	1.10	215	40 TW						
250	.61	1450	440	1.20	110	80 TW	250	.67	1400	475	1.20	150	240	.71	1300	490	1.20	195	225	.75	1250	515	1.20	240	80 TW						
240	.58	1400	470	1.35	125	120 TW	245	.65	1350	505	1.30	165	235	.70	1250	520	1.30	220	225	.75	1250	550	1.25	270	120 TW						

SPECIAL NOTES

(1) Climb at military power.

(2) Descend at idle power.

(3) Make additional allowance for landing, reserve fuel, combat, et cetera, as required.

(4) Read lower half of chart opposite effective wind only.

(5) For all combinations of external stores included in this configuration, see figure A-1.

EXAMPLE

If you are at 30,000 feet with 1500 pounds of available fuel, you can fly 410 nautical air miles by holding 260 knots CAS (no wind). However, you can fly 465 nautical air miles by immediately climbing to 40,000 feet using "MIL" (100%) RPM. At 40,000 feet, cruise at 230 knots CAS and start letdown 185 nautical miles from destination. With a 40-knot tailwind, the range at 40,000 feet would be 1.1 x 465 or 510 nautical miles. Cruise at 230 knots CAS with this wind and start letdown 215 nautical miles from destination.

LEGEND

HW – Headwind in knots
TW – Tailwind in knots
R.F. – Range factor; ratio of ground distance to air miles for corresponding winds
G.S. – Ground speed in knots
C.A.S. – Calibrated airspeed in knots
LB/HR/ENG. – Fuel consumption in pounds per hour per engine
Range – Nautical miles
( ) – Range in parentheses for interpolation purposes only

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

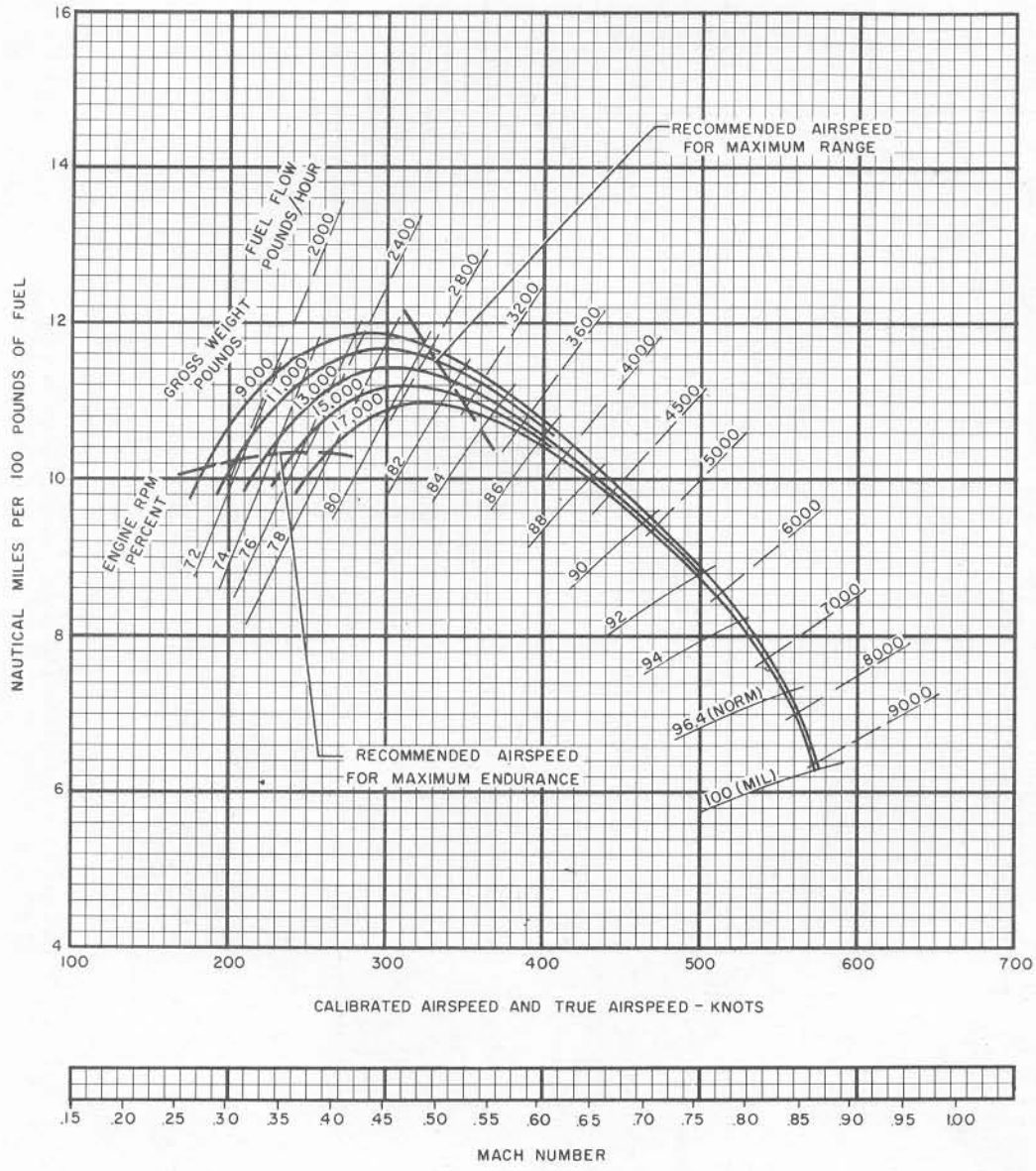
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

Figure A-22 (Sheet 4)

SPECIFIC RANGE

BASIC ATTACK CONFIGURATION SEA LEVEL

MODEL: A4D-1 ENGINE: J65-W-4



P 8386-1

REMARKS:

For all combinations of external stores included in this configuration, see figure A-1.

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

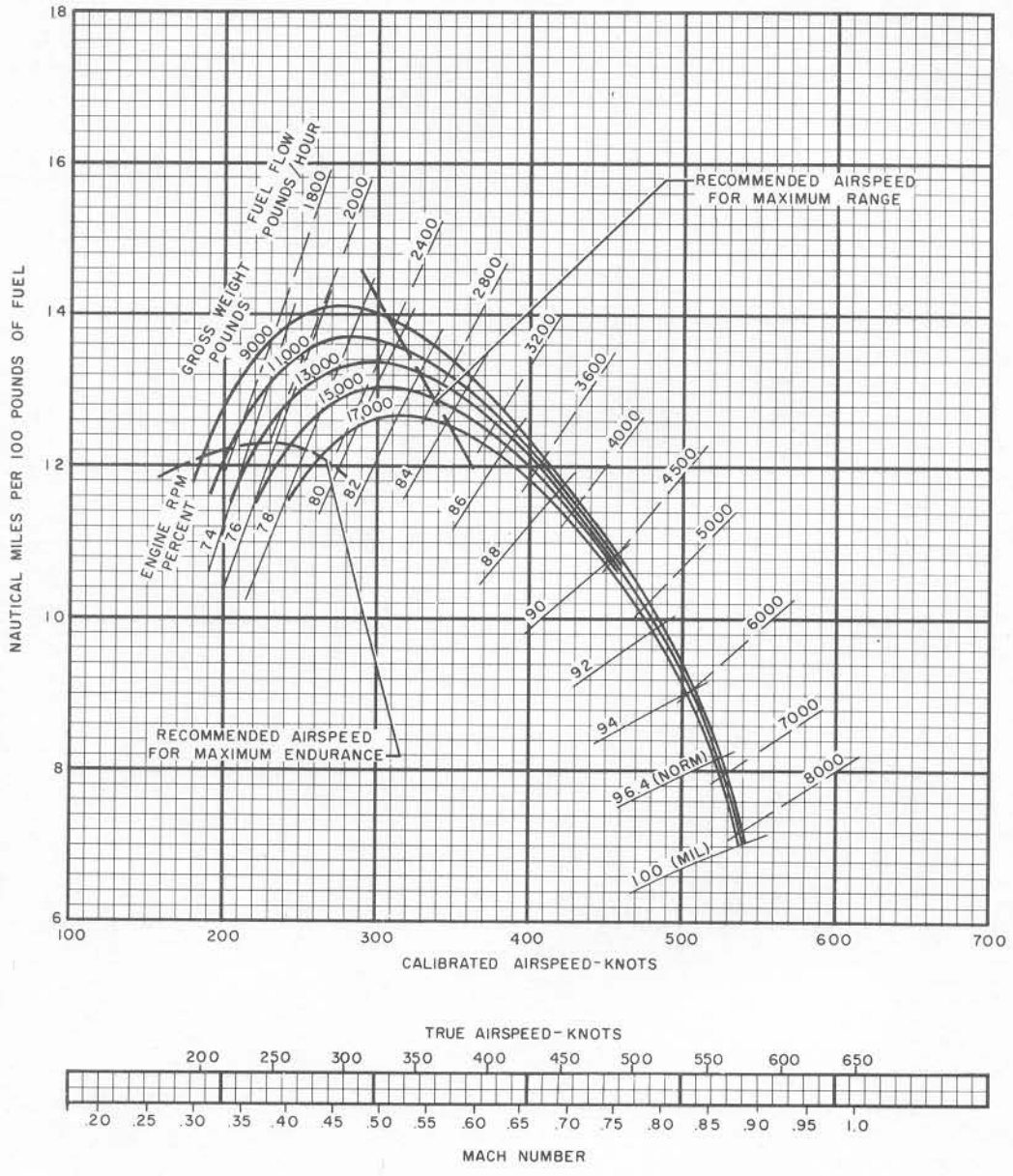
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

Figure A-23 (Sheet 1)

SPECIFIC RANGE

BASIC ATTACK CONFIGURATION 5000 FEET

MODEL: A4D-1 ENGINE: J65-W-4



P 8386-2

REMARKS:

For all combinations of external stores included in this configuration, see figure A-1.

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

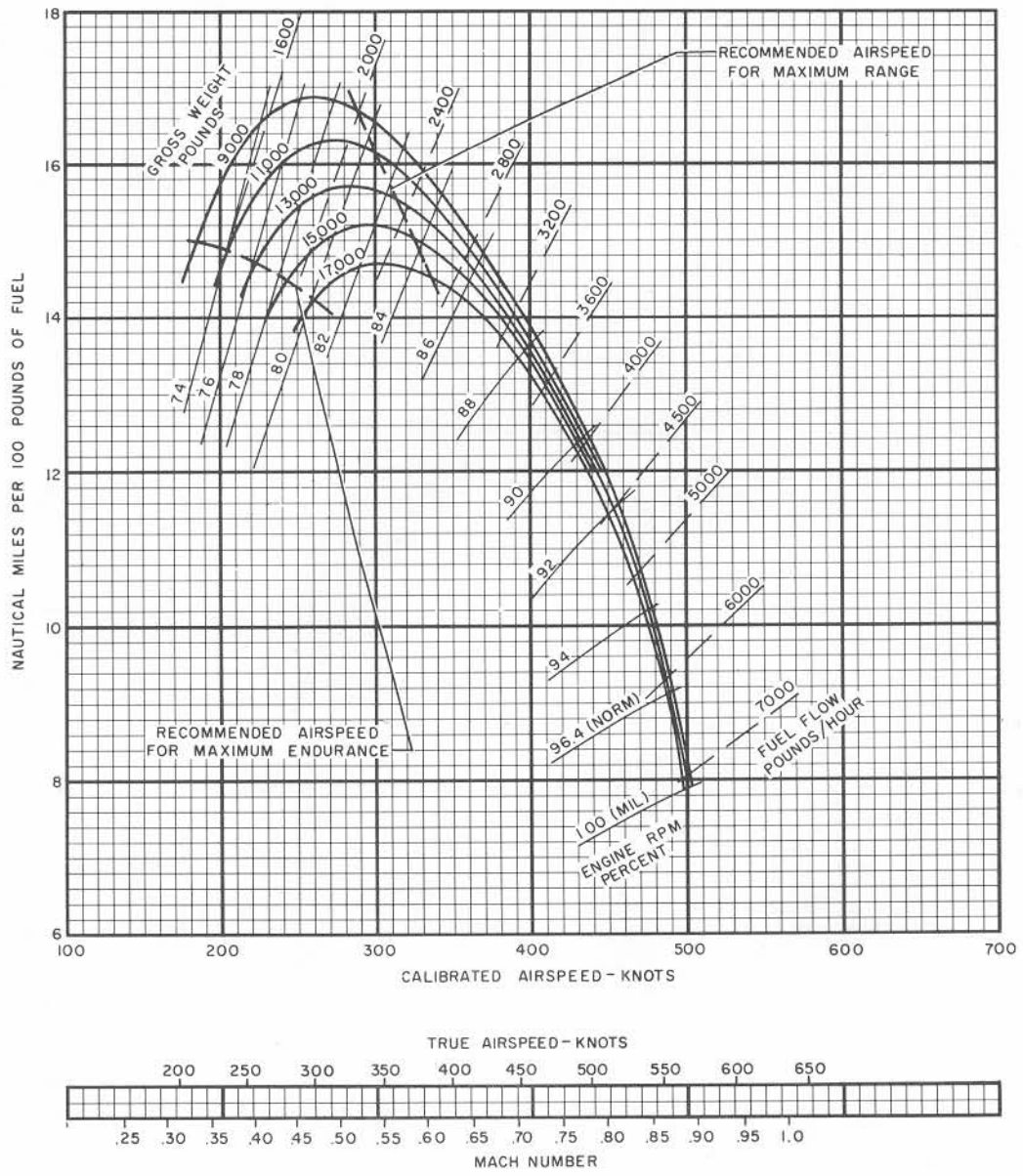
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

Figure A-23 (Sheet 2)

SPECIFIC RANGE

BASIC ATTACK CONFIGURATION 10,000 FEET

MODEL: A4D-1 ENGINE: J65-W-4



P8386-3

REMARKS:

For all combinations of external stores included in this configuration, see figure A-1.

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

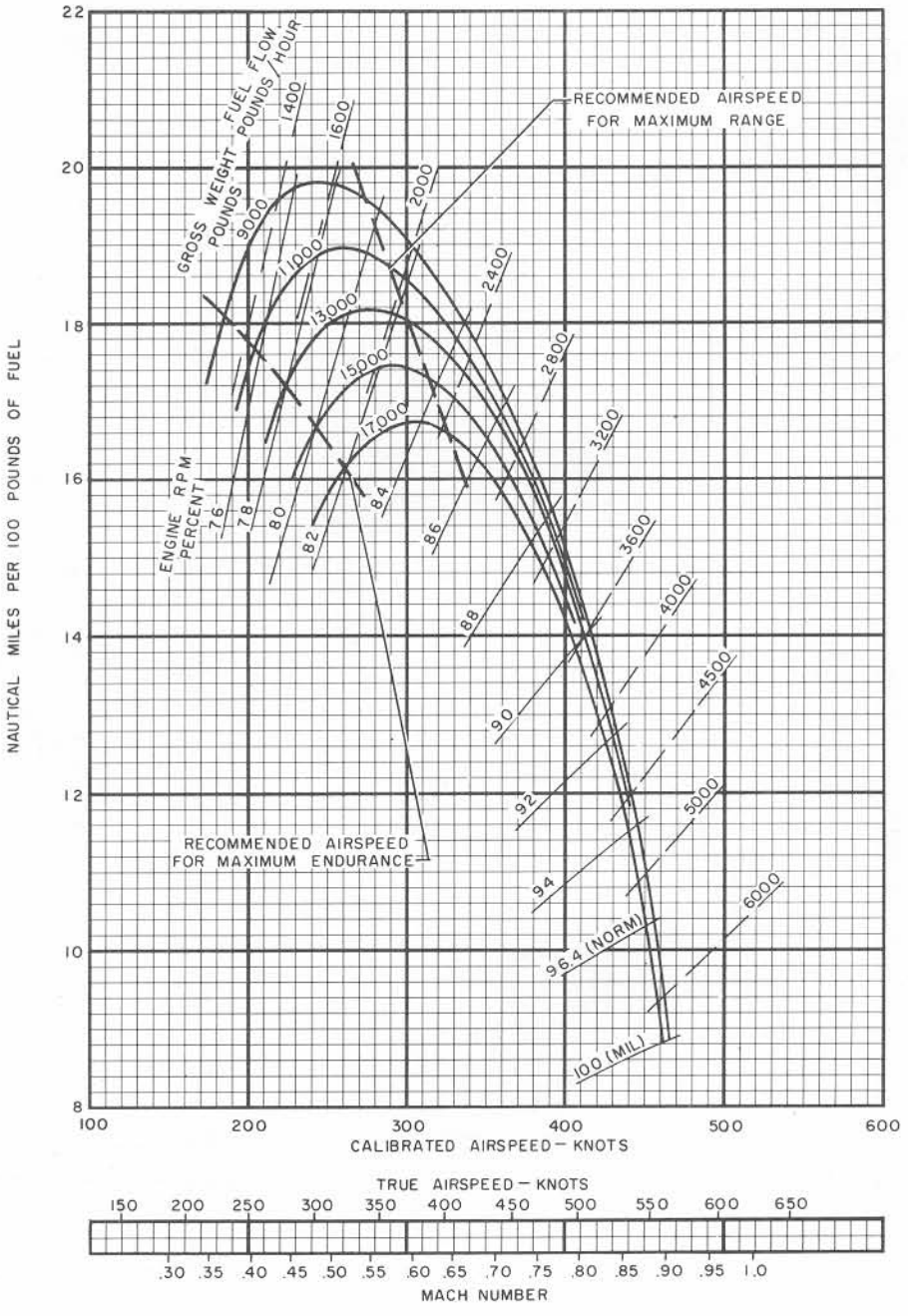
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

Figure A-23 (Sheet 3)

SPECIFIC RANGE

BASIC ATTACK CONFIGURATION 15,000 FEET

MODEL: A4D-1 ENGINE: J65-W-4



P8386-4

REMARKS:

For all combinations of external stores included in this configuration, see figure A-1.

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

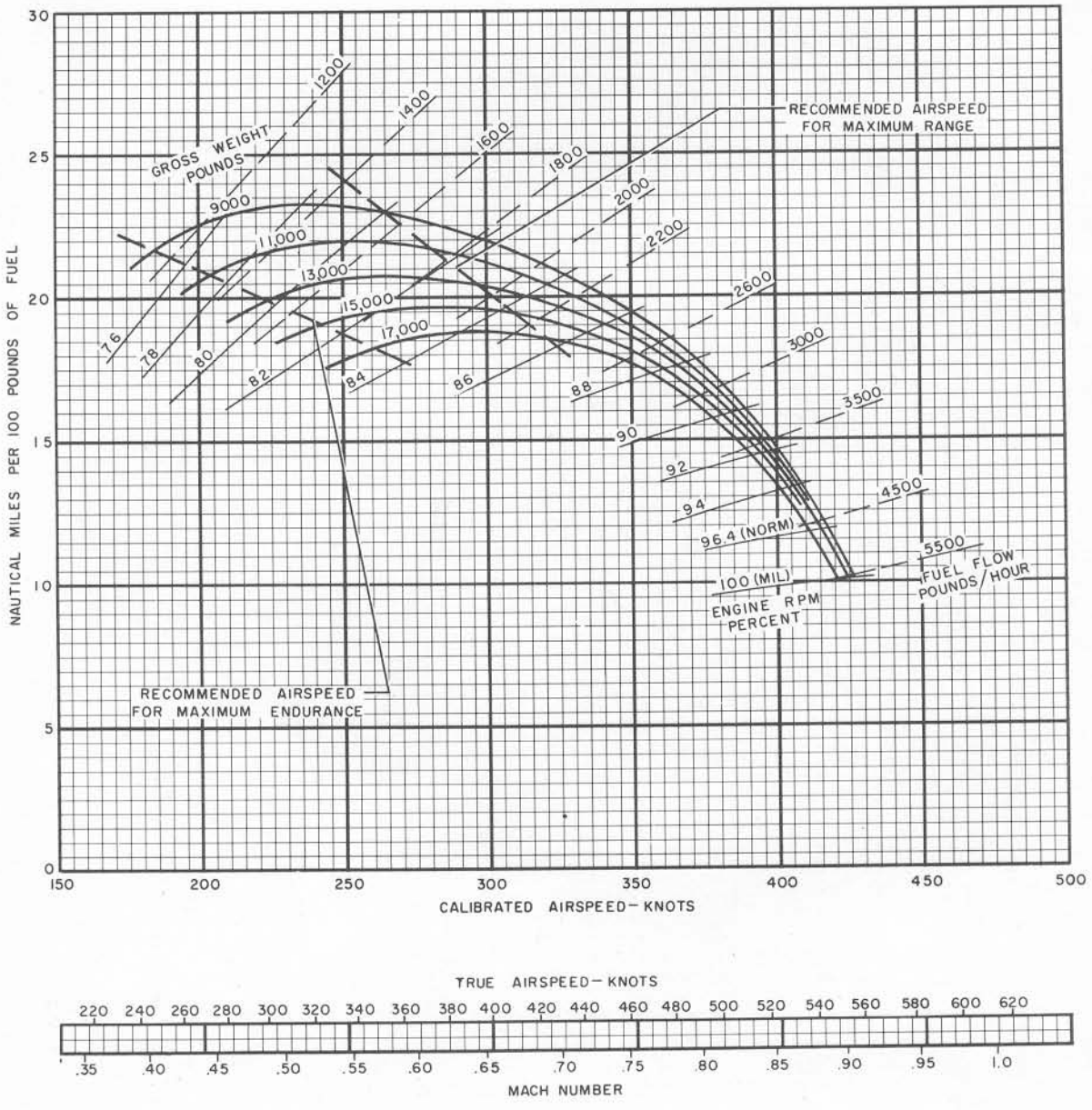
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

Figure A-23 (Sheet 4)

SPECIFIC RANGE

BASIC ATTACK CONFIGURATION 20,000 FEET

MODEL: A4D-1 ENGINE: J65-W-4



P 8386-5

REMARKS:

For all combinations of external stores included in this configuration, see figure A-1.

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

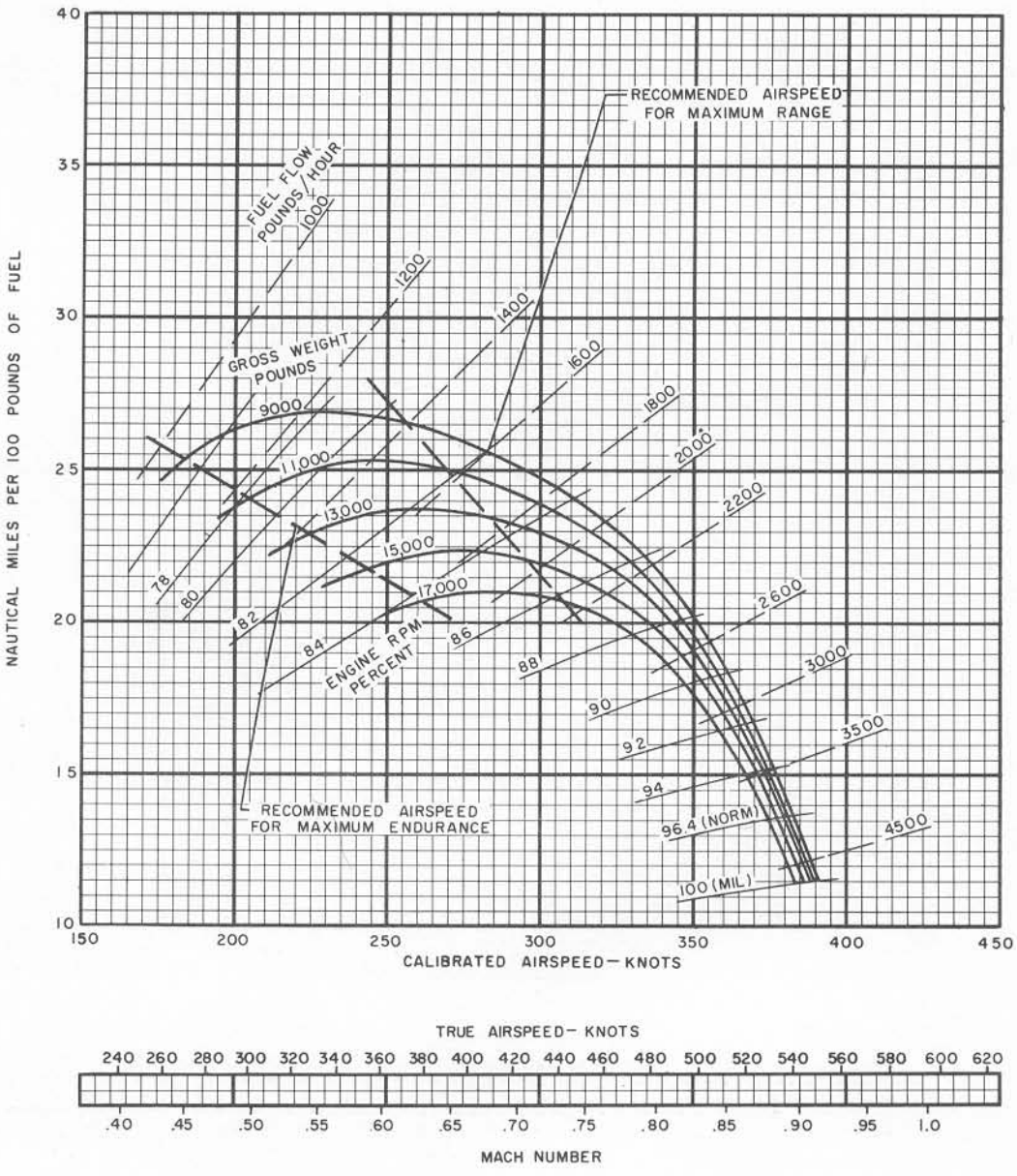
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

Figure A-23 (Sheet 5)

SPECIFIC RANGE

BASIC ATTACK CONFIGURATION 25,000 FEET

MODEL: A4D-1 ENGINE: J65-W-4



P 8386-6

REMARKS:

For all combinations of external stores included in this configuration, see figure A-1.

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

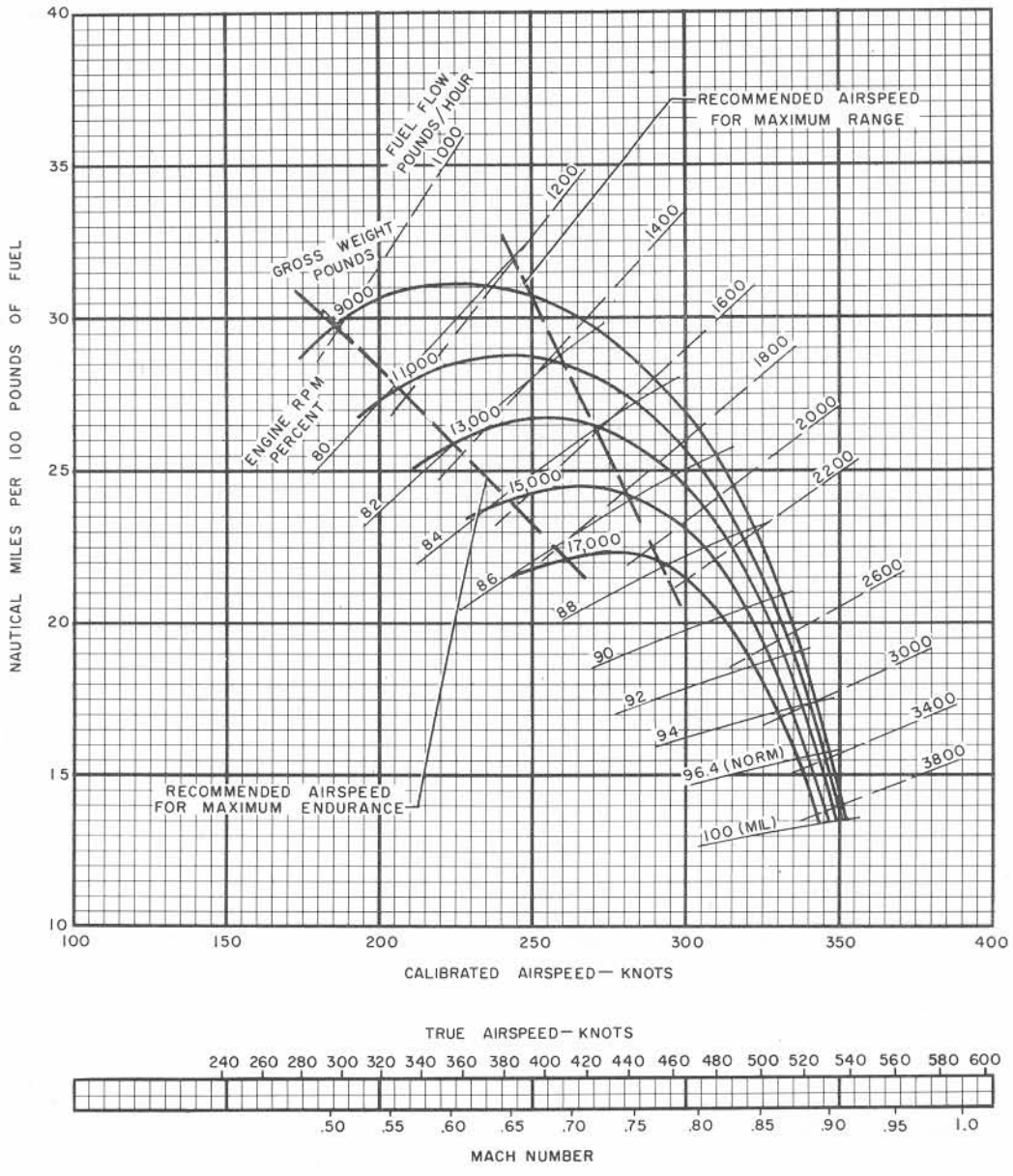
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

Figure A-23 (Sheet 6)

SPECIFIC RANGE

BASIC ATTACK CONFIGURATION 30,000 FEET

MODEL: A4D-1 ENGINE: J65-W-4



P8386-7

REMARKS:

For all combinations of external stores included in this configuration, see figure A-1.

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

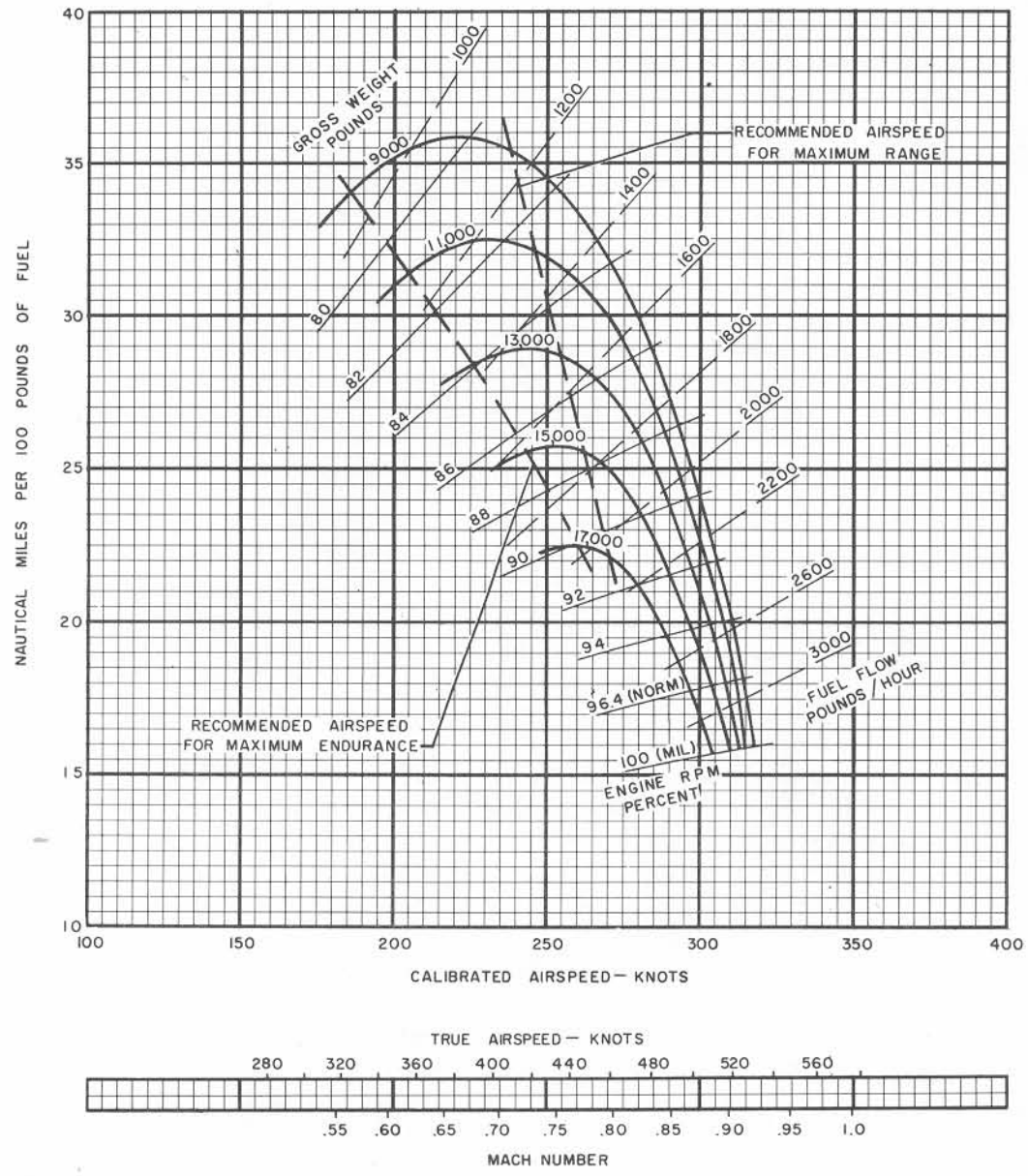
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

Figure A-23 (Sheet 7)

SPECIFIC RANGE

BASIC ATTACK CONFIGURATION 35,000 FEET

MODEL: A4D-1 ENGINE: J65-W-4



REMARKS:

For all combinations of external stores included in this configuration, see figure A-1.

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

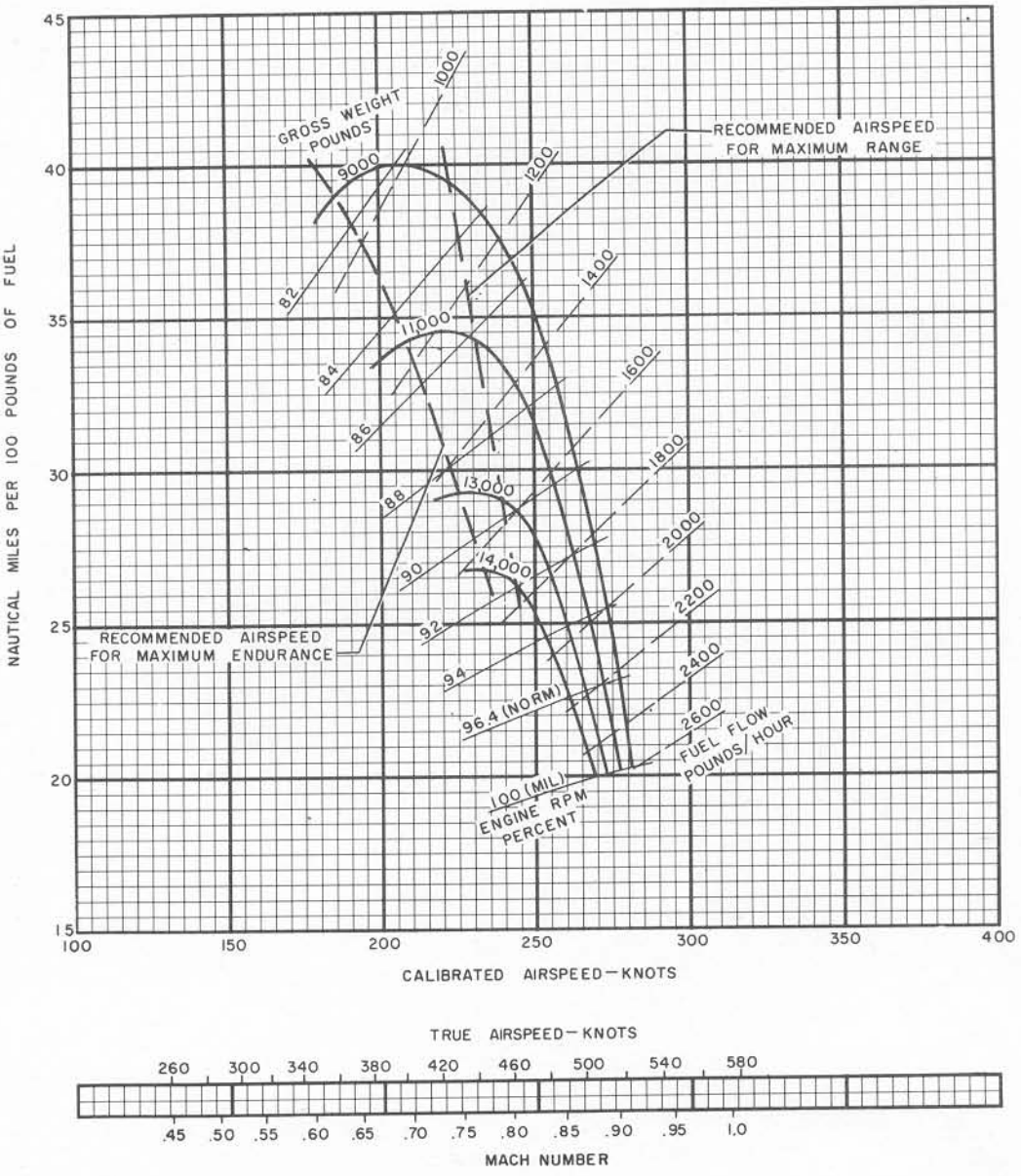
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

Figure A-23 (Sheet 8)

SPECIFIC RANGE

BASIC ATTACK CONFIGURATION 40,000 FEET

MODEL: A4D-1 ENGINE: J65-W-4



P8386-9

REMARKS:

For all combinations of external stores included in this configuration, see figure A-1.

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

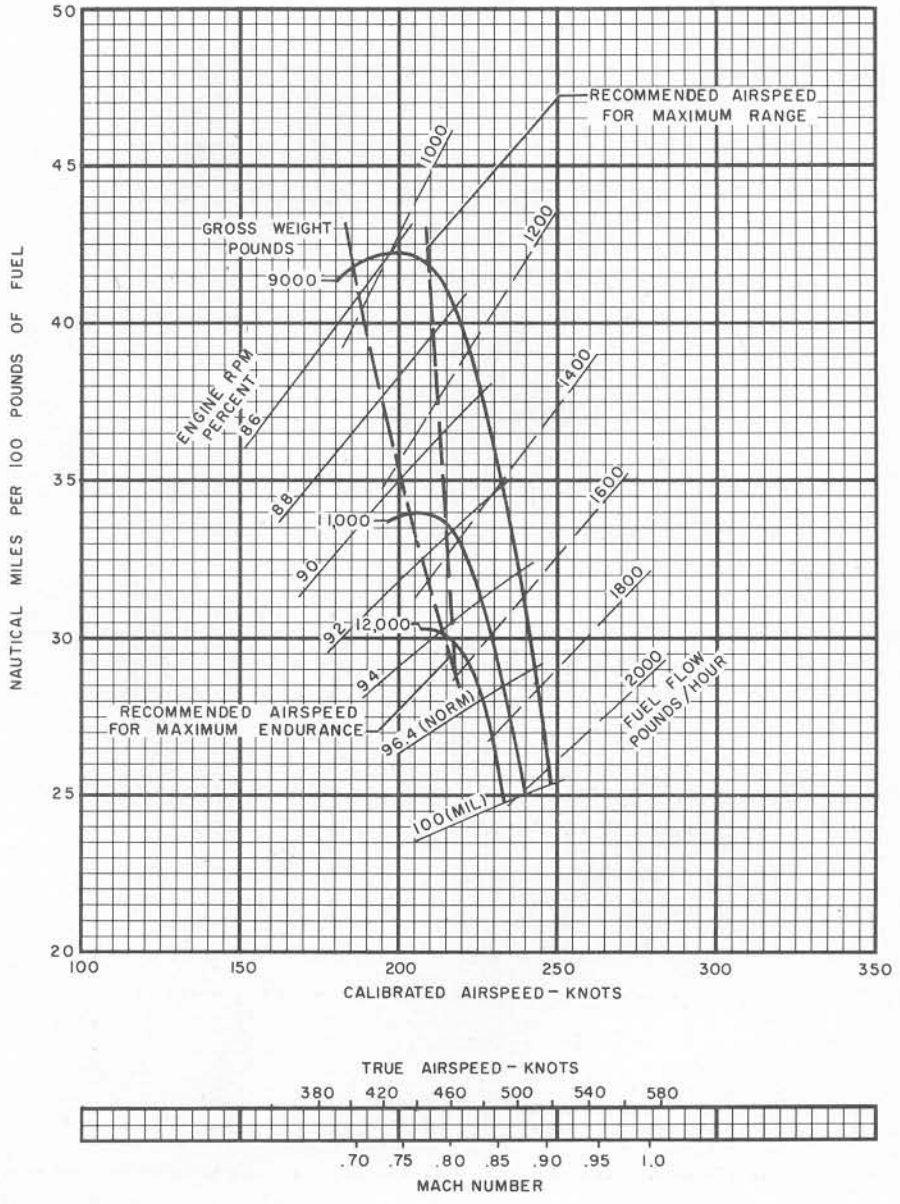
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

Figure A-23 (Sheet 9)

SPECIFIC RANGE

BASIC ATTACK CONFIGURATION 45,000 FEET

MODEL: A4D-1 ENGINE: J65-W-4



P 8386-10

REMARKS:

For all combinations of external stores included in this configuration, see figure A-1.

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

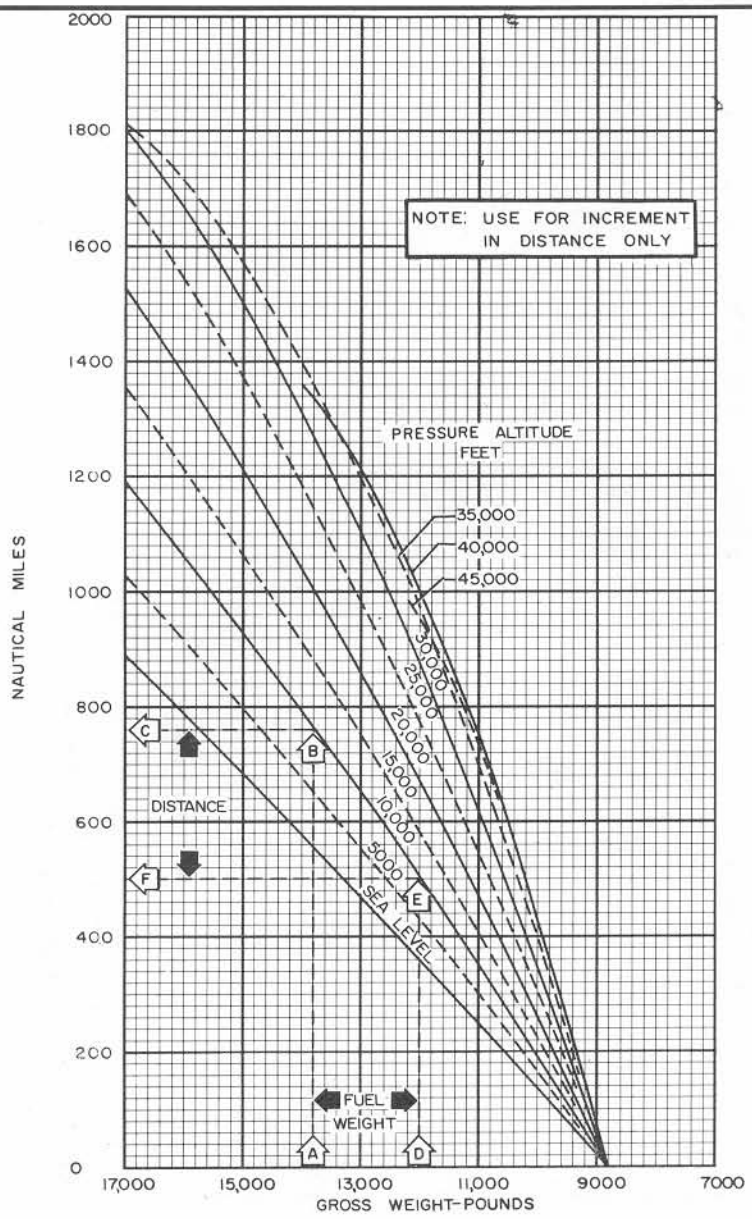
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

Figure A-23 (Sheet 10)

LONG RANGE PREDICTION — DISTANCE

BASIC ATTACK CONFIGURATION

MODEL: A4D-1 ENGINE: J65-W-4



REMARKS:

(1) For all combinations of external stores included in this configuration, see figure A-1.

(2) For recommended airspeeds for maximum range, see figure A-23.

EXAMPLE:

Assume 13,800 pounds gross weight with 1800 pounds of fuel available for cruise at 10,000 feet:

(1) Enter chart at 13,800 pounds A and move vertically to 10,000 feet B.

(2) Move horizontally left and read 760 nautical miles C.

(3) Re-enter chart at weight after cruise (13,800–1800) = 12,000 pounds D and move vertically to 10,000 feet E.

(4) Move horizontally left and read 500 nautical miles F.

Maximum range at 10,000 feet with 1800 pounds of fuel is 760–500 = 260 nautical miles.

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

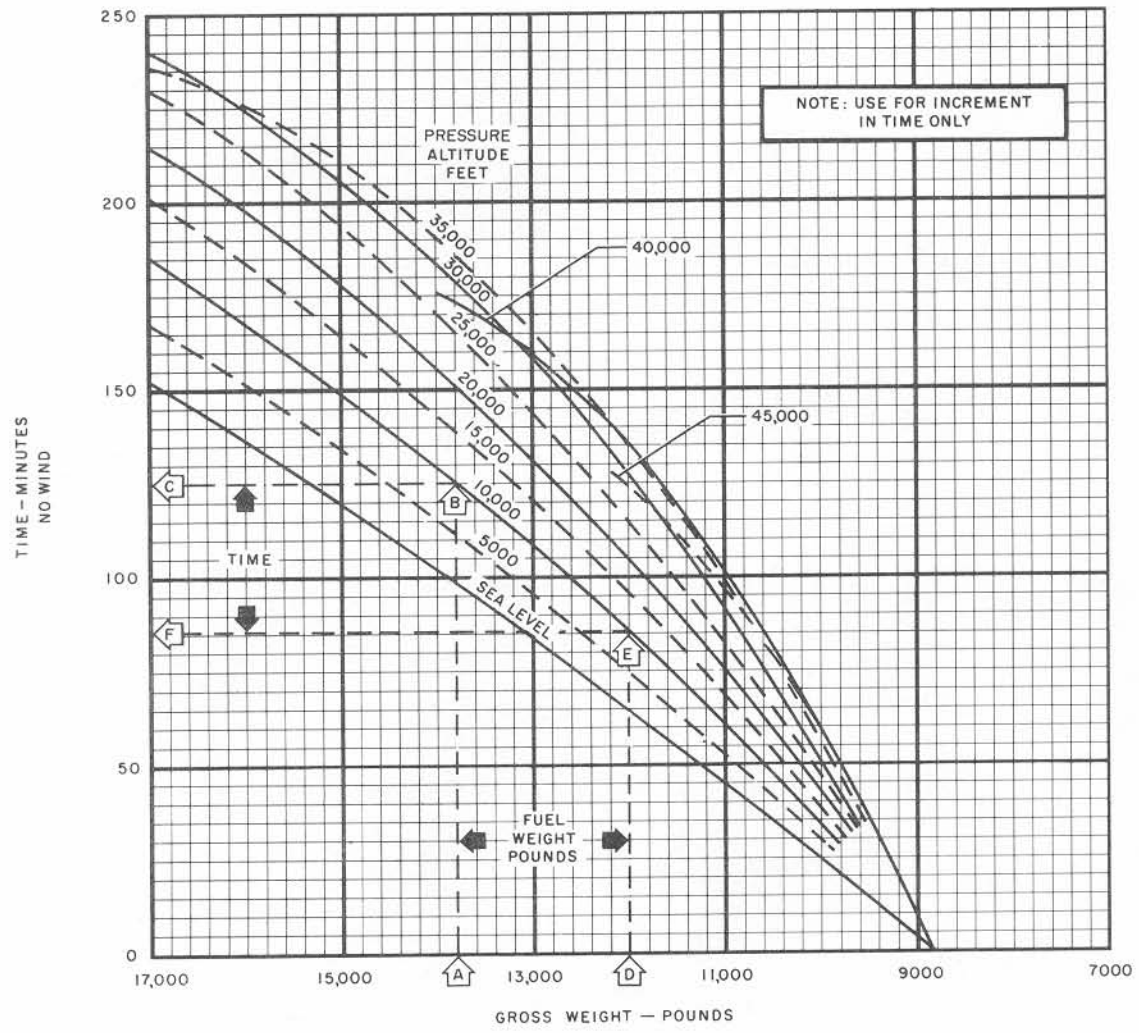
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

Figure A-24

LONG RANGE PREDICTION—TIME

BASIC ATTACK CONFIGURATION

MODEL: A4D-1 ENGINE: J65-W-4



REMARKS:

(1) For all combinations of external stores included in this configuration, see figure A-1.

(2) For recommended airspeeds for maximum range, see figure A-23.

EXAMPLE:

Assume 13,800 pounds gross weight with 1800 pounds of fuel available for cruise at 10,000 feet:

(1) Enter chart at 13,800 pounds (A) and move vertically to 10,000 feet (B).

(2) Move horizontally left and read 125 minutes (C).

(3) Re-enter chart at weight after cruise (13,800–1800) = 12,000 pounds (D) and move vertically to 10,000 feet (E).

(4) Move horizontally left and read 85 minutes (F).

Cruise time at airspeed for maximum range at 10,000 feet with 1800 pounds of fuel is 125–85 = 40 minutes.

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

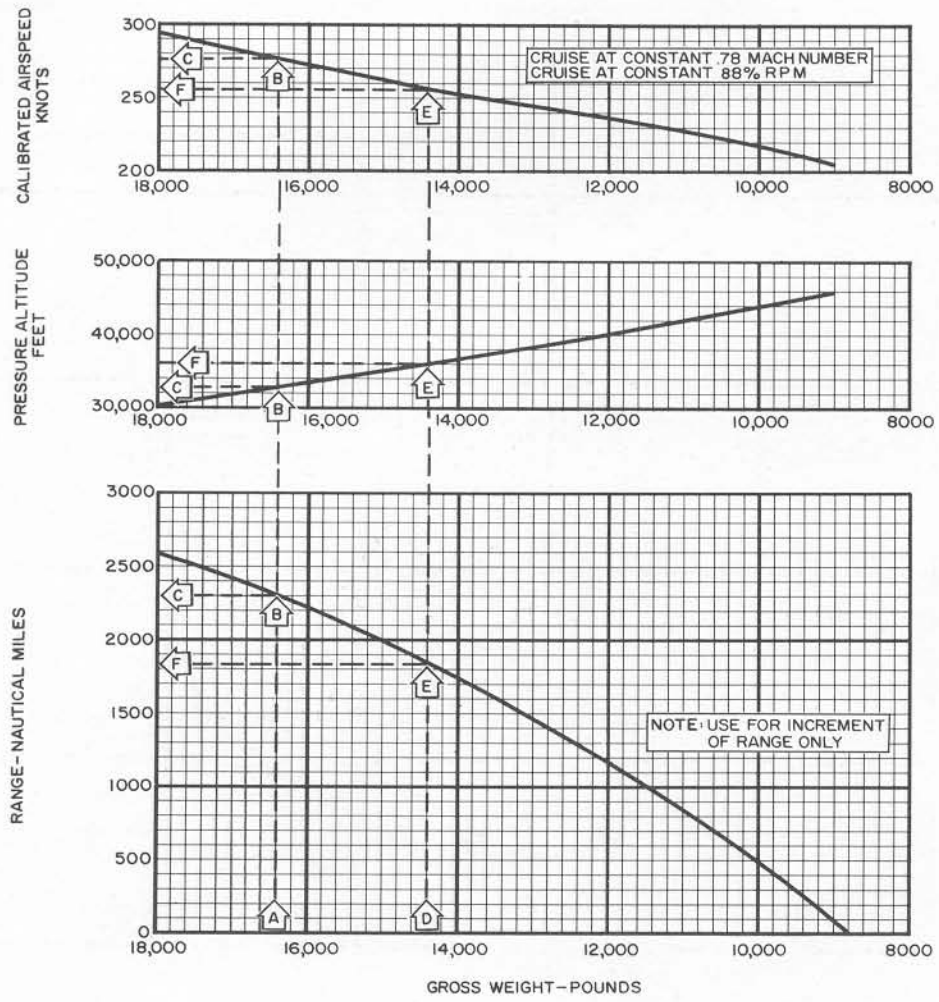
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

Figure A-25

MAXIMUM RANGE—VARIABLE ALTITUDE

BASIC ATTACK CONFIGURATION

MODEL: A4D-1 ENGINE: J65-W-4



P-8389-1

REMARKS:

For all combinations of external stores included in this configuration, see figure A-1.

EXAMPLE:

Assume an initial gross weight of 16,400 pounds with 2000 pounds of fuel available for cruise:

(1) Enter charts at a weight of 16,400 pounds (A) and move vertically to intersect the Range line, Altitude line, and Calibrated Airspeed line (B) ; move left on the respective charts and read:

a. Range – 2300 nautical miles (C)

b. Initial optimum cruise altitude – 33,000 feet (C)

c. Initial calibrated airspeed – 275 knots (C) .

(2) Re-enter charts at a weight of (16,400 – 2000) = 14,400 pounds (D) and move vertically to intersect the Range line, Altitude line and Calibrated airspeed line (E) ; move left on the respective charts and read:

a. Range – 1850 nautical miles (F)

b. Final optimum cruise altitude – 36,000 feet (F)

c. Final calibrated airspeed – 255 knots (F) .

A maximum range of (2300 – 1850) = 450 nautical miles will be covered by flying at a constant .78 Mach number using a constant engine rpm of 88%.

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

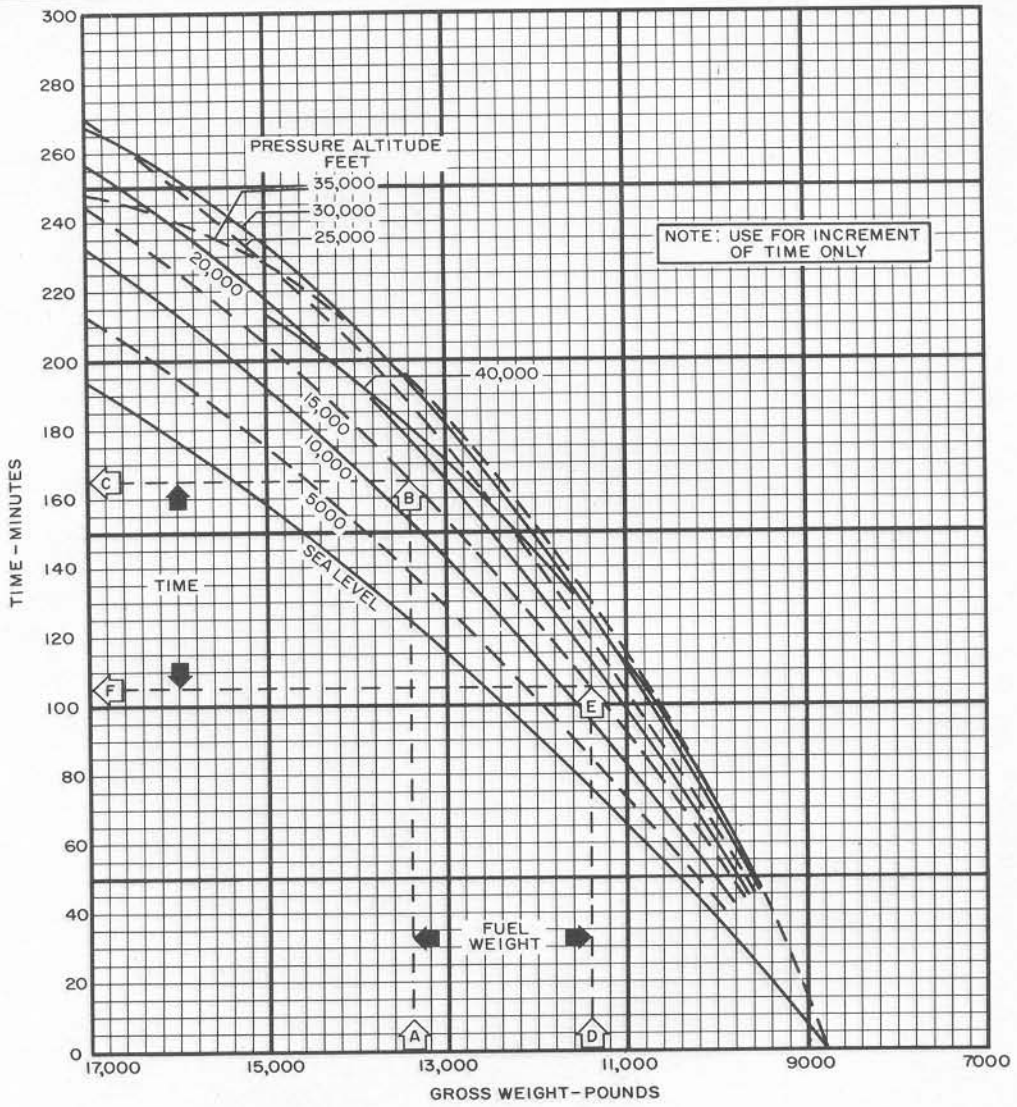
Figure A-26

ENDURANCE PREDICTION

BASIC ATTACK CONFIGURATION

MODEL: A4D-1

ENGINE: J65-W-4



REMARKS:

(1) For all combinations of external stores included in this configuration, see figure A-1.

(2) For recommended airspeeds for maximum endurance, see figure A-23.

EXAMPLE:

Assume an initial weight of 13,400 pounds with 2000 pounds of fuel for loiter at 15,000 feet:

(1) Enter chart at 13,400 pounds (A) and move vertically to 15,000 feet (B).

(2) Move horizontally left and read 165 minutes (C).

(3) Re-enter chart at weight after loiter (13,400–2000) = 11,400 pounds (D) and move vertically to 15,000 feet (E).

(4) Move horizontally left and read 105 minutes (F).

Total loiter time is (165–105) = 60 minutes.

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

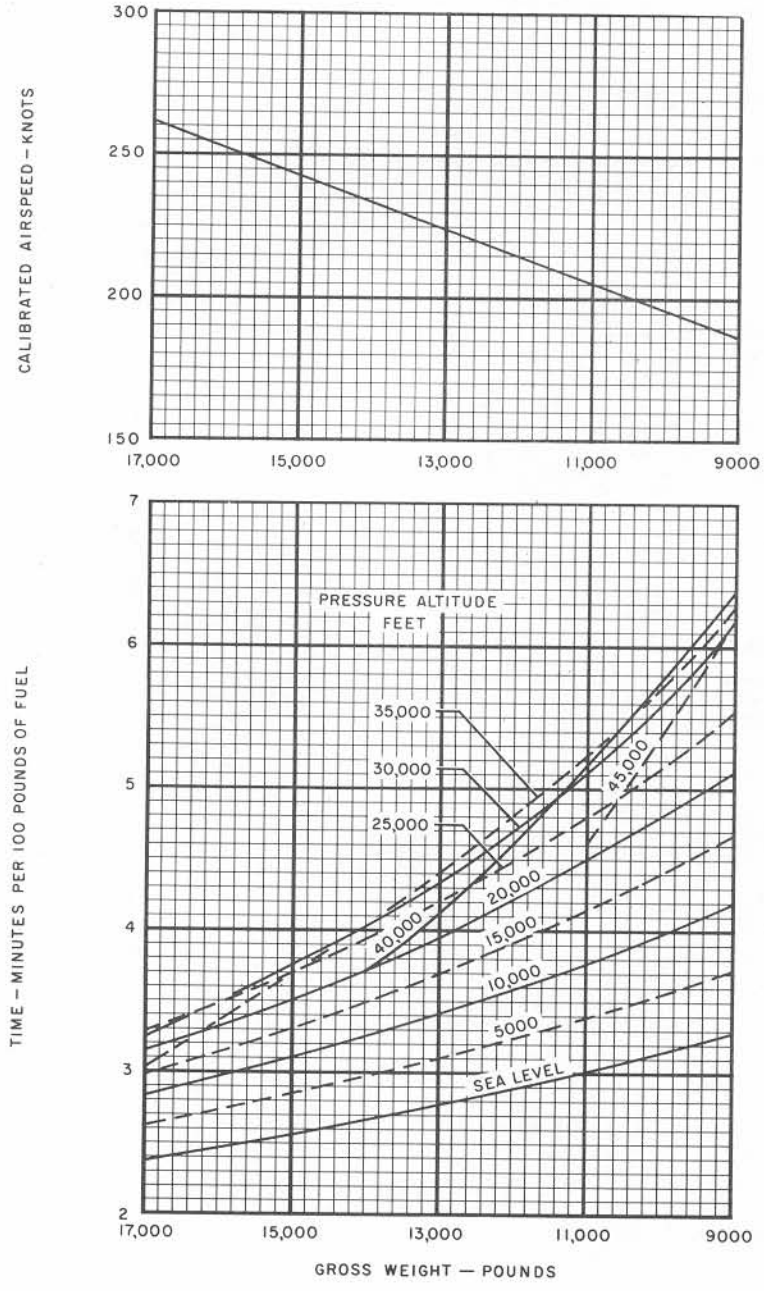
Figure A-27

ENDURANCE-LEVEL FLIGHT

BASIC ATTACK CONFIGURATION

MODEL: A4D-1

ENGINE: J65-W-4



REMARKS:

(1) For all combinations of external stores included in this configuration, see figure A-1.

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

Figure A-28

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AIRCRAFT MODEL: A4D-1

ENGINE: J65-W-4

FLIGHT OPERATION INSTRUCTION CHART

STANDARD DAY

CHART WEIGHT LIMITS: 19,500 TO 17,000 POUNDS

EXTERNAL LOAD ITEMS

LONG RANGE ATTACK CONFIGURATION

NUMBER OF ENGINES OPERATING: ONE

INSTRUCTIONS FOR USING CHART: (A) IN FLIGHT. Select figure in fuel column equal to or less than fuel available for cruise (fuel on board minus allowance for reserve, combat, navigational error, formation flight, etc.). Move horizontally right or left to section according to present altitude and read total range available (no wind) by cruising at that altitude or by climbing to another altitude of maximum range. For a flight at initial altitude, operating instructions are given directly below. For a flight at higher altitude, climb immediately to desired altitude and read cruising instructions in appropriate cruising altitude section. (B) FLIGHT PLANNING. From initial fuel on board subtract fuel for takeoff and climb to desired altitude and all other necessary allowances. Then use chart as for IN FLIGHT above, adding initial climb distance to range values.

NOTES: Ranges shown at optimum altitudes are maximum. In order to obtain maximum range on flights requiring more than one chart (due to external configuration or gross weight changes), it is necessary to observe the optimum cruising altitude on each chart; i.e., when changing charts, a climb may be required to obtain a maximum range. All range values include allowances for descent distance and fuel. Climb distance and fuel are included where climbs are indicated.

DATA BELOW CONTAIN NO FUEL RESERVE FOR LANDING

LOW ALTITUDE

IF YOU ARE AT S.L.			FUEL	IF YOU ARE AT 5000′			IF YOU ARE AT 10,000′			IF YOU ARE AT 15,000′			FUEL	IF YOU ARE AT 20,000′		
RANGE IN AIRMILES				RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES				RANGE IN AIRMILES		
BY CRUISING AT S.L.	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	LBS.	BY CRUISING AT 5000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	BY CRUISING AT 10,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	BY CRUISING AT 15,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	LBS.	BY CRUISING AT 20,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL)																
(700)	30	(1270)	7000	(810)	30	(1290)	(935)	30	(1315)	(1060)	30	(1340)	7000	(1185)	30	1365
650	30	1175	6500	755	30	1195	870	30	1220	985	30	1240	6500	1100	30	1265
600	30	1080	6000	695	30	1100	800	30	1125	910	30	1145	6000	1020	30	1170
550	30	985	5500	640	30	1005	735	30	1030	835	30	1050	5500	935	30	1070
500	30	890	5000	580	30	910	670	30	930	760	30	955	5000	850	30	975
450	30	795	4500	525	30	815	600	30	835	685	30	855	4500	765	30	875

CRUISING AT S.L.						EFFEC-TIVE WIND	CRUISING AT 5000′						CRUISING AT 10,000′						CRUISING AT 15,000′						EFFEC-TIVE WIND	CRUISING AT 20,000′					
	APPROXIMATE							APPROXIMATE						APPROXIMATE						APPROXIMATE						APPROXIMATE				
C.A.S.	MACH NO.	LBS/ HR/ ENG.	G.S.	R.F.	LET DOWN DIST.		C.A.S.	MACH NO.	LBS/ HR/ ENG.	G.S.	R.F.	LET DOWN DIST.	C.A.S.	MACH NO.	LBS/ HR/ ENG.	G.S.	R.F.	LET DOWN DIST.	C.A.S.	MACH NO.	LBS/ HR/ ENG.	G.S.	R.F.	LET DOWN DIST.		C.A.S.	MACH NO.	LBS/ HR/ ENG.	G.S.	R.F.	LET DOWN DIST.
						120 HW																			120 HW	340	.73	2800	330	.70	25
						80 HW							355	.64	3200	330	.75	15	345	.68	2900	345	.80	20	80 HW	335	.72	2700	360	.80	35
370	.55	3800	330	.85	0	40 HW	360	.59	3350	345	.85	5	345	.62	3050	360	.85	20	330	.66	2750	370	.90	30	40 HW	325	.70	2600	390	.90	40
350	.53	3550	350	1.0	0	0	345	.57	3200	370	1.00	10	335	.60	2950	385	1.0	20	325	.64	2700	400	1.0	35	0	320	.69	2550	420	1.0	50
335	.50	3350	375	1.10	0	40 TW	330	.54	3050	395	1.10	10	325	.59	2800	415	1.10	25	315	.62	2600	430	1.10	40	40 TW	310	.67	2450	450	1.10	60
						80 TW							315	.57	2700	445	1.20	30	305	.61	2500	460	1.20	50	80 TW	300	.65	2350	480	1.20	70
						120 TW																			120 TW	295	.64	2300	515	1.30	80

P-8392-1

HIGH ALTITUDE

IF YOU ARE AT 25,000′ RANGE IN AIRMILES: BY CRUISING AT 25,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	FUEL LBS.	IF YOU ARE AT 30,000′ RANGE IN AIRMILES: BY CRUISING AT 30,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	IF YOU ARE AT 35,000′ RANGE IN AIRMILES: BY CRUISING AT 35,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	IF YOU ARE AT 40,000′ RANGE IN AIRMILES: BY CRUISING AT 40,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	FUEL LBS.	IF YOU ARE AT 45,000′ RANGE IN AIRMILES: BY CRUISING AT 45,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL)																
(1315)	30	(1385)	7000	(1400)	30	(1400)	(1370)	35	(1370)							
1220	30	1285	6500	1305	30	1305	1275	35	1275							
1130	30	1185	6000	1205	30	1205	1180	35	1180							
1035	30	1090	5500	1105	30	1105	1085	35	1085							
945	30	990	5000	1010	30	1010	990	35	990							
850	30	895	4500	910	30	910	895	35	895							

CRUISING AT 25,000′ C.A.S.	APPROX. MACH NO.	APPROX. LBS/HR/ENG.	APPROX. G.S.	APPROX. R.F.	APPROX. LET DOWN DIST.	EFFECTIVE WIND	CRUISING AT 30,000′ C.A.S.	APPROX. MACH NO.	APPROX. LBS/HR/ENG.	APPROX. G.S.	APPROX. R.F.	APPROX. LET DOWN DIST.	CRUISING AT 35,000′ C.A.S.	APPROX. MACH NO.	APPROX. LBS/HR/ENG.	APPROX. G.S.	APPROX. R.F.	APPROX. LET DOWN DIST.	CRUISING AT 40,000′ C.A.S.	APPROX. MACH NO.	APPROX. LBS/HR/ENG.	APPROX. G.S.	APPROX. R.F.	APPROX. LET DOWN DIST.	EFFECTIVE WIND	CRUISING AT 45,000′ C.A.S.	APPROX. MACH NO.	APPROX. LBS/HR/ENG.	APPROX. G.S.	APPROX. R.F.	APPROX. LET DOWN DIST.
310	.75	2450	330	.70	35	120 HW	295	.78	2350	340	.70	50	270	.80	2400	340	.70	65							120 HW						
310	.74	2450	365	.80	50	80 HW	290	.77	2350	375	.80	65	270	.79	2400	375	.80	85							80 HW						
305	.73	2400	400	.90	60	40 HW	290	.77	2350	415	.90	75	270	.79	2400	415	.90	100							40 HW						
300	.71	2350	430	1.0	70	0	285	.76	2300	445	1.0	90	265	.78	2400	450	1.0	115							0						
300	.72	2350	470	1.10	80	40 TW	285	.75	2300	485	1.05	105	265	.78	2400	490	1.05	135							40 TW						
295	.70	2300	505	1.20	95	80 TW	285	.75	2300	525	1.15	120	265	.78	2400	530	1.15	150							80 TW						
285	.68	2200	535	1.30	105	120 TW	285	.75	2300	560	1.25	135	265	.78	2400	565	1.25	165							120 TW						

SPECIAL NOTES

(1) Climb at military power.

(2) Descend at idle power.

(3) Make additional allowance for landing, reserve fuel, combat, et cetera, as required.

(4) Read lower half of chart opposite effective wind only.

(5) For all combinations of external stores included in this configuration, see figure A-1.

EXAMPLE

If you are at 20,000 feet with 6000 pounds of available fuel, you can fly 1020 nautical air miles by holding 320 knots CAS (no wind). However, you can fly 1170 nautical air miles by immediately climbing to 30,000 feet using "MIL" (100%) RPM. At 30,000 feet, cruise at 285 knots CAS and start letdown 90 nautical miles from destination. With a 40-knot tailwind, the range at 30,000 feet would be 1.05 x 1170 or 1225 nautical miles. Cruise at 285 knots CAS with this wind and start letdown 105 nautical miles from destination.

LEGEND

HW – Headwind in knots

TW – Tailwind in knots

R.F. – Range factor: ratio of ground distance to air miles for corresponding winds

G.S. – Ground speed in knots

C.A.S. – Calibrated airspeed in knots

LB/HR/ENG. – Fuel consumption in pounds per hour per engine

Range – Nautical miles

( ) – Range in parentheses for interpolation purposes only

DATA AS OF: 1 August 1955

DATA BASIS: Calculations

FUEL GRADE: JP-4

FUEL DENSITY: 6.5 lb/gal

P-8392-2

Figure A-29 (Sheet 1)

AIRCRAFT MODEL: A4D-1

ENGINE: J65-W-4

FLIGHT OPERATION INSTRUCTION CHART

STANDARD DAY

CHART WEIGHT LIMITS: 17,000 TO 15,000 POUNDS

EXTERNAL LOAD ITEMS

LONG RANGE ATTACK CONFIGURATION

NUMBER OF ENGINES OPERATING: ONE

INSTRUCTIONS FOR USING CHART: (A) IN FLIGHT. Select figure in fuel column equal to or less than fuel available for cruise (fuel on board minus allowance for reserve, combat, navigational error, formation flight, etc.). Move horizontally right or left to section according to present altitude and read total range available (no wind) by cruising at that altitude or by climbing to another altitude of maximum range. For a flight at initial altitude, operating instructions are given directly below. For a flight at higher altitude, climb immediately to desired altitude and read cruising instructions in appropriate cruising altitude section. (B) FLIGHT PLANNING. From initial fuel on board subtract fuel for takeoff and climb to desired altitude and all other necessary allowances. Then use chart as for IN FLIGHT above, adding initial climb distance to range values.

NOTES: Ranges shown at optimum altitudes are maximum. In order to obtain maximum range on flights requiring more than one chart (due to external configuration or gross weight changes), it is necessary to observe the optimum cruising altitude on each chart; i.e., when changing charts, a climb may be required to obtain a maximum range. All range values include allowances for descent distance and fuel. Climb distance and fuel are included where climbs are indicated.

DATA BELOW CONTAIN NO FUEL RESERVE FOR LANDING

LOW ALTITUDE

IF YOU ARE AT S.L.			FUEL	IF YOU ARE AT 5000′			IF YOU ARE AT 10,000′			IF YOU ARE AT 15,000′			FUEL	IF YOU ARE AT 20,000′		
RANGE IN AIRMILES				RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES				RANGE IN AIRMILES		
BY CRUISING AT S.L.	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	LBS.	BY CRUISING AT 5000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	BY CRUISING AT 10,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	BY CRUISING AT 15,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	LBS.	BY CRUISING AT 20,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL)																
(820)	30	(1640)	8000	(955)	30	(1655)	(1100)	30	(1665)	(1260)	30	(1680)	8000	(1410)	30	(1690)
770	30	1530	7500	895	30	1545	1035	30	1560	1180	30	1575	7500	1325	30	1585
720	30	1425	7000	835	30	1440	965	30	1455	1100	30	1470	7000	1235	30	1480
670	30	1320	6500	775	30	1335	895	30	1350	1025	30	1360	6500	1150	30	1375
615	30	1215	6000	720	30	1230	830	30	1240	945	30	1255	6000	1060	30	1265
565	30	1105	5500	660	30	1120	760	30	1135	865	30	1150	5500	975	30	1160
515	30	1000	5000	600	30	1015	690	30	1030	790	30	1045	5000	885	30	1055
460	30	895	4500	540	30	910	620	30	925	710	30	935	4500	800	30	950
410	30	790	4000	480	30	805	555	30	815	630	30	830	4000	710	30	840
360	30	680	3500	420	30	695	485	30	710	555	30	725	3500	620	30	735
305	30	575	3000	360	30	590	415	30	605	475	30	620	3000	535	30	630
255	30	470	2500	300	30	485	345	30	500	400	30	510	2500	445	30	525

CRUISING AT S.L.						EFFECTIVE WIND	CRUISING AT 5000′						CRUISING AT 10,000′						CRUISING AT 15,000′						EFFECTIVE WIND	CRUISING AT 20,000′					
	APPROXIMATE							APPROXIMATE						APPROXIMATE						APPROXIMATE						APPROXIMATE				
C.A.S.	MACH NO.	LBS/ HR/ ENG.	G.S.	R.F.	LET DOWN DIST.		C.A.S.	MACH NO.	LBS/ HR/ ENG.	G.S.	R.F.	LET DOWN DIST.	C.A.S.	MACH NO.	LBS/ HR/ ENG.	G.S.	R.F.	LET DOWN DIST.	C.A.S.	MACH NO.	LBS/ HR/ ENG.	G.S.	R.F.	LET DOWN DIST.		C.A.S.	MACH NO.	LBS/ HR/ ENG.	G.S.	R.F.	LET DOWN DIST.
						120 HW																			120 HW	335	.72	2650	325	.70	25
						80 HW							350	.63	3050	325	.75	15	340	.66	2800	335	.75	25	80 HW	325	.70	2550	350	.80	35
355	.54	3500	315	.85	0	40 HW	350	.57	3200	335	.85	5	340	.61	2900	350	.85	20	325	.64	2650	360	.90	30	40 HW	315	.68	2400	380	.90	45
340	.51	3350	340	1.0	0	0	335	.55	3050	360	1.0	10	330	.59	2750	375	1.0	20	315	.62	2550	390	1.00	35	0	310	.66	2350	410	1.0	55
325	.49	3150	365	1.10	0	40 TW	320	.53	2850	385	1.10	10	315	.57	2600	400	1.10	25	305	.60	2400	415	1.10	45	40 TW	300	.65	2300	440	1.10	65
						80 TW							305	.55	2550	430	1.20	30	295	.59	2350	450	1.20	50	80 TW	295	.64	2250	475	1.20	75
						120 TW																			120 TW	285	.62	2150	505	1.30	85

HIGH ALTITUDE

IF YOU ARE AT 25,000′ RANGE IN AIRMILES: BY CRUISING AT 25,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	FUEL LBS.	IF YOU ARE AT 30,000′ RANGE IN AIRMILES: BY CRUISING AT 30,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	IF YOU ARE AT 35,000′ RANGE IN AIRMILES: BY CRUISING AT 35,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	IF YOU ARE AT 40,000′ RANGE IN AIRMILES: BY CRUISING AT 40,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	FUEL LBS.	IF YOU ARE AT 45,000′ RANGE IN AIRMILES: BY CRUISING AT 45,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL)																
(1580)	30	(1705)	8000	(1715)	30	(1715)	(1690)	35	(1690)							
1485	30	1595	7500	1610	30	1610	1585	35	1585							
1385	30	1490	7000	1500	30	1500	1480	35	1480							
1290	30	1385	6500	1395	30	1395	1380	35	1380							
1190	30	1280	6000	1290	30	1290	1275	35	1275							
1090	30	1170	5500	1185	30	1185	1170	35	1170							
995	30	1065	5000	1075	30	1075	1070	35	1070							
895	30	960	4500	970	30	970	965	35	965							
795	30	855	4000	865	30	865	860	35	860							
700	30	745	3500	760	30	760	755	35	755							
600	30	640	3000	650	30	650	655	35	655							
500	30	535	2500	545	30	545	550	35	550							

CRUISING AT 25,000′ C.A.S.	APPROX. MACH NO.	APPROX. LBS/HR/ENG.	APPROX. G.S.	APPROX. R.F.	APPROX. LET DOWN DIST.	EFFECTIVE WIND	CRUISING AT 30,000′ C.A.S.	APPROX. MACH NO.	APPROX. LBS/HR/ENG.	APPROX. G.S.	APPROX. R.F.	APPROX. LET DOWN DIST.	CRUISING AT 35,000′ C.A.S.	APPROX. MACH NO.	APPROX. LBS/HR/ENG.	APPROX. G.S.	APPROX. R.F.	APPROX. LET DOWN DIST.	CRUISING AT 40,000′ C.A.S.	APPROX. MACH NO.	APPROX. LBS/HR/ENG.	APPROX. G.S.	APPROX. R.F.	APPROX. LET DOWN DIST.	EFFECTIVE WIND	CRUISING AT 45,000′ C.A.S.	APPROX. MACH NO.	APPROX. LBS/HR/ENG.	APPROX. G.S.	APPROX. R.F.	APPROX. LET DOWN DIST.
315	.75	2400	330	.70	35	120 HW	290	.77	2200	335	.70	50	270	.79	2250	335	.70	70							120 HW						
305	.74	2300	360	.80	50	80 HW	290	.76	2200	370	.80	70	265	.78	2150	375	.80	90							80 HW						
300	.72	2200	395	.90	65	40 HW	285	.75	2150	405	.90	85	265	.78	2150	410	.90	115							40 HW						
290	.70	2150	420	1.0	75	0	280	.74	2100	435	1.0	100	260	.77	2100	445	1.0	135							0						
290	.70	2150	455	1.05	90	40 TW	280	.74	2100	480	1.05	120	260	.77	2100	485	1.05	155							40 TW						
285	.69	2100	490	1.20	105	80 TW	280	.74	2100	515	1.15	135	260	.76	2100	520	1.15	175							80 TW						
275	.66	2000	520	1.30	115	120 TW	275	.73	2050	555	1.25	150	255	.76	2050	560	1.25	195							120 TW						

SPECIAL NOTES

(1) Climb at military power.

(2) Descend at idle power.

(3) Make additional allowance for landing, reserve fuel, combat, et cetera, as required.

(4) Read lower half of chart opposite effective wind only.

(5) For all combinations of external stores included in this configuration, see figure A-1.

EXAMPLE

If you are at 25,000 feet with 5500 pounds of available fuel, you can fly 1090 nautical air miles by holding 290 knots CAS (no wind). However, you can fly 1170 nautical air miles by immediately climbing to 30,000 feet using "MIL" (100%) RPM. At 30,000 feet, cruise at 280 knots CAS and start letdown 100 nautical miles from destination. With a 120-knot headwind, the range at 30,000 feet would be .7 x 1170 or 815 nautical miles. Cruise at 290 knots CAS with this wind and start letdown 50 nautical miles from destination.

LEGEND

HW –Headwind in knots
TW –Tailwind in knots
R.F. –Range factor; ratio of ground distance to air miles for corresponding winds
G.S. –Ground speed in knots
C.A.S. –Calibrated airspeed in knots
LB/HR/ENG. –Fuel consumption in pounds per hour per engine
Range –Nautical miles
( ) –Range in parentheses for interpolation purposes only

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

P-8392-4

Figure A-29 (Sheet 2)

AIRCRAFT MODEL: A4D-1

ENGINE: J65-W-4

FLIGHT OPERATION INSTRUCTION CHART

STANDARD DAY

CHART WEIGHT LIMITS: 15,000 TO 13,000 POUNDS

EXTERNAL LOAD ITEMS

LONG RANGE ATTACK CONFIGURATION

NUMBER OF ENGINES OPERATING: ONE

INSTRUCTIONS FOR USING CHART: (A) IN FLIGHT. Select figure in fuel column equal to or less than fuel available for cruise (fuel on board minus allowance for reserve, combat, navigational error, formation flight, etc.). Move horizontally right or left to section according to present altitude and read total range available (no wind) by cruising at that altitude or by climbing to another altitude of maximum range. For a flight at initial altitude, operating instructions are given directly below. For a flight at higher altitude, climb immediately to desired altitude and read cruising instructions in appropriate cruising altitude section. (B) FLIGHT PLANNING. From initial fuel on board subtract fuel for takeoff and climb to desired altitude and all other necessary allowances. Then use chart as for IN FLIGHT above, adding initial climb distance to range values.

NOTES: Ranges shown at optimum altitudes are maximum. In order to obtain maximum range on flights requiring more than one chart (due to external configuration or gross weight changes), it is necessary to observe the optimum cruising altitude on each chart; i.e., when changing charts, a climb may be required to obtain a maximum range. All range values include allowances for descent distance and fuel. Climb distance and fuel are included where climbs are indicated.

DATA BELOW CONTAIN NO FUEL RESERVE FOR LANDING

LOW ALTITUDE

IF YOU ARE AT S.L. — RANGE IN AIRMILES			FUEL	IF YOU ARE AT 5000′ — RANGE IN AIRMILES			IF YOU ARE AT 10,000′ — RANGE IN AIRMILES			IF YOU ARE AT 15,000′ — RANGE IN AIRMILES			FUEL	IF YOU ARE AT 20,000′ — RANGE IN AIRMILES		
BY CRUISING AT S.L.	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	LBS.	BY CRUISING AT 5000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	BY CRUISING AT 10,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	BY CRUISING AT 15,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	LBS.	BY CRUISING AT 20,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL)																
(630)	35	(1375)	6000	(740)	35	(1385)	(860)	35	(1400)	(990)	35	(1415)	6000	(1115)	35	(1425)
580	35	1255	5500	680	35	1265	790	35	1280	905	35	1295	5500	1020	35	1305
525	35	1135	5000	615	35	1150	715	35	1160	825	35	1175	5000	930	35	1185
475	35	1015	4500	555	35	1030	645	35	1040	740	35	1055	4500	835	35	1065
420	35	895	4000	495	35	910	575	35	920	660	35	935	4000	745	35	945
370	35	775	3500	430	35	790	505	35	800	580	35	815	3500	655	35	825
315	35	655	3000	370	35	670	430	35	680	495	35	695	3000	560	35	705
260	35	535	2500	310	35	550	360	35	560	415	35	575	2500	470	35	585
210	35	415	2000	245	35	430	290	35	440	335	35	455	2000	375	35	465
155	40	300	1500	185	40	315	220	35	325	250	35	335	1500	285	35	345
105	30	170	1000	125	35	190	145	35	205	170	40	225	1000	190	40	235
50	15	65	500	60	15	70	75	20	80	85	25	95	500	100	25	100

CRUISING AT S.L. — APPROXIMATE						EFFECTIVE WIND	CRUISING AT 5000′ — APPROXIMATE						CRUISING AT 10,000′ — APPROXIMATE						CRUISING AT 15,000′ — APPROXIMATE						EFFECTIVE WIND	CRUISING AT 20,000′ — APPROXIMATE					
C.A.S.	MACH NO.	LBS/HR/ENG.	G.S.	R.F.	LET DOWN DIST.		C.A.S.	MACH NO.	LBS/HR/ENG.	G.S.	R.F.	LET DOWN DIST.	C.A.S.	MACH NO.	LBS/HR/ENG.	G.S.	R.F.	LET DOWN DIST.	C.A.S.	MACH NO.	LBS/HR/ENG.	G.S.	R.F.	LET DOWN DIST.		C.A.S.	MACH NO.	LBS/HR/ENG.	G.S.	R.F.	LET DOWN DIST.
						120 HW																			120 HW	325	.70	2500	315	.65	25
						80 HW							345	.62	2900	315	.75	15	330	.65	2600	325	.75	25	80 HW	315	.68	2350	340	.75	35
350	.53	3400	310	.85	0	40 HW	340	.56	3050	325	.85	5	330	.59	2700	340	.85	20	310	.61	2400	345	.85	30	40 HW	305	.66	2250	365	.90	45
335	.50	3200	335	1.00	0	0	325	.53	2850	345	1.00	10	315	.56	2550	360	1.00	20	300	.59	2300	370	1.00	35	0	295	.64	2150	395	1.00	55
315	.48	3000	355	1.10	0	40 TW	310	.51	2700	375	1.10	10	300	.54	2450	385	1.10	25	290	.57	2200	400	1.10	45	40 TW	285	.62	2100	420	1.10	65
						80 TW							290	.52	2350	415	1.25	30	285	.56	2150	430	1.25	50	80 TW	280	.61	2050	450	1.20	75
						120 TW																			120 TW	270	.59	2000	485	1.35	85

P-8392-5

HIGH ALTITUDE

IF YOU ARE AT 25,000′			FUEL LBS.	IF YOU ARE AT 30,000′			IF YOU ARE AT 35,000′			IF YOU ARE AT 40,000′			FUEL LBS.	IF YOU ARE AT 45,000′		
RANGE IN AIRMILES				RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES				RANGE IN AIRMILES		
BY CRUISING AT 25,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.		BY CRUISING AT 30,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	BY CRUISING AT 35,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	BY CRUISING AT 40,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.		BY CRUISING AT 45,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL)																
(1265)	35	(1435)	6000	(1385)	35	(1445)	(1455)	35	(1455)	(1395)	40	(1395)	6000			
1160	35	1315	5500	1270	35	1325	1335	35	1335	1280	40	1280	5500			
1055	35	1195	5000	1155	35	1205	1215	35	1215	1170	40	1170	5000			
950	35	1075	4500	1040	35	1085	1095	35	1095	1055	40	1055	4500			
845	35	955	4000	925	35	965	975	35	975	940	40	940	4000			
740	35	835	3500	810	35	845	855	35	855	830	40	830	3500			
635	35	715	3000	695	35	725	735	35	735	715	40	715	3000			
530	35	595	2500	580	35	610	615	35	615	605	40	605	2500			
425	35	475	2000	465	35	490	495	35	495	490	40	490	2000			
320	35	360	1500	350	35	370	375	35	375	380	40	380	1500			
215	40	245	1000	235	40	255	255	40	260	265	40	265	1000			
110	25	110	500	120	30	120	135	35	135				500			

CRUISING AT 25,000′						EFFEC-TIVE WIND	CRUISING AT 30,000′						CRUISING AT 35,000′						CRUISING AT 40,000′						EFFEC-TIVE WIND	CRUISING AT 45,000′					
	APPROXIMATE							APPROXIMATE						APPROXIMATE						APPROXIMATE							APPROXIMATE				
C.A.S.	MACH NO.	LBS/HR/ENG.	G.S.	R.F.	LET DOWN DIST.		C.A.S.	MACH NO.	LBS/HR/ENG.	G.S.	R.F.	LET DOWN DIST.	C.A.S.	MACH NO.	LBS/HR/ENG.	G.S.	R.F.	LET DOWN DIST.	C.A.S.	MACH NO.	LBS/HR/ENG.	G.S.	R.F.	LET DOWN DIST.		C.A.S.	MACH NO.	LBS/HR/ENG.	G.S.	R.F.	LET DOWN DIST.
310	.74	2250	325	.70	35	120 HW	285	.76	2050	325	.70	50	265	.78	1950	330	.70	70	240	.80	2100	340	.70	95	120 HW						
300	.72	2150	355	.80	50	80 HW	280	.74	1950	360	.80	70	260	.77	1950	365	.80	90	240	.80	2100	380	.80	120	80 HW						
295	.70	2050	385	.90	65	40 HW	275	.73	1900	390	.90	85	260	.76	1900	400	.90	115	240	.80	2050	420	.90	145	40 HW						
285	.68	2000	410	1.00	75	0	270	.72	1900	425	1.00	100	255	.75	1850	435	1.00	135	260	.80	2050	460	1.00	165	0						
280	.67	1950	445	1.10	90	40 TW	270	.71	1850	460	1.10	120	250	.75	1850	470	1.05	155	240	.79	2050	495	1.10	190	40 TW						
270	.65	1900	475	1.20	105	80 TW	265	.71	1850	500	1.20	135	250	.74	1800	510	1.15	175	235	.79	2000	535	1.15	215	80 TW						
265	.64	1850	505	1.30	115	120 TW	265	.70	1800	535	1.30	150	250	.74	1800	545	1.25	195	235	.79	2000	575	1.25	240	120 TW						

SPECIAL NOTES

(1) Climb at military power.

(2) Descend at idle power.

(3) Make additional allowance for landing, reserve fuel, combat, et cetera, as required.

(4) Read lower half of chart opposite effective wind only.

(5) For all combinations of external stores included in this configuration, see figure A-1.

EXAMPLE

If you are at 20,000 feet with 4000 pounds of available fuel, you can fly 745 nautical air miles by holding 295 knots CAS (no wind). However, you can fly 945 nautical air miles by immediately climbing to 35,000 feet using "MIL" (100%) RPM. At 35,000 feet, cruise at 255 knots CAS and start letdown 135 nautical miles from destination. With a 120-knot headwind, the range at 35,000 feet would be .7 x 945 or 660 nautical miles. Cruise at 265 knots CAS with this wind and start letdown 70 nautical miles from destination.

LEGEND

HW –Headwind in knots
TW –Tailwind in knots
R.F. –Range factor; ratio of ground distance to air miles for corresponding winds
G.S. –Ground speed in knots
C.A.S. –Calibrated airspeed in knots
LB/HR/ENG. –Fuel consumption in pounds per hour per engine
Range –Nautical miles
( ) –Range in parentheses for interpolation purposes only

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

P-8362-6

Figure A-29 (Sheet 3)

AIRCRAFT MODEL: A4D-1

ENGINE: J65-W-4

FLIGHT OPERATION INSTRUCTION CHART

STANDARD DAY

CHART WEIGHT LIMITS: 13,000 TO 11,000 POUNDS

EXTERNAL LOAD ITEMS

LONG RANGE ATTACK CONFIGURATION

NUMBER OF ENGINES OPERATING: ONE

INSTRUCTIONS FOR USING CHART: (A) IN FLIGHT. Select figure in fuel column equal to or less than fuel available for cruise (fuel on board minus allowance for reserve, combat, navigational error, formation flight, etc.). Move horizontally right or left to section according to present altitude and read total range available (no wind) by cruising at that altitude or by climbing to another altitude of maximum range. For a flight at initial altitude, operating instructions are given directly below. For a flight at higher altitude, climb immediately to desired altitude and read cruising instructions in appropriate cruising altitude section. (B) FLIGHT PLANNING. From initial fuel on board subtract fuel for takeoff and climb to desired altitude and all other necessary allowances. Then use chart as for IN FLIGHT above, adding initial climb distance to range values.

NOTES: Ranges shown at optimum altitudes are maximum. In order to obtain maximum range on flights requiring more than one chart (due to external configuration or gross weight changes), it is necessary to observe the optimum cruising altitude on each chart; i.e., when changing charts, a climb may be required to obtain a maximum range. All range values include allowances for descent distance and fuel. Climb distance and fuel are included where climbs are indicated.

DATA BELOW CONTAIN NO FUEL RESERVE FOR LANDING

LOW ALTITUDE

IF YOU ARE AT S.L.			FUEL	IF YOU ARE AT 5000′			IF YOU ARE AT 10,000′			IF YOU ARE AT 15,000′			FUEL	IF YOU ARE AT 20,000′		
RANGE IN AIRMILES				RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES				RANGE IN AIRMILES		
BY CRUISING AT S.L.	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	LBS.	BY CRUISING AT 5000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	BY CRUISING AT 10,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	BY CRUISING AT 15,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	LBS.	BY CRUISING AT 20,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL)																
(430)	40	(1025)	4000	(505)	40	(1040)	(595)	40	(1050)	(690)	40	(1065)	4000	(785)	40	(1075)
375	40	885	3500	445	40	900	520	40	915	605	40	925	3500	685	40	935
320	40	750	3000	380	40	765	450	40	775	520	40	790	3000	590	40	800
270	40	610	2500	315	40	625	375	40	640	435	40	650	2500	490	40	660
215	40	475	2000	255	40	490	300	40	500	350	40	515	2000	395	40	525
160	40	335	1500	190	40	350	225	40	365	260	40	375	1500	295	40	385
105	35	195	1000	125	35	205	150	40	225	175	40	240	1000	200	40	250
50	15	70	500	65	20	80	75	20	85	90	25	100	500	100	25	105

CRUISING AT S.L.						EFFECTIVE WIND	CRUISING AT 5000′						CRUISING AT 10,000′						CRUISING AT 15,000′						EFFECTIVE WIND	CRUISING AT 20,000′					
	APPROXIMATE							APPROXIMATE						APPROXIMATE						APPROXIMATE						APPROXIMATE				
C.A.S.	MACH NO.	LBS/ HR/ ENG.	G.S.	R.F.	LET DOWN DIST.		C.A.S.	MACH NO.	LBS/ HR/ ENG.	G.S.	R.F.	LET DOWN DIST.	C.A.S.	MACH NO.	LBS/ HR/ ENG.	G.S.	R.F.	LET DOWN DIST.	C.A.S.	MACH NO.	LBS/ HR/ ENG.	G.S.	R.F.	LET DOWN DIST.		C.A.S.	MACH NO.	LBS/ HR/ ENG.	G.S.	R.F.	LET DOWN DIST.
						120 HW																			120 HW	320	.69	2300	305	.65	25
						80 HW							340	.61	2750	310	.75	15	320	.63	2450	315	.75	25	80 HW	305	.66	2150	325	.75	35
345	.52	3250	305	.85	0	40 HW	330	.54	2900	315	.85	5	320	.57	2550	325	.85	20	300	.59	2200	330	.85	30	40 HW	290	.63	2050	350	.85	45
325	.49	3050	325	1.00	0	0	315	52	2700	335	1.00	10	300	.54	2350	345	1.00	20	285	.57	2100	355	1.00	35	0	280	.61	1950	375	1.00	55
310	.46	2850	350	1.10	0	40 TW	300	.49	2550	360	1.10	10	290	.52	2250	375	1.10	25	275	.55	2000	385	1.10	45	40 TW	270	.59	1900	405	1.10	65
						80 TW							280	.50	2200	400	1.25	30	270	.53	1950	415	1.25	50	80 TW	260	.57	1800	430	1.20	75
						120 TW																			120 TW	255	.56	1750	465	1.35	85

HIGH ALTITUDE

IF YOU ARE AT 25,000′			FUEL LBS.	IF YOU ARE AT 30,000′			IF YOU ARE AT 35,000′			IF YOU ARE AT 40,000′			FUEL LBS.	IF YOU ARE AT 45,000′		
RANGE IN AIRMILES				RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES				RANGE IN AIRMILES		
BY CRUISING AT 25,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.		BY CRUISING AT 30,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	BY CRUISING AT 35,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	BY CRUISING AT 40,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.		BY CRUISING AT 45,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL)																
(890)	40	(1085)	4000	(995)	40	(1095)	(1080)	40	(1105)	(1115)	40	(1115)	4000			
780	40	945	3500	870	40	960	945	40	965	975	40	975	3500			
670	40	810	3000	745	40	820	810	40	830	840	40	840	3000			
560	40	670	2500	620	40	685	675	40	690	700	40	700	2500			
445	40	535	2000	495	40	545	540	40	555	565	40	565	2000			
335	40	395	1500	375	40	410	405	40	415	425	40	425	1500			
225	40	260	1000	250	40	270	270	40	280	290	40	290	1000			
115	30	115	500	125	30	125	135	35	135				500			

CRUISING AT 25,000′						EFFEC-TIVE WIND	CRUISING AT 30,000′						CRUISING AT 35,000′						CRUISING AT 40,000′						EFFEC-TIVE WIND	CRUISING AT 45,000′					
	APPROXIMATE							APPROXIMATE						APPROXIMATE						APPROXIMATE							APPROXIMATE				
C.A.S.	MACH NO.	LBS/ HR/ ENG.	G.S.	R.F.	LET DOWN DIST.		C.A.S.	MACH NO.	LBS/ HR/ ENG.	G.S.	R.F.	LET DOWN DIST.	C.A.S.	MACH NO.	LBS/ HR/ ENG.	G.S.	R.F.	LET DOWN DIST.	C.A.S.	MACH NO.	LBS/ HR/ ENG.	G.S.	R.F.	LET DOWN DIST.		C.A.S.	MACH NO.	LBS/ HR/ ENG.	G.S.	R.F.	LET DOWN DIST.
300	.72	2050	315	.65	35	120 HW	280	.74	1850	320	.70	50	260	.77	1700	325	.70	70	240	.80	1700	340	.70	95	120 HW						
295	.70	1950	345	.75	50	80 HW	275	.73	1800	350	.80	70	255	.76	1700	355	.80	90	235	.79	1700	375	.80	120	80 HW						
285	.68	1900	370	.85	65	40 HW	270	.71	1750	380	.90	85	250	.75	1600	390	.90	115	235	.78	1700	410	.90	145	40 HW						
275	.66	1800	395	1.00	75	0	260	.69	1650	410	1.00	100	245	.73	1600	425	1.00	135	235	.78	1650	450	1.00	165	0						
270	.65	1750	430	1.10	90	40 TW	260	.68	1650	445	1.10	120	245	.73	1600	460	1.05	155	230	.77	1650	485	1.05	190	40 TW						
260	.63	1700	460	1.20	105	80 TW	255	.67	1600	480	1.20	135	245	.72	1550	495	1.15	175	230	.77	1600	525	1.15	215	80 TW						
250	.60	1650	485	1.30	115	120 TW	250	.67	1600	515	1.30	150	240	.72	1550	535	1.30	195	230	.77	1600	560	1.25	240	120 TW						

SPECIAL NOTES

(1) Climb at military power.

(2) Descend at idle power.

(3) Make additional allowance for landing, reserve fuel, combat, et cetera, as required.

(4) Read lower half of chart opposite effective wind only.

(5) For all combinations of external stores included in this configuration, see figure A-1.

EXAMPLE

If you are at 20,000 feet with 3000 pounds of available fuel, you can fly 590 nautical air miles by holding 280 knots CAS (no wind). However, you can fly 800 nautical air miles by immediately climbing to 40,000 feet using "MIL" (100%) RPM. At 40,000 feet, cruise at 235 knots CAS and start letdown 165 nautical miles from destination. With an 80-knot tailwind, the range at 40,000 feet would be 1.15 x 800 or 920 nautical miles. Cruise at 230 knots CAS with this wind and start letdown 215 nautical miles from destination.

LEGEND

HW –Headwind in knots

TW –Tailwind in knots

R.F. –Range factor; ratio of ground distance to air miles for corresponding winds

G.S. –Ground speed in knots

C.A.S. –Calibrated airspeed in knots

LB/HR/ENG. –Fuel consumption in pounds per hour per engine

Range –Nautical miles

( ) –Range in parentheses for interpolation purposes only

DATA AS OF: 1 August 1955

DATA BASIS: Calculations

FUEL GRADE: JP-4

FUEL DENSITY: 6.5 lb/gal

P-8392-8

Figure A-29 (Sheet 4)

AIRCRAFT MODEL: A4D-1

ENGINE: J65-W-4

FLIGHT OPERATION INSTRUCTION CHART

STANDARD DAY

CHART WEIGHT LIMITS: 11,000 TO 9000 POUNDS

EXTERNAL LOAD ITEMS

LONG RANGE ATTACK CONFIGURATION

NUMBER OF ENGINES OPERATING: ONE

INSTRUCTIONS FOR USING CHART: (A) IN FLIGHT. Select figure in fuel column equal to or less than fuel available for cruise (fuel on board minus allowance for reserve, combat, navigational error, formation flight, etc.). Move horizontally right or left to section according to present altitude and read total range available (no wind) by cruising at that altitude or by climbing to another altitude of maximum range. For a flight at initial altitude, operating instructions are given directly below. For a flight at higher altitude, climb immediately to desired altitude and read cruising instructions in appropriate cruising altitude section. (B) FLIGHT PLANNING. From initial fuel on board subtract fuel for takeoff and climb to desired altitude and all other necessary allowances. Then use chart as for IN FLIGHT above, adding initial climb distance to range values.

NOTES: Ranges shown at optimum altitudes are maximum. In order to obtain maximum range on flights requiring more than one chart (due to external configuration or gross weight changes), it is necessary to observe the optimum cruising altitude on each chart; i.e., when changing charts, a climb may be required to obtain a maximum range. All range values include allowances for descent distance and fuel. Climb distance and fuel are included where climbs are indicated.

DATA BELOW CONTAIN NO FUEL RESERVE FOR LANDING

LOW ALTITUDE

IF YOU ARE AT S.L. RANGE IN AIRMILES			FUEL LBS.	IF YOU ARE AT 5000′ RANGE IN AIRMILES			IF YOU ARE AT 10,000′ RANGE IN AIRMILES			IF YOU ARE AT 15,000′ RANGE IN AIRMILES			FUEL LBS.	IF YOU ARE AT 20,000′ RANGE IN AIRMILES		
BY CRUISING AT S.L.	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.		BY CRUISING AT 5000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	BY CRUISING AT 10,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	BY CRUISING AT 15,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.		BY CRUISING AT 20,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL)																
(220)	45	(540)	2000	(260)	45	(555)	(310)	45	(565)	(360)	45	(580)	2000	(410)	45	(590)
165	45	380	1500	195	45	395	230	45	405	270	45	420	1500	305	45	430
110	35	210	1000	130	40	225	155	45	240	180	40	250	1000	205	45	270
55	20	75	500	65	20	80	80	20	90	90	25	100	500	100	25	105

CRUISING AT S.L.						EFFECTIVE WIND	CRUISING AT 5000′						CRUISING AT 10,000′						CRUISING AT 15,000′						EFFECTIVE WIND	CRUISING AT 20,000′					
	APPROXIMATE							APPROXIMATE						APPROXIMATE						APPROXIMATE						APPROXIMATE				
C.A.S.	MACH NO.	LBS/HR/ENG.	G.S.	R.F.	LET DOWN DIST.		C.A.S.	MACH NO.	LBS/HR/ENG.	G.S.	R.F.	LET DOWN DIST.	C.A.S.	MACH NO.	LBS/HR/ENG.	G.S.	R.F.	LET DOWN DIST.	C.A.S.	MACH NO.	LBS/HR/ENG.	G.S.	R.F.	LET DOWN DIST.		C.A.S.	MACH NO.	LBS/HR/ENG.	G.S.	R.F.	LET DOWN DIST.
						120 HW																			120 HW	310	.67	2150	290	.65	25
						80 HW							330	.59	2600	295	.75	10	310	.61	2250	305	.75	20	80 HW	295	.64	2000	310	.75	35
335	.51	3150	295	.85	0	40 HW	320	.53	2700	300	.85	5	310	.55	2400	315	.85	15	290	.57	2050	320	.85	30	40 HW	280	.61	1850	335	.85	45
320	.49	2950	320	1.00	0	0	305	.50	2550	325	1.00	10	290	.52	2200	330	1.00	20	275	.54	1950	340	1.00	35	0	265	.58	1800	355	1.00	55
300	.45	2750	340	1.10	0	40 TW	290	.47	2400	350	1.10	10	275	.50	2100	360	1.10	25	260	.52	1850	365	1.10	45	40 TW	255	.56	1700	385	1.10	70
						80 TW							265	.48	2000	390	1.25	30	255	.50	1750	395	1.25	50	80 TW	245	.54	1600	410	1.25	80
						120 TW																			120 TW	240	.52	1550	440	1.35	90

HIGH ALTITUDE

IF YOU ARE AT 25,000′ RANGE IN AIRMILES: BY CRUISING AT 25,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	FUEL LBS.	IF YOU ARE AT 30,000′ RANGE IN AIRMILES: BY CRUISING AT 30,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	IF YOU ARE AT 35,000′ RANGE IN AIRMILES: BY CRUISING AT 35,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	IF YOU ARE AT 40,000′ RANGE IN AIRMILES: BY CRUISING AT 40,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	FUEL LBS.	IF YOU ARE AT 45,000′ RANGE IN AIRMILES: BY CRUISING AT 45,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL)																
(470)	45	(600)	2000	(530)	45	(610)	(585)	45	(620)	(625)	45	(630)	2000	(640)	45	(640)
350	45	440	1500	395	45	450	435	45	460	465	45	470	1500	480	45	480
230	45	280	1000	260	45	290	285	45	300	305	45	310	1000	320	45	320
115	30	115	500	125	30	125							500			

CRUISING AT 25,000′ C.A.S.	APPROX. MACH NO.	APPROX. LBS/HR/ENG.	APPROX. G.S.	APPROX. R.F.	APPROX. LET DOWN DIST.	EFFECTIVE WIND	CRUISING AT 30,000′ C.A.S.	APPROX. MACH NO.	APPROX. LBS/HR/ENG.	APPROX. G.S.	APPROX. R.F.	APPROX. LET DOWN DIST.	CRUISING AT 35,000′ C.A.S.	APPROX. MACH NO.	APPROX. LBS/HR/ENG.	APPROX. G.S.	APPROX. R.F.	APPROX. LET DOWN DIST.	CRUISING AT 40,000′ C.A.S.	APPROX. MACH NO.	APPROX. LBS/HR/ENG.	APPROX. G.S.	APPROX. R.F.	APPROX. LET DOWN DIST.	EFFECTIVE WIND	CRUISING AT 45,000′ C.A.S.	APPROX. MACH NO.	APPROX. LBS/HR/ENG.	APPROX. G.S.	APPROX. R.F.	APPROX. LET DOWN DIST.
290	.69	1850	295	.65	35	120 HW	275	.73	1650	310	.65	55	255	.75	1500	315	.70	75	235	.79	1450	335	.70	100	120 HW	210	.79	1450	335	.70	125
280	.67	1750	325	.75	50	80 HW	265	.71	1600	335	.75	75	250	.74	1450	345	.80	100	235	.78	1450	370	.80	130	80 HW	210	.79	1450	375	.80	160
270	.65	1700	350	.85	65	40 HW	260	.69	1550	365	.85	90	245	.73	1400	380	.90	125	230	.77	1400	405	.90	155	40 HW	210	.78	1450	410	.90	190
265	.63	1650	380	1.00	80	0	250	.67	1500	395	1.00	110	240	.71	1400	410	1.00	145	225	.75	1350	430	1.00	185	0	210	.78	1450	450	1.00	220
250	.61	1550	405	1.10	95	40 TW	245	.65	1450	425	1.10	130	240	.71	1350	450	1.10	170	225	.75	1350	470	1.10	210	40 TW	210	.78	1450	490	1.05	250
240	.58	1500	430	1.20	110	80 TW	240	.64	1400	460	1.20	150	235	.70	1350	485	1.20	195	220	.74	1350	505	1.15	240	80 TW	205	.78	1400	525	1.15	280
230	.56	1450	455	1.35	125	120 TW	235	.63	1400	490	1.30	165	230	.69	1350	520	1.30	215	220	.73	1300	540	1.25	270	120 TW	205	.77	1400	565	1.25	315

SPECIAL NOTES

(1) Climb at military power.

(2) Descend at idle power.

(3) Make additional allowance for landing, reserve fuel, combat, et cetera, as required.

(4) Read lower half of chart opposite effective wind only.

(5) For all combinations of external stores included in this configuration, see figure A-1.

EXAMPLE

If you are at 15,000 feet with 1000 pounds of available fuel, you can fly 180 nautical air miles by holding 275 knots CAS (no wind). However, you can fly 250 nautical air miles by immediately climbing to 40,000 feet using "MIL" (100%) RPM. At 40,000 feet, cruise at 225 knots CAS and start letdown 185 nautical miles from destination. With an 80-knot tailwind, the range at 40,000 feet would be 1.15 x 250 or 285 nautical miles. Cruise at 220 knots CAS with this wind and start letdown 240 nautical miles from destination.

LEGEND

HW – Headwind in knots

TW – Tailwind in knots

R.F. – Range factor; ratio of ground distance to air miles for corresponding winds

G.S. – Ground speed in knots

C.A.S. – Calibrated airspeed in knots

LB/HR/ENG. – Fuel consumption in pounds per hour per engine

Range – Nautical miles

( ) – Range in parentheses for interpolation purposes only

DATA AS OF: 1 August 1955

DATA BASIS: Calculations

FUEL GRADE: JP-4

FUEL DENSITY: 6.5 lb/gal

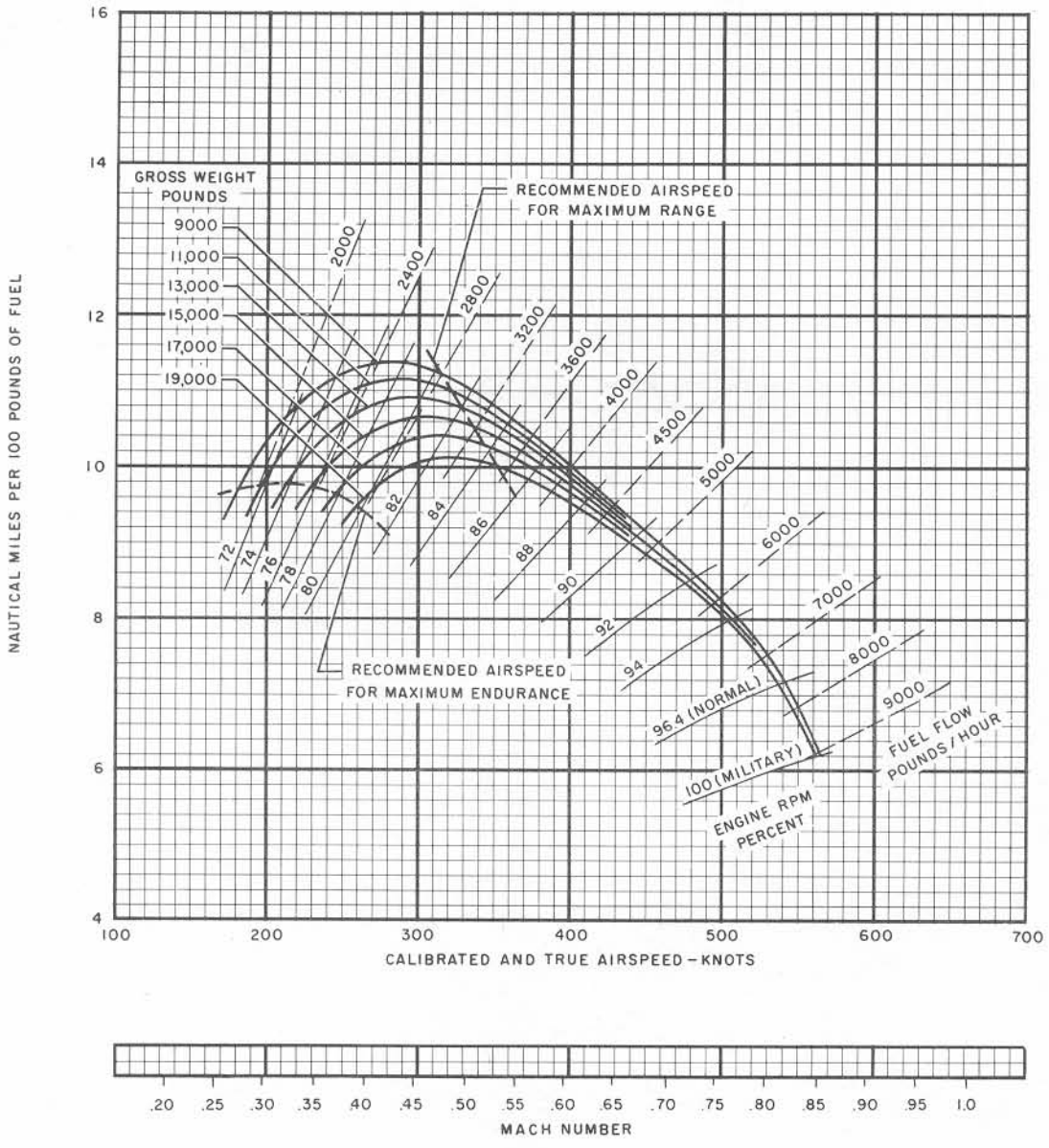
P8392-10

Figure A-29 (Sheet 5)

SPECIFIC RANGE

LONG RANGE ATTACK CONFIGURATION SEA LEVEL

MODEL: A4D-1 ENGINE: J65-W-4



P-8393-1

REMARKS:

For all combinations of external stores included in this configuration, see figure A-1.

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

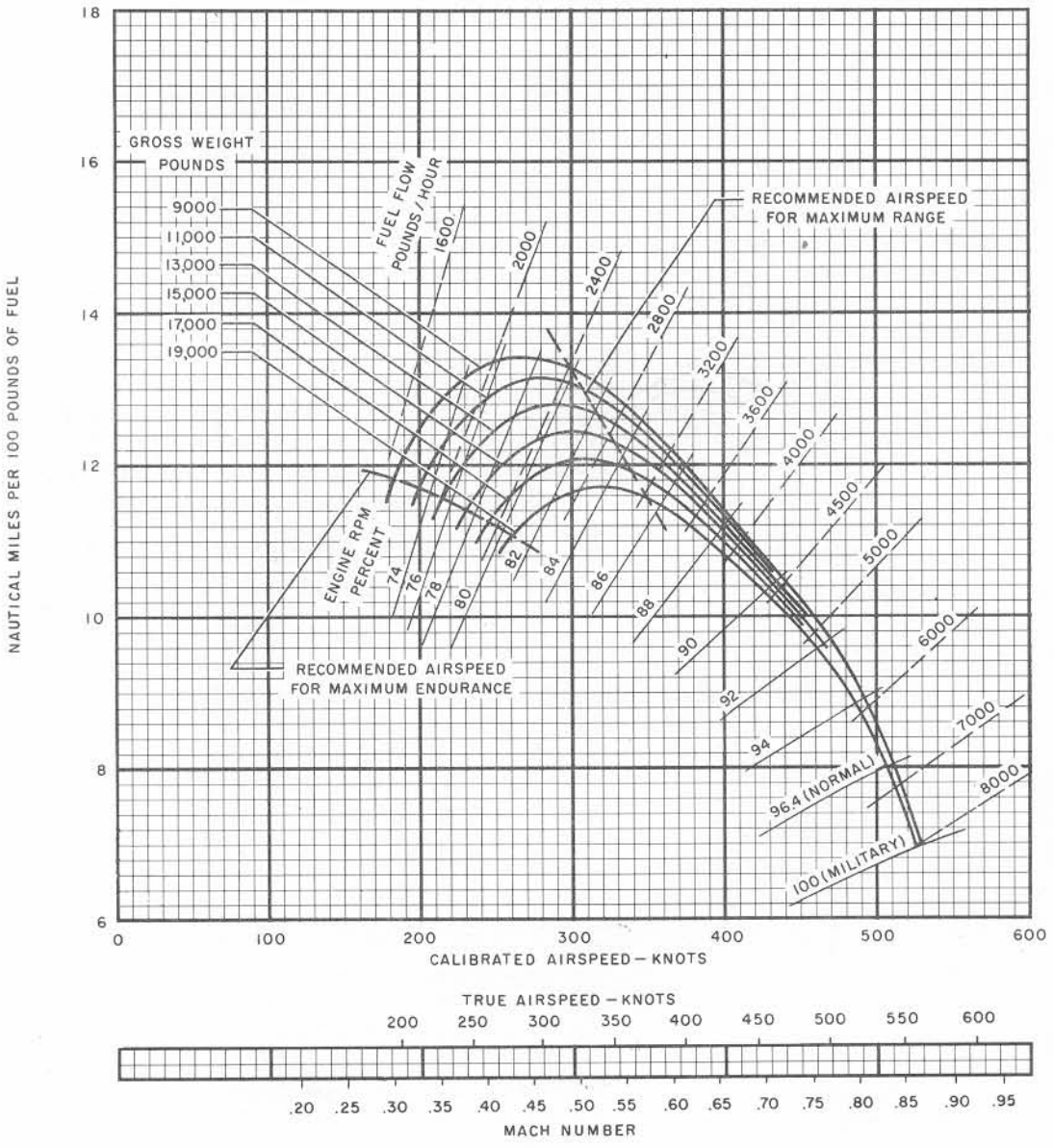
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

Figure A-30 (Sheet 1)

SPECIFIC RANGE

LONG RANGE ATTACK CONFIGURATION 5000 FEET

MODEL: A4D-1 ENGINE: J65-W-4



P-8393-2

REMARKS:

For all combinations of external stores included in this configuration, see figure A-1.

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

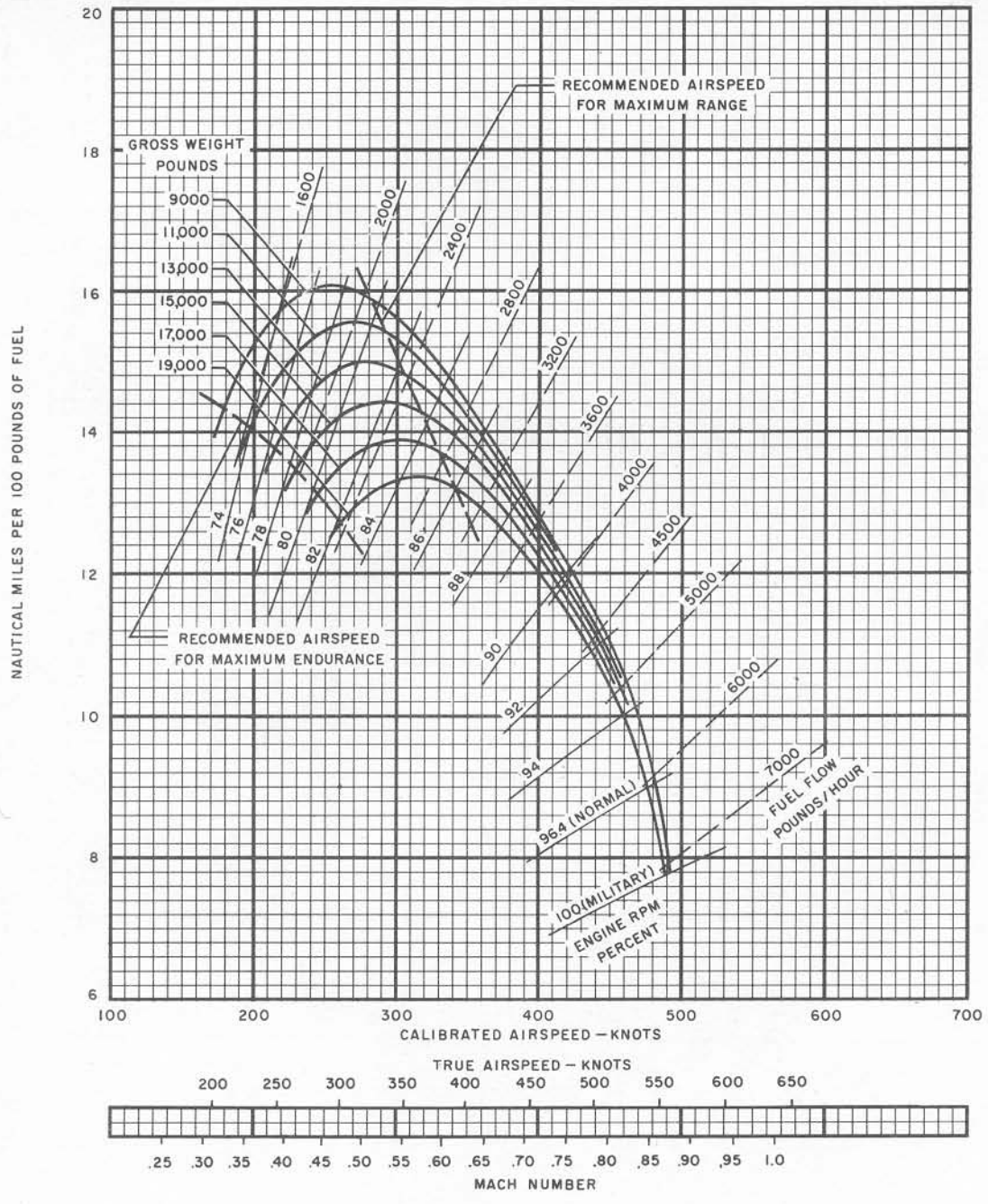
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

Figure A-30 (Sheet 2)

SPECIFIC RANGE

LONG RANGE ATTACK CONFIGURATION 10,000 FEET

MODEL: A4D-1 ENGINE: J65-W-4



REMARKS:

For all combinations of external stores included in this configuration, see figure A-1.

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

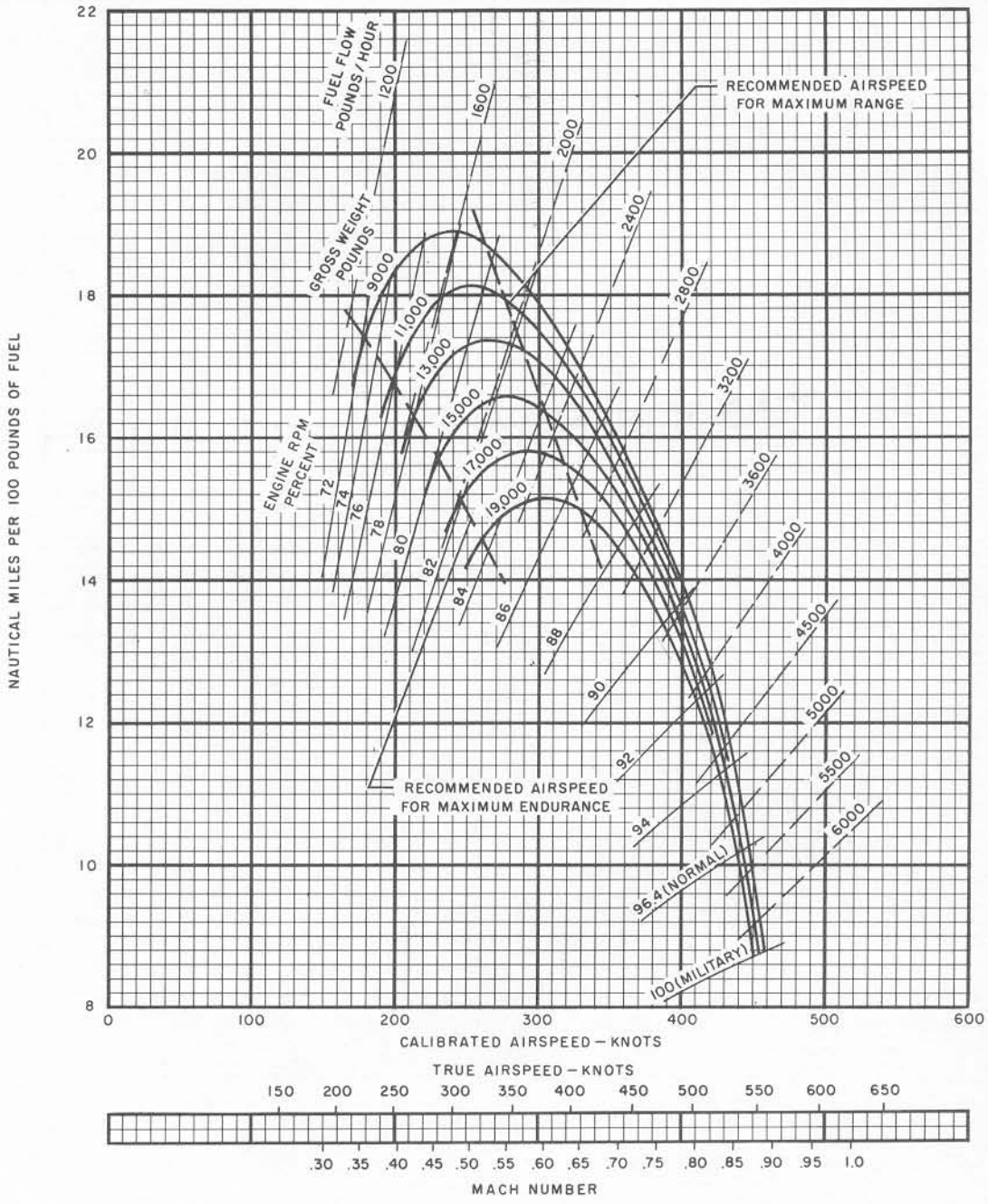
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

Figure A-30 (Sheet 3)

SPECIFIC RANGE

LONG RANGE ATTACK CONFIGURATION 15,000 FEET

MODEL: A4D-1 ENGINE: J65-W-4



REMARKS:

For all combinations of external stores included in this configuration, see figure A-1.

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

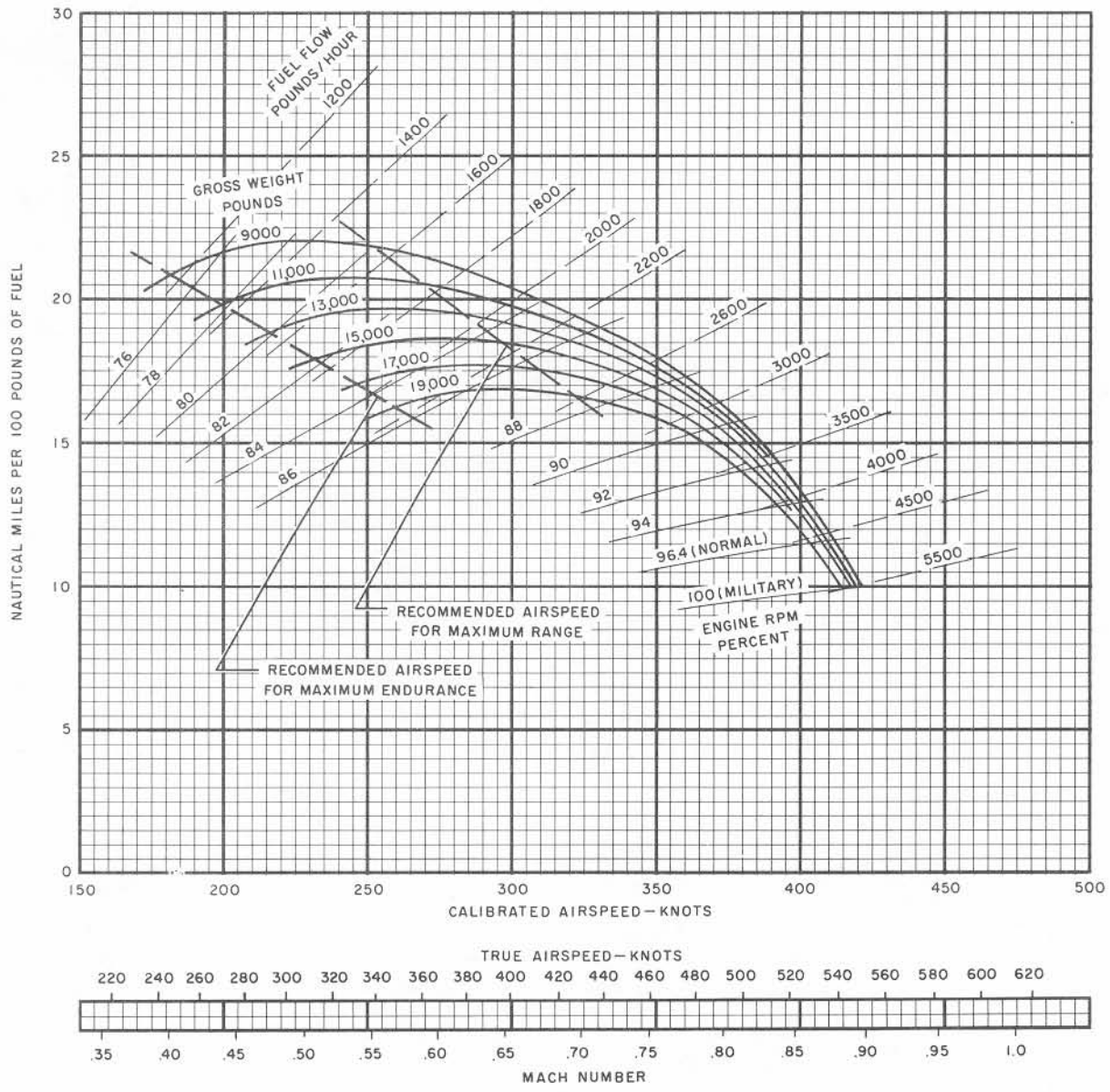
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

Figure A-30 (Sheet 4)

SPECIFIC RANGE

LONG RANGE ATTACK CONFIGURATION 20,000 FEET

MODEL: A4D-1 ENGINE: J65-W-4



REMARKS:

For all combinations of external stores included in this configuration, see figure A-1.

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

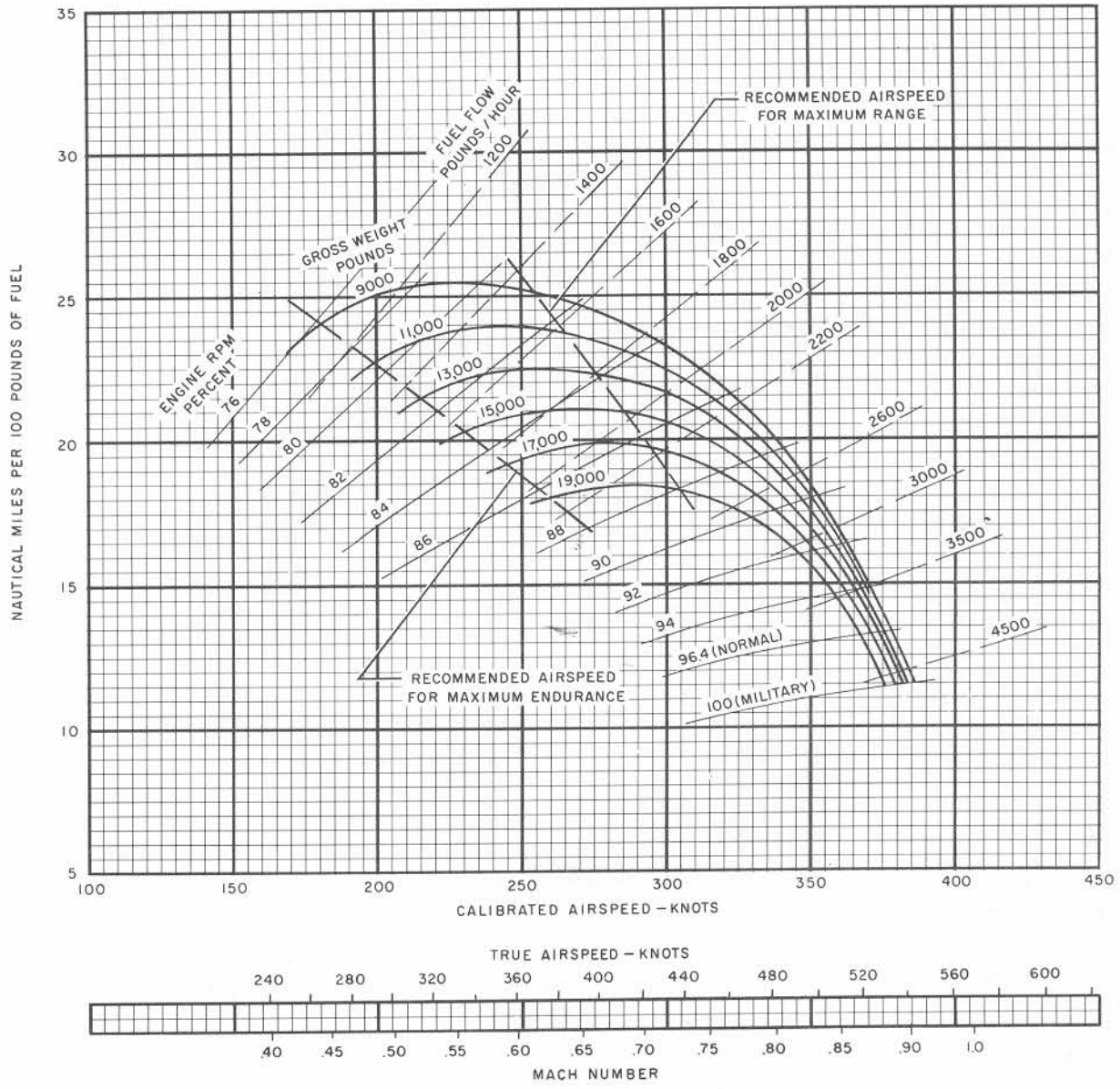
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

Figure A-30 (Sheet 5)

SPECIFIC RANGE

LONG RANGE ATTACK CONFIGURATION 25,000 FEET

MODEL: A4D-1 ENGINE: J65-W-4



P-8393-6

REMARKS:

For all combinations of external stores included in this configuration, see figure A-1.

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

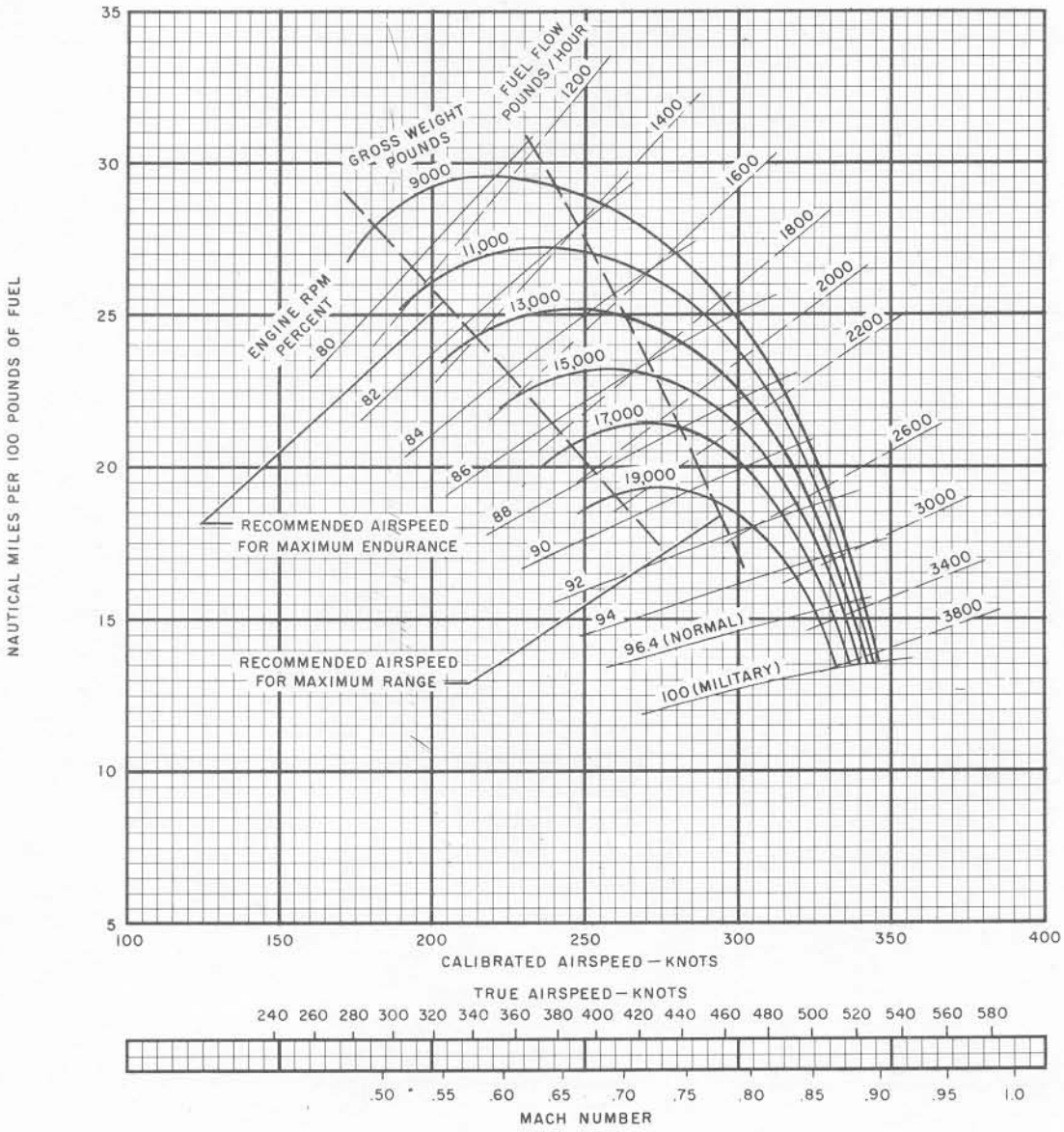
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

Figure A-30 (Sheet 6)

SPECIFIC RANGE

LONG RANGE ATTACK CONFIGURATION 30,000 FEET

MODEL: A4D-1 ENGINE: J65-W-4



REMARKS:

For all combinations of external stores included in this configuration, see figure A-1.

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

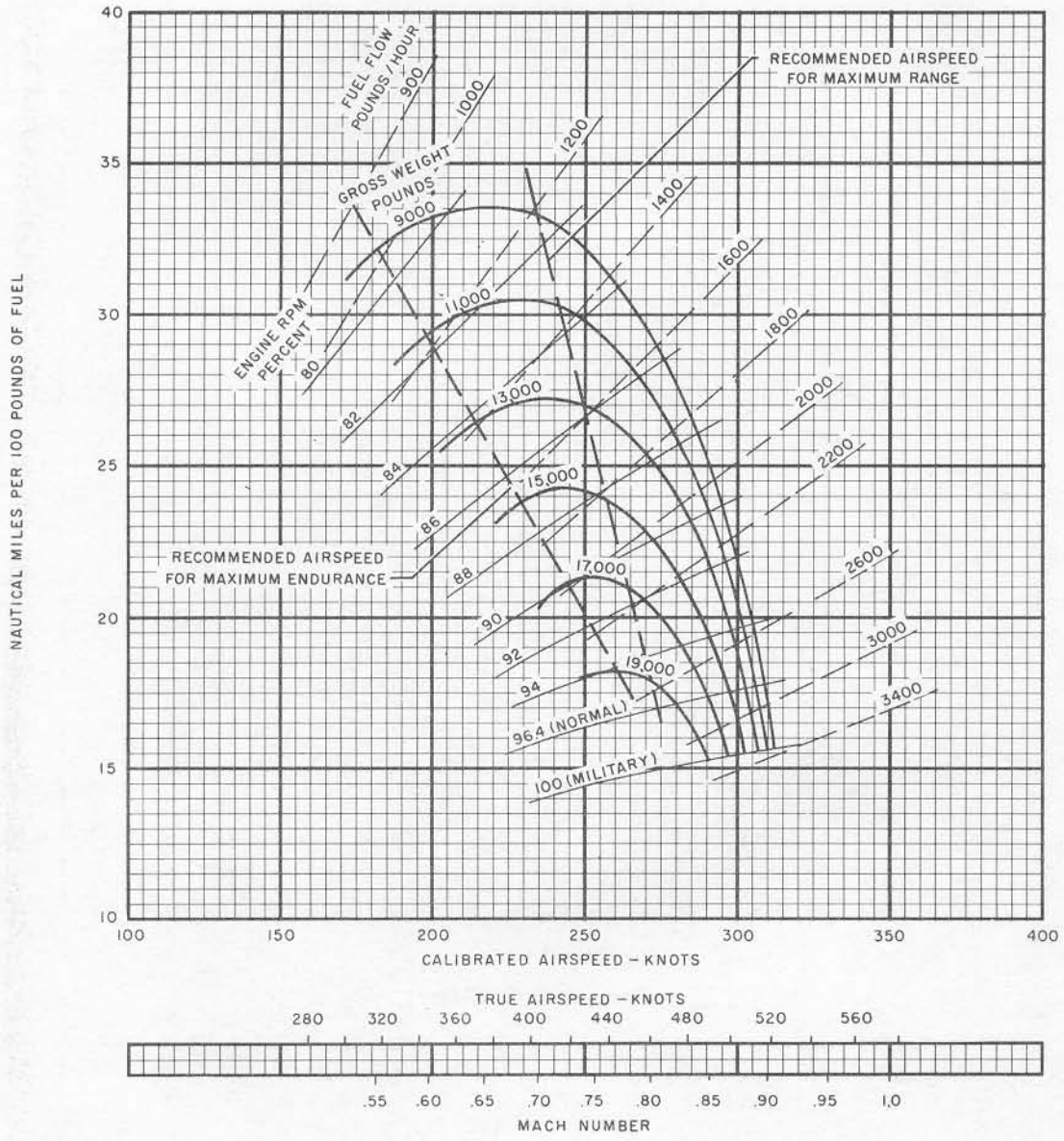
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

Figure A-30 (Sheet 7)

SPECIFIC RANGE

LONG RANGE ATTACK CONFIGURATION 35,000 FEET

MODEL: A4D-1 ENGINE: J65-W-4



P-8393-8

REMARKS:

For all combinations of external stores included in this configuration, see figure A-1.

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

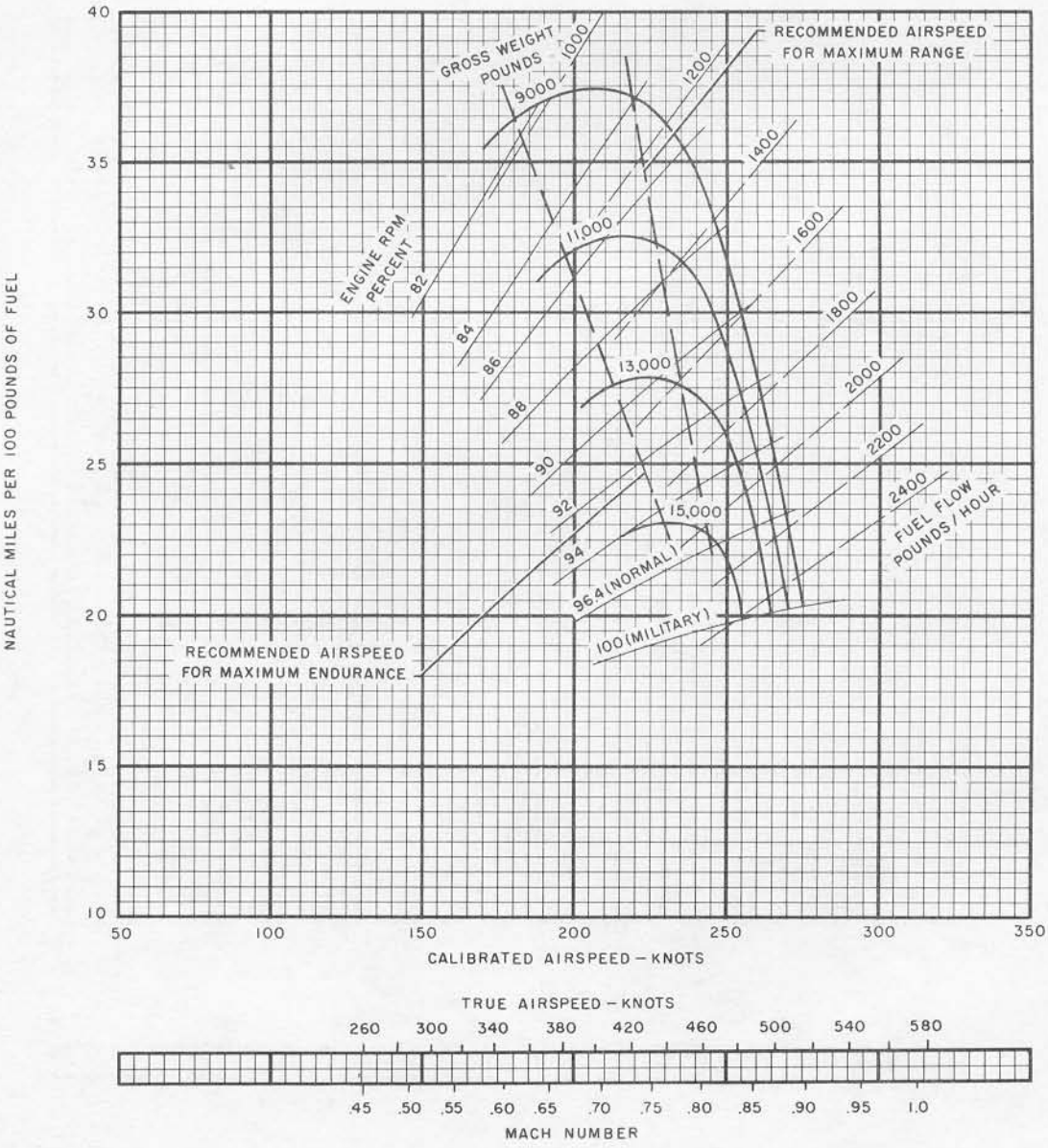
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

Figure A-30 (Sheet 8)

SPECIFIC RANGE

LONG RANGE ATTACK CONFIGURATION 40,000 FEET

MODEL: A4D-1 ENGINE: J65-W-4



REMARKS:

For all combinations of external stores included in this configuration, see figure A-1.

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

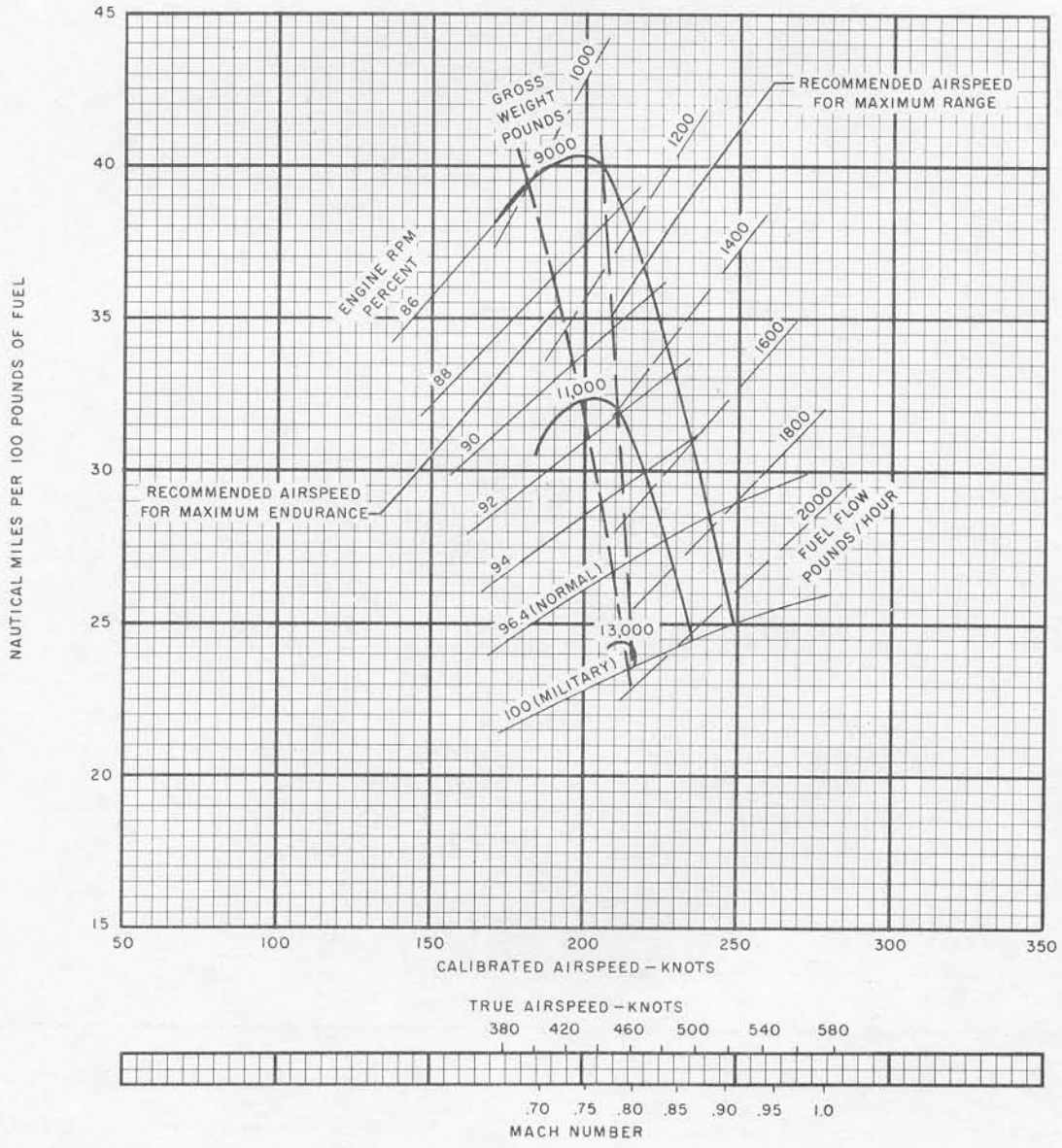
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

Figure A-30 (Sheet 9)

SPECIFIC RANGE

LONG RANGE ATTACK CONFIGURATION 45,000 FEET

MODEL: A4D-1 ENGINE: J65-W-4



P-8393-10

REMARKS:

For all combinations of external stores included in this configuration, see figure A-1.

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

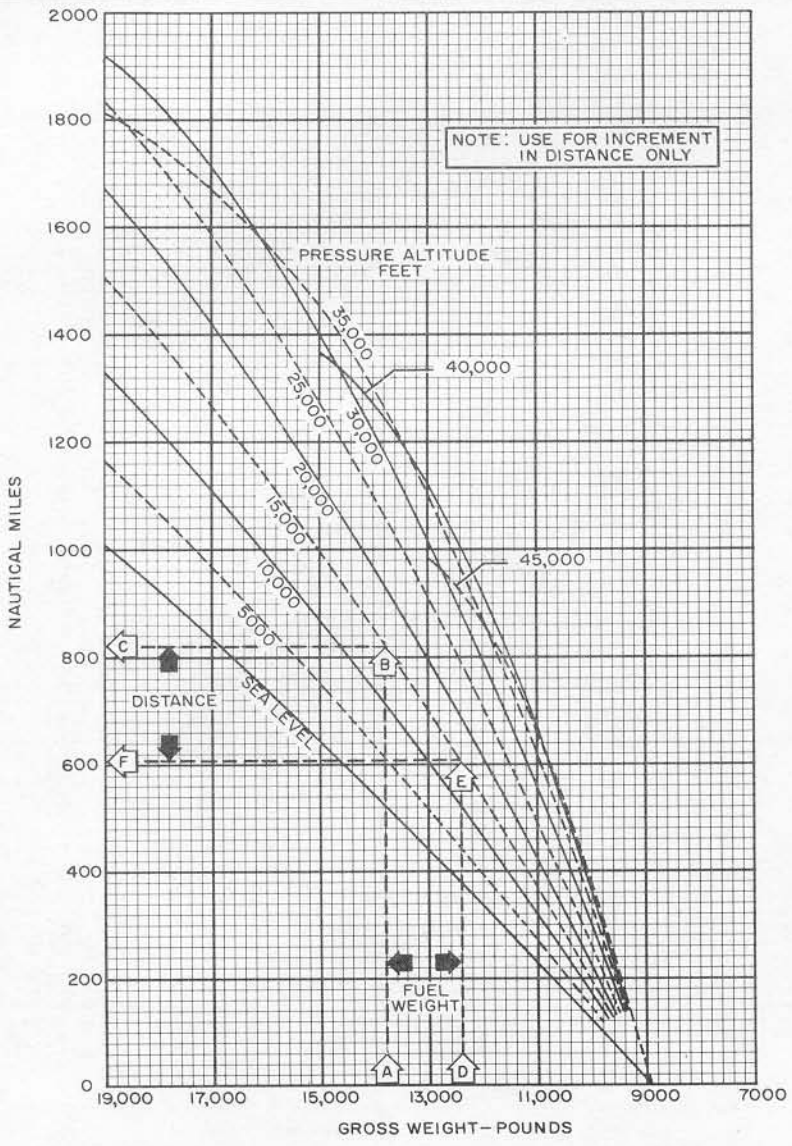
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

Figure A-30 (Sheet 10)

LONG RANGE PREDICTION — DISTANCE

LONG RANGE ATTACK CONFIGURATION

MODEL: A4D-1 ENGINE: J65-W-4



REMARKS:

(1) For all combinations of external stores included in this configuration, see figure A-1.

(2) For recommended airspeeds for maximum range, see figure A-30.

EXAMPLE:

Assume 13,800 pounds gross weight with 1400 pounds of fuel available for cruise at 15,000 feet:

(1) Enter chart at 13,800 pounds (A) and move vertically to 15,000 feet (B).

(2) Move horizontally left and read 820 nautical miles (C).

(3) Re-enter chart at weight after cruise (13,800–1400) = 12,400 pounds (D) and move vertically to 15,000 feet (E).

(4) Move horizontally left and read 610 nautical miles (F).

Maximum range at 15,000 feet with 1400 pounds of fuel is (820–610) = 210 nautical miles

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

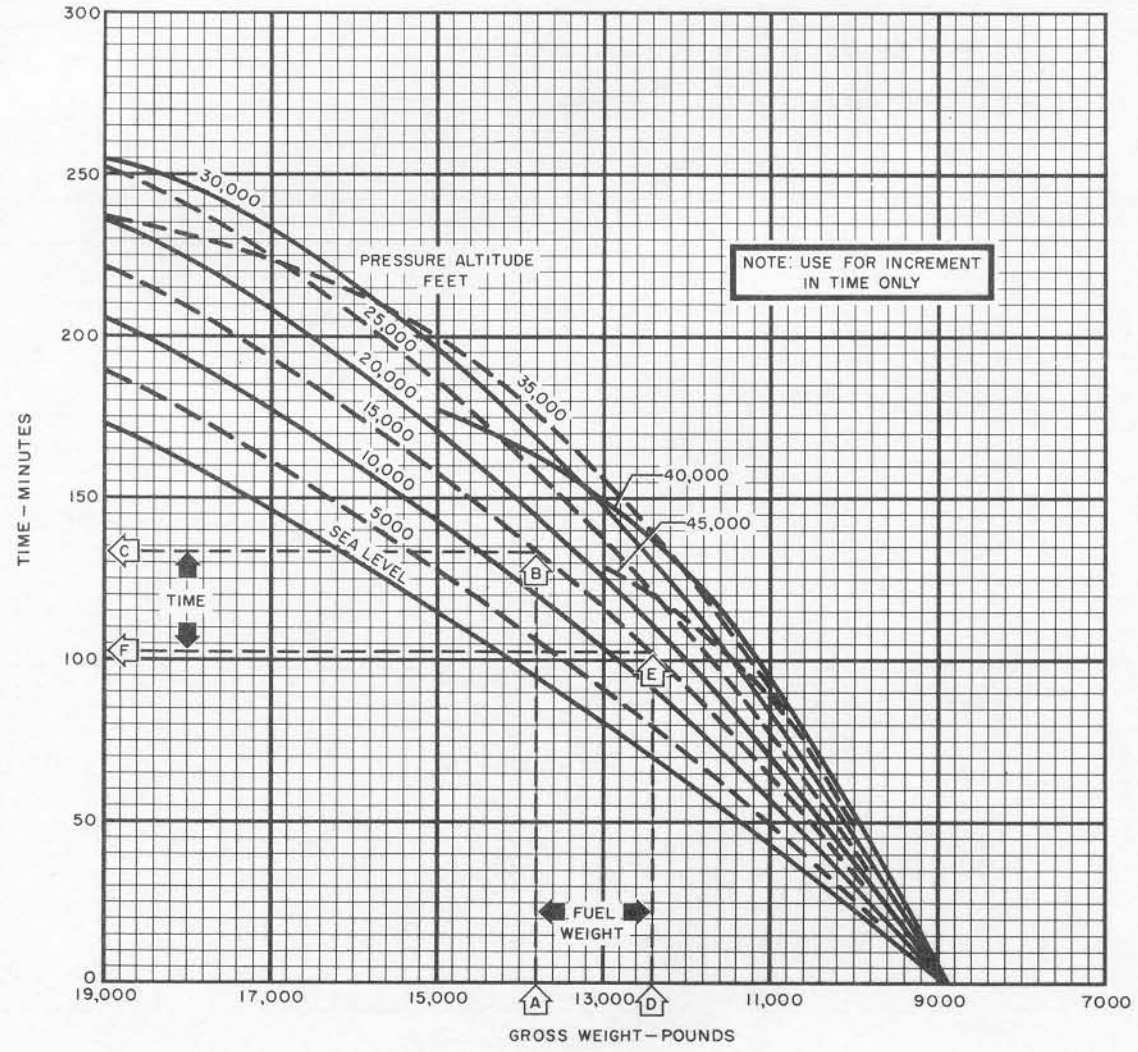
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

Figure A-31

LONG RANGE PREDICTION—TIME

LONG RANGE ATTACK CONFIGURATION

MODEL: A4D-1 ENGINE: J65-W-4



REMARKS:

(1) For all combinations of external stores included in this configuration, see figure A-1.

(2) For recommended airspeeds for maximum range, see figure A-30.

EXAMPLE:

Assume 13,800 pounds gross weight with 1400 pounds of fuel available for cruise at 15,000 feet:

(1) Enter chart at 13,800 pounds (A) and move vertically to 15,000 feet (B).

(2) Move horizontally left and read 135 minutes (C).

(3) Re-enter chart at weight after cruise (13,800–1400) = 12,400 pounds (D) and move vertically to 15,000 feet (E).

(4) Move horizontally left and read 100 minutes (F).

Cruise time at airspeed for maximum range at 15,000 feet with 1400 pounds of fuel is (135–100) = 35 minutes.

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

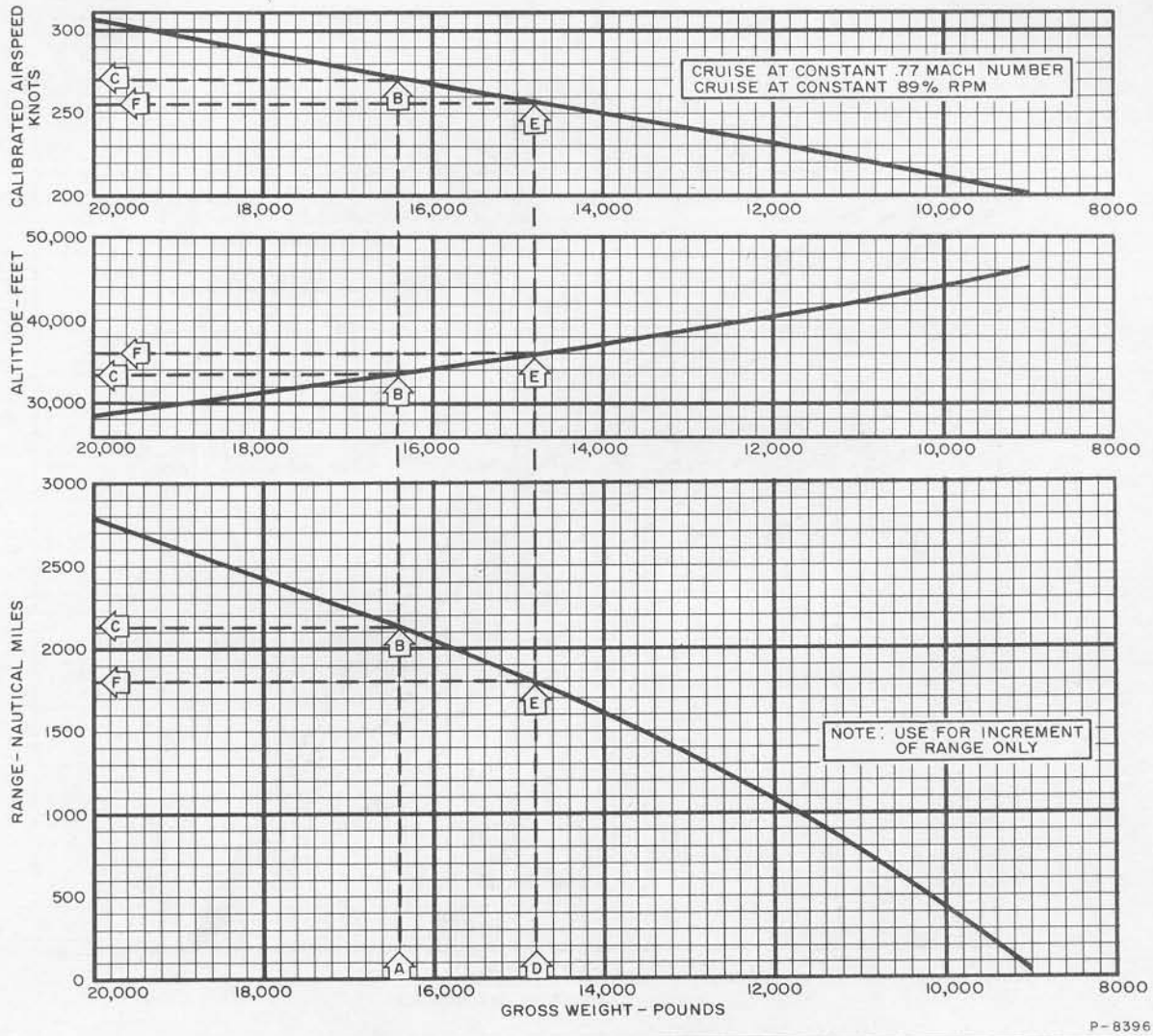
Figure A-32

MAXIMUM RANGE—VARIABLE ALTITUDE

LONG RANGE ATTACK CONFIGURATION

MODEL: A4D-1

ENGINE: J65-W-4



REMARKS:

For all combinations of external stores included in this configuration, see figure A-1.

EXAMPLE:

Assume an initial gross weight of 16,400 pounds with 1600 pounds of fuel available for cruise:

(1) Enter charts at a weight of 16,400 pounds (A) and move vertically to intersect the Range line, Altitude line, and Calibrated Airspeed line (B) ; move left on the respective charts and read:
   a. Range – 2100 nautical miles (C)
   b. Initial optimum cruise altitude – 34,000 feet (C)
   c. Initial calibrated airspeed – 270 knots (C).

(2) Re-enter charts at a weight of (16,400 – 1600) = 14,800 pounds (D) and move vertically to intersect the Range line, Altitude line and Calibrated airspeed line (E) ; move left on the respective charts and read:
   a. Range – 1800 nautical miles (F)
   b. Final optimum cruise altitude – 36,000 feet (F)
   c. Final calibrated airspeed – 255 knots (F)

A maximum range of (2100–1800) = 300 nautical miles will be covered by flying at a constant .77 Mach number using a constant engine rpm of 89%.

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

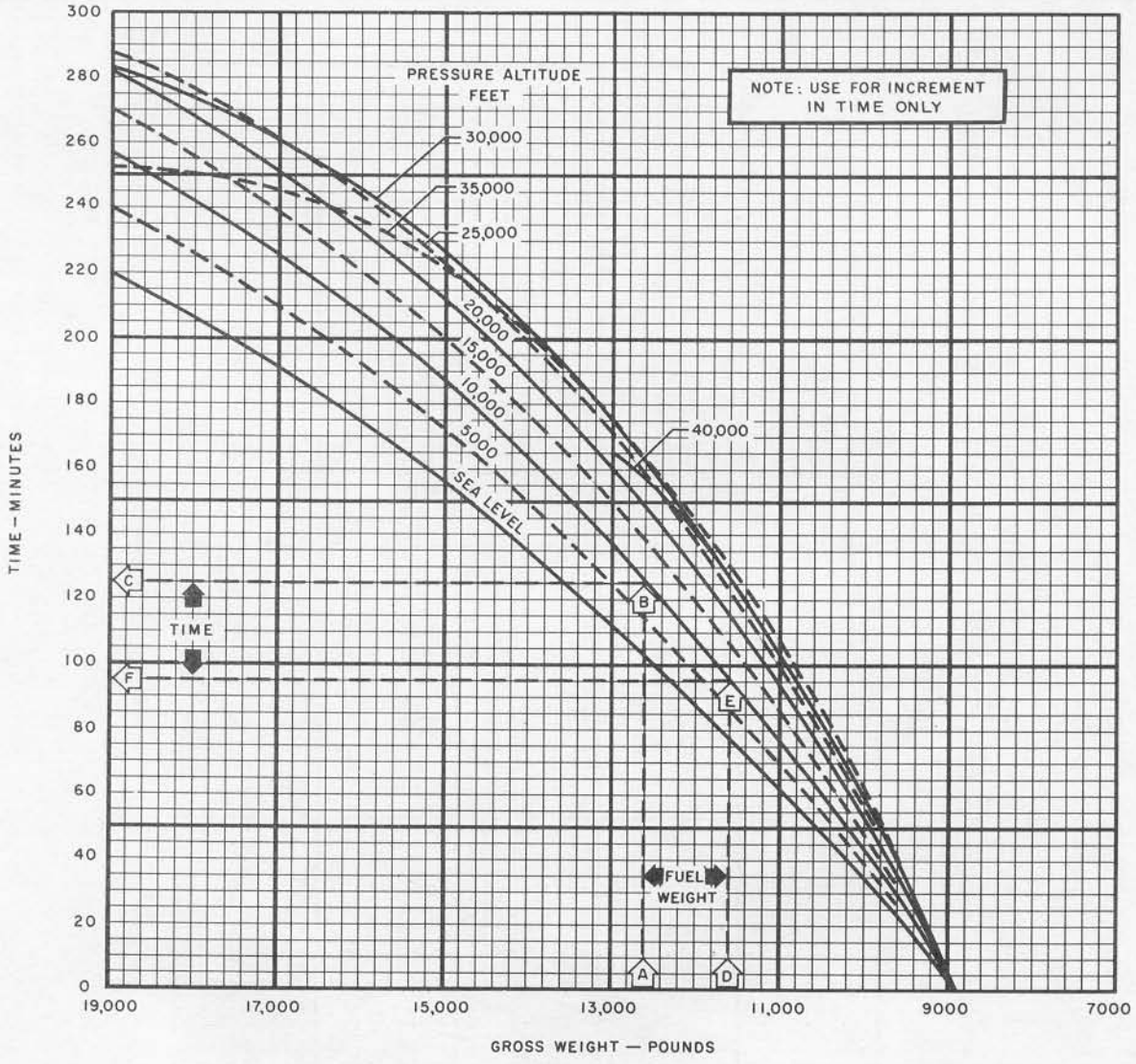
Figure A-33

ENDURANCE PREDICTION

LONG RANGE ATTACK CONFIGURATION

MODEL: A4D-1

ENGINE: J65-W-4



P-8397-1

REMARKS:

(1) For all combinations of external stores included in this configuration, see figure A-1.
(2) For recommended airspeeds for maximum endurance, see figure A-30.

EXAMPLE:

Assume an initial weight of 12,600 pounds with 1000 pounds of fuel for loiter at 10,000 feet:

(1) Enter chart at 12,600 pounds (A) and move vertically to 10,000 feet (B).
(2) Move horizontally left and read 125 minutes (C).
(3) Re-enter chart at weight after loiter (12,600–1000) = 11,600 pounds (D) and move vertically to 10,000 feet (E).
(4) Move horizontally left and read 95 minutes (F).

Total loiter time is (125–95) = 30 minutes.

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

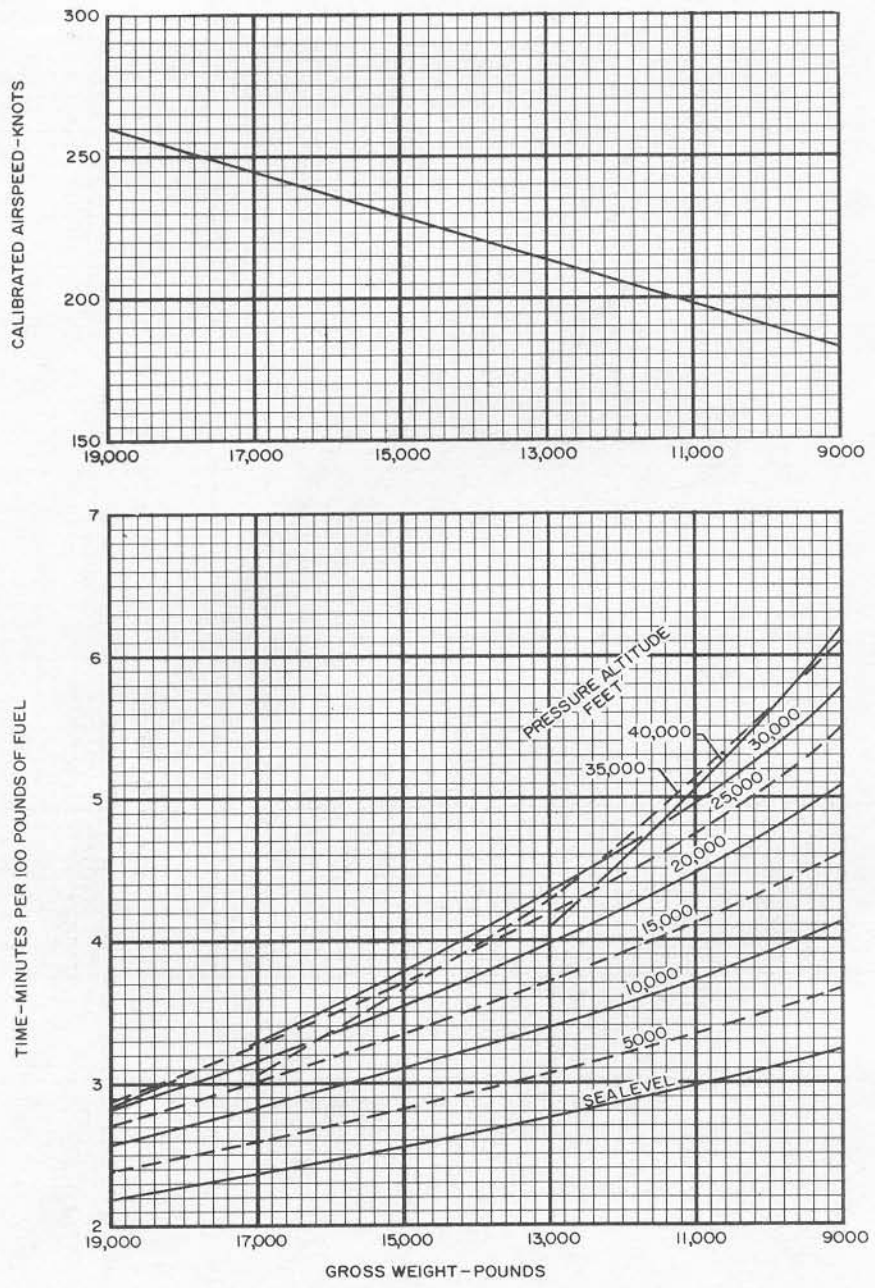
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

Figure A-34

ENDURANCE-LEVEL FLIGHT

LONG RANGE ATTACK CONFIGURATION

MODEL: A4D-1 **ENGINE:** J65-W-4



REMARKS:

(1) For all combinations of external stores included in this configuration, see figure A-1.

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

Figure A-35

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AIRCRAFT MODEL: A4D-1

ENGINE: J65-W-4

FLIGHT OPERATION INSTRUCTION CHART

STANDARD DAY

CHART WEIGHT LIMITS: 18,000 TO 16,000 POUNDS

EXTERNAL LOAD ITEMS

FERRY CONFIGURATION

NUMBER OF ENGINES OPERATING: ONE

INSTRUCTIONS FOR USING CHART: (A) IN FLIGHT. Select figure in fuel column equal to or less than fuel available for cruise (fuel on board minus allowance for reserve, combat, navigational error, formation flight, etc.). Move horizontally right or left to section according to present altitude and read total range available (no wind) by cruising at that altitude or by climbing to another altitude of maximum range. For a flight at initial altitude, operating instructions are given directly below. For a flight at higher altitude, climb immediately to desired altitude and read cruising instructions in appropriate cruising altitude section. (B) FLIGHT PLANNING. From initial fuel on board subtract fuel for takeoff and climb to desired altitude and all other necessary allowances. Then use chart as for IN FLIGHT above, adding initial climb distance to range values.

NOTES: Ranges shown at optimum altitudes are maximum. In order to obtain maximum range on flights requiring more than one chart (due to external configuration or gross weight changes), it is necessary to observe the optimum cruising altitude on each chart; i.e., when changing charts, a climb may be required to obtain a maximum range. All range values include allowances for descent distance and fuel. Climb distance and fuel are included where climbs are indicated.

DATA BELOW CONTAIN NO FUEL RESERVE FOR LANDING

LOW ALTITUDE

(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL)

IF YOU ARE AT S.L. — RANGE IN AIRMILES			FUEL LBS.	IF YOU ARE AT 5000′ — RANGE IN AIRMILES			IF YOU ARE AT 10,000′ — RANGE IN AIRMILES			IF YOU ARE AT 15,000′ — RANGE IN AIRMILES			FUEL LBS.	IF YOU ARE AT 20,000′ — RANGE IN AIRMILES		
BY CRUISING AT S.L.	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.		BY CRUISING AT 5000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	BY CRUISING AT 10,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	BY CRUISING AT 15,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.		BY CRUISING AT 20,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.
(890)	30	(1695)	9000	(1030)	30	(1715)	(1195)	30	(1735)	(1355)	30	(1760)	9000	(1525)	35	(1780)
840	30	1600	8500	975	30	1620	1130	30	1640	1280	30	1660	8500	1445	35	1680
790	30	1500	8000	915	30	1520	1065	30	1540	1205	30	1560	8000	1360	35	1505
740	30	1405	7500	860	30	1425	995	30	1445	1130	30	1465	7500	1275	35	1485
690	30	1310	7000	800	30	1325	930	30	1345	1055	30	1365	7000	1190	35	1385
640	30	1210	6500	745	30	1230	865	30	1250	980	30	1265	6500	1105	35	1290
590	30	1115	6000	685	30	1135	800	30	1150	905	30	1170	6000	1020	35	1190
545	30	1020	5500	630	30	1035	730	30	1055	830	30	1070	5500	935	35	1090
495	30	920	5000	575	30	940	665	30	955	755	30	975	5000	855	35	995

CRUISING AT S.L.						EFFECTIVE WIND	CRUISING AT 5000′						CRUISING AT 10,000′						CRUISING AT 15,000′						EFFECTIVE WIND	CRUISING AT 20,000′					
C.A.S.	APPROXIMATE MACH NO.	APPROXIMATE LBS/HR/ENG.	APPROXIMATE G.S.	APPROXIMATE R.F.	LET DOWN DIST.		C.A.S.	APPROXIMATE MACH NO.	APPROXIMATE LBS/HR/ENG.	APPROXIMATE G.S.	APPROXIMATE R.F.	LET DOWN DIST.	C.A.S.	APPROXIMATE MACH NO.	APPROXIMATE LBS/HR/ENG.	APPROXIMATE G.S.	APPROXIMATE R.F.	LET DOWN DIST.	C.A.S.	APPROXIMATE MACH NO.	APPROXIMATE LBS/HR/ENG.	APPROXIMATE G.S.	APPROXIMATE R.F.	LET DOWN DIST.		C.A.S.	APPROXIMATE MACH NO.	APPROXIMATE LBS/HR/ENG.	APPROXIMATE G.S.	APPROXIMATE R.F.	LET DOWN DIST.
						120 HW							350	.63	3150	320	.75	10	340	.66	2900	375	.75	20	120 HW	340	.73	2800	330	.70	25
						80 HW																			80 HW	325	.71	2600	355	.80	35
355	.54	3650	315	.85	0	40 HW	340	.56	3200	325	.85	5	335	.61	2950	345	85	15	325	.64	2700	320	.85	30	40 HW	315	.68	2500	375	.90	45
335	.51	3400	335	1.00	0	0	325	.54	3100	345	1.00	10	320	.58	2800	370	1.00	20	310	.62	2600	385	1.00	35	0	310	.66	2450	410	1.00	55
320	.48	3200	360	1.10	0	40 TW	315	.52	2950	375	1.10	10	310	.56	2700	395	1.10	25	305	.60	2500	415	1.10	45	40 TW	295	.64	2300	435	1.10	65
						80 TW							295	.54	2550	425	1.20	30	295	.59	2400	445	1.20	50	80 TW	290	.63	2250	470	1.20	75
						120 TW																			120 TW	285	.62	2200	500	1.30	85

P8399-1

HIGH ALTITUDE

IF YOU ARE AT 25,000′ RANGE IN AIRMILES: BY CRUISING AT 25,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	FUEL LBS.	IF YOU ARE AT 30,000′ RANGE IN AIRMILES: BY CRUISING AT 30,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	IF YOU ARE AT 35,000′ RANGE IN AIRMILES: BY CRUISING AT 35,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	IF YOU ARE AT 40,000′ RANGE IN AIRMILES: BY CRUISING AT 40,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	FUEL LBS.	IF YOU ARE AT 45,000′ RANGE IN AIRMILES: BY CRUISING AT 45,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL)																
(1680)	35	(1805)	9000	(1815)	35	(1825)	(1850)	35	(1850)							
1590	35	1705	8500	1715	35	1725	1750	35	1750							
1495	35	1605	8000	1615	35	1625	1645	35	1645							
1400	35	1505	7500	1515	35	1525	1545	35	1545							
1310	35	1405	7000	1415	35	1425	1445	35	1445							
1215	35	1310	6500	1315	35	1325	1345	35	1345							
1125	35	1210	6000	1215	35	1225	1245	35	1245							
1030	35	1110	5500	1115	35	1130	1145	35	1145							
940	35	1010	5000	1015	35	1030	1045	35	1045							

CRUISING AT 25,000′ C.A.S.	APPROX. MACH NO.	APPROX. LBS/HR/ENG.	APPROX. G.S.	APPROX. R.F.	APPROX. LET DOWN DIST.	EFFECTIVE WIND	CRUISING AT 30,000′ C.A.S.	APPROX. MACH NO.	APPROX. LBS/HR/ENG.	APPROX. G.S.	APPROX. R.F.	APPROX. LET DOWN DIST.	CRUISING AT 35,000′ C.A.S.	APPROX. MACH NO.	APPROX. LBS/HR/ENG.	APPROX. G.S.	APPROX. R.F.	APPROX. LET DOWN DIST.	CRUISING AT 40,000′ C.A.S.	APPROX. MACH NO.	APPROX. LBS/HR/ENG.	APPROX. G.S.	APPROX. R.F.	APPROX. LET DOWN DIST.	EFFECTIVE WIND	CRUISING AT 45,000′ C.A.S.	APPROX. MACH NO.	APPROX. LBS/HR/ENG.	APPROX. G.S.	APPROX. R.F.	APPROX. LET DOWN DIST.
310	.74	2450	325	.70	35	120 HW	300	.79	2500	345	.70	50	270	.79	2300	340	.70	75							120 HW						
305	.73	2400	365	.80	50	80 HW	290	.77	2350	370	.80	70	265	.79	2200	375	.80	95							80 HW						
300	.71	2350	390	.90	65	40 HW	285	.76	2250	410	.90	90	265	.79	2200	410	.90	115							40 HW						
290	.70	2300	415	1.00	75	0	285	.74	2250	440	1.00	105	265	.78	2200	450	1.00	135							0						
290	.69	2250	455	1.10	90	40 TW	275	.73	2150	475	1.10	120	260	.77	2150	485	1.10	160							40 TW						
280	.67	2200	485	1.20	105	80 TW	275	.73	2150	510	1.20	140	260	.77	2150	525	1.15	180							80 TW						
275	.66	2150	520	1.30	120	120 TW	270	.72	2100	540	1.30	155	255	.76	2100	560	1.25	200							120 TW						

SPECIAL NOTES

(1) Climb at military power.

(2) Descend at idle power.

(3) Make additional allowance for landing, reserve fuel, combat, et cetera, as required.

(4) Read lower half of chart opposite effective wind only.

(5) For all combinations of external stores included in this configuration, see figure A-1.

EXAMPLE

If you are at 25,000 feet with 7000 pounds of available fuel, you can fly 1310 nautical air miles by holding 290 knots CAS (no wind). However, you can fly 1405 nautical air miles by immediately climbing to 35,000 feet using "MIL" (100%) RPM. At 35,000 feet, cruise at 265 knots CAS and start letdown 135 nautical miles from destination. With a 40-knot headwind, the range at 35,000 feet would be .9 x 1405 or 1265 nautical miles. Cruise at 265 knots CAS with this wind and start letdown 115 nautical miles from destination.

LEGEND

HW	–Headwind in knots
TW	–Tailwind in knots
R.F.	–Range factor; ratio of ground distance to air miles for corresponding winds
G.S.	–Ground speed in knots
C.A.S.	–Calibrated airspeed in knots
LB/HR/ENG.	–Fuel consumption in pounds per hour per engine
Range	–Nautical miles
( )	–Range in parentheses for interpolation purposes only

DATA AS OF: 1 August 1955

DATA BASIS: Calculations

FUEL GRADE: JP-4

FUEL DENSITY: 6.5 lb/gal

P8399-2

Figure A-36 (Sheet 1)

AIRCRAFT MODEL: A4D-1

ENGINE: J65-W-4

FLIGHT OPERATION INSTRUCTION CHART

STANDARD DAY

CHART WEIGHT LIMITS: 16,000 TO 14,000 POUNDS

EXTERNAL LOAD ITEMS

FERRY CONFIGURATION

NUMBER OF ENGINES OPERATING: ONE

INSTRUCTIONS FOR USING CHART: (A) IN FLIGHT. Select figure in fuel column equal to or less than fuel available for cruise (fuel on board minus allowance for reserve, combat, navigational error, formation flight, etc.). Move horizontally right or left to section according to present altitude and read total range available (no wind) by cruising at that altitude or by climbing to another altitude of maximum range. For a flight at initial altitude, operating instructions are given directly below. For a flight at higher altitude, climb immediately to desired altitude and read cruising instructions in appropriate cruising altitude section. (B) FLIGHT PLANNING. From initial fuel on board subtract fuel for takeoff and climb to desired altitude and all other necessary allowances. Then use chart as for IN FLIGHT above, adding initial climb distance to range values.

NOTES: Ranges shown at optimum altitudes are maximum. In order to obtain maximum range on flights requiring more than one chart (due to external configuration or gross weight changes), it is necessary to observe the optimum cruising altitude on each chart; i.e., when changing charts, a climb may be required to obtain a maximum range. All range values include allowances for descent distance and fuel. Climb distance and fuel are included where climbs are indicated.

DATA BELOW CONTAIN NO FUEL RESERVE FOR LANDING

LOW ALTITUDE

IF YOU ARE AT S.L. — RANGE IN AIRMILES			FUEL	IF YOU ARE AT 5000′ — RANGE IN AIRMILES			IF YOU ARE AT 10,000′ — RANGE IN AIRMILES			IF YOU ARE AT 15,000′ — RANGE IN AIRMILES			FUEL	IF YOU ARE AT 20,000′ — RANGE IN AIRMILES		
BY CRUISING AT S.L.	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	LBS.	BY CRUISING AT 5000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	BY CRUISING AT 10,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	BY CRUISING AT 15,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	LBS.	BY CRUISING AT 20,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL)																
705	35	1470	7000	825	35	1480	955	35	1495	1085	35	1505	7000	1230	35	1520
655	35	1360	6500	765	35	1375	890	35	1385	1005	35	1400	6500	1140	35	1410
605	35	1250	6000	705	35	1265	820	35	1275	930	35	1290	6000	1055	35	1300
555	35	1145	5500	650	35	1155	750	35	1170	855	35	1180	5500	970	35	1195
505	35	1035	5000	590	35	1045	685	35	1060	775	35	1075	5000	880	35	1085
450	35	925	4500	530	35	940	615	35	950	700	35	965	4500	795	35	975
400	35	820	4000	470	35	830	550	35	845	620	35	855	4000	705	35	870
350	35	710	3500	415	35	725	480	35	735	545	35	750	3500	620	35	760
300	35	600	3000	355	35	615	410	35	630	470	35	640	3000	530	35	650

CRUISING AT S.L.						EFFECTIVE WIND	CRUISING AT 5000′						CRUISING AT 10,000′						CRUISING AT 15,000′						EFFECTIVE WIND	CRUISING AT 20,000′					
	APPROXIMATE							APPROXIMATE						APPROXIMATE						APPROXIMATE						APPROXIMATE				
C.A.S.	MACH NO.	LBS/ HR/ ENG.	G.S.	R.F.	LET DOWN DIST.		C.A.S.	MACH NO.	LBS/ HR/ ENG.	G.S.	R.F.	LET DOWN DIST.	C.A.S.	MACH NO.	LBS/ HR/ ENG.	G.S.	R.F.	LET DOWN DIST.	C.A.S.	MACH NO.	LBS/ HR/ ENG.	G.S.	R.F.	LET DOWN DIST.		C.A.S.	MACH NO.	LBS/ HR/ ENG.	G.S.	R.F.	LET DOWN DIST.
						120 HW																			120 HW	335	.72	2700	325	.65	25
						80 HW							340	.62	3000	315	.75	10	335	.66	2800	330	.75	20	80 HW	320	.70	2500	350	.75	35
350	.52	3550	310	.85	0	40 HW	335	.55	3100	320	.85	5	325	.59	2800	335	.85	15	320	.63	2600	355	.85	30	40 HW	305	.67	2350	370	.90	45
330	.50	3300	330	1.00	0	0	320	.53	2900	340	1.00	10	310	.56	2650	360	1.00	20	305	.60	2500	380	1.00	35	0	295	.65	2250	395	1.00	55
315	.47	3100	355	1.10	0	40 TW	300	.50	2700	365	1.10	10	300	.54	2550	385	1.10	25	300	.58	2400	410	1.10	45	40 TW	290	.63	2200	425	1.10	65
						80 TW							285	.52	2400	410	1.25	30	290	.57	2250	440	1.20	50	80 TW	285	.61	2150	460	1.20	75
						120 TW																			120 TW	275	.60	2100	490	1.30	85

P8399-3

HIGH ALTITUDE

IF YOU ARE AT 25,000′ RANGE IN AIRMILES: BY CRUISING AT 25,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	FUEL LBS.	IF YOU ARE AT 30,000′ RANGE IN AIRMILES: BY CRUISING AT 30,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	IF YOU ARE AT 35,000′ RANGE IN AIRMILES: BY CRUISING AT 35,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	IF YOU ARE AT 40,000′ RANGE IN AIRMILES: BY CRUISING AT 40,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	FUEL LBS.	IF YOU ARE AT 45,000′ RANGE IN AIRMILES: BY CRUISING AT 45,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL)																
1370	35	1530	7000	1485	35	1535	1545	35	1545							
1275	35	1420	6500	1380	35	1430	1435	35	1435							
1175	35	1310	6000	1275	35	1320	1330	35	1330							
1080	35	1205	5500	1170	35	1215	1220	35	1220							
980	35	1095	5000	1065	35	1105	1110	35	1110							
885	35	985	4500	960	35	995	1005	35	1005							
790	35	880	4000	855	35	890	895	35	895							
690	35	770	3500	750	35	780	785	35	785							
595	35	660	3000	645	35	670	680	35	680							

CRUISING AT 25,000′ C.A.S.	APPROX. MACH NO.	APPROX. LBS/HR/ENG.	APPROX. G.S.	APPROX. R.F.	APPROX. LET DOWN DIST.	EFFECTIVE WIND	CRUISING AT 30,000′ C.A.S.	APPROX. MACH NO.	APPROX. LBS/HR/ENG.	APPROX. G.S.	APPROX. R.F.	APPROX. LET DOWN DIST.	CRUISING AT 35,000′ C.A.S.	APPROX. MACH NO.	APPROX. LBS/HR/ENG.	APPROX. G.S.	APPROX. R.F.	APPROX. LET DOWN DIST.	CRUISING AT 40,000′ C.A.S.	APPROX. MACH NO.	APPROX. LBS/HR/ENG.	APPROX. G.S.	APPROX. R.F.	APPROX. LET DOWN DIST.	EFFECTIVE WIND	CRUISING AT 45,000′ C.A.S.	APPROX. MACH NO.	APPROX. LBS/HR/ENG.	APPROX. G.S.	APPROX. R.F.	APPROX. LET DOWN DIST.
310	.74	2400	325	.70	35	120 HW	295	.78	2350	335	.70	50	265	.79	2100	335	.70	75							120 HW						
300	.72	2300	355	.80	50	80 HW	290	.77	2250	375	.80	70	265	.78	2100	370	.80	95							80 HW						
295	.70	2200	385	.85	65	40 HW	285	.75	2200	405	.90	90	260	.78	2050	410	.90	115							40 HW						
285	.68	2150	415	1.00	75	0	280	.74	2100	435	1.00	105	260	.77	2050	445	1.00	135							0						
280	.67	2100	445	1.10	90	40 TW	275	.72	2050	465	1.10	120	260	.77	2050	480	1.05	160							40 TW						
275	.66	2050	475	1.20	105	80 TW	265	.71	2000	500	1.20	140	255	.76	2000	520	1.15	180							80 TW						
270	.64	2000	510	1.30	120	120 TW	265	.70	2000	535	1.30	155	255	.75	2000	555	1.25	200							120 TW						

SPECIAL NOTES

(1) Climb at military power.

(2) Descend at idle power.

(3) Make additional allowance for landing, reserve fuel, combat, et cetera, as required.

(4) Read lower half of chart opposite effective wind only.

(5) For all combinations of external stores included in this configuration, see figure A-1.

EXAMPLE

If you are at 5,000 feet with 4500 pounds of available fuel, you can fly 530 nautical air miles by holding 320 knots CAS (no wind). However, you can fly 940 nautical air miles by immediately climbing to 35,000 feet using "MIL" (100%) RPM. At 35,000 feet, cruise at 260 knots CAS and start letdown 135 nautical miles from destination. With a 120-knot tailwind, the range at 35,000 feet would be 1.25 x 940 or 1175 nautical miles. Cruise at 255 knots CAS with this wind and start letdown 200 nautical miles from destination.

LEGEND

HW –Headwind in knots
TW –Tailwind in knots
R.F. –Range factor; ratio of ground distance to air miles for corresponding winds
G.S. –Ground speed in knots
C.A.S. –Calibrated airspeed in knots
LB/HR/ENG. –Fuel consumption in pounds per hour per engine
Range –Nautical miles
( ) –Range in parentheses for interpolation purposes only

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

P8399-4

Figure A-36 (Sheet 2)

AIRCRAFT MODEL: A4D-1

ENGINE: J65-W-4

FLIGHT OPERATION INSTRUCTION CHART

STANDARD DAY

CHART WEIGHT LIMITS: 14,000 TO 12,000 POUNDS

EXTERNAL LOAD ITEMS

FERRY CONFIGURATION

NUMBER OF ENGINES OPERATING: ONE

INSTRUCTIONS FOR USING CHART: (A) IN FLIGHT. Select figure in fuel column equal to or less than fuel available for cruise (fuel on board minus allowance for reserve, combat, navigational error, formation flight, etc.). Move horizontally right or left to section according to present altitude and read total range available (no wind) by cruising at that altitude or by climbing to another altitude of maximum range. For a flight at initial altitude, operating instructions are given directly below. For a flight at higher altitude, climb immediately to desired altitude and read cruising instructions in appropriate cruising altitude section. (B) FLIGHT PLANNING. From initial fuel on board subtract fuel for takeoff and climb to desired altitude and all other necessary allowances. Then use chart as for IN FLIGHT above, adding initial climb distance to range values.

NOTES: Ranges shown at optimum altitudes are maximum. In order to obtain maximum range on flights requiring more than one chart (due to external configuration or gross weight changes), it is necessary to observe the optimum cruising altitude on each chart; i.e., when changing charts, a climb may be required to obtain a maximum range. All range values include allowances for descent distance and fuel. Climb distance and fuel are included where climbs are indicated.

DATA BELOW CONTAIN NO FUEL RESERVE FOR LANDING

LOW ALTITUDE

IF YOU ARE AT S.L. — RANGE IN AIRMILES			FUEL	IF YOU ARE AT 5000′ — RANGE IN AIRMILES			IF YOU ARE AT 10,000′ — RANGE IN AIRMILES			IF YOU ARE AT 15,000′ — RANGE IN AIRMILES			FUEL	IF YOU ARE AT 20,000′ — RANGE IN AIRMILES		
BY CRUISING AT S.L.	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	LBS.	BY CRUISING AT 5000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	BY CRUISING AT 10,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	BY CRUISING AT 15,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	LBS.	BY CRUISING AT 20,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL)																
515	35	1170	5000	610	35	1185	705	35	1195	810	35	1205	5000	925	35	1215
465	35	1045	4500	550	35	1060	635	35	1070	730	35	1085	4500	830	35	1095
410	35	925	4000	485	35	935	565	35	950	650	35	960	4000	740	35	970
360	35	800	3500	425	35	815	495	35	825	570	35	840	3500	650	35	850
310	35	675	3000	365	35	690	425	35	705	490	35	715	3000	555	35	725
255	35	555	2500	305	35	570	355	35	580	410	35	590	2500	465	35	600
205	40	435	2000	245	40	450	285	40	460	330	35	470	2000	375	35	480
155	40	315	1500	185	40	330	215	40	340	245	40	355	1500	280	40	365
100	35	185	1000	120	35	200	145	35	210	165	40	230	1000	190	40	240

CRUISING AT S.L. — APPROXIMATE						EFFECTIVE WIND	CRUISING AT 5000′ — APPROXIMATE						CRUISING AT 10,000′ — APPROXIMATE						CRUISING AT 15,000′ — APPROXIMATE						EFFECTIVE WIND	CRUISING AT 20,000′ — APPROXIMATE					
C.A.S.	MACH NO.	LBS/HR/ENG.	G.S.	R.F.	LET DOWN DIST.		C.A.S.	MACH NO.	LBS/HR/ENG.	G.S.	R.F.	LET DOWN DIST.	C.A.S.	MACH NO.	LBS/HR/ENG.	G.S.	R.F.	LET DOWN DIST.	C.A.S.	MACH NO.	LBS/HR/ENG.	G.S.	R.F.	LET DOWN DIST.		C.A.S.	MACH NO.	LBS/HR/ENG.	G.S.	R.F.	LET DOWN DIST.
						120 HW																			120 HW	325	.69	2500	310	.65	25
						80 HW							335	.60	2850	305	.75	10	325	.64	2600	320	.75	20	80 HW	310	.67	2300	335	.75	35
340	.51	3350	300	.85	0	40 HW	330	.54	3000	310	.85	5	315	.57	2600	325	.85	15	310	.61	2450	345	.85	30	40 HW	295	.64	2150	355	.85	45
320	.48	3100	320	1.00	0	0	310	.51	2750	330	1.00	10	305	.55	2500	350	1.00	20	295	.58	2300	365	1.00	35	0	285	.62	2100	380	1.00	55
305	.46	2900	345	1.10	0	40 TW	295	.48	2600	355	1.10	10	290	.52	2350	375	1.10	25	285	.56	2200	395	1.10	45	40 TW	275	.60	2000	410	1.10	65
						80 TW							270	.49	2200	395	1.25	30	275	.54	2100	420	1.20	50	80 TW	270	.58	1950	440	1.25	75
						120 TW																			120 TW	260	.57	1900	470	1.35	85

P8399-5

HIGH ALTITUDE

(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL)

IF YOU ARE AT 25,000′ RANGE IN AIRMILES: BY CRUISING AT 25,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	FUEL LBS.	IF YOU ARE AT 30,000′ RANGE IN AIRMILES: BY CRUISING AT 30,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	IF YOU ARE AT 35,000′ RANGE IN AIRMILES: BY CRUISING AT 35,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	IF YOU ARE AT 40,000′ RANGE IN AIRMILES: BY CRUISING AT 40,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	FUEL LBS.	IF YOU ARE AT 45,000′ RANGE IN AIRMILES: BY CRUISING AT 45,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.
1045	35	1225	5000	1160	35	1235	1245	35	1245	1240	40	1240	5000			
940	35	1105	4500	1045	35	1110	1120	35	1120	1120	40	1120	4500			
840	35	980	4000	930	35	990	1000	35	1000	995	40	995	4000			
735	35	855	3500	815	35	865	875	35	875	875	40	875	3500			
630	35	755	3000	700	35	745	750	35	750	755	40	755	3000			
525	35	610	2500	585	35	620	630	35	630	635	40	635	2500			
420	35	490	2000	470	35	495	505	35	505	515	40	515	2000			
320	40	370	1500	355	40	380	385	40	390	395	40	395	1500			
215	40	250	1000	240	40	260	260	40	270	275	40	275	1000			

CRUISING AT 25,000′ C.A.S.	APPROX. MACH NO.	APPROX. LBS/HR/ENG.	APPROX. G.S.	APPROX. R.F.	APPROX. LET DOWN DIST.	EFFECTIVE WIND	CRUISING AT 30,000′ C.A.S.	APPROX. MACH NO.	APPROX. LBS/HR/ENG.	APPROX. G.S.	APPROX. R.F.	APPROX. LET DOWN DIST.	CRUISING AT 35,000′ C.A.S.	APPROX. MACH NO.	APPROX. LBS/HR/ENG.	APPROX. G.S.	APPROX. R.F.	APPROX. LET DOWN DIST.	CRUISING AT 40,000′ C.A.S.	APPROX. MACH NO.	APPROX. LBS/HR/ENG.	APPROX. G.S.	APPROX. R.F.	APPROX. LET DOWN DIST.	EFFECTIVE WIND	CRUISING AT 45,000′ C.A.S.	APPROX. MACH NO.	APPROX. LBS/HR/ENG.	APPROX. G.S.	APPROX. R.F.	APPROX. LET DOWN DIST.
305	.73	2250	315	.65	35	120 HW	290	.76	2100	330	.70	55	260	.77	1900	325	.70	75	240	.80	1900	340	.70	95	120 HW								
295	.70	2150	345	.75	50	80 HW	280	.75	2000	360	.80	70	260	.76	1900	360	.80	95	240	.80	1900	380	.80	120	80 HW								
285	.68	2000	375	.85	65	40 HW	275	.73	1900	390	.90	90	255	.76	1850	400	.90	115	240	.79	1900	415	.90	150	40 HW								
275	.66	1950	595	1.00	75	0	265	.71	1850	415	1.00	105	250	.75	1800	425	1.00	135	240	.79	1900	455	1.00	175	0								
270	.64	1900	430	1.10	90	40 TW	260	.70	1800	450	1.10	120	250	.75	1800	470	1.05	160	235	.79	1850	490	1.05	200	40 TW								
260	.63	1800	460	1.20	105	80 TW	255	.68	1750	485	1.20	140	250	.74	1800	505	1.15	180	235	.78	1850	530	1.15	225	80 TW								
255	.61	1800	490	1.30	120	120 TW	250	.67	1700	515	1.30	155	250	.73	1800	545	1.25	200	235	.78	1850	565	1.25	250	120 TW								

SPECIAL NOTES

(1) Climb at military power.

(2) Descend at idle power.

(3) Make additional allowance for landing, reserve fuel, combat, et cetera, as required.

(4) Read lower half of chart opposite effective wind only.

(5) For all combinations of external stores included in this configuration, see figure A-1

EXAMPLE

If you are at 30,000 feet with 3000 pounds of available fuel, you can fly 700 nautical air miles by holding 265 knots CAS (no wind). However, you can fly 745 nautical air miles by immediately climbing to 35,000 feet using "MIL" (100%) RPM. At 35,000 feet, cruise at 250 knots CAS and start letdown 135 nautical miles from destination. With a 40-knot headwind, the range at 35,000 feet would be .9 x 745 or 670 nautical miles. Cruise at 255 knots CAS with this wind and start letdown 115 nautical miles from destination.

LEGEND

HW –Headwind in knots
TW –Tailwind in knots
R.F. –Range factor; ratio of ground distance to air miles for corresponding winds
G.S. –Ground speed in knots
C.A.S. –Calibrated airspeed in knots
LB/HR/ENG. –Fuel consumption in pounds per hour per engine
Range –Nautical miles
( ) –Range in parentheses for interpolation purposes only

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

P8399-6

Figure A-36 (Sheet 3)

AIRCRAFT MODEL: A4D-1

ENGINE: J65-W-4

FLIGHT OPERATION INSTRUCTION CHART

STANDARD DAY

CHART WEIGHT LIMITS: 12,000 TO 10,000 POUNDS

EXTERNAL LOAD ITEMS

FERRY CONFIGURATION

NUMBER OF ENGINES OPERATING: ONE

INSTRUCTIONS FOR USING CHART: (A) IN FLIGHT. Select figure in fuel column equal to or less than fuel available for cruise (fuel on board minus allowance for reserve, combat, navigational error, formation flight, etc.). Move horizontally right or left to section according to present altitude and read total range available (no wind) by cruising at that altitude or by climbing to another altitude of maximum range. For a flight at initial altitude, operating instructions are given directly below. For a flight at higher altitude, climb immediately to desired altitude and read cruising instructions in appropriate cruising altitude section. (B) FLIGHT PLANNING. From initial fuel on board subtract fuel for takeoff and climb to desired altitude and all other necessary allowances. Then use chart as for IN FLIGHT above, adding initial climb distance to range values.

NOTES: Ranges shown at optimum altitudes are maximum. In order to obtain maximum range on flights requiring more than one chart (due to external configuration or gross weight changes), it is necessary to observe the optimum cruising altitude on each chart; i.e., when changing charts, a climb may be required to obtain a maximum range. All range values include allowances for descent distance and fuel. Climb distance and fuel are included where climbs are indicated.

DATA BELOW CONTAIN NO FUEL RESERVE FOR LANDING

LOW ALTITUDE

IF YOU ARE AT S.L. RANGE IN AIRMILES			FUEL LBS.	IF YOU ARE AT 5000′ RANGE IN AIRMILES			IF YOU ARE AT 10,000′ RANGE IN AIRMILES			IF YOU ARE AT 15,000′ RANGE IN AIRMILES			FUEL LBS.	IF YOU ARE AT 20,000′ RANGE IN AIRMILES		
BY CRUISING AT S.L.	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.		BY CRUISING AT 5000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	BY CRUISING AT 10,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	BY CRUISING AT 15,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.		BY CRUISING AT 20,000′	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL)																
320	40	780	3000	375	40	795	440	40	810	510	40	820	3000	585	40	830
265	40	640	2500	310	40	650	370	40	665	425	40	675	2500	490	40	685
210	40	495	2000	250	40	510	295	40	520	340	40	530	2000	390	40	545
160	40	350	1500	190	45	370	220	40	380	255	40	390	1500	295	40	400
105	35	200	1000	125	40	220	150	40	235	175	45	255	1000	200	40	265
50	20	70	500	65	20	80	75	20	85	90	25	100	500	100	25	105

CRUISING AT S.L.						EFFECTIVE WIND	CRUISING AT 5000′						CRUISING AT 10,000′						CRUISING AT 15,000′						EFFECTIVE WIND	CRUISING AT 20,000′					
	APPROXIMATE							APPROXIMATE						APPROXIMATE						APPROXIMATE						APPROXIMATE				
C.A.S.	MACH NO.	LBS/ HR/ ENG.	G.S.	R.F.	LET DOWN DIST.		C.A.S.	MACH NO.	LBS/ HR/ ENG.	G.S.	R.F.	LET DOWN DIST.	C.A.S.	MACH NO.	LBS/ HR/ ENG.	G.S.	R.F.	LET DOWN DIST.	C.A.S.	MACH NO.	LBS/ HR/ ENG.	G.S.	R.F.	LET DOWN DIST.		C.A.S.	MACH NO.	LBS/ HR/ ENG.	G.S.	R.F.	LET DOWN DIST.
						120 HW																			120 HW	315	.67	2300	300	.65	25
						80 HW							320	.58	2600	290	.75	10	315	.62	2400	310	.75	20	80 HW	300	.65	2150	320	.75	35
330	.50	3200	290	.85	0	40 HW	320	.53	2800	305	.85	5	305	.55	2450	315	.85	15	300	.59	2250	335	.85	30	40 HW	285	.61	2000	340	.85	45
310	.46	2950	310	1.00	0	0	300	.49	2600	320	1.00	10	290	.53	2350	335	1.00	20	280	.56	2100	355	1.00	35	0	270	.58	1900	360	1.00	55
300	.45	2800	340	1.10	0	40 TW	285	.47	2450	345	1.10	10	275	.50	2150	360	1.10	25	275	.54	2050	380	1.10	45	40 TW	255	.56	1750	385	1.10	65
						80 TW							265	.47	2100	385	1.25	30	260	.52	1900	405	1.25	50	80 TW	250	.54	1700	415	1.25	75
						120 TW																			120 TW	245	.53	1700	450	1.35	85

P8399-7

HIGH ALTITUDE

IF YOU ARE AT 25,000'			FUEL LBS.	IF YOU ARE AT 30,000'			IF YOU ARE AT 35,000'			IF YOU ARE AT 40,000'			FUEL LBS.	IF YOU ARE AT 45,000'		
RANGE IN AIRMILES				RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES				RANGE IN AIRMILES		
BY CRUISING AT 25,000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.		BY CRUISING AT 30,000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	BY CRUISING AT 35,000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.	BY CRUISING AT 40,000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.		BY CRUISING AT 45,000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL)																
665 555	40 40	840 695	3000 2500	755 630	40 40	850 705	820 685	40 40	860 715	870 725	40 40	870 725	3000 2500	850 715	45 45	850 715
445 335	40 40	555 410	2000 1500	505 380	40 40	560 420	545 410	40 40	570 430	580 435	40 40	580 435	2000 1500	575 440	45 45	575 440
225 110	45 30	275 120	1000 500	250 125	45 30	280 125	275	45	290	295	40	295	1000 500	305	45	305

CRUISING AT 25,000'						EFFEC-TIVE WIND	CRUISING AT 30,000'						CRUISING AT 35,000'						CRUISING AT 40,000'						EFFEC-TIVE WIND	CRUISING AT 45,000'					
	APPROXIMATE							APPROXIMATE						APPROXIMATE						APPROXIMATE						APPROXIMATE				
C.A.S.	MACH NO.	LBS/ HR/ ENG.	G.S.	R.F.	LET DOWN DIST.		C.A.S.	MACH NO.	LBS/ HR/ ENG.	G.S.	R.F.	LET DOWN DIST.	C.A.S.	MACH NO.	LBS/ HR/ ENG.	G.S.	R.F.	LET DOWN DIST.	C.A.S.	MACH NO.	LBS/ HR/ ENG.	G.S.	R.F.	LET DOWN DIST.		C.A.S.	MACH NO.	LBS/ HR/ ENG.	G.S.	R.F.	LET DOWN DIST.
300	.71	2100	310	.65	35	120 HW	280	.74	1850	320	.65	55	255	.76	1650	315	.70	75	240	.79	1650	335	.70	90	120 HW	215	.79	1700	340	.70	115
285	.69	1950	335	.75	50	80 HW	270	.72	1750	345	.75	70	250	.75	1600	350	.80	95	235	.78	1600	370	.80	120	80 HW	210	.78	1650	375	.80	145
275	.66	1850	360	.85	65	40 HW	265	.70	1700	375	.85	90	250	.74	1600	385	.90	115	235	.77	1600	405	.90	150	40 HW	210	.78	1650	415	.90	170
260	.63	1750	380	1.00	75	0	250	.68	1600	395	1.00	105	240	.73	1550	415	1.00	135	230	.77	1550	440	1.00	175	0	210	.78	1650	455	1.00	200
255	.61	1700	410	1.10	90	40 TW	250	.66	1600	430	1.10	120	240	.72	1550	455	1.10	160	230	.76	1550	480	1.10	200	40 TW	210	.78	1650	490	1.05	225
245	.60	1600	440	1.20	105	80 TW	245	.65	1550	465	1.20	140	240	.71	1550	490	1.15	180	225	.75	1500	515	1.15	225	80 TW	210	.77	1650	530	1.15	250
240	.58	1500	470	1.35	120	120 TW	235	.64	1550	495	1.30	155	235	.70	1500	525	1.30	200	225	.74	1500	550	1.25	250	120 TW	210	.77	1650	570	1.25	280

SPECIAL NOTES

(1) Climb at military power.

(2) Descend at idle power.

(3) Make additional allowance for landing, reserve fuel, combat, et cetera, as required.

(4) Read lower half of chart opposite effective wind only.

(5) For all combinations of external stores included in this configuration, see figure A-1.

EXAMPLE

If you are at 15,000 feet with 2000 pounds of available fuel, you can fly 340 nautical air miles by holding 280 knots CAS (no wind). However, you can fly 530 nautical air miles by immediately climbing to 40,000 feet using "MIL" (100%) RPM. At 40,000 feet, cruise at 230 knots CAS and start letdown 175 nautical miles from destination. With an 80-knot tailwind, the range at 40,000 feet would be 1.15 x 530 or 610 nautical miles. Cruise at 225 knots CAS with this wind and start letdown 225 nautical miles from destination.

LEGEND

HW – Headwind in knots
TW – Tailwind in knots
R.F. – Range factor; ratio of ground distance to air miles for corresponding winds
G.S. – Ground speed in knots
C.A.S. – Calibrated airspeed in knots
LB/HR/ENG. – Fuel consumption in pounds per hour per engine
Range – Nautical miles
( ) – Range in parentheses for interpolation purposes only

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

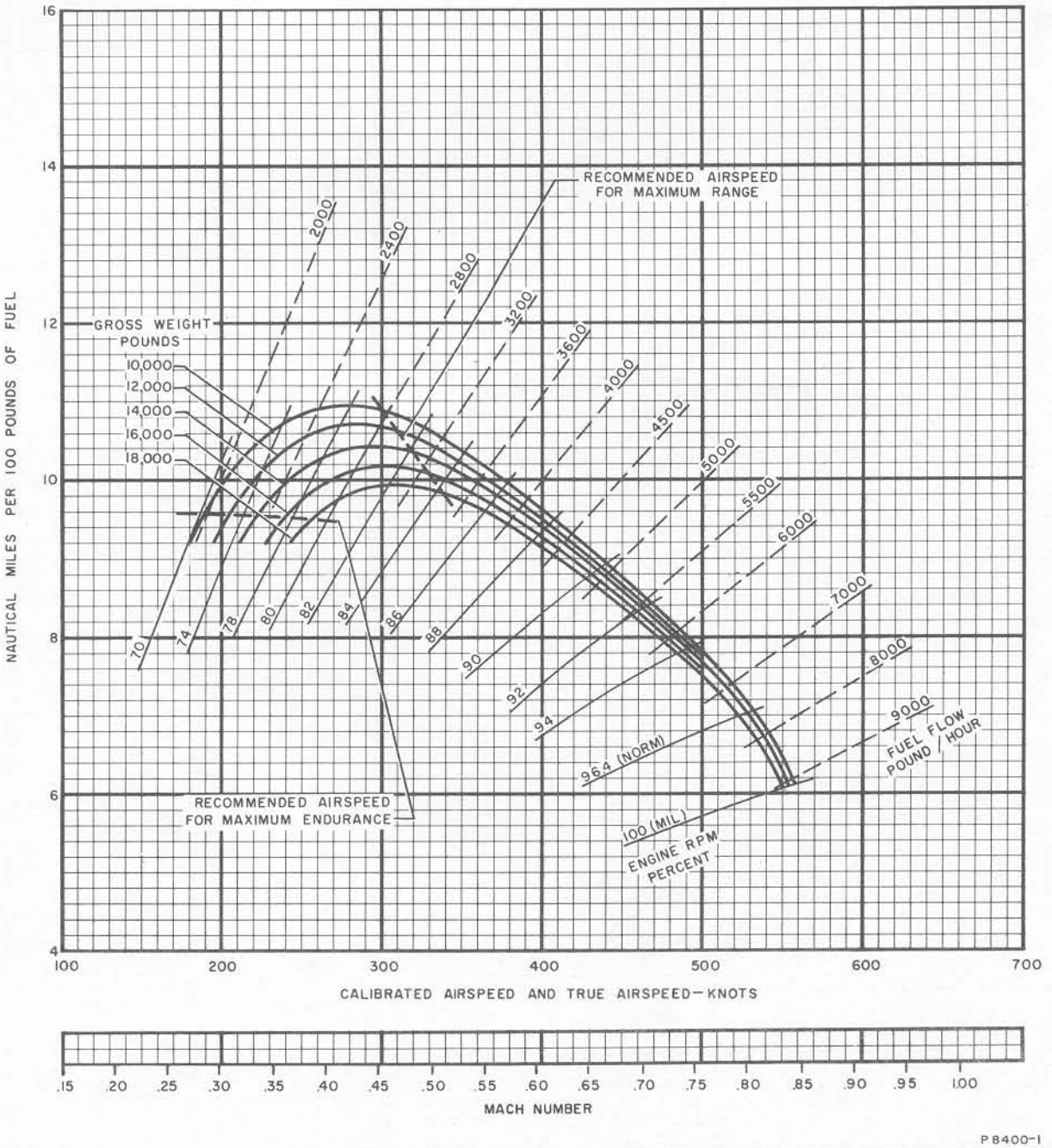
P8369-8

Figure A-36 (Sheet 4)

SPECIFIC RANGE

FERRY CONFIGURATION SEA LEVEL

MODEL: A4D-1 ENGINE: J65-W-4



REMARKS:

For all combinations of external stores included in this configuration, see figure A-1.

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

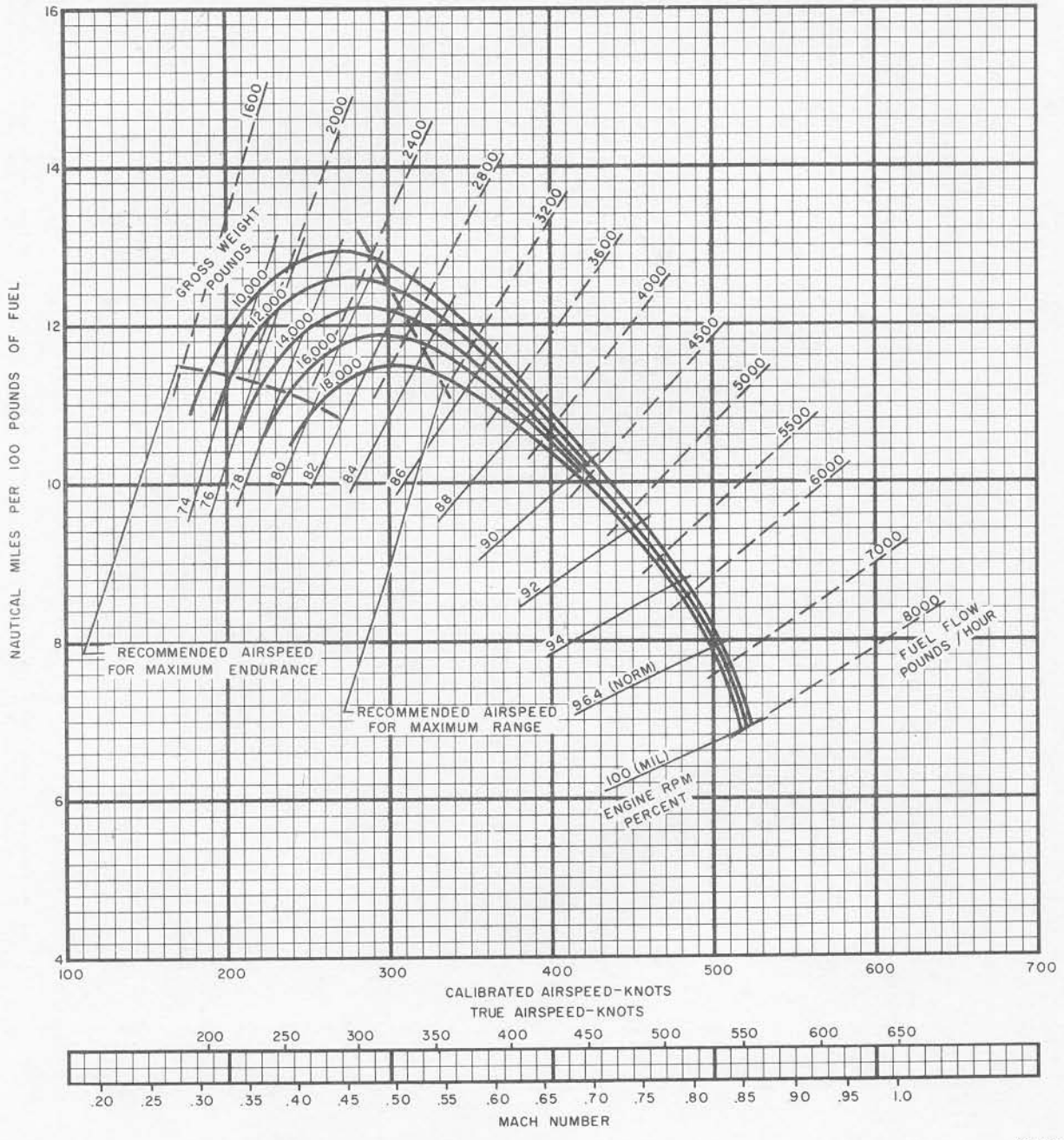
Figure A-37 (Sheet 1)

SPECIFIC RANGE

FERRY CONFIGURATION 5000 FEET

MODEL: A4D-1

ENGINE: J65-W-4



P8400-2

REMARKS:

For all combinations of external stores included in this configuration, see figure A-1.

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

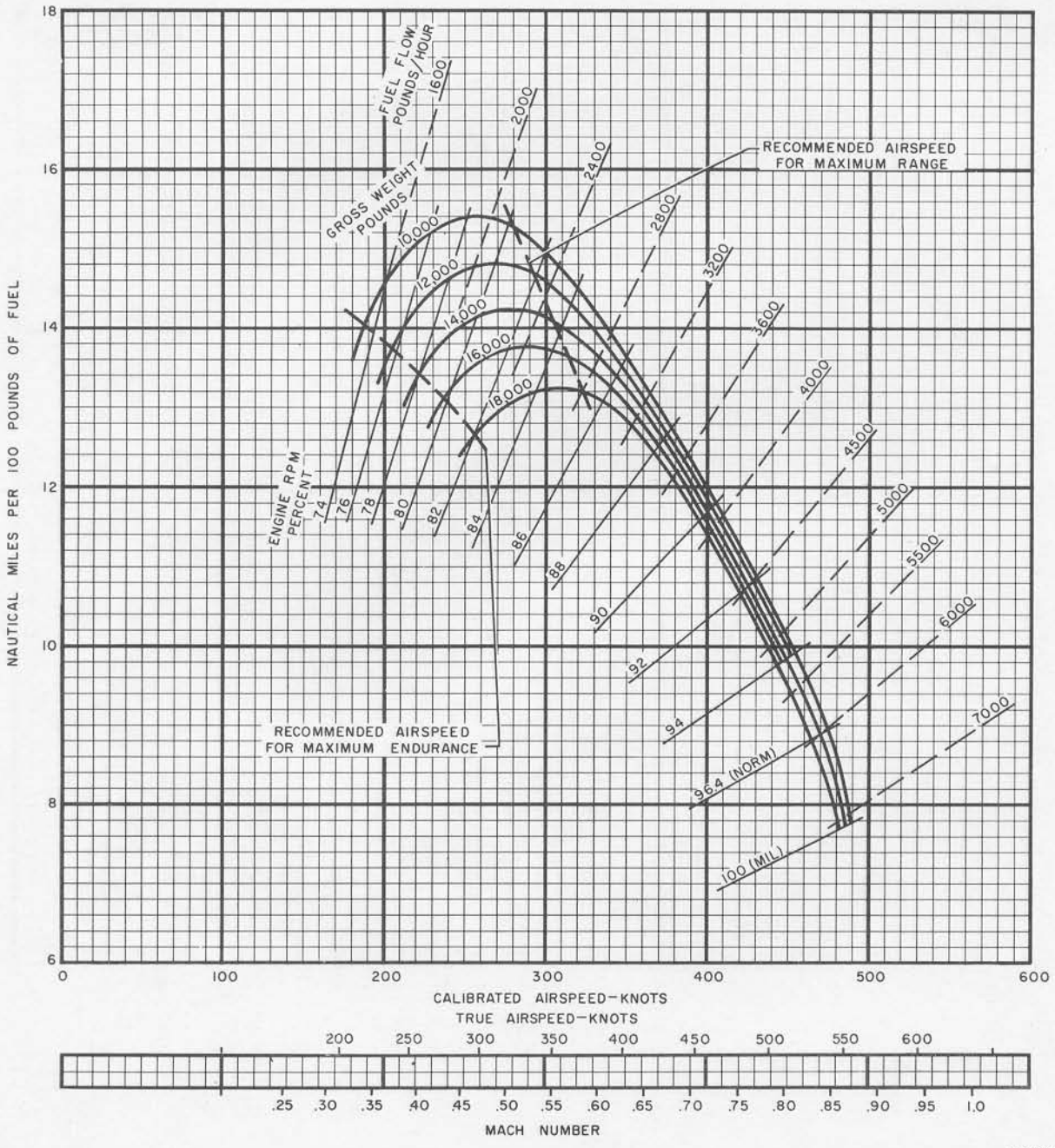
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

Figure A-37 (Sheet 2)

SPECIFIC RANGE

FERRY CONFIGURATION 10,000 FEET

MODEL: A4D-1 ENGINE: J65-W-4



REMARKS:

For all combinations of external stores included in this configuration, see figure A-1.

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

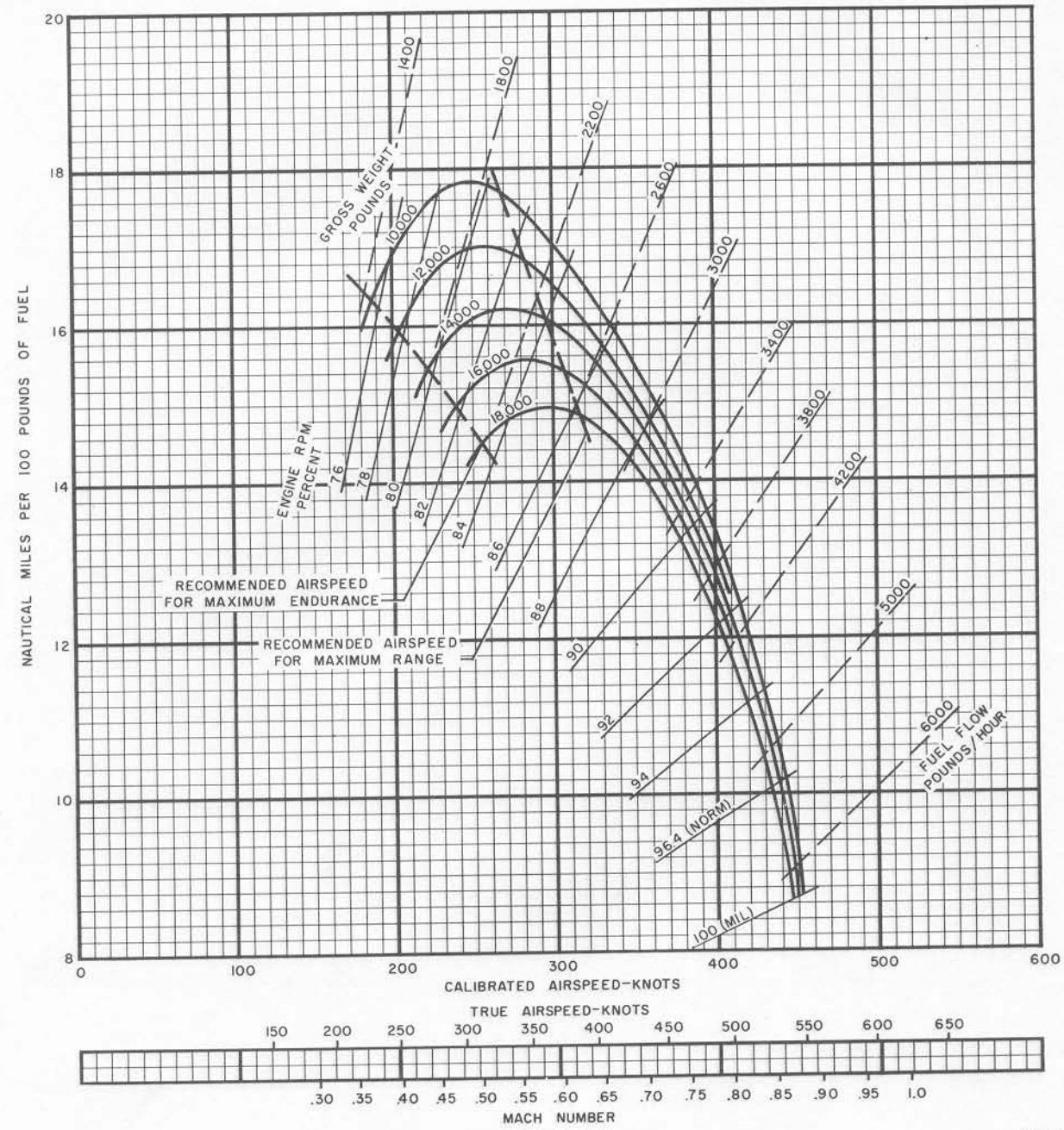
Figure A-37 (Sheet 3)

SPECIFIC RANGE

FERRY CONFIGURATION 15,000 FEET

MODEL: A4D-1

ENGINE: J65-W-4



REMARKS:

For all combinations of external stores included in this configuration, see figure A-1.

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

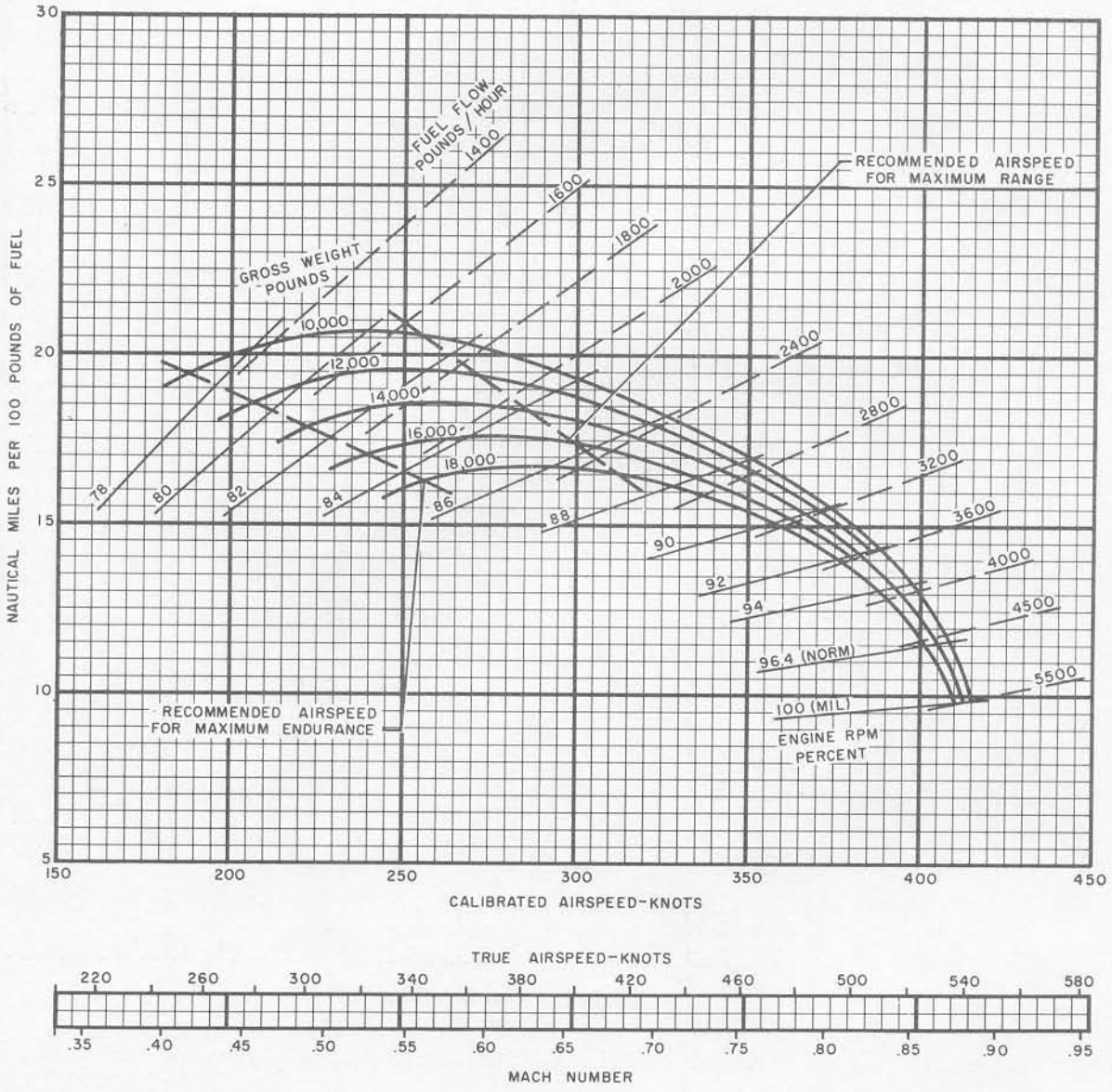
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

Figure A-37 (Sheet 4)

SPECIFIC RANGE

FERRY CONFIGURATION 20,000 FEET

MODEL: A4D-1 ENGINE: J65-W-4



P8400-5

REMARKS:

For all combinations of external stores included in this configuration, see figure A-1.

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

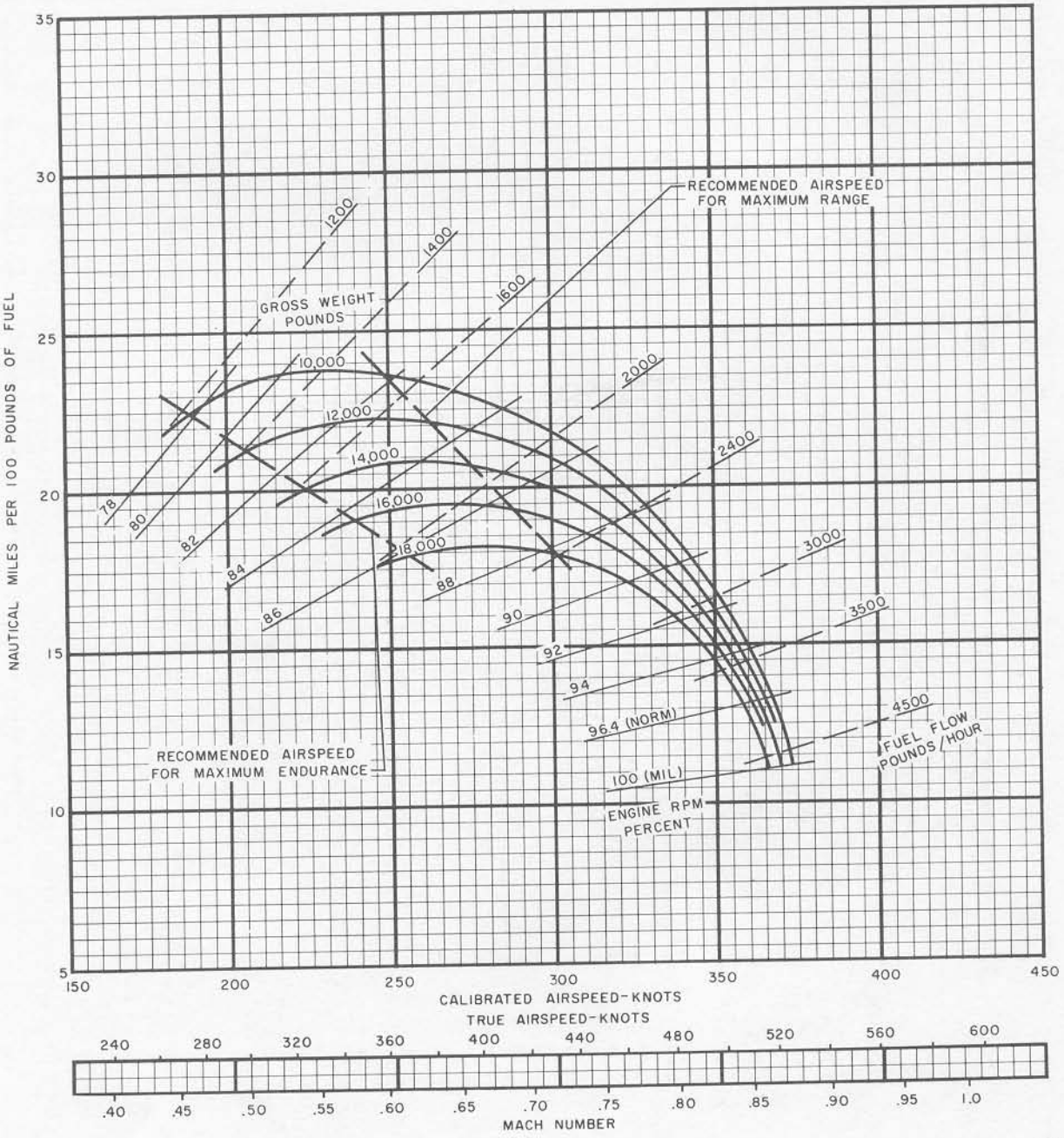
Figure A-37 (Sheet 5)

SPECIFIC RANGE

FERRY CONFIGURATION 25,000 FEET

MODEL: A4D-1

ENGINE: J65-W-4



REMARKS:

For all combinations of external stores included in this configuration, see figure A-1.

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

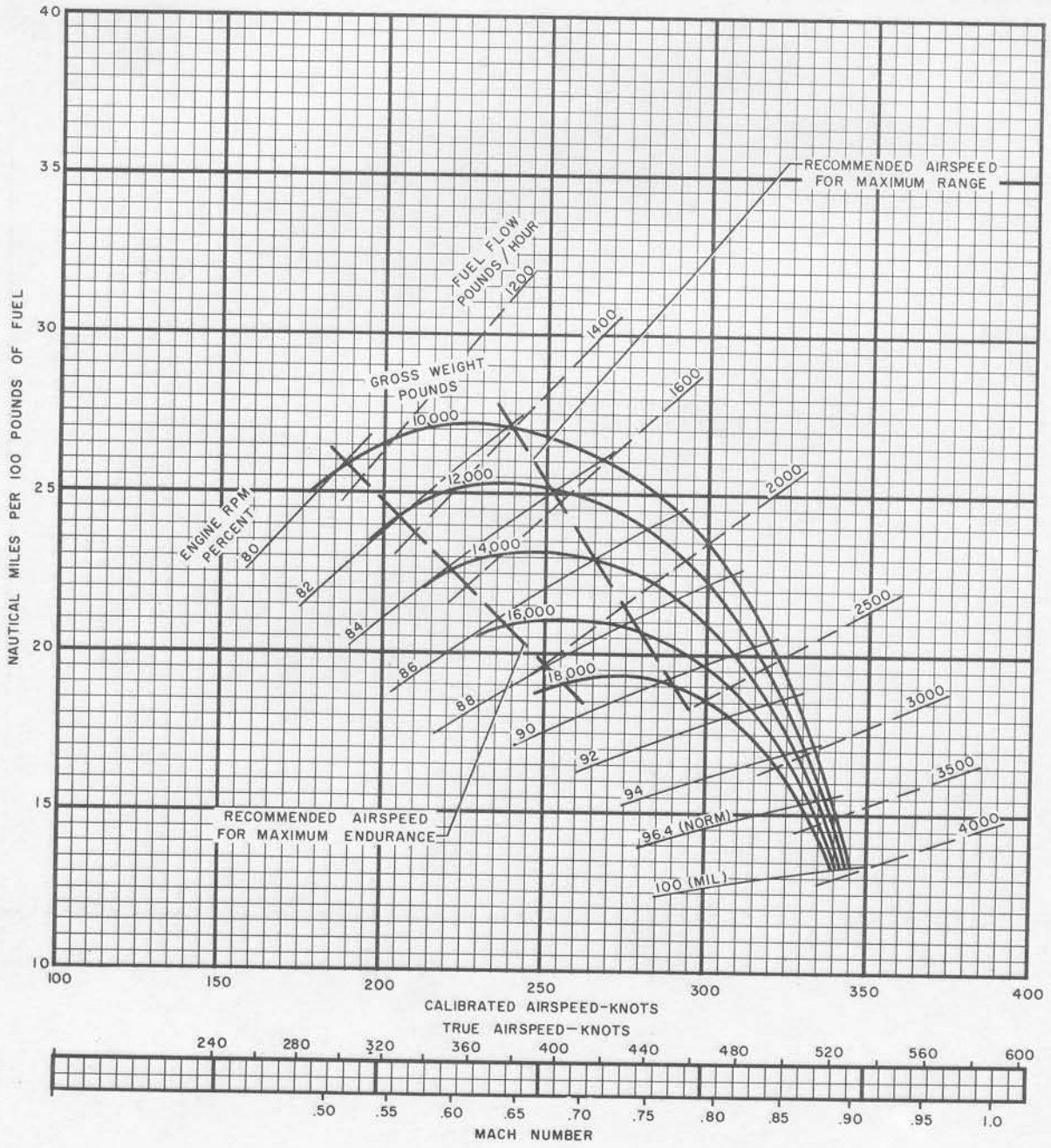
Figure A-37 (Sheet 6)

SPECIFIC RANGE

FERRY CONFIGURATION 30,000 FEET

MODEL: A4D-1

ENGINE: J65-W-4



REMARKS:

For all combinations of external stores included in this configuration, see figure A-1.

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

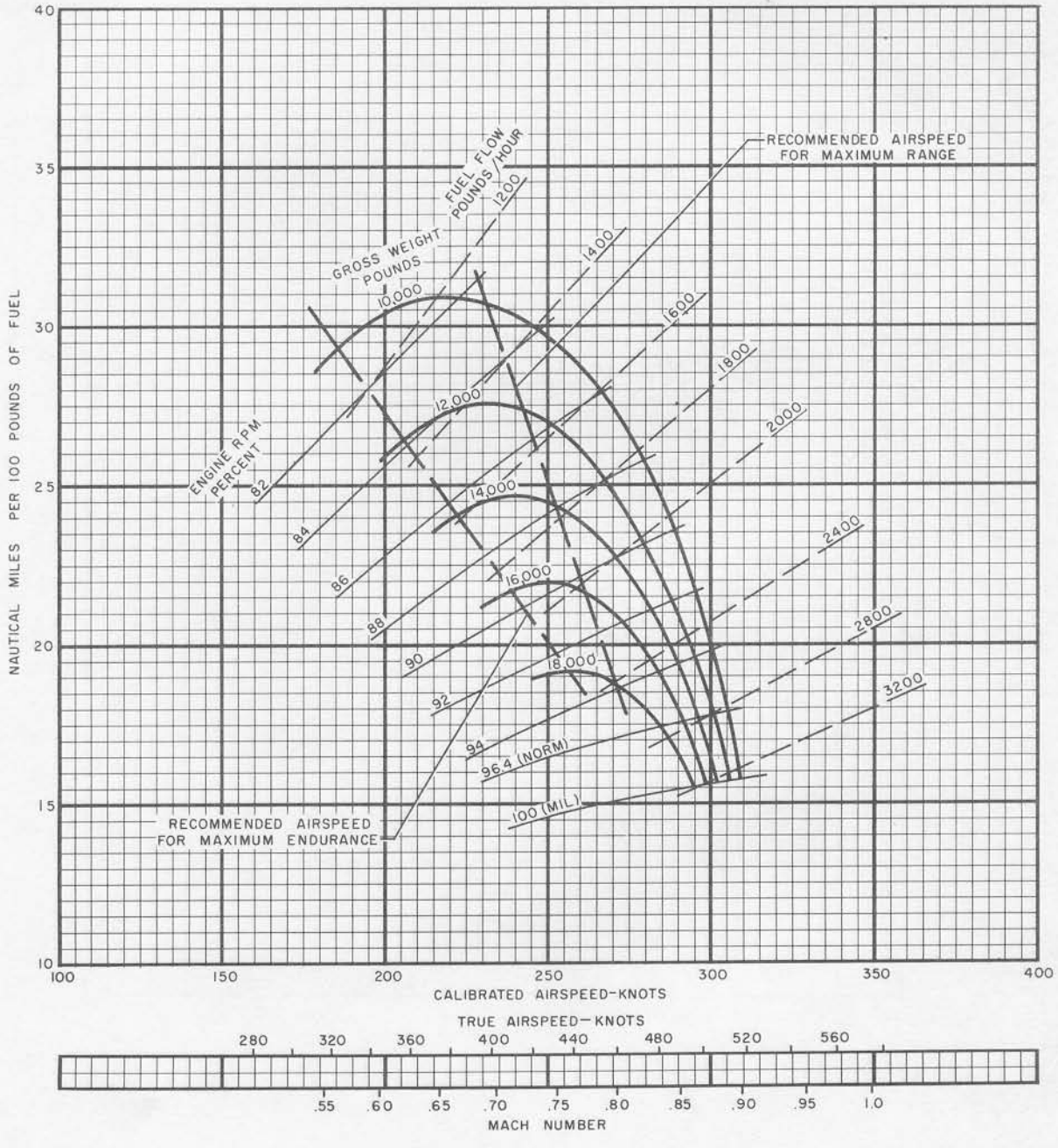
Figure A-37 (Sheet 7)

SPECIFIC RANGE

FERRY CONFIGURATION 35,000 FEET

MODEL: A4D-1

ENGINE: J65-W-4



REMARKS:

For all combinations of external stores included in this configuration, see figure A-1.

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

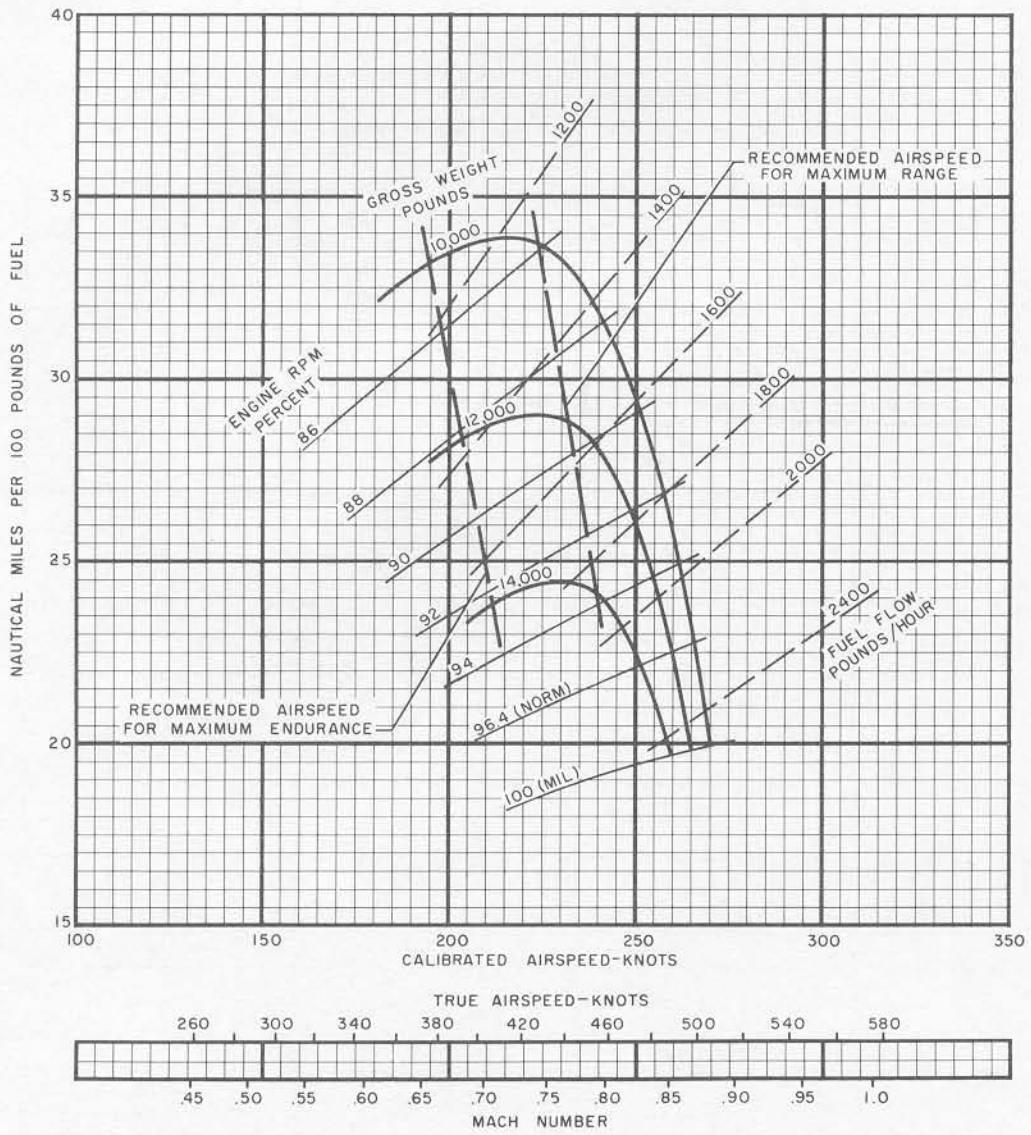
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

Figure A-37 (Sheet 8)

SPECIFIC RANGE

FERRY CONFIGURATION 40,000 FEET

MODEL: A4D-1 ENGINE: J65-W-4



P8400-9

REMARKS:

For all combinations of external stores included in this configuration, see figure A-1.

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

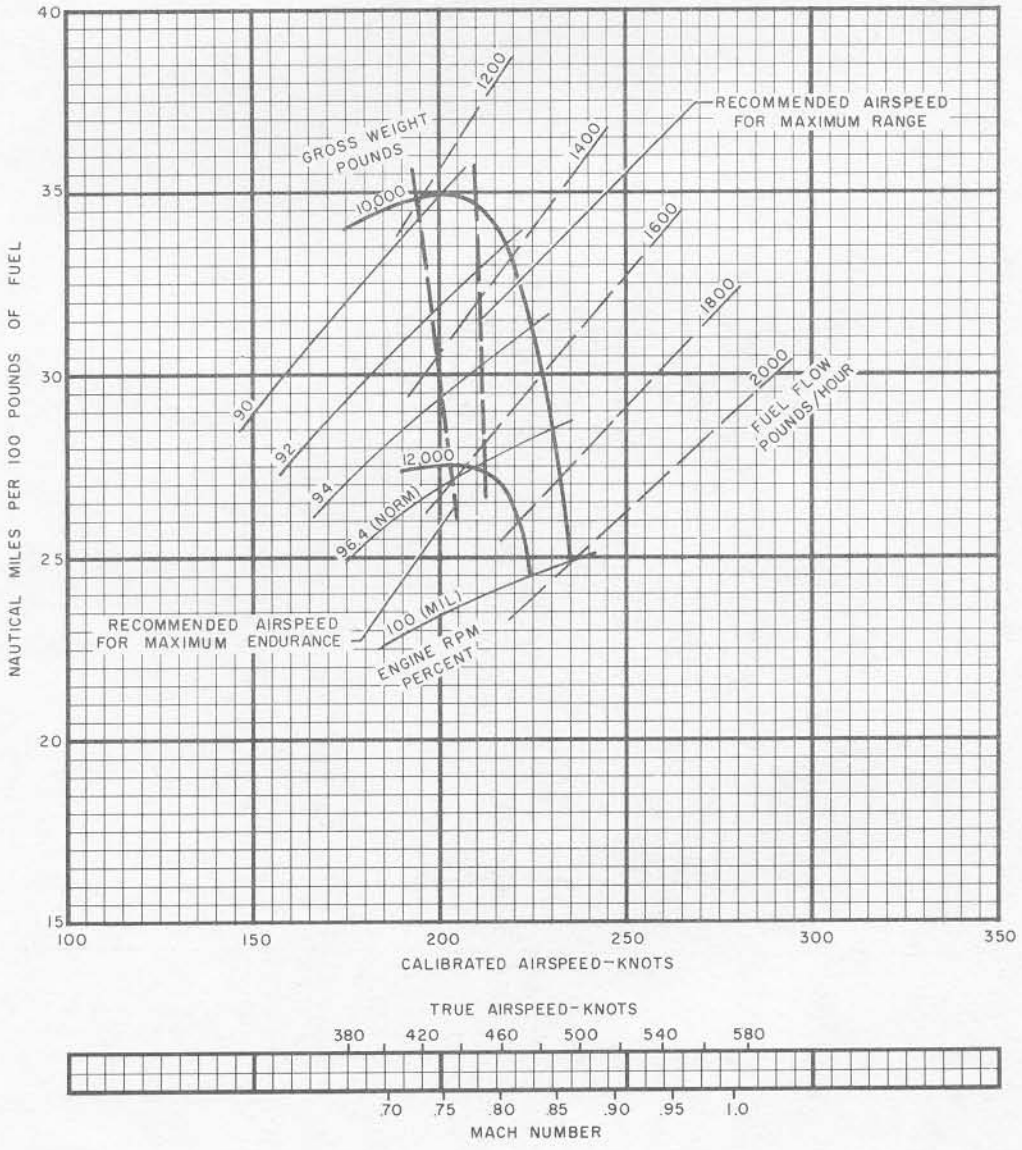
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

Figure A-37 (Sheet 9)

SPECIFIC RANGE

FERRY CONFIGURATION 45,000 FEET

MODEL: A4D-1 ENGINE: J65-W-4



P8400-10

REMARKS:

For all combinations of external stores included in this configuration, see figure A-1.

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

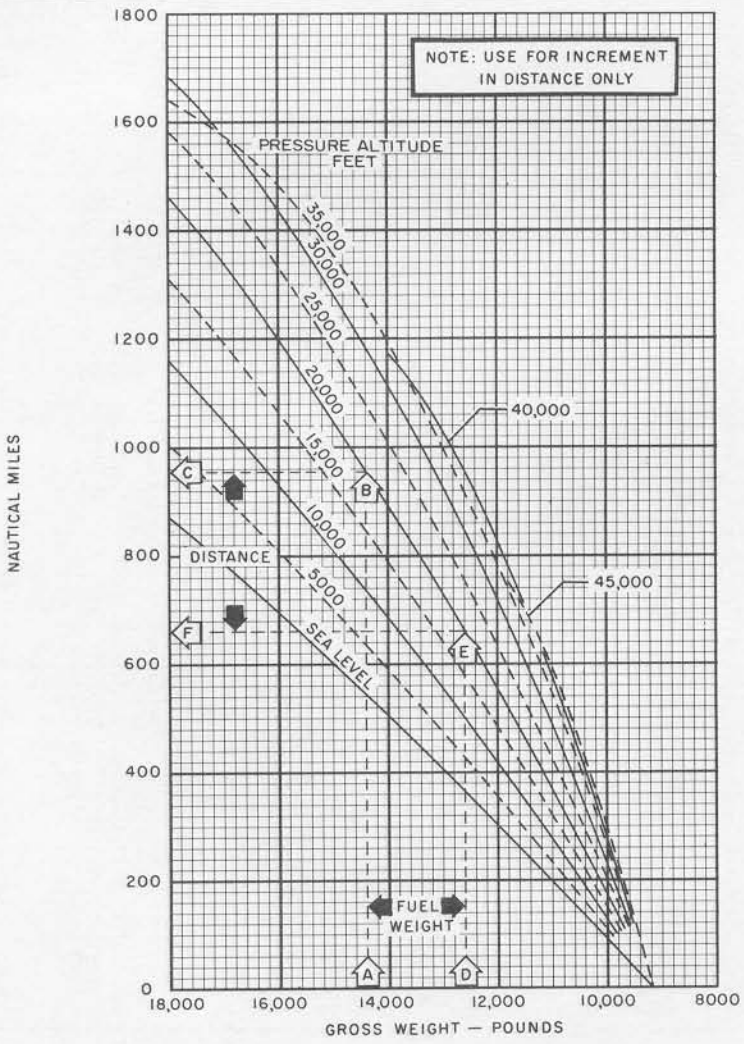
Figure A-37 (Sheet 10)

LONG RANGE PREDICTION — DISTANCE

FERRY CONFIGURATION

MODEL: A4D-1

ENGINE: J65-W-4



REMARKS:

(1) For all combinations of external stores included in this configuration, see figure A-1.

(2) For recommended airspeeds for maximum range, see figure A-37.

EXAMPLE:

Assume 14,400 pounds gross weight with 1800 pounds of fuel available for cruise at 20,000 feet:

(1) Enter chart at 14,400 pounds (A) and move vertically to 20,000 feet (B).

(2) Move horizontally left and read 960 nautical miles (C).

(3) Re-enter chart at weight after cruise (14,400–1800) = 12,600 pounds (D) and move vertically to 20,000 feet (E).

(4) Move horizontally left and read 660 nautical miles (F).

Maximum range at 20,000 feet with 1800 pounds of fuel is (960–660) = 300 nautical miles.

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

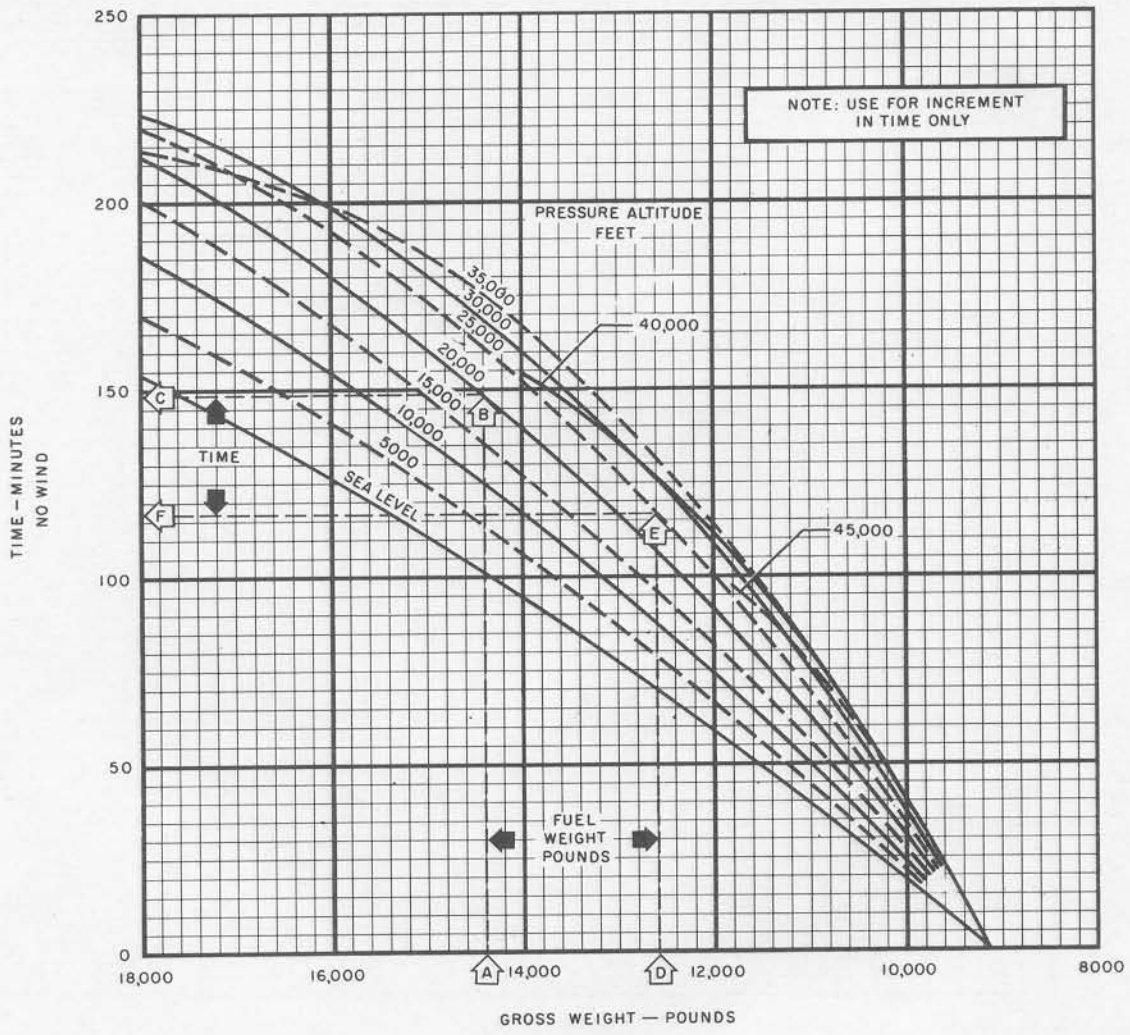
Figure A-38

LONG RANGE PREDICTION—TIME

FERRY CONFIGURATION

MODEL: A4D-1

ENGINE: J65-W-4



P-8402-1

REMARKS:

(1) For all combinations of external stores included in this configuration, see figure A-1.

(2) For recommended airspeeds for maximum range, see figure A-37.

EXAMPLE:

Assume 14,400 pounds gross weight with 1800 pounds of fuel available for cruise at 20,000 feet:

(1) Enter chart at 14,400 pounds A and move vertically to 20,000 feet B.

(2) Move horizontally left and read 150 minutes C.

(3) Re-enter chart at weight after cruise (14,400–1800) = 12,600 pounds D and move vertically to 20,000 feet E.

(4) Move horizontally left and read 115 minutes F.

Cruise time at airspeed for maximum range at 20,000 feet with 1800 pounds of fuel is (150–115) = 35 minutes.

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

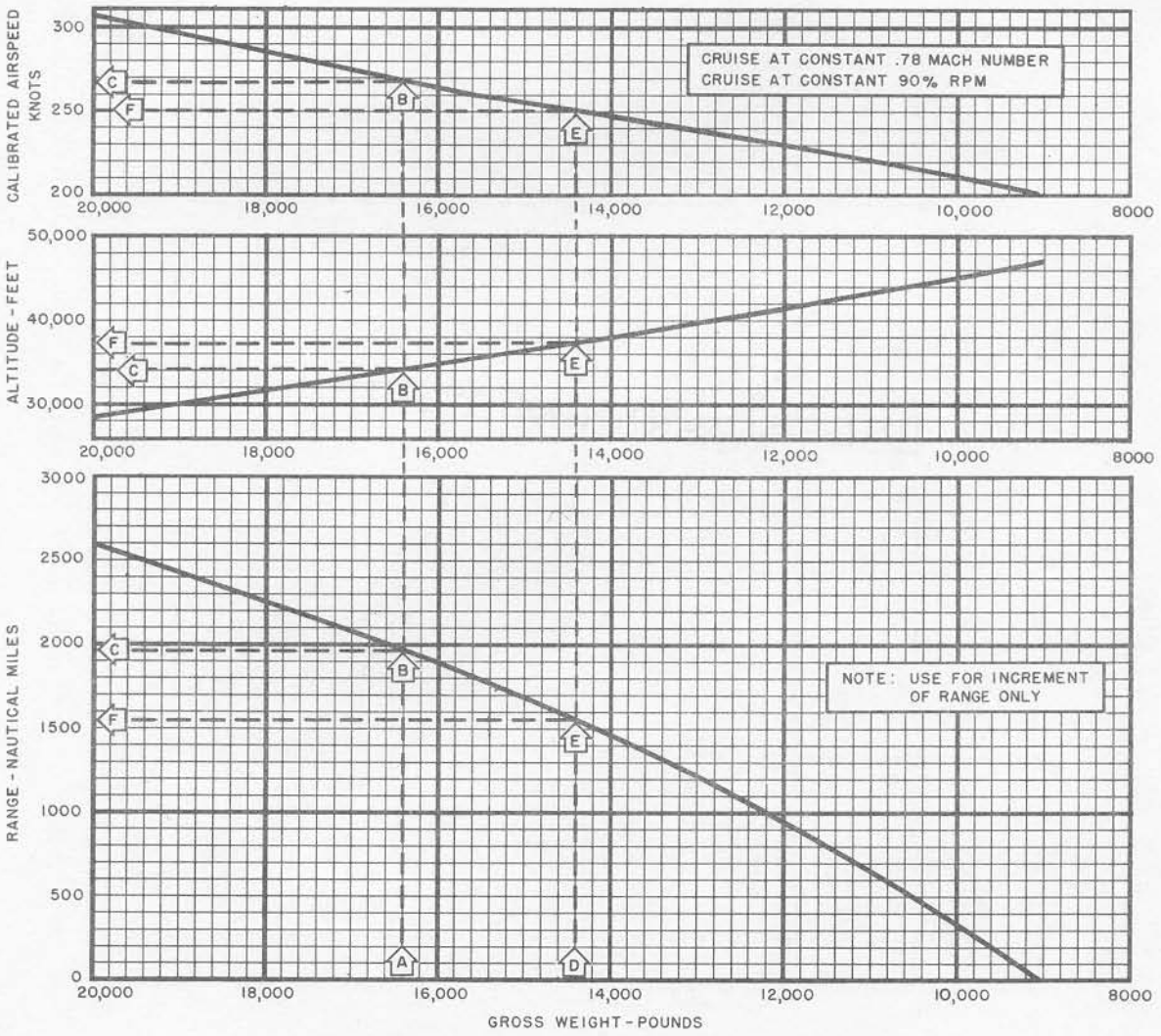
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

Figure A-39

MAXIMUM RANGE—VARIABLE ALTITUDE

FERRY CONFIGURATION

MODEL: A4D-1 **ENGINE:** J65-W-4



P8403-1

REMARKS:

For all combinations of external stores included in this configuration, see figure A-1.

EXAMPLE:

Assume an initial gross weight of 16,400 pounds with 2000 pounds of fuel available for cruise:

(1) Enter charts at a weight of 16,400 pounds (A) and move vertically to intersect the Range line, Altitude line, and Calibrated Airspeed line (B) ; move left on the respective charts and read:

a. Range – 1950 nautical miles (C)

b. Initial optimum cruise altitude – 34,000 feet (C)

c. Initial calibrated airspeed – 270 knots (C) .

(2) Re-enter charts at a weight of (16,400 – 2000) = 14,400 pounds (D) and move vertically to intersect the Range line, Altitude line and Calibrated airspeed line (E) ; move left on the respective charts and read:

a. Range – 1550 nautical miles (F)

b. Final optimum cruise altitude – 37,000 feet (F)

c. Final calibrated airspeed line – 250 knots (F) .

A maximum range of (1950 – 1550) = 400 nautical miles will be covered by flying at a constant .78 Mach number using a constant engine rpm of 90%.

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

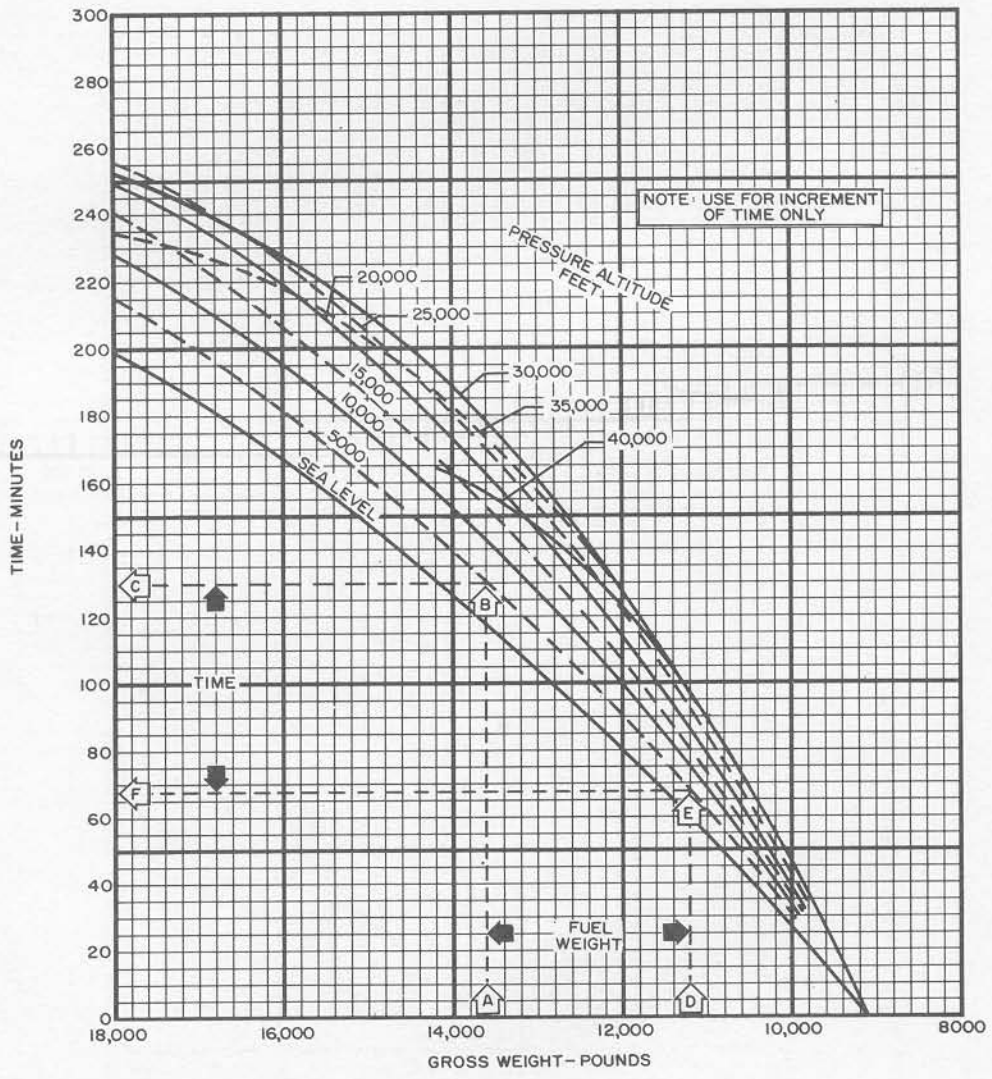
Figure A-40

ENDURANCE PREDICTION

FERRY CONFIGURATION

MODEL: A4D-1

ENGINE: J65-W-4



P-8404-1

REMARKS:

(1) For all combinations of external stores included in this configuration, see figure A-1.

(2) For recommended airspeeds for maximum endurance, see figure A-37.

EXAMPLE:

Assume an initial gross weight of 13,600 pounds with 2400 pounds of fuel for loiter at 5000 feet:

(1) Enter chart at 13,600 pounds (A) and move vertically to 5000 feet (B).

(2) Move horizontally left and read 130 minutes (C).

(3) Re-enter chart at weight after loiter (13,600–2400) = 11,200 pounds (D) and move vertically to 5000 feet (E).

(4) Move horizontally left and read 70 minutes (F).

Total loiter time is (130–70) = 60 minutes.

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

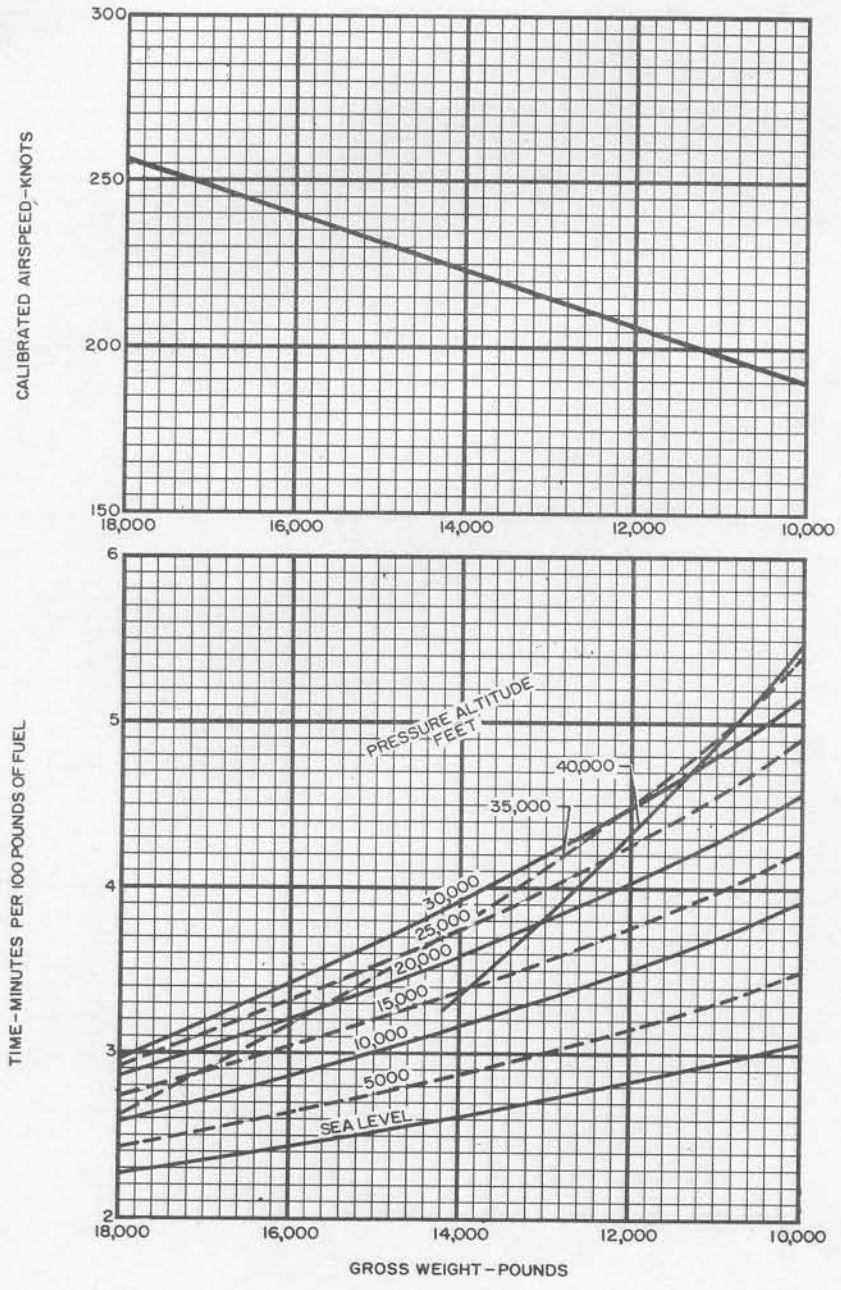
Figure A-41

ENDURANCE-LEVEL FLIGHT

FERRY CONFIGURATION

MODEL: A4D-1

ENGINE: J65-W-4



P-8405-1

REMARKS:

(1) For all combinations of external stores included in this configuration, see figure A-1.

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

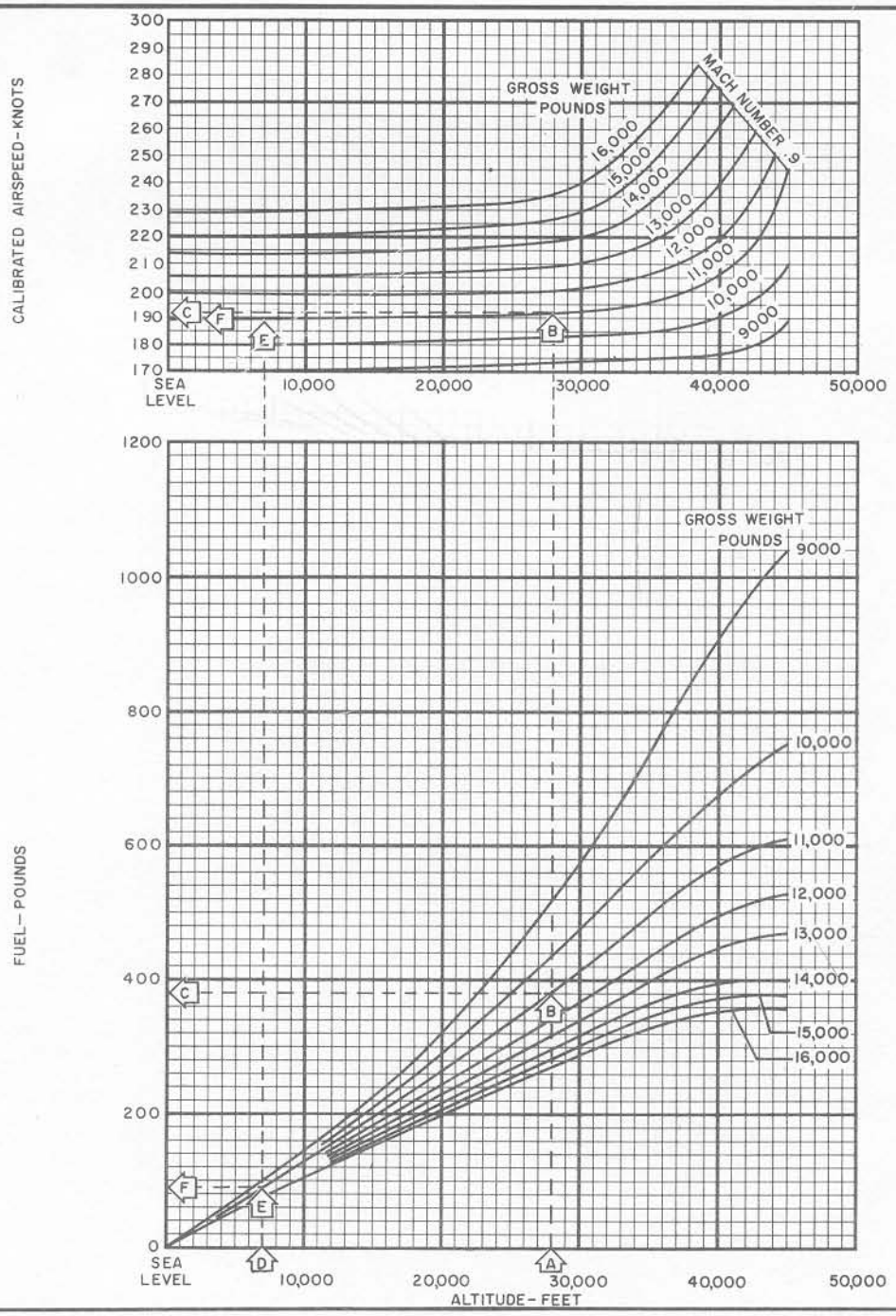
Figure A-42

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MAXIMUM RANGE DESCENT

ENGINE IDLE

MODEL: A4D-1 ENGINE: J65-W-4



REMARKS:

(1) These charts are valid for all configurations.
(2) Use idle rpm.

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

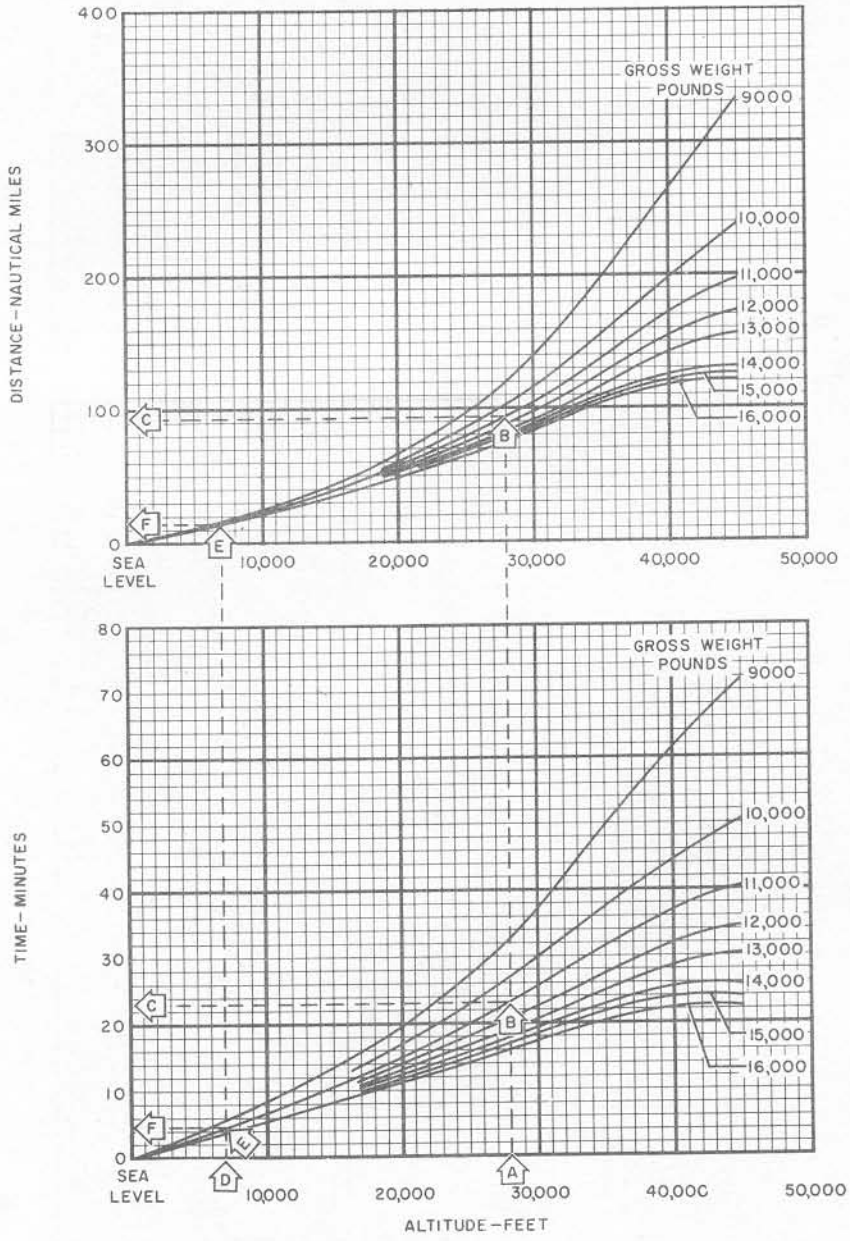
Figure A-43 (Sheet 1)

MAXIMUM RANGE DESCENT

ENGINE IDLE

MODEL: A4D-1

ENGINE: J65-W-4



P8406-2

REMARKS:

(1) These charts are valid for all configurations.
(2) Use idle rpm.

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

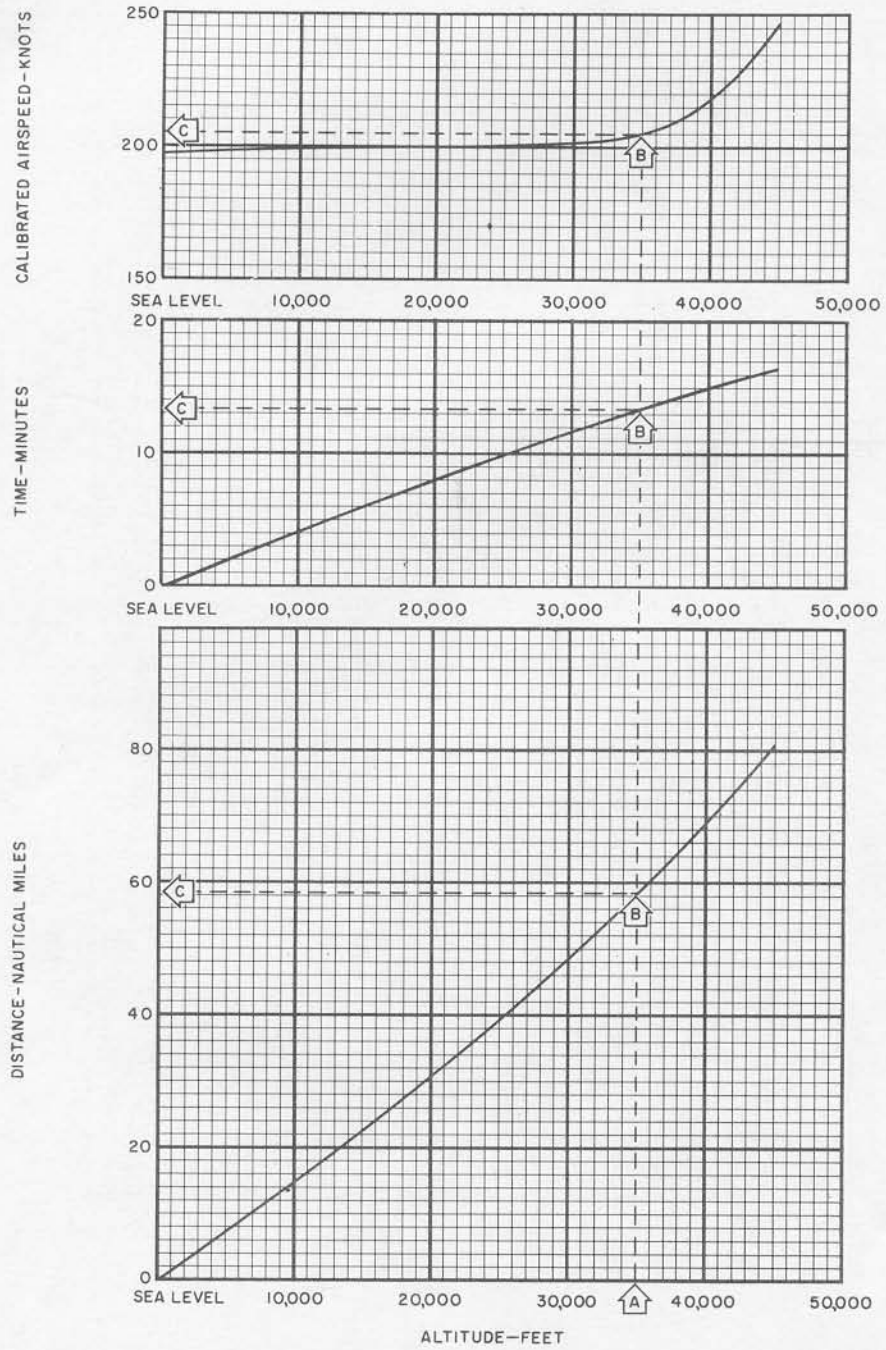
Figure A-43 (Sheet 2)

MAXIMUM RANGE DESCENT

ENGINE WINDMILLING

MODEL: A4D-1

ENGINE: J65-W-4



REMARKS:

(1) Chart is valid for all configurations and for weights up to 16,000 pounds.

(2) Vary calibrated airspeed with altitude during descent as shown by the calibrated airspeed chart to attain the maximum distance.

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

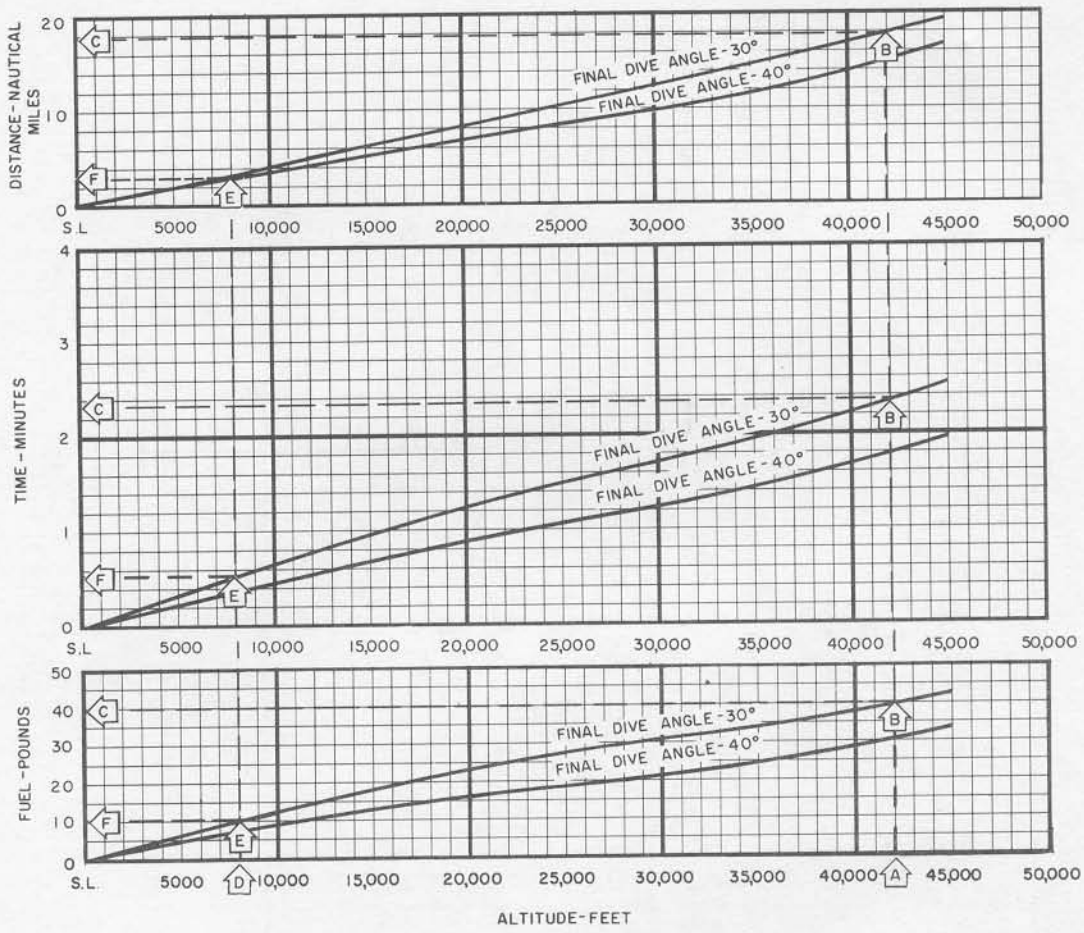
Figure A-43 (Sheet 3)

MAXIMUM RATE DESCENT

ENGINE IDLE

MODEL: A4D-1

ENGINE: J65-W-4



REMARKS:

(1) Charts are valid for all configurations and all weights up to 13,000 pounds.

(2) Use idle rpm and open speedbrakes.

(3) These descents are based on letting down at a constant .90 Mach number, increasing the dive angle during letdown to maintain .90 Mach number until a desired dive angle is reached. This dive angle is then held constant for the remainder of the descent.

EXAMPLE:

A maximum rate descent is desired from 42,000 feet to 8000 feet, the dive angle not to exceed 30 degrees:

(1) Enter charts at 42,000 feet (A) and move vertically on all charts to intersect the 30° Dive Angle line (B); move horizontally left and read from the respective charts:

a. Fuel – 40 pounds (C)

b. Time – 2.4 minutes (C)

c. Distance – 18 miles (C)

(2) Re-enter all charts at 8000 feet (D) and move vertically on all charts to intersect the 30° Dive Angle line (E). Move horizontally left and read from the respective charts:

a. Fuel – 10 pounds (F)

b. Time – 0.5 minute (F)

c. Distance – 3 miles (F)

(3) The fuel required for the descent will be (40–10) = 30 pounds.

(4) The time required for the descent will be (2.4–0.5) = 1.9 minutes.

(5) The distance covered during the descent will be (18–3) = 15 miles.

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

Figure A-44

FOULED DECK ENDURANCE

CLEAN CONFIGURATION

MODEL: A4D-1 ENGINE: J65-W-4

FUEL ON BOARD — POUNDS

	IF YOU ARE AT SEA LEVEL				IF YOU ARE AT 10,000 FEET				IF YOU ARE AT 20,000 FEET			
	ENDURANCE AT SEA LEVEL	OPTIMUM ALTITUDE	ENDURANCE AT OPTIMUM ALTITUDE	C.A.S. AT OPTIMUM ALTITUDE	ENDURANCE AT 10,000	OPTIMUM ALTITUDE	ENDURANCE AT OPTIMUM ALTITUDE	C.A.S. AT OPTIMUM ALTITUDE	ENDURANCE AT 20,000	OPTIMUM ALTITUDE	ENDURANCE AT OPTIMUM ALTITUDE	C.A.S. AT OPTIMUM ALTITUDE
	MINUTES	FEET	MINUTES	KNOTS	MINUTES	FEET	MINUTES	KNOTS	MINUTES	FEET	MINUTES	KNOTS
2300	60	35,000	91	210	76	35,000	96	210	92	35,000	101	210
1900	48	35,000	70	205	61	35,000	75	205	73	35,000	79	205
1700	42	35,000	59	200	53	35,000	64	200	64	35,000	69	200
1500	36	30,000	50	200	45	35,000	53	200	55	35,000	58	200
1300	30	25,000	39	200	38	30,000	43	200	46	30,000	47	200
1100	24	20,000	29	195	30	25,000	33	195	36	25,000	37	195
900	18	15,000	20	195	23	20,000	24	195	27	20,000	27	195
700	12	S.L.	12	190	15	10,000	15	195	27	20,000	27	195
500	6	S.L.	6	190	7	10,000	7	190	9	20,000	9	190
CLIMB CAS KNOTS	390 DECREASING 3 KTS PER 1000 FT. UP TO 25,000 5KTS PER 1000 FT. ABOVE 25,000				360 DECREASING 3 KTS PER 1000 FT. UP TO 25,000 5KTS PER 1000 FT. ABOVE 25,000				330 DECREASING 3 KTS PER 1000 FT. UP TO 25,000 5KTS PER 1000 FT. ABOVE 25,000			
LET DOWN AIRSPEED	30° DIVE NOT TO EXCEED .9 MACH – SPEED BRAKES OPEN				30° DIVE NOT TO EXCEED .9 MACH – SPEED BRAKES OPEN				30° DIVE NOT TO EXCEED .9 MACH – SPEED BRAKES OPEN			
START LET DOWN WITH FUEL ON BOARD – POUNDS	300				315				325			

	IF YOU ARE AT 30,000 FEET				IF YOU ARE AT 35,000 FEET				IF YOU ARE AT 40,000 FEET			
	ENDURANCE AT 30,000	OPTIMUM ALTITUDE	ENDURANCE AT OPTIMUM ALTITUDE	C.A.S. AT OPTIMUM ALTITUDE	ENDURANCE AT 35,000	OPTIMUM ALTITUDE	ENDURANCE AT OPTIMUM ALTITUDE	C.A.S. AT OPTIMUM ALTITUDE	ENDURANCE AT 40,000	OPTIMUM ALTITUDE	ENDURANCE AT OPTIMUM ALTITUDE	C.A.S. AT OPTIMUM ALTITUDE
	MINUTES	FEET	MINUTES	KNOTS	MINUTES	FEET	MINUTES	KNOTS	MINUTES	FEET	MINUTES	KNOTS
2300	102	35,000	105	210	106	35,000	106	210	103	35,000	107	210
1900	82	35,000	83	205	85	35,000	85	205	82	35,000	86	205
1700	72	35,000	73	200	74	35,000	74	200	72	35,000	75	200
1500	61	35,000	62	200	64	35,000	64	200	62	35,000	65	200
1300	51	30,000	51	200	53	35,000	53	200	51	35,000	54	200
1100	41	30,000	41	195	42	35,000	42	195	41	35,000	43	195
900	30	30,000	30	195	32	35,000	32	195	31	35,000	33	195
700	20	30,000	20	195	21	35,000	21	195	20	35,000	22	195
500	10	30,000	10	190	11	35,000	11	190	10	35,000	12	190
CLIMB CAS KNOTS	285 DECREASING 5 KNOTS PER 1000 FT.				NO CLIMB REQUIRED				DESCEND IMMEDIATELY TO 35,000 FEET			
LET DOWN AIRSPEED	30° DIVE NOT TO EXCEED .9 MACH – SPEED BRAKES OPEN				30° DIVE NOT TO EXCEED .9 MACH – SPEED BRAKES OPEN				30° DIVE NOT TO EXCEED .9 MACH – SPEED BRAKES OPEN			
START LET DOWN WITH FUEL ON BOARD – POUNDS	330				335				340			

P8408-1

REMARKS:

(1) Endurance times are in minutes.

(2) Endurance times include a climb to optimum altitude (where applicable) using "MIL" (100%) RPM, and a 30 degrees maximum rate descent (speedbrakes open, idle rpm) to sea level with an allowance of 300 pounds of fuel for landing.

DATA AS OF: 1 August 1955
DATA BASIS: Calculations

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

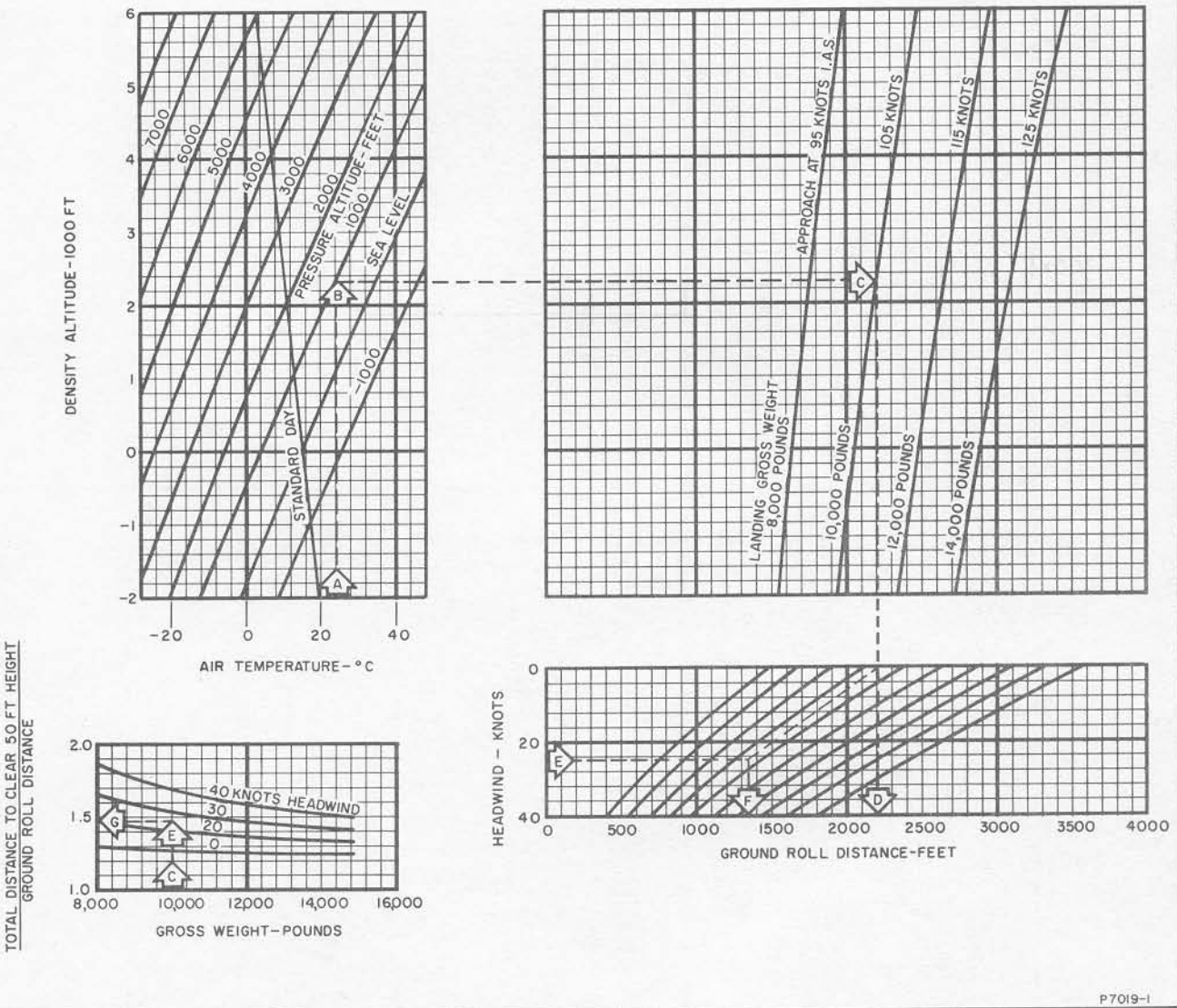
Figure A-45

LANDING DISTANCE

HARD SURFACE RUNWAY

MODEL: A4D-1

ENGINE: J65-W-4



P7019-1

REMARKS:

(1) Retract wing flaps immediately upon touchdown.
(2) Chart distances will be obtained by applying maximum braking action without skidding.

DATA AS OF: 15 April 1955
DATA BASIS: Calculations

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 lb/gal

Figure A-46

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