performance data

APPENDIX I

AA1-215

TABLE OF CONTENTS

Note

The illustrations in this appendix are applicable to both the C-118A and the VC-118A.

part 1 introduction

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LIST OF ILLUSTRATIONS

ABBREVIATIONS.

Abbreviation	*Definition*
ADI	Anti-detonation injection
Alt.	Altitude
BHP	Brake horsepower
BMEP	Brake mean effective pressure
°C	Degrees Centigrade
CAS	Calibrated airspeed
CAT	Carburetor air temperature
CHT	Cylinder head temperature
Comp.	Component
Crit.	Critical
EAS	Equivalent airspeed
Eng.	Engine
°F	Degrees Fahrenheit
Fld.	Field
Ft.	Feet
Hg	Mercury
IAS	Indicated airspeed
ICAO	International Civil Aviation Organization
In.	Inch
Kts.	Knots
Lbs.	Pounds
MAP	Manifold absolute pressure
METO	Maximum except takeoff
Min.	Minute
OAT	Outside air temperature

Abbreviation	*Definition*
PSI	Pounds per square inch
Pt.	Point
RPM	Revolutions per minute
S.L.	Sea level
Std.	Standard
T	Absolute temperature
TAS	True airspeed
V_A	Acceleration check speed
V_{CO}	Climbout speed
V_{CRIT}	Critical engine failure speed
V_D	Decision speed
$V_{L/D}$	Speed for maximum lift to drag ratio
V_{MC}	Minimum control speed
V_{NE}	Maximum dive speed
V_{NO}	Maximum speed for normal operation
V_R	Refusal speed
V_S	Stalling speed
V_{SO}	Stalling speed with zero thrust and wing flaps in landing configuration
V_{TO}	Takeoff speed
Wt.	Weight
δ	Delta; ratio of ambient air pressure to standard sea level air pressure
σ	Sigma: ratio of ambient air density to standard sea level air density

DEFINITION OF TERMS.

AIRSPEED — the speed of the aircraft relative to the air through which it is moving.

AMBIENT CONDITIONS — conditions of the air surrounding the aircraft at any given time under consideration.

AUTO-LEAN — the mixture control lever at the lean detent.

AUTO-RICH — the mixture control lever at the rich detent.

BEST ECONOMY MIXTURE — the fuel-air mixture which results in the most power for a given fuel flow.

BEST POWER MIXTURE — the fuel-air mixture which results in the most power for a given manifold pressure.

BMEP DROP — a loss in BMEP due to a manual adjustment of the mixture control.

CALIBRATED AIRSPEED — indicated airspeed corrected for instrument and position error.

CLIMBOUT FACTOR — a factor used to detremine the maximum gross weight allowable for climbout over a given obstacle on three engines, based on the height of the obstacle and distance of the obstacle from brake release.

COMPRESSIBILITY ERROR — an error in the airspeed indicator reading and the outside air temperature indicator reading caused by air being slightly compressed by the moving aircraft.

CRITICAL ENGINE FAILURE SPEED — the speed at which engine failure permits acceleration to takeoff speed in the same distance that the aircraft may be decelerated to a stop.

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

DENSITY ALTITUDE — the altitude obtained from a standard density altitude chart (such as figure A1-12) for any given pressure altitude and temperature or for any density ratio factor ($1/\sqrt{\sigma}$).

DEW POINT — the temperature at which condensation occurs in a cooling mass of air.

DRY BULB TEMPERATURE — the air tmeperature as indicated by a thermometer with a dry bulb (true air temperature).

DRY POWER — engine power being developed without the aid of water injection (ADI switch OFF).

EFFECTIVE WIND (HEADWIND OR TAILWIND) — The component of the existing wind condition which acts opposite to or in the direction of travel. For takeoff or landing, this component will be computed from the takeoff and landing crosswind chart.

EQUIVALENT AIRSPEED — calibrated airspeed corrected for compressibility.

ACCELERATION CHECK POINT — a predetermined point, based on time/distance, at which the acceleration check speed should be attained.

ACCELERATION SPEED — the minimum acceptable speed at the acceleration checkpoint.

GROUND EFFECT — the reduction in induced drag when the aircraft is near the ground.

HIGH BLOWER — the engine supercharger in high gear ratio.

INCHES HG — a measure of air pressure which compares it to the weight of a column of mercury.

INDICATED AIRSPEED — airspeed indicator reading uncorrected (assuming the mechanical error in the instrument is negligible).

LOW BLOWER — the engine supercharger in low gear ratio.

MANUAL LEAN — fuel-air mixture on the lean side of best power mixture, adjusted manually to give a prescribed BMEP drop from best power mixture.

MANUAL RICH — fuel-air mixture on the rich side of best power mixture, adjusted manually to reduce fuel flow to the prescribed minimum shown on figure A2-13.

NAUTICAL MILES PER POUND — the number of nautical miles traveled while consuming a pound of fuel.

OPERATING WEIGHT EMPTY — the weight of the aircraft and its contents, not including payload, fuel or regular engine oil, when the aircraft is loaded with all provisions necessary to complete a mission.

POSITION ERROR — the error in the airspeed indicator reading and the altimeter reading caused by the inability of the static orifices to experience the true ambient air pressure.

PRESSURE ALTITUDE — the altitude obtained from a standard atmosphere table, such as figure A1-13, for any given value of air pressure (measured in inches Hg). This is the altitude that an altimeter will show (after correcting for position error) when tbe barometric setting is at 29.92.

RAM — the increase in air pressure at the entrance to an airscoop due to the speed of the aircraft.

RECOMMENDED LONG RANGE CRUISE SPEED — the speed at which it is recommended to fly the aircraft when long range is of more concern than high speed. For the C-118A recommended long range cruise speed is the same at 110 percent of the speed of maximum lift to drag ratio.

REFUSAL DISTANCE — the distance required to accelerate to the refusal speed.

REFUSAL SPEED — maximum speed to which the aircraft can accelerate and then stop in tbe available runway length.

RELATIVE HUMIDITY — the ratio of the amount of water vapor in a given mass of air to the maximum amount of water vapor that the mass of air could hold at the same temperature.

SPECIFIC HUMIDITY — the ratio of the amount of water vapor in a given mass of air to the mass of dry air, measured in pounds.

STANDARD ATMOSPHERIC CONDITIONS — an arbitrarily selected set of atmospheric conditions chosen to approximate the average atmosphere of the world.

STANDARD DAY — a day on which standard atmospheric conditions are assumed to exist.

TAKEOFF FACTOR — a factor used to determine takeoff performance, based on available BMEP corrected for pressure altitude and temperature.

THRESHOLD SPEED — the speed at which the aircraft crosses the end of the runway during a normal landing (130 percent of the stall speed for wing flaps in the landing position).

TOUCHDOWN SPEED — the speed at which the aircraft comes in contact with the runway during a normal landing (120 percent of the stall speed for wing flaps in the landing position).

TRUE AIRSPEED — the true speed of the aircraft relative to the air through which it is moving (equal to EAS times $1/\sqrt{\sigma}$).

TRUE ALTITUDE — altitude above sea level.

VAPOR PRESSURE — the partial pressure of water vapor existing in the air.

V_D — DESCISION SPEED; the highest speed at which the pilot may elect either to continue takeoff or to stop should an engine fail. At higher speeds the aircraft is committed to takeoff.

$V_{L/D}$ — the speed for maximum lift to drag ratio.

V_{SO} — the zero thrust stalling speed with wing flaps in the landing configuration.

V_{TO} — takeoff speed (115 percent of the stalling speed with the wing flaps in the takeoff configuration).

WET BULB TEMPERATURE — the temperature indicated by a thermometer whose bulb has been kept moist with water and which has been circulated in the air. This temperature, along with the dry bulb temperature, is used in conjunction with a psychrometric chart to determine the degree of humidity.

WET POWER — the power developed by an engine with the aid of water injection (ADI fluid).

WIND GRADIENT — the change in wind speed with altitude. Because of friction between the air and the ground surface, the wind speed generally diminishes as one nears the ground.

INTRODUCTION.

The data shown in this Appendix are provided to aid the flight crews in achieving maximum utilization of the aircraft consistent with safety. In most cases data are included to permit missions to be planned with allowances for more than one degree of safety. This is done so that the importance of the mission may be weighed against safety requirements. For example, the charts in Part 3 allow takeoff distance to be determined based on the engines developing 100% of the predicted power or 95% of the predicted power, or even less, if desired. Furthermore, this takeoff distance may be based on all four engines operating all the way, or may allow for an engine failure at the most critical time. Similarly, rates of climb and cruise performance are shown for two, three or four engines operating, and landing distances are provided for brakes only or for either two engines or four engines operating at full reverse thrust.

It should be stressed that these charts show the optimum performance expected from the aircraft when flown with careful pilot technique under stable atmospheric conditions. There are several factors (mechanical imperfections, improper pilot technique, turbulent air, etc.) which adversely affect performance, whereas very few factors can improve performance. This is one of the reasons for allowing performance margins when planning a mission.

FUEL GRADES.

The standard fuel grade for the C-118A and VC-118A is 115/145. The alternate fuel grade is 100/130. Takeoff and climb data may be determined for both standard and alternate fuel grades. Cruise data is applicable to either fuel grade, except as noted.

Note

The P&W R2800-52W engine used on C-118A aircraft was certificated using 108/135 grade fuel. It is permissible to substitute 108/135 grade fuel for 115/145 grade fuel without any loss in engine performance.

INSTRUMENT ERRORS.

All instruments have some degree of mechanical error. Ordinarily this may be assumed to be negligible since the instruments are maintained within specified tolerances. However, the airspeed indicator, altimeter and outside air temperature indicator have other sources of error which, under certain circumstances, are great enough to require corrections to be made to the instrument readings. One of these errors, known as the position error, arises from the requirement that the airspeed indicator and altimeter must measure the ambient air pressure. This is done through the static orifices on the side of the fuselage for the pilot's and copilot's normal systems and through a duct ending in the tailcone for the alternate systems. Because of the rapid motion of the airplane through the air neither of these locations transmit the true ambient pressure at all speeds and angles of attack. The correction for this error is included in the Airspeed Position Error Correction charts *(figures A1-1 through A1-4)* and the Altimeter Position Error Correction charts *(figures A1-6 through A1-9)*. The Airspeed Position Error Correction charts also include a correction for a smaller error due to the position of the pitot tubes which measure the impact pressure.

Another error in the airspeed system is due to the behavior of air striking the pitot tubes at high velocities. This is called the compressibility error. The markings on the airspeed indicator have been spaced so that this error is automatically accounted for at sea level. At higher altitudes, however, corrections for this error should be applied to the instrument reading. These corrections appear on the Calibrated Airspeed Correction for Compressibility chart *(figure A1-5)*.

The outside air temperature indicator also has an error known as the compressibility error. This error arises from the fact that the outside air passes the temperature sensing element at a speed approximately equal to the speed of the aircraft. However, the very thin layer of air in immediate contact with the sensing element has been brought almost to rest (relative to the element). In doing this its temperature has risen due to a combination of compression and friction. The correction for this error appears on the Temperature Correction for Compressibility chart *(figure A1-10)*.

AIRSPEED TERMINOLOGY.

Airspeed terminology used in this Appendix is defined as follows:

Term	*Abbreviation*	*Definition*
Indicated Airspeed	IAS	*Airspeed Indicator reading uncorrected.
Calibrated Airspeed	CAS	Indicated airspeed corrected for position error.
Equivalent Airspeed	EAS	Calibrated airspeed corrected for compressibility.
True Airspeed	TAS	$TAS = EAS \times 1/\sqrt{\sigma}$

*IAS is used in this Appendix as though the mechanical error in the instrument is zero.

All airspeeds of importance in takeoff and landing procedures are shown in this Appendix as indicated airspeed (IAS).

PROCEDURE TO CONVERT INDICATED AIRSPEED (IAS) TO TRUE AIRSPEED (TAS).

Charts and tables are provided to convert indicated airspeed to true airspeed. This is done in three steps as follows:

Sample Problem.

GIVEN:	Indicated Airspeed	= 185 knots
	Pressure Altitude	= 15,000 feet
	Outside Air Temperature	= −30°C
FIND:	True Airspeed	

INDICATED AIRSPEED (IAS) TO CALIBRATED AIRSPEED (CAS).

1. Find applicable position error correction chart, noting static source reference. For example, Figure A1-1, Airspeed Position Error Correction Chart — Pilot's Normal Static Source.
2. Enter chart at 185 knots IAS and project vertically to curve.
3. Project horizontally left to correction scale. Read 3.5 knots. Round off to 4 knots.
4. To obtain calibrated airspeed, add correction.

   185 knots IAS + 4 knots = 189 knots CAS.

CALIBRATED AIRSPEED (CAS) TO EQUIVALENT AIRSPEED (EAS).

1. To obtain equivalent airspeed, correct calibrated airspeed for compressibility error, which varies with airspeed and pressure altitude.
2. Use chart Figure A1-5, Calibrated Airspeed Correction for Compressibility Chart.
3. Enter chart on calibrated airspeed scale at 189 knots (CAS). Project vertically to intersection with 15,000 feet pressure altitude curve.
4. Project horizontally to scale on left edge of chart. Read correction 1.5 knots. Round off to 2 knots.
5. Subtract correction from calibrated airspeed to obtain equivalent airspeed.

   189 knots CAS − 2 knots = 187 knots EAS.

EQUIVALENT AIRSPEED (EAS) TO TRUE AIRSPEED (TAS).

True airspeed may be found by multiplying the equivalent airspeed by the quantity $1/\sqrt{\sigma}$, where σ (sigma) is the density ratio of ambient air to standard sea level air. The quantity $1/\sqrt{\sigma}$ is sometimes referred to as the "Smoe factor."

1. Correct OAT for compressibility by use of Figure A1-10. For 15,000 feet pressure altitude and 189 knots CAS, read 3.6°C correction. Round off to 4°C.

   −30°C OAT −4°C correction = −34°C OAT.
2. Enter Density Altitude chart, Figure A1-11, with −34°C and project vertically to 15,000 feet pressure altitude line.
3. Project horizontally to right edge of chart. Read $1/\sqrt{\sigma} = 1.213$.
4. Another method of obtaining $1/\sqrt{\sigma}$ is to project horizontally to the density altitude scale at the left. Read 12,600 feet density altitude. Then, by using the ICAO Standard Atmosphere Table (*Figure A1-12,* sheet two), read $1/\sqrt{\sigma} = 1.2127$ opposite 12,600 feet.
5. EAS x $1/\sqrt{\sigma}$ = TAS.

   189 knots EAS x 1.213 = 229 knots TAS.

DISCUSSION OF CHARTS.

AIRSPEED POSITION ERROR CORRECTION CHARTS.

These charts (*figures A1-1 through A1-4*) show the correction that must be applied to the indicated airspeed to determine the calibrated airspeed. Corrections are shown for the pilot's normal static source, the copilot's normal static source, and the pilot's and copilot's alternate static source. It will be seen on the chart for the pilot's and copilot's alternate static source that one curve is provided for airplanes with sealed tailcone and another for airplanes with unsealed tailcone. The choice between using one curve or the other depends upon the configuration of the particular aircraft.

Three of the charts are for in-flight use, while the fourth is for use during the takeoff ground run.

CALIBRATED AIRSPEED CORRECTION FOR COMPRESSIBILITY CHART.

This chart *(figure A1-5)* shows the correction that must he subtracted from calibrated airspeed to determine equivalent airspeed. It will be noted that there is no correction at sea level and that the amount of the correction increases with increasing altitude.

ALTIMETER POSITION ERROR CORRECTION CHARTS.

These charts *(figures A1-6 through A1-9)* show the corrections that must be applied to the altimeter reading to obtain the true altitude. If the barometric setting is at 29.92 the result will be true pressure altitude. If, instead, the barometric setting is at the local sea level value the result will be approximate true altitude.

Corrections are shown for the pilot's normal static source, the copilot's normal static source, and the pilot's and copilot's alternate static source. It will be seen that there are two charts for the alternate static source. One is for airplanes with sealed tailcone and the other is for airplanes with unsealed tailcone. The choice between using one curve or the other depends upon the configuration of the particular aircraft.

On figures A1-6 through A1-9 chase-around lines illustrate the following sample problem.

GIVEN: Airspeed = 185 knots IAS.
Altimeter reading =

14,940 feet, pilot's normal static source;

14,890 feet, copilot's normal static source;

14,950 feet, pilot's and copilot's alternate static source, tailcone sealed;

15,150 feet, pilot's and copilot's alternate static source, tailcone unsealed.

FIND: True altitude

1. Enter the indicated airspeed scale at 185 knots.

2. Proceed vertically to appropriate altimeter reading.

3. Go horizontally to the left hand scale and read the correction:

60 feet, pilot's normal static source *(figure A1-6);*

110 feet, copilot's normal static source *(figure A1-7);*

50 feet, pilot's and copilot's alternate static source, tailcone sealed *(figure A1-8);*

−150 feet, pilot's and copilot's alternate static source, tailcone unsealed *(figure A1-9).*

In each case when the correction is added to the appropriate altimeter reading the true altitude becomes 15,000 feet.

TEMPERATURE CORRECTION FOR COMPRESSIBILITY CHART.

This chart *(figure A1-10)* shows the correction that must be subtracted from the outside air temperature indicator reading to determine the true outside air temperature (see next under "INSTRUMENT ERRORS"). For example, assume that the airplane is cruising at 185 knots CAS (point A) at an altitude of 15,000 feet (point B). The chart shows that the correction is 3.5°C (point C). This amount must be subtracted from the indicated air temperature to determine the outside air temperature. If the instrument read 6°C, then the outside air temperature would be 6 −3.5, or 2.5°C. If the instrument read −12°C, then the outside air temperature would be −12 −3.5, or −15.5°C.

DENSITY ALTITUDE CHART.

A Density Altitude Chart *(figure A1-11)* has been included so that the density altitude and the reciprocal of the square root of the density ratio ($1/\sqrt{\sigma}$) may be determined for any pressure altitude under nonstandard conditions. Sheet one covers a range of density altitudes from −8,000 feet to 18,000 feet, and sheet two extends from 14,000 feet to 40,000 feet.

ICAO STANDARD ATMOSPHERE TABLE.

The ICAO Standard Atmosphere Table *(figure A1-12)* shows values of the various atmospheric properties for a standard day as defined by the International Civil Aviation Organization. Sheet one lists the density ratio (σ), the reciprocal of the square root of the density ratio ($1/\sqrt{\sigma}$), the temperature, speed of sound, pressure and pressure ratio (δ) for every thousand feet of altitude from sea level to 45,000 feet. Sheet two lists only the reciprocal of the square root of the density ratio ($1/\sqrt{\sigma}$) for every 100 feet of altitude from 100 feet to 30,000 feet.

The standard atmosphere defined by ICAO represents an approximation to the average atmosphere of the world. It is based on a temperature of 15°C (59°F) and a pressure of 29.92 inches Hg for sea level conditions. The temperature variation with height is uniform from 15°C (59°F) at sea level to −56.5°C (−69.7°F) at 36,089 feet. This altitude is assumed to be the beginning of the isothermal region or stratosphere. For all practical purposes, the temperature will remain constant as altitude is increased above 36,089 feet. ICAO standard atmosphere values have been used in preparation of all performance charts in this Appendix.

PSYCHROMETRIC CHART.

The Psychrometric Chart (*figure A1-13*) graphically relates the various measures of water vapor in the atmosphere. Although it is the dew point which is commonly furnished the pilot, occasionally humidity may be available as wet and dry bulb temperatures, and less often, as relative humidity. To meet all such situations the psychrometric chart provides a means of converting from one variable to another.

Three examples for obtaining specific humidity are given below which differ as to which quantities are known.

Example 1:

GIVEN: Pressure altitude = 5000 ft.
Dew point = 54.5°F

FIND: Specific humidity

1. Locate 54.5°F dew point temperature on curved line for 100% relative humidity (point B). This point can be found either by interpolation between 50°F and 60°F along curved line or by entering at 54.5°F on dry bulb temperature scale (point A) and projecting vertically upward to curved line for 100% relative humidity.
2. From point B, proceed horizontally to left to base line and then follow along curved path interpolated between guide lines to 5000 ft. pressure altitude (point C).
3. Project horizontally to specific humidity scale at extreme left (point D) and read .0108.
4. If vapor pressure is desired, project horizontally from point B to extreme right (point E) and read 0.425 inches Hg.

Example 2:

GIVEN: Pressure altitude = 5000 ft.
Wet bulb temperature = 17°C
Dry bulb temperature = 26°C

FIND: Dew point and specific humidity

1. Enter with 26°C dry bulb temperature (point F) and proceed vertically upward to intersection with imaginary slant line for 17°C wet bulb temperature (point G). Note that the 17°C wet bulb temperature line can be located by interpolation between the 15°C and 20°C wet bulb lines for 5000 ft. altitude. To assist interpolation, the upper end of this line can be located by entering the dry bulb temperature scale at 17°C (point H) and projecting vertically upward to the 100% relative humidity line (point I). Draw slant line through point I parallel to 5000 ft. wet bulb dashed lines to intersection (point G) with vertical projection of point F.
2. From point G, project horizontally to left to dew point scale (point B) and read dew point, 54.5°F.
3. Continue left as in Example 1 (points C and D) to obtain a specific humidity of .0108.
4. From point G, project horizontally to right to obtain 0.425 inches Hg vapor pressure (point E).

Example 3:

GIVEN: Relative humidity = 43%
Dry bulb temperature = 26°C

FIND: Dew point and specific humidity

1. Enter dry bulb temperature scale at 26°C (point F) and proceed vertically upward to intersection with 43% relative humidity line, interpolated between 40% and 60% (point G).
2. Project horizontally to the left to the dew point scale (point B) and read dew point, 54.5°F.
3. To obtain specific humidity project horizontally to left base line and continue as in example 1 (points C and D) to read .0108.
4. From point G project horizontally to right to obtain 0.425 inches Hg vapor pressure (point E).

TEMPERATURE CONVERSION CHART.

A Temperature Conversion chart is provided *(figure A1-14)* to facilitate the conversion of either Fahrenheit temperatures to Centigrade or Centigrade temperatures to Fahrenheit. The appropriate scale is entered at the known temperature. The corresponding value may then be read from the other scale as indicated by the oblique line. For example, the chart shows that 50° Fahrenheit is the same temperature as 10° Centigrade.

AIRSPEED POSITION ERROR CORRECTION - FLIGHT

PILOT'S NORMAL STATIC SOURCE

THIS CHART APPLIES TO ALL FLAP
AND LANDING GEAR CONFIGURATIONS

Note:
Add correction to indicated airspeed to obtain calibrated airspeed.

MODEL: C-118A
DATA AS OF: 2-15-59
DATA BASIS: FLIGHT TEST

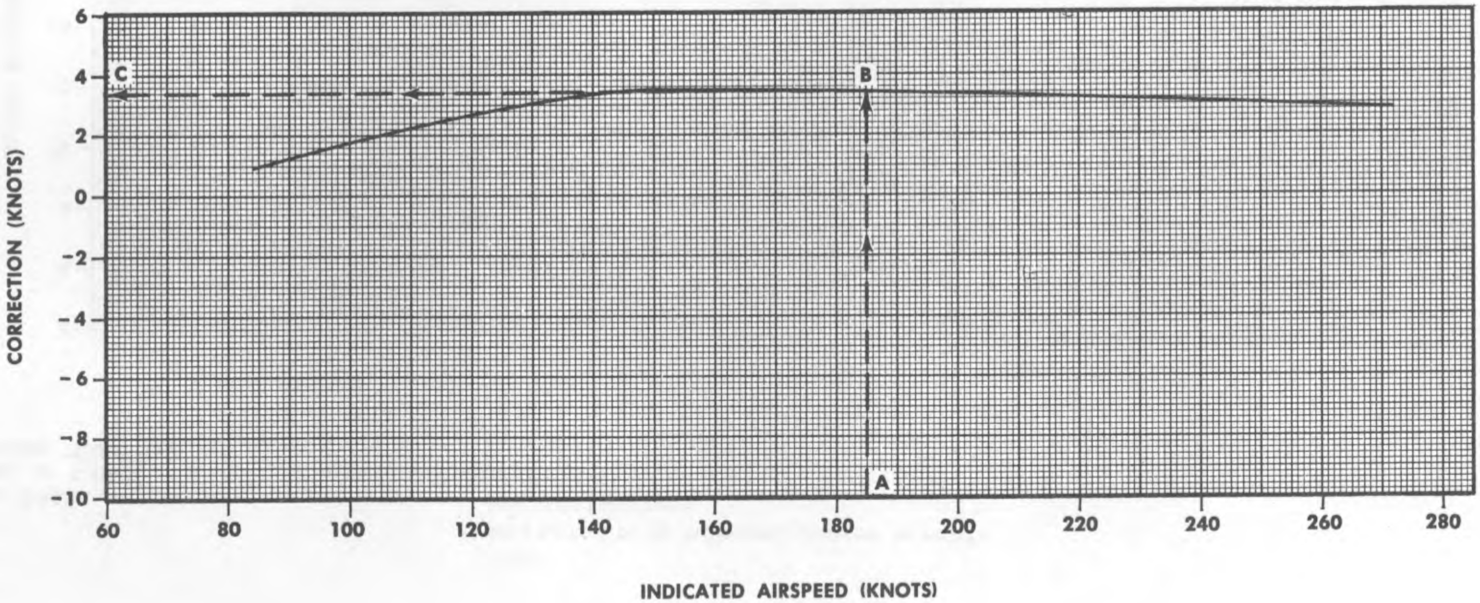


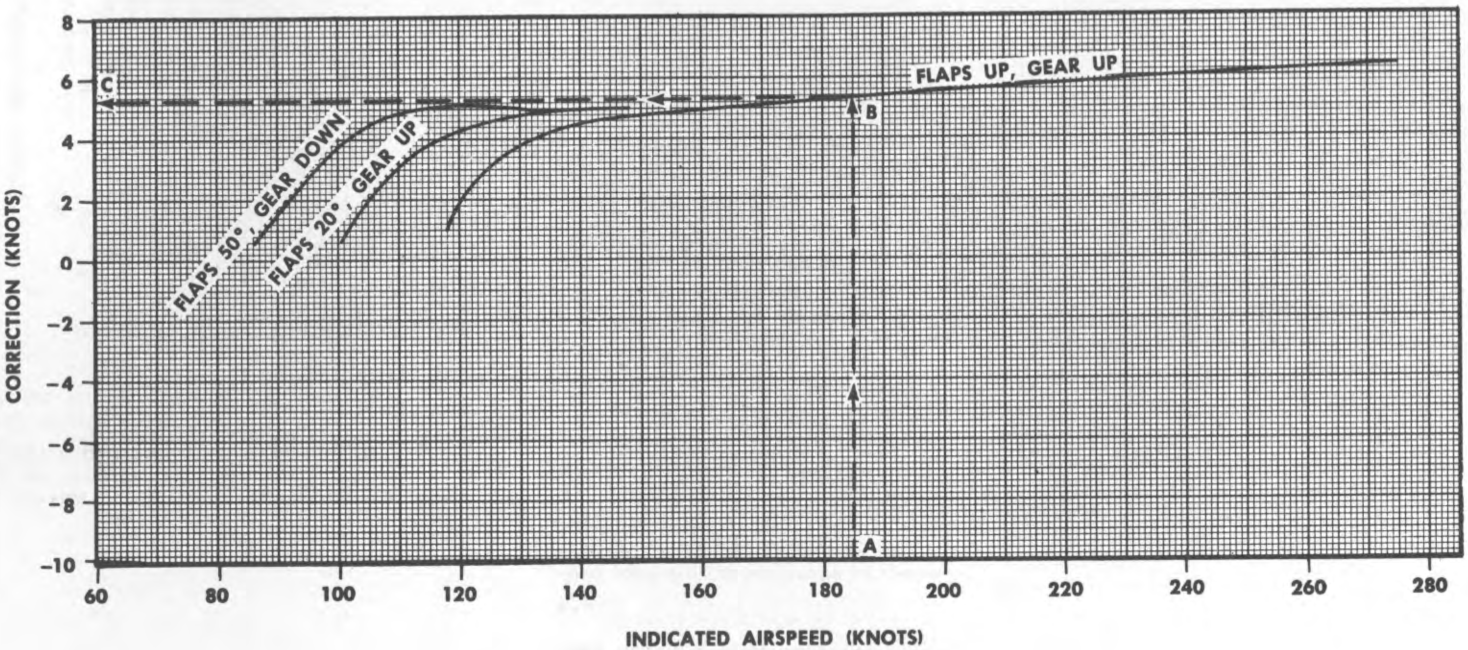
Figure A1-1. Airspeed Position Error Correction — Flight — Pilot's Normal Static Source

AA1-4

AIRSPEED POSITION ERROR CORRECTION — FLIGHT
COPILOT'S NORMAL STATIC SOURCE

MODEL: C-118A
DATA AS OF 2-15-59
DATA BASIS: FLIGHT TEST

Note:
Add correction to indicated airspeed to obtain calibrated airspeed.



AA1-3

Figure A1-2. Airspeed Position Error Correction — Flight — Copilot's Normal Static Source

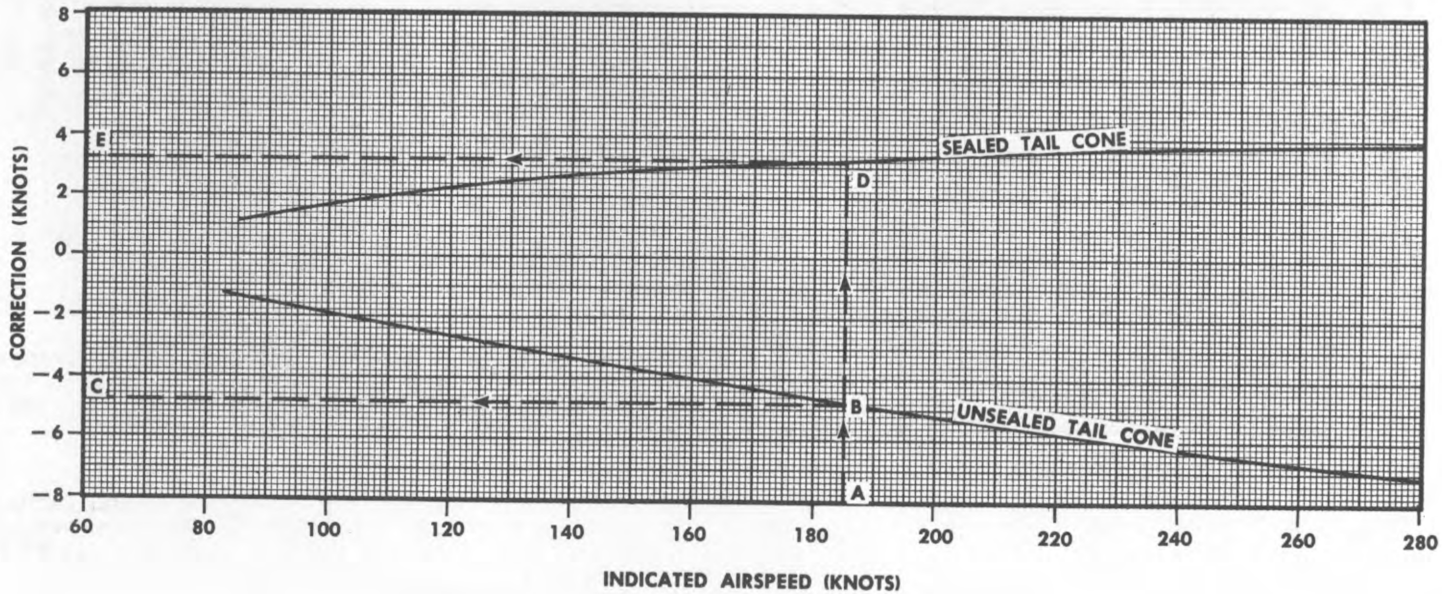
AIRSPEED POSITION ERROR CORRECTION — FLIGHT

PILOT'S AND COPILOT'S ALTERNATE STATIC SOURCE

THIS CHART APPLIES TO ALL FLAP AND LANDING GEAR CONFIGURATIONS

Note:
Add correction to indicated airspeed to obtain calibrated airspeed.

MODEL: C-118A
DATA AS OF 2-15-59
DATA BASIS: FLIGHT TEST



AA1-206

Figure A1-3. Airspeed Position Error Correction — Flight — Pilot's and Copilot's Alternate Static Source

AIRSPEED POSITION ERROR CORRECTION FOR THE GROUND RUN

PILOT'S AND COPILOT'S NORMAL STATIC SOURCE

MODEL: C-118A
DATA AS OF: 2-15-59
BASED ON: FLIGHT TEST

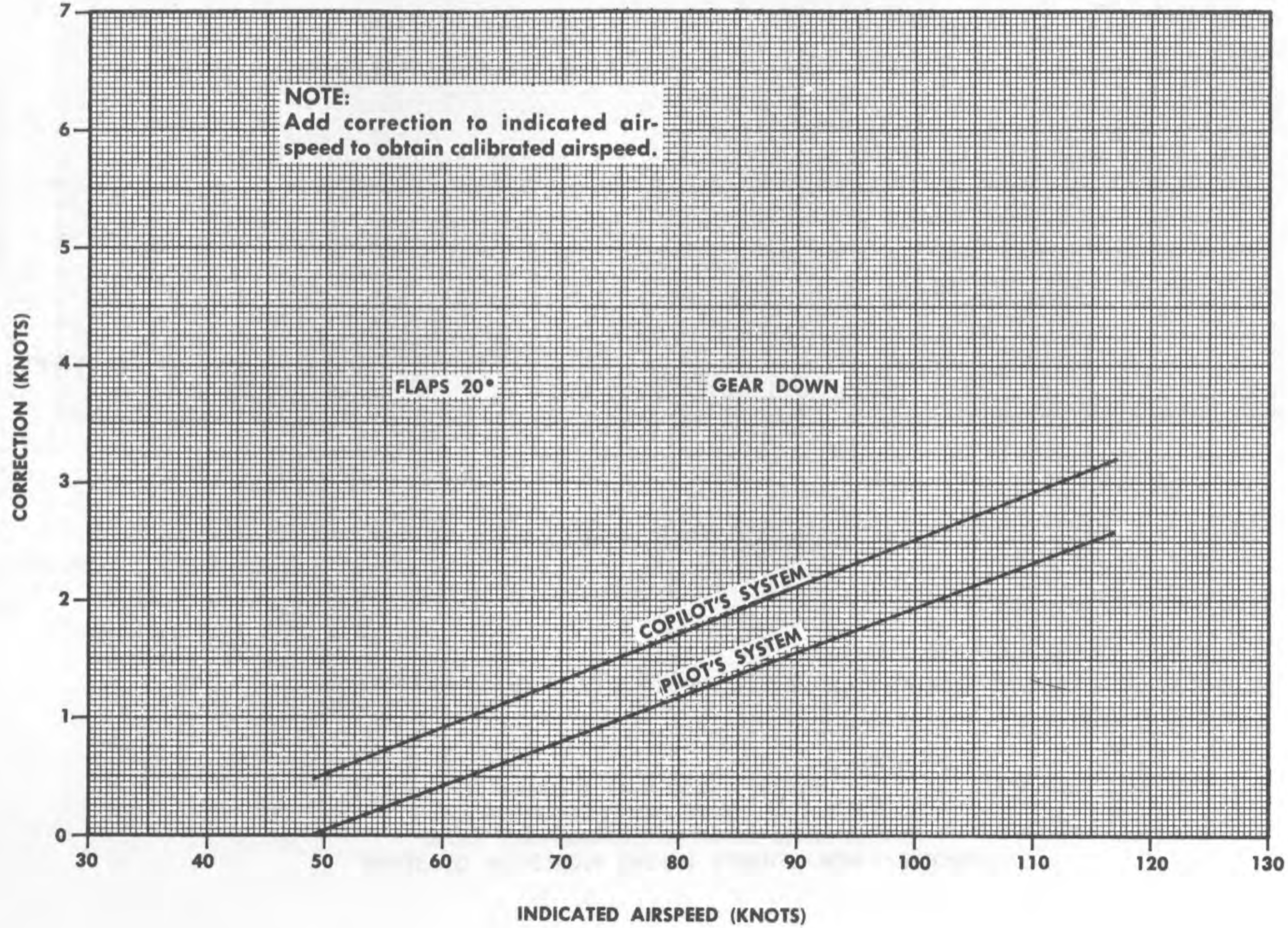


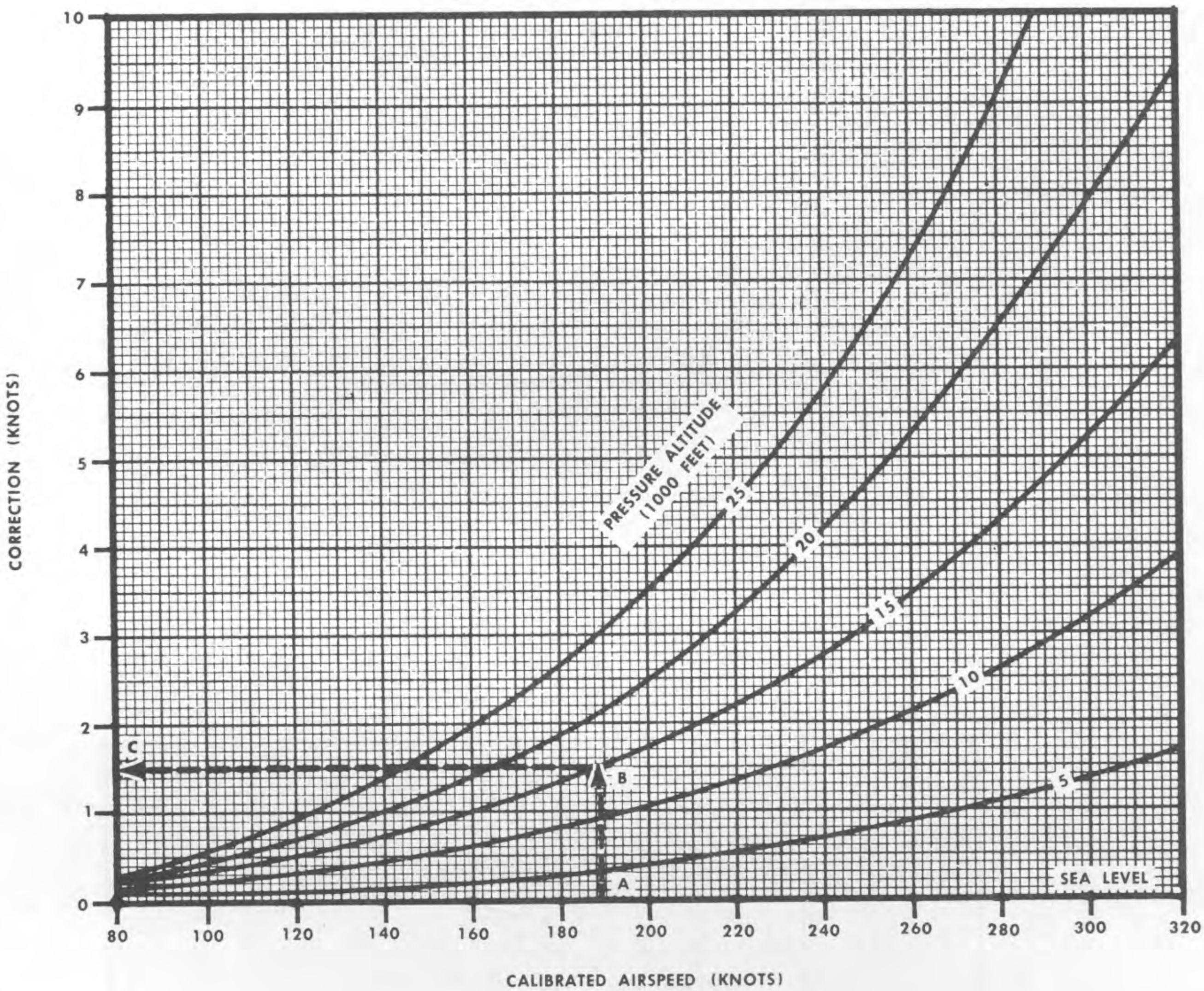
Figure A1-4. Airspeed Position Error Correction for the Ground Run

AA1-1

CALIBRATED AIRSPEED CORRECTION FOR COMPRESSIBILITY

MODEL: C-118A
DATA AS OF: 2-15-59

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



SAMPLE PROBLEM:
Given: Pressure altitude = 15,000 feet
calibrated airspeed = 189 knots
A. Enter graph at 189 knots CAS
B. At 15,000 feet read correction
C. Correction = 1.5 knots (round off to 2 knots).
D. 189 knots CAS — 2 knots = 187 knots EAS.

AA1-B

Figure A1-5. Calibrated Airspeed Correction for Compressibility

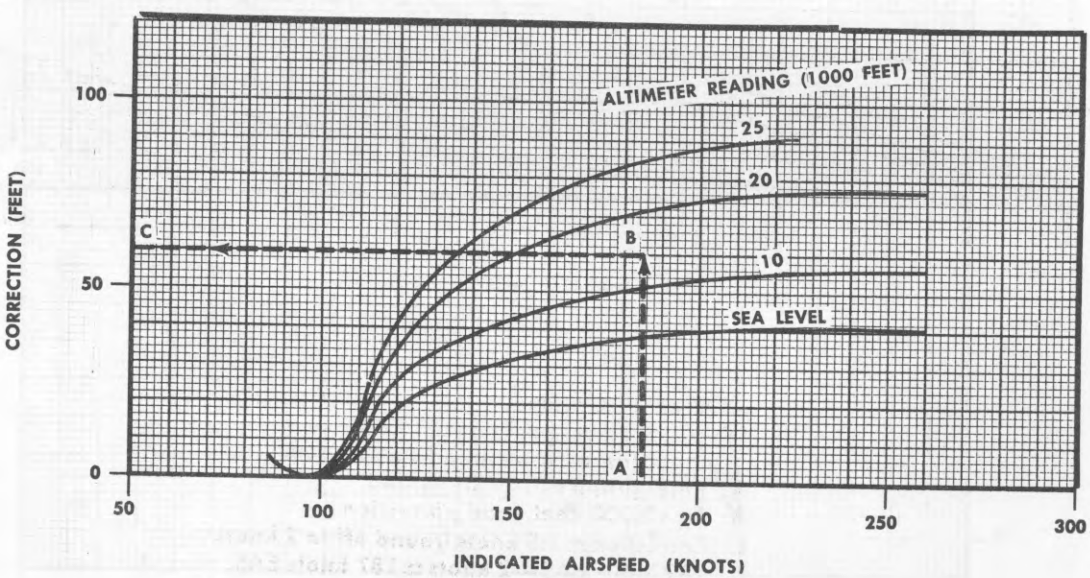
ALTIMETER POSITION ERROR CORRECTION

PILOT'S NORMAL STATIC SOURCE

THIS CHART APPLIES TO ALL FLAP AND LANDING GEAR CONFIGURATIONS

MODEL: C-118A
DATA AS OF: 2-15-59
DATA BASIS: FLIGHT TEST

Note:
Add correction to altimeter reading to obtain altitude.



AA1-207

Figure A1-6. Altimeter Position Error Correction — Pilot's Normal Static Source

ALTIMETER POSITION ERROR CORRECTION

COPILOT'S NORMAL STATIC SOURCE

MODEL: C-118A
DATA AS OF: 2-15-59
DATA BASIS: FLIGHT TEST

Note:
Add correction to altimeter reading to obtain altitude.

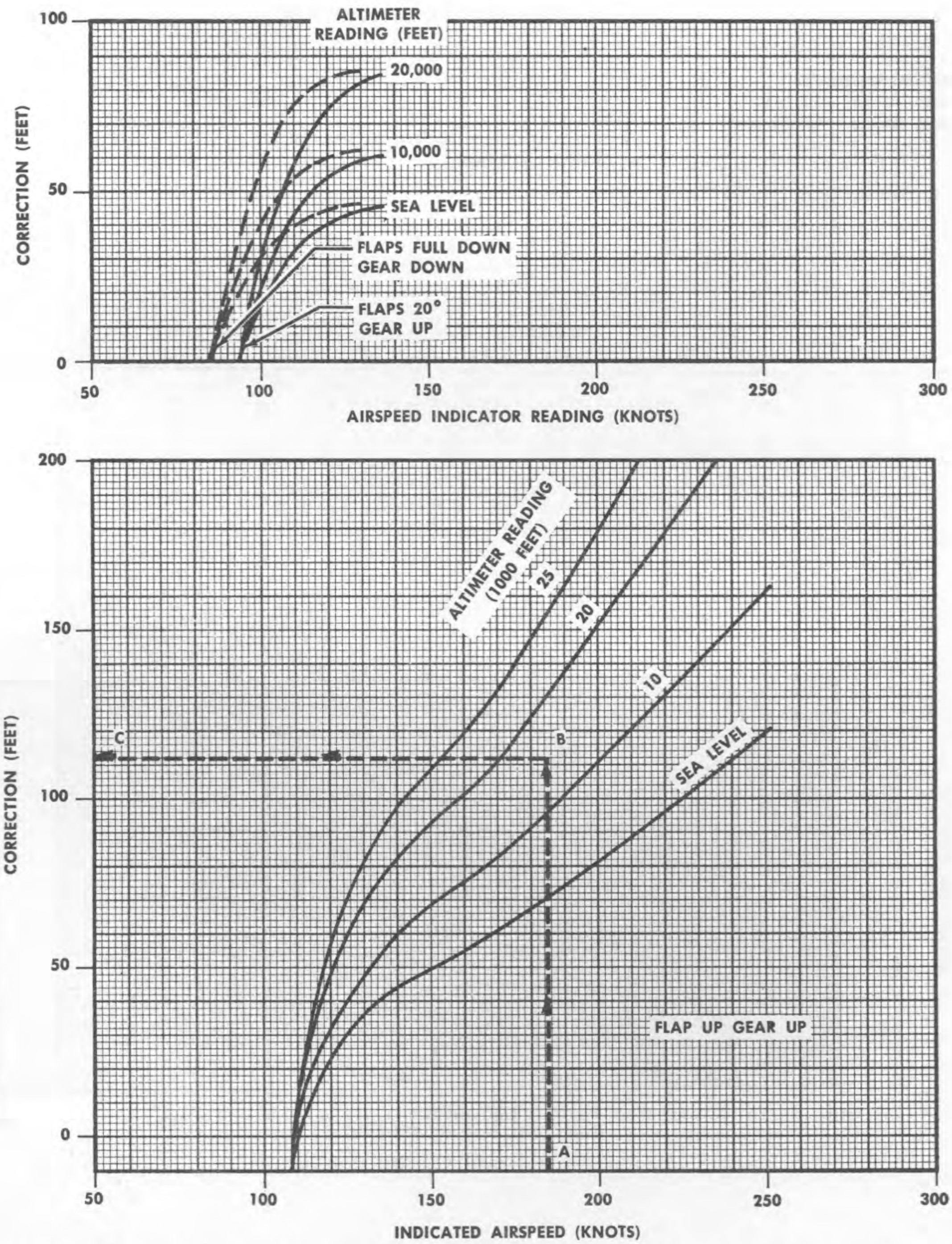


Figure A1-7. Altimeter Position Error Correction — Copilot's Normal Static Source

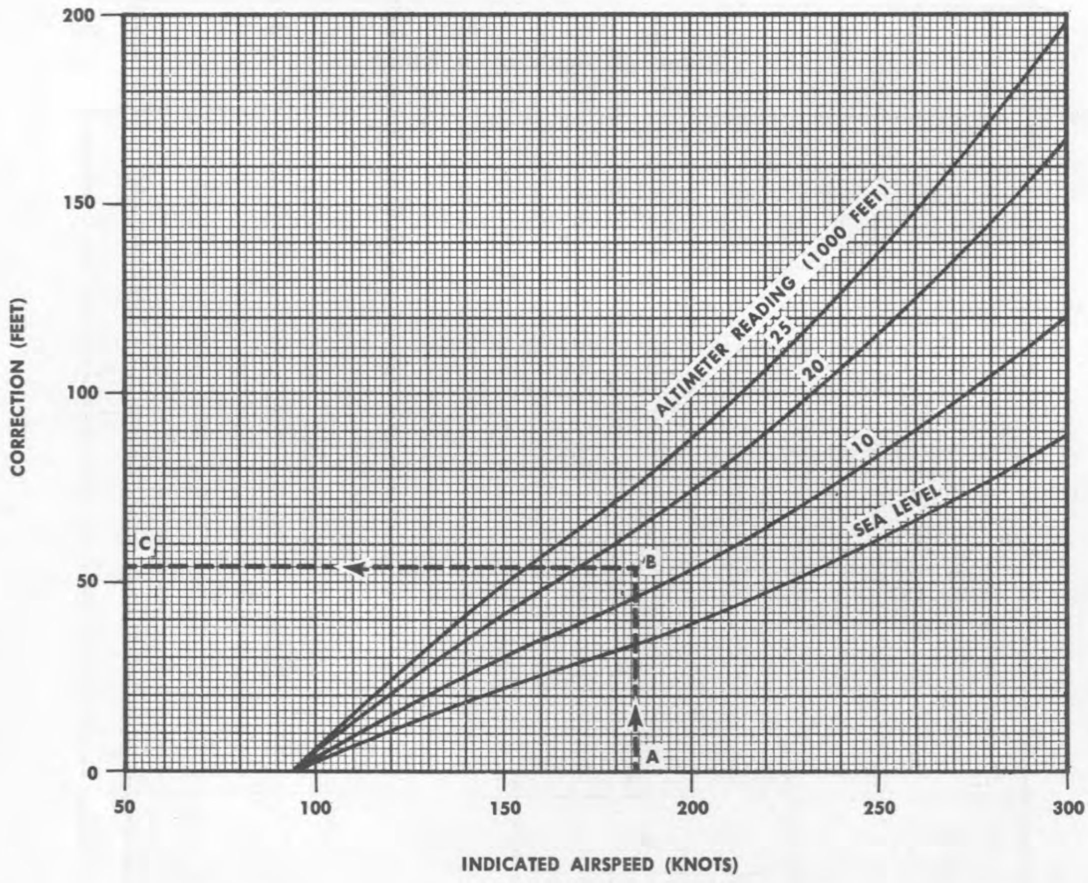
ALTIMETER POSITION ERROR CORRECTION

PILOT'S AND COPILOT'S ALTERNATE STATIC SOURCE
TAIL CONE SEALED

THIS CHART APPLIES TO ALL FLAP
AND LANDING GEAR CONFIGURATIONS

MODEL: C-118A
DATA AS OF 2-15-59
DATA BASIS: FLIGHT TEST

Note:
Add correction to altimeter reading to obtain altitude.



AA1-205

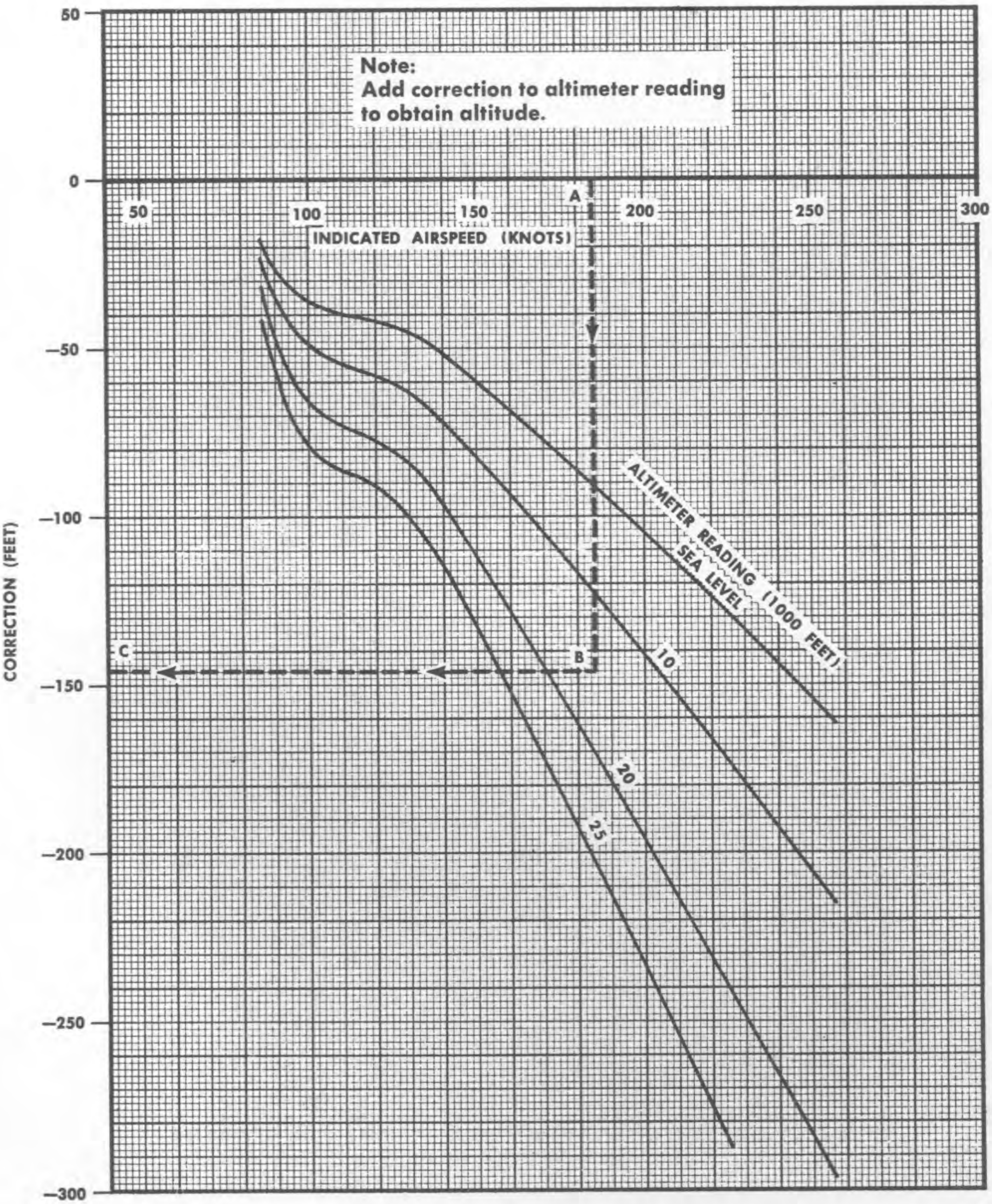
Figure A1-8. Altimeter Position Error Correction — Pilot's and Copilot's Alternate Static Source — Tailcone Sealed

ALTIMETER POSITION ERROR CORRECTION

PILOT'S AND COPILOT'S ALTERNATE STATIC SOURCE
TAILCONE UNSEALED

MODEL: C-118A
DATA AS OF: 2-15-59
DATA BASIS: FLIGHT TEST

THIS CHART APPLIES TO ALL FLAP AND LANDING GEAR CONFIGURATIONS



AA1-208

Figure A1-9. Altimeter Position Error Correction — Pilot's and Copilot's Alternate Static Source — Tailcone Unsealed

TEMPERATURE CORRECTION FOR COMPRESSIBILITY

MODEL: C-118A
DATA AS OF: 2-15-59
DATA BASIS: FLIGHT TEST

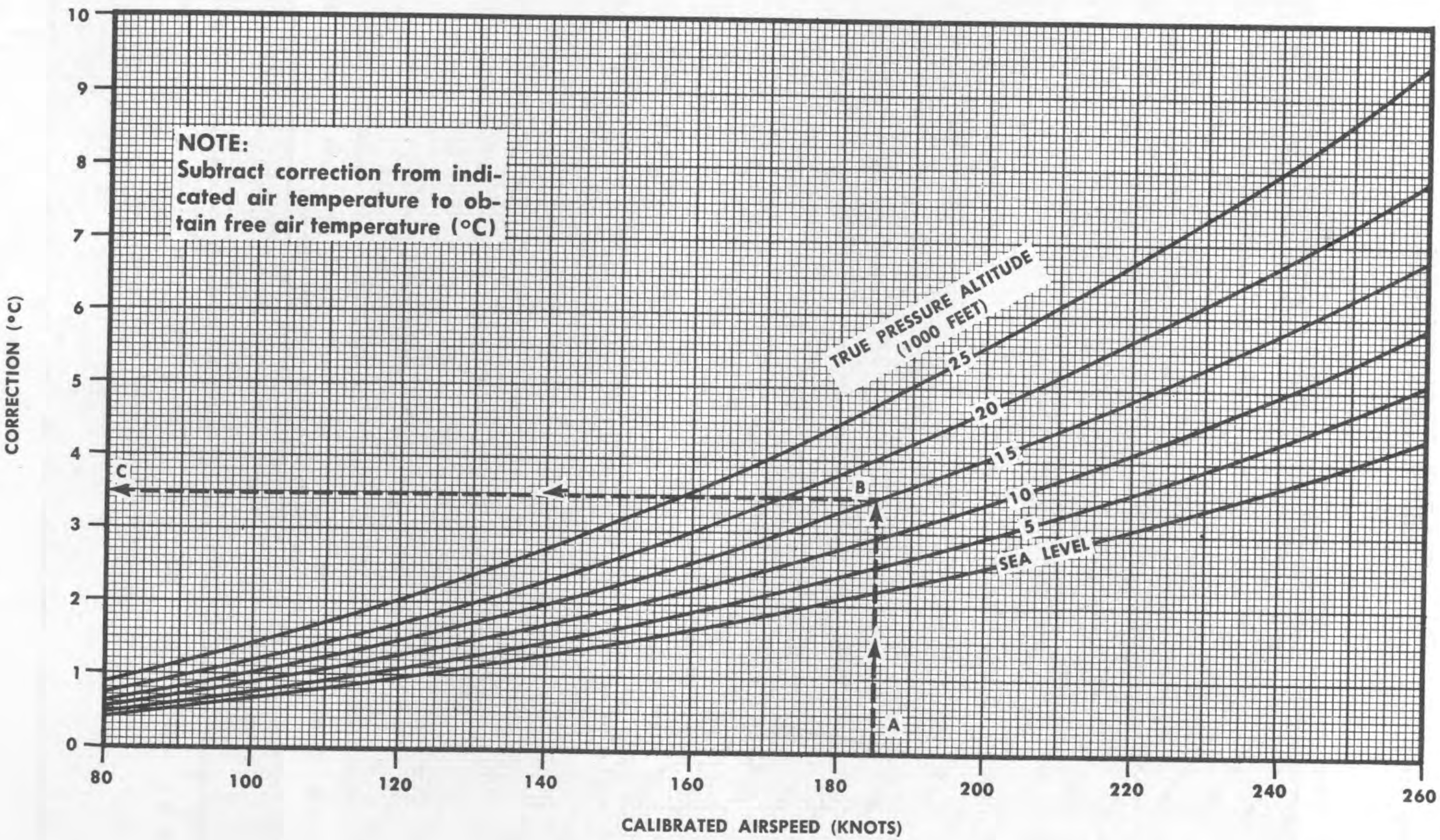


Figure A1-10. Temperature Correction for Compressibility

AA1-9

DENSITY ALTITUDE CHART

SAMPLE PROBLEM:

A. OUTSIDE AIR TEMPERATURE = 25°

B. PRESSURE ALTITUDE = 1500 FEET

C. $\frac{1}{\sqrt{\sigma}}$ = 1.045

D. DENSITY ALTITUDE = 3000 FEET

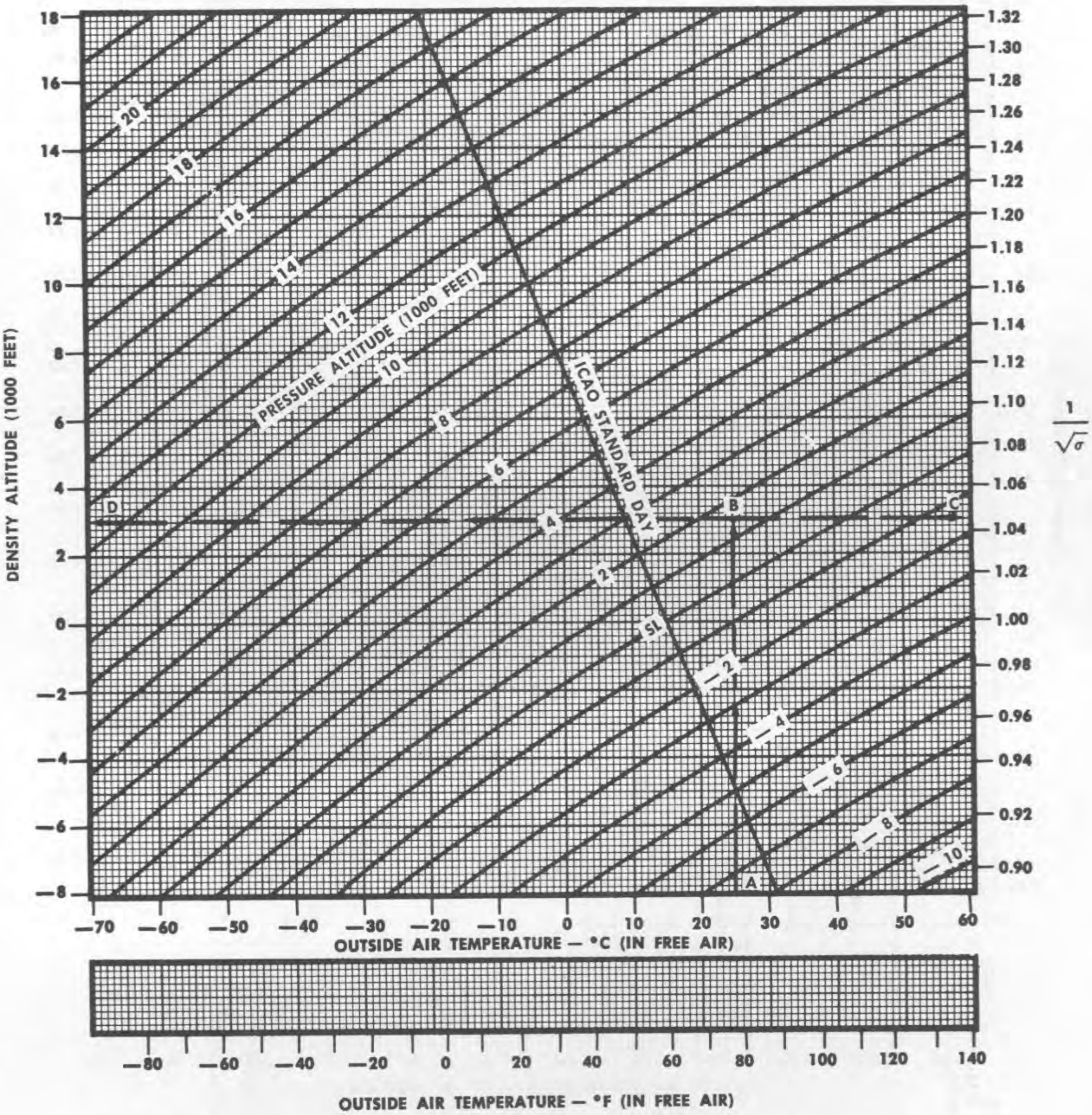


Figure A1-11. Density Altitude Chart (Sheet 1 of 2)

DENSITY ALTITUDE CHART

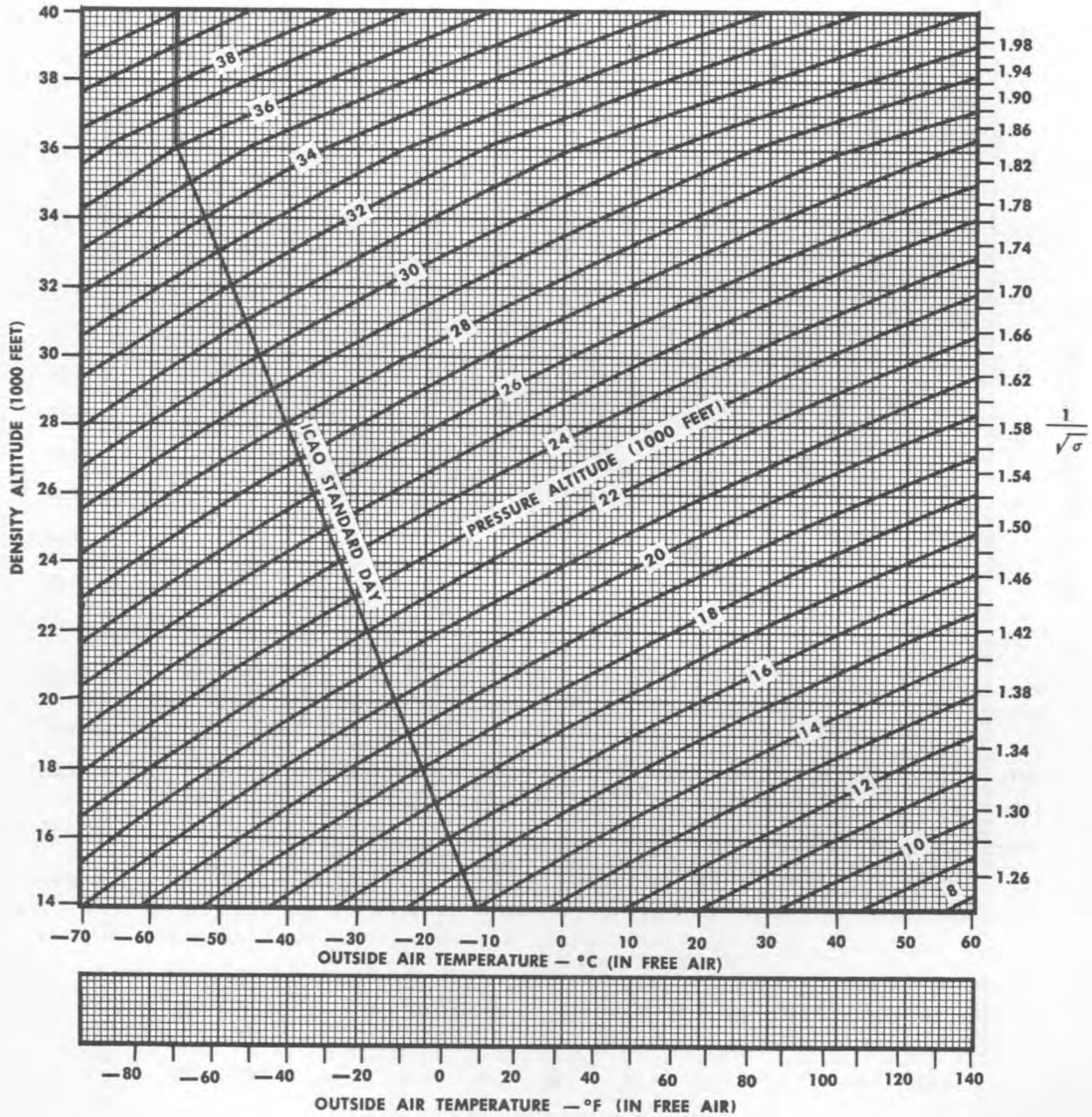


Figure A1-11. Density Altitude Chart (Sheet 2 of 2)

ICAO STANDARD ATMOSPHERE TABLE

STANDARD SEA LEVEL CONDITIONS:

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

CONVERSION FACTORS:

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

Altitude (Feet)	*Density Ratio* σ	$\frac{1}{\sqrt{\sigma}}$	*Temperature* °C	°F	*Speed of Sound (Knots)*	*Pressure (In. Hg)*	*Pressure Ratio* δ
0	1.000	1.0000	15.000	59.000	661.7	29.921	1.0000
1000	.9711	1.0148	13.019	55.434	659.5	28.856	.9644
2000	.9428	1.0299	11.038	51.868	657.2	27.821	.9298
3000	.9151	1.0454	9.056	48.302	654.9	26.817	.8962
4000	.8881	1.0611	7.076	44.735	652.6	25.842	.8637
5000	.8617	1.0773	5.094	41.169	650.3	24.896	.8320
6000	.8359	1.0938	3.113	37.603	648.7	23.978	.8014
7000	.8106	1.1107	1.132	34.037	645.6	23.088	.7716
8000	.7860	1.1279	− 0.850	30.471	643.3	22.225	.7428
9000	.7620	1.1456	− 2.831	26.905	640.9	21.388	.7148
10,000	.7385	1.1637	− 4.812	23.338	638.6	20.577	.6877
11,000	.7155	1.1822	− 6.793	19.772	636.2	19.791	.6614
12,000	.6932	1.2011	− 8.774	16.206	633.9	19.029	.6360
13,000	.6713	1.2205	−10.756	12.640	631.5	18.292	.6113
14,000	.6500	1.2403	−12.737	9.074	629.0	17.577	.5875
15,000	.6292	1.2606	−14.718	5.508	626.6	16.886	.5643
16,000	.6090	1.2815	−16.699	1.941	624.2	16.216	.5420
17,000	.5892	1.3028	−18.680	− 1.625	621.8	15.569	.5203
18,000	.5699	1.3246	−20.662	− 5.191	619.4	14.942	.4994
19,000	.5511	1.3470	−22.643	− 8.757	617.0	14.336	.4791
20,000	.5328	1.3700	−24.624	−12.323	614.6	13.750	.4595
21,000	.5150	1.3935	−26.605	−15.889	612.1	13.184	.4406
22,000	.4976	1.4176	−28.587	−19.456	609.6	12.636	.4223
23,000	.4800	1.4424	−30.568	−23.022	607.1	12.107	.4046
24,000	.4642	1.4678	−32.549	−26.588	604.6	11.597	.3876
25,000	.4481	1.4938	−34.530	−30.154	602.1	11.103	.3711
26,000	.4325	1.5206	−36.511	−33.720	599.6	10.627	.3552
27,000	.4173	1.5480	−38.492	−37.286	597.1	10.168	.3398
28,000	.4025	1.5762	−40.474	−40.852	594.6	9.725	.3250
29,000	.3881	1.6052	−42.455	−44.419	592.1	9.297	.3107
30,000	.3741	1.6349	−44.436	−47.985	589.5	8.885	.2970
31,000	.3605	1.6654	−46.417	−51.551	586.9	8.488	.2837
32,000	.3473	1.6968	−48.398	−55.117	584.4	8.106	.2709
33,000	.3345	1.7291	−50.379	−58.683	581.8	7.737	.2586
34,000	.3220	1.7623	−52.361	−62.249	579.2	7.382	.2467
35,000	.3099	1.7964	−54.342	−65.816	576.6	7.041	.2353
36,000	.2981	1.8315	−56.323	−69.382	574.0	6.712	.2243
36,089	.2971	1.8347	−56.500	−69.700	573.7	6.683	.2234
37,000	.2843	1.8753	−56.500	−69.700	573.7	6.397	.2138
38,000	.2710	1.9209	−56.500	−69.700	573.7	6.097	.2038
39,000	.2583	1.9677	−56.500	−69.700	573.7	5.811	.1942
40,000	.2462	2.0155	−56.500	−69.700	573.7	5.538	.1851
41,000	.2346	2.0645	−56.500	−69.700	573.7	5.278	.1764
42,000	.2236	2.1148	−56.500	−69.700	573.7	5.030	.1681
43,000	.2131	2.1662	−56.500	−69.700	573.7	4.794	.1602
44,000	.2031	2.2189	−56.500	−69.700	573.7	4.569	.1527
45,000	.1936	2.2728	−56.500	−69.700	573.7	4.355	.1455

Figure A1-12. ICAO Standard Atmosphere Table (Sheet 1 of 2)

ICAO STANDARD ATMOSPHERE TABLE

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

Altitude (Feet)	$\frac{1}{\sqrt{\sigma}}$	*Altitude (Feet)*	$\frac{1}{\sqrt{\sigma}}$	*Altitude (Feet)*	$\frac{1}{\sqrt{\sigma}}$	*Altitude (Feet)*	$\frac{1}{\sqrt{\sigma}}$	*Altitude (Feet)*	$\frac{1}{\sqrt{\sigma}}$
100	1.0015	6100	1.0955	12100	1.2030	18100	1.3269	24100	1.4704
200	1.0029	6200	1.0971	12200	1.2049	18200	1.3291	24200	1.4729
300	1.0044	6300	1.0988	12300	1.2069	18300	1.3313	24300	1.4755
400	1.0059	6400	1.1005	12400	1.2088	18400	1.3335	24400	1.4781
500	1.0074	6500	1.1022	12500	1.2107	18500	1.3358	24500	1.4807
600	1.0088	6600	1.1039	12600	1.2127	18600	1.3380	24600	1.4833
700	1.0103	6700	1.1056	12700	1.2146	18700	1.3403	24700	1.4860
800	1.0118	6800	1.1073	12800	1.2166	18800	1.3425	24800	1.4886
900	1.0133	6900	1.1090	12900	1.2185	18900	1.3448	24900	1.4912
1000	1.0148	7000	1.1107	13000	1.2205	19000	1.3470	25000	1.4938
1100	1.0163	7100	1.1124	13100	1.2224	19100	1.3493	25100	1.4965
1200	1.0178	7200	1.1141	13200	1.2244	19200	1.3516	25200	1.4991
1300	1.0193	7300	1.1158	13300	1.2264	19300	1.3539	25300	1.5018
1400	1.0208	7400	1.1175	13400	1.2284	19400	1.3561	25400	1.5045
1500	1.0223	7500	1.1193	13500	1.2303	19500	1.3584	25500	1.5071
1600	1.0238	7600	1.1210	13600	1.2323	19600	1.3607	25600	1.5098
1700	1.0253	7700	1.1127	13700	1.2343	19700	1.3630	25700	1.5125
1800	1.0269	7800	1.1245	13800	1.2363	19800	1.3653	25800	1.5152
1900	1.0284	7900	1.1262	13900	1.2383	19900	1.3677	25900	1.5179
2000	1.0299	8000	1.1279	14000	1.2403	20000	1.3700	26000	1.5206
2100	1.0314	8100	1.1297	14100	1.2423	20100	1.3723	26100	1.5233
2200	1.0330	8200	1.1314	14200	1.2444	20200	1.3746	26200	1.5260
2300	1.0345	8300	1.1332	14300	1.2464	20300	1.3770	26300	1.5287
2400	1.0360	8400	1.1350	14400	1.2484	20400	1.3793	26400	1.5315
2500	1.0376	8500	1.1367	14500	1.2504	20500	1.3817	26500	1.5342
2600	1.0391	8600	1.1385	14600	1.2525	20600	1.3840	26600	1.5370
2700	1.0407	8700	1.1403	14700	1.2545	20700	1.3864	26700	1.5397
2800	1.0422	8800	1.1420	14800	1.2565	20800	1.3888	26800	1.5425
2900	1.0438	8900	1.1438	14900	1.2586	20900	1.3911	26900	1.5453
3000	1.0454	9000	1.1456	15000	1.2606	21000	1.3935	27000	1.5480
3100	1.0469	9100	1.1474	15100	1.2627	21100	1.3959	27100	1.5508
3200	1.0485	9200	1.1492	15200	1.2648	21200	1.3983	27200	1.5536
3300	1.0501	9300	1.1510	15300	1.2668	21300	1.4007	27300	1.5564
3400	1.0516	9400	1.1528	15400	1.2689	21400	1.4031	27400	1.5592
3500	1.0532	9500	1.1546	15500	1.2710	21500	1.4055	27500	1.5620
3600	1.0548	9600	1.1564	15600	1.2731	21600	1.4079	27600	1.5649
3700	1.0564	9700	1.1582	15700	1.2752	21700	1.4103	27700	1.5677
3800	1.0580	9800	1.1600	15800	1.2773	21800	1.4128	27800	1.5705
3900	1.0595	9900	1.1618	15900	1.2794	21900	1.4152	27900	1.5734
4000	1.0611	10000	1.1637	16000	1.2815	22000	1.4176	28000	1.5762
4100	1.0627	10100	1.1655	16100	1.2836	22100	1.4201	28100	1.5791
4200	1.0643	10200	1.1673	16200	1.2857	22200	1.4225	28200	1.5819
4300	1.0659	10300	1.1692	16300	1.2878	22300	1.4250	28300	1.5848
4400	1.0676	10400	1.1710	16400	1.2899	22400	1.4275	28400	1.5877
4500	1.0692	10500	1.1729	16500	1.2921	22500	1.4299	28500	1.5906
4600	1.0708	10600	1.1747	16600	1.2942	22600	1.4324	28600	1.5935
4700	1.0724	10700	1.1766	16700	1.2963	22700	1.4349	28700	1.5964
4800	1.0740	10800	1.1784	16800	1.2985	22800	1.4374	28800	1.5993
4900	1.0757	10900	1.1803	16900	1.3006	22900	1.4399	28900	1.6022
5000	1.0773	11000	1.1822	17000	1.3028	23000	1.4424	29000	1.6052
5100	1.0789	11100	1.1840	17100	1.3049	23100	1.4449	29100	1.6081
5200	1.0806	11200	1.1859	17200	1.3071	23200	1.4474	29200	1.6110
5300	1.0822	11300	1.1878	17300	1.3093	23300	1.4499	29300	1.6140
5400	1.0838	11400	1.1897	17400	1.3115	23400	1.4525	29400	1.6170
5500	1.0855	11500	1.1916	17500	1.3136	23500	1.4550	29500	1.6199
5600	1.0871	11600	1.1935	17600	1.3158	23600	1.4576	29600	1.6229
5700	1.0888	11700	1.1954	17700	1.3180	23700	1.4601	29700	1.6259
5800	1.0905	11800	1.1973	17800	1.3202	23800	1.4627	29800	1.6289
5900	1.0921	11900	1.1992	17900	1.3224	23900	1.4652	29900	1.6319
6000	1.0938	12000	1.2011	18000	1.3246	24000	1.4678	30000	1.6349

Figure A1-12. ICAO Standard Atmosphere Table (Sheet 2 of 2)

PSYCHROMETRIC CHART

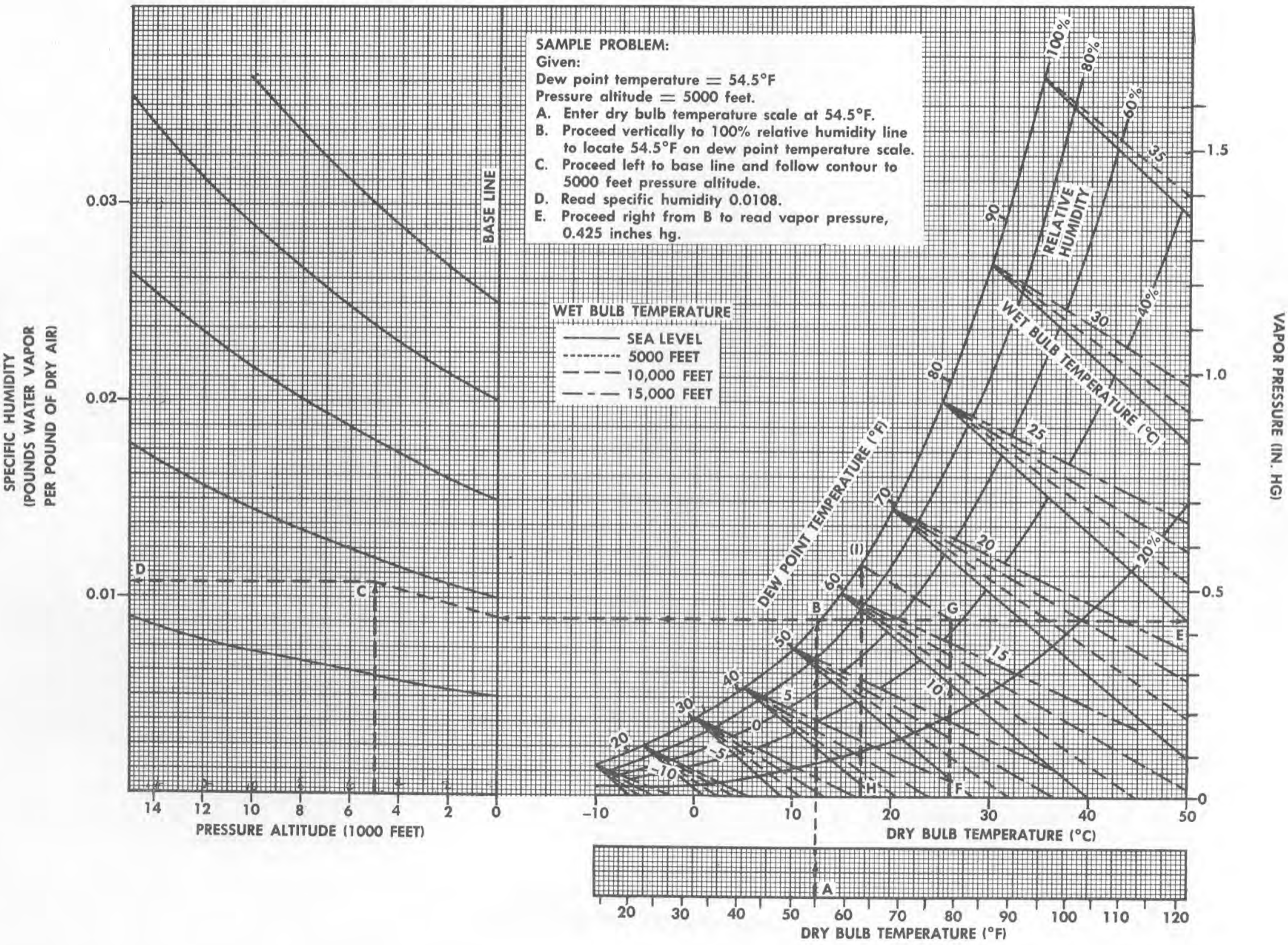


Figure A1-13. Psychrometric Chart

AA1-543

TEMPERATURE CONVERSION CHART

CENTIGRADE VS FAHRENHEIT

TEMPERATURE CONVERSION:
Centigrade = 5/9 (F — 32)
Fahrenheit = 9/5 C + 32

SAMPLE PROBLEM:
A. Centigrade = 10°
B. Fahrenheit = 50°

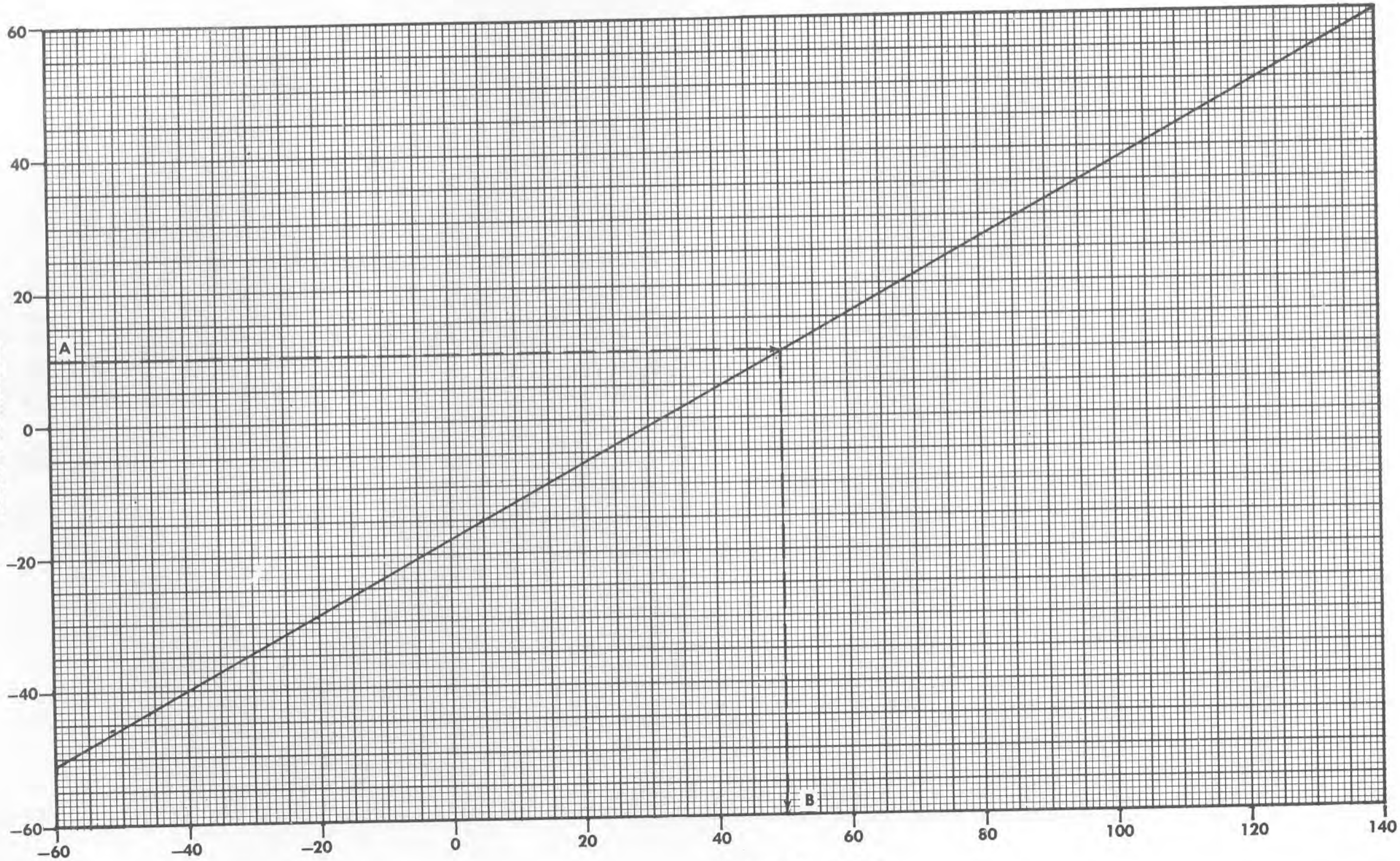


Figure A1-14. Temperature Conversion Chart

AA1-541