APPENDIX I—PERFORMANCE DATA

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part 1—INTRODUCTON

TABLE OF CONTENTS

Page numbers in bold face type denote illustrations.

SCOPE.

The purpose of this appendix is two-fold: it provides EC-121D, H, Q and C-121G aircraft performance information needed for flight planning under standard and non-standard conditions, and it also provides information needed to check aircraft and engine performance in flight. The purpose is accomplished by an eight-part arrangement of data, and except as noted below, covers both aircraft in each part. Each part relates either to a particular phase of flight or summarizes a particular type of information. For example, Part 2 presents engine operating data which applies to all phases of operation. Detailed engine limits, power available, and fuel flow characteristics are given there. Part 3 contains data needed for takeoff planning, such as maximum power prediction, critical field lengths, speed schedules, and check data so that aircraft speed can be compared with predicted performance during the takeoff run. Parts 5 and 6 deviate from the dual coverage concept in that Part 5 is applicable only to cruising operation of the EC-121 and Part 6 applies only to the C-121G. Silhouettes in the upper corners of the charts are used to indicate the model or models to which charts are applicable. The procedures to be followed in using the charts are given with discussions of the data. Numerical examples and solutions are also provided.

CARBURETOR AIR SCOOPS.

All performance data shown in this appendix reflects operation with the overcowl (Mark V-A) ram air scoops installed with the ram air doors open. Operation with the ram doors closed can result in a cruise speed loss of up to 2 knots IAS under part-throttle conditions.

DATA BASIS.

EC-121R performance data is based on flight tests and performance reports for C-121C and G aircraft and commercial models 1049C, G, and H. Receipt of this material has extended over a period of several years. The release date on the performance charts represents the approximate time of its reevaluation for applicability to this flight manual.

FUEL AND FUEL DENSITY.

Aircraft and engine performance shown is representative of normal operation with 115/145 grade fuel in all cases except where specifically noted. This fuel has a nominal density of 6 pounds per gallon (US).

AIRSPEED AND ALTIMETER CORRECTION CHARTS.

Airspeed and altitude readings obtained directly from flight instruments should be corrected prior to use to account for the mechanical errors in individual instruments and the position errors due to locations selected for the static holes. An additional correction to airspeed readings should be made to account for compressibility effects due to altitude. Position and compressibility error correction charts are provided for this purpose in this part of the Appendix. Note that they give the correction to be applied, not the error. Individual instrument corrections cannot be supplied here, but should be made available by periodic bench calibrations and supplied on calibration cards for your instruments in use. Particular attention should be given to the altitude correction as it may mean the difference between clearing an obstacle or not. See the altitude relationship sample problem.

Note

The physical condition of the flush-static and pitot-head pressure sources is quite important as it affects the accuracy of the position error corrections. These sources should be inspected frequently, heads kept in alignment, and be free of water, dirt, leaks, metal burrs, etc., which might result in serious malfunction of the airspeed system.

SYMBOLS AND DEFINITIONS.

IAS — Indicated airspeed—The speed value read from an airspeed indicator. Where this symbol (IAS) is used on performance charts, mechanical error is assumed zero or applied.

BAS — Basic airspeed—The indicated airspeed reading corrected for instrument mechanical error.

CAS — Calibrated airspeed—The airspeed obtained by applying the position error correction to basic airspeed.

EAS — Equivalent airspeed—The airspeed obtained by applying the altitude compressibility correction to calibrated airspeed. Also obtained by dividing true airspeed by $1/\sqrt{\sigma}$.

TAS — True airspeed—Speed of aircraft relative to the air through which it is flying (EAS $\times$ $1/\sqrt{\sigma}$).

V_p — Airspeed position correction.

V_c — Airspeed compressibility correction.

V_s — Stall speed at zero thrust.

V_G — Groundspeed—Speed of the aircraft relative to the ground over which it flies.

V_{MCG} — Minimum control speed (ground) with a failed engine and maximum power on the operative engines.

V_{MCA} — Minimum control speed (air) with a failed engine, maximum power on operative engines, constant heading, and a bank angle equal or less than 5°.

ICAO — International Civil Aviation Organization.

H_p — Pressure altitude—That value obtained after correcting an altimeter reading for instrument and position errors.

H_d — Density altitude—That value obtained from the Density Altitude Chart at which air density at the existing pressure altitude and temperature equals air density as defined by the ICAO for standard atmospheric condition.

SL — Sea level.

$1/\sqrt{\sigma}$ — Smoe factor.

σ — Sigma—Ratio of ambient air density to standard day sea level air density.

OATI — Indicated outside air temperature — Value read from air temperature gage.

BAT — Basic air temperature—Indicated outside air temperature corrected for instrument mechanical error.

OATC — Corrected outside air temperature—Air temperature obtained by correcting BAT for the temperature rise which accompanies adiabatic compression.

CAT — Carburetor air temperature.

CHT — Cylinder head temperature.

RPM — Revolutions Per Minute—Engine rotational speed.

BMEP — Brake Mean Effective Pressure—BMEP gage reading corrected for instrument error.

BHP — Brake Horsepower—Engine power delivered for propulsion. BHP = RPM $\times$ BMEP/236 for 3350-cubic-inch-displacement engines.

MAP — Manifold absolute pressure.

in. Hg — Inches of mercury.

R.T. — Reverse thrust.

F.T. — Full-throttle engine performance.

METO — Maximum except takeoff power.

lb/hr/eng — Pound per hour per engine (fuel flow).

R/C — Rate of climb.

Ft/Min — Feet per minute (fpm).

RCR — Runway condition reading.

RSC — Runway surface condition.

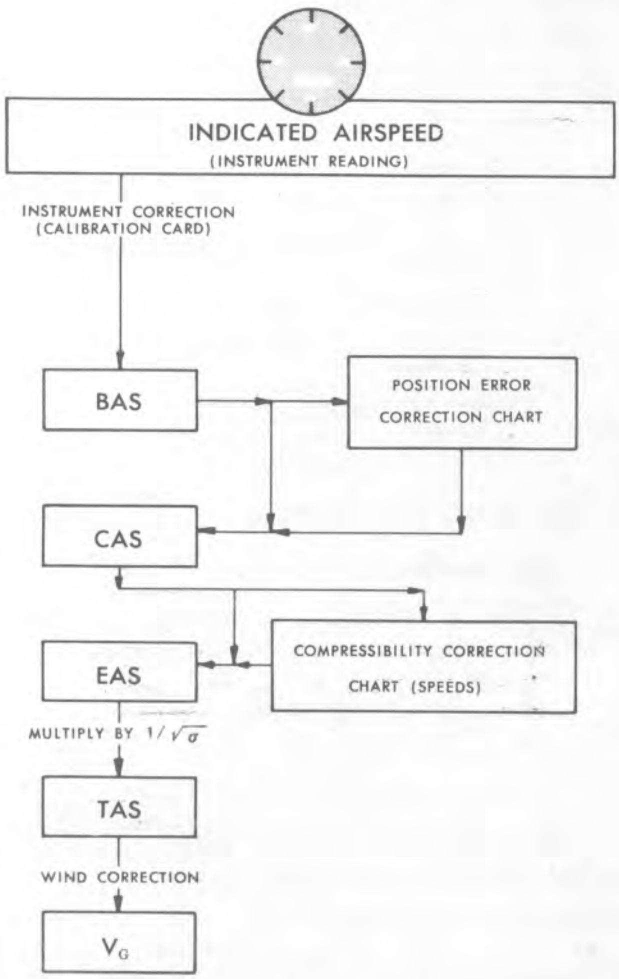
SAMPLE PROBLEMS—USE OF STANDARD CHARTS.

The examples illustrate the use of the standard correction charts and the sequence to be followed. The cases are for level flight conditions that provide the stabilized instrument readings shown. Instrument calibrations used are assumed values. The instrument calibration cards should be employed when available; otherwise, assume zero error.

TEMPERATURE CORRECTION AND CONVERSION CHARTS.

At normal flight speeds, outside air temperature is less than the value indicated by the flight instruments. This is due to the temperature rise which occurs when ram air surrounds the sensing element. The air is heated by compression to nearly 100 percent of the possible adiabatic rise. Figures A1-7 and A1-8 provide corrections which must be made to the indicated value to obtain correct true ambient air temperature. Corrections for individual instruments errors should be applied first, of course. Figure A1-9 is provided as a convenience for converting from Centigrade to Fahrenheit temperature.

SPEED RELATIONSHIP



SAMPLE PROBLEMS.

Static System Used .... No. 2
Instrument Panel .... Pilot
Wing Flaps and Gear .... Up

Problem 1: To find calibrated airspeed (CAS).

Indicated Airspeed (IAS) .... 184 Knots
(Instrument reading)

Instrument Correction (assumed) .... −2
(Obtain from calibration card)

Basic Airspeed (BAS) .... 182 Knots
(IAS + calibration card correction)

Position Error Correction .... +3.0
(Use figure A1-2, V_p)

Calibrated Airspeed (CAS) .... 185 Knots
(BAS + ΔV_p)

Problem 2: To find equivalent airspeed (EAS).

Altimeter Reading .... 20,250 ft
(From instrument set at 29.92 in. Hg)

Instrument Correction .... −340 ft
(Obtain from calibration card)

Indicated Pressure Altitude .... 19,910 ft
(Instrument reading + correction)

Position Error Correction .... +90
(From figure A1-4, ΔH_p)

Pressure Altitude (H_p) .... 20,000 ft
(Indicated pressure altitude + ΔH_p)

Airspeed Compressibility Correction .... −2.0
(Use figure A1-5 or A1-6, find ΔV_c)

Equivalent Airspeed (EAS) .... 183 Knots
(CAS + ΔV_c)

Problem 3: To find true airspeed (TAS).

Equivalent Airspeed .... 183 Knots
(From problem above)

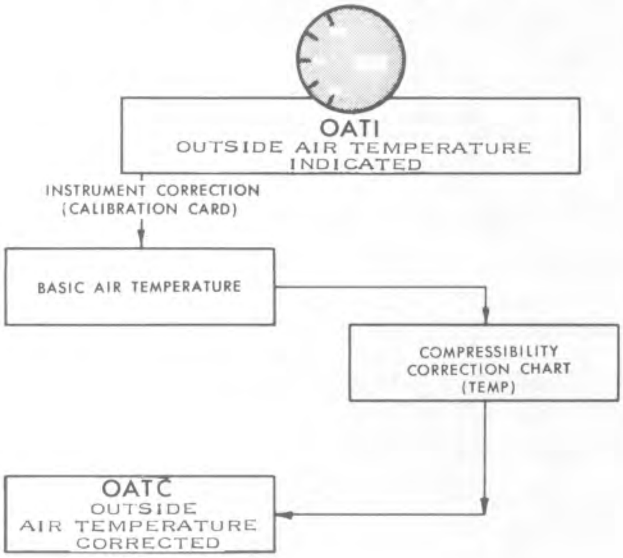
$1/\sqrt{\sigma}$ (H_d at 21,050 ft) 1.395
(Use figure A1-11 or A1-12)

True Airspeed (TAS) .... 255 Knots
(EAS × $1/\sqrt{\sigma}$)

STANDARD ATMOSPHERE TABLE.

The Standard Atmosphere Table (figure A1-10), presented for reference purposes, shows the standard variation of temperature, pressure, and density with altitude. It is based on definitions adopted by the ICAO, and supersedes data previously issued by the NACA.

TEMPERATURE RELATIONSHIP



SAMPLE PROBLEM.

Indicated Outside Air Temperature . . . . −4°C
(From OATI instrument)

Instrument Correction (assumed) . . . . −3°C
(Obtained from calibration card)

Basic Air Temperature . . . . −7°C
(Instrument reading + correction)

Compressibility Correction . . . . −8.5°C
(Use figure A1-7 or A1-7, read ΔT)

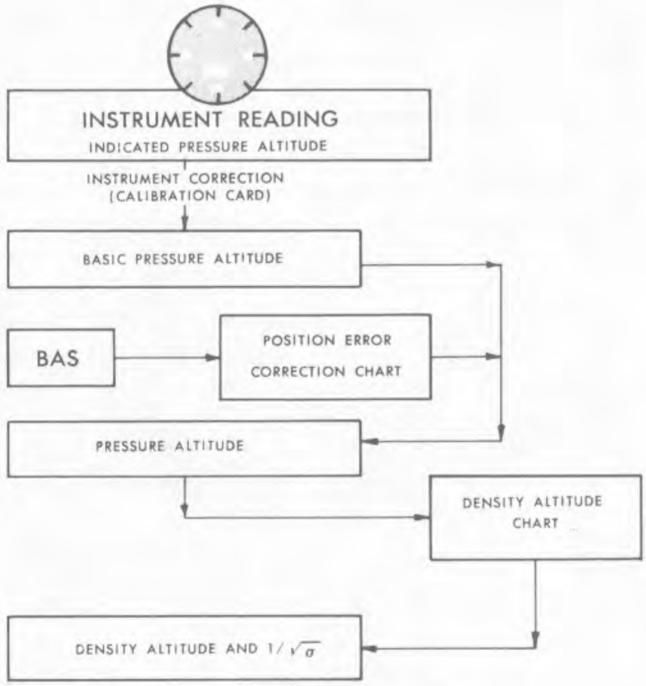
Corrected Outside Air Temperature
(OATC) . . . . −15.5°C
(Basic air temperature + ΔT)

Temperature Conversion . . . . +4°F
(Use figure A1-9, read OATC in °F)

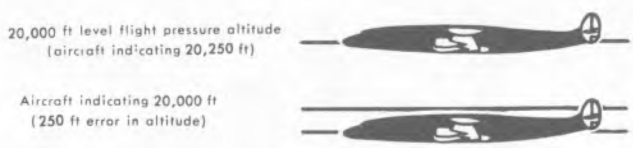
DENSITY ALTITUDE CHART.

The Density Altitude Chart, figure A1-12, is based on the ICAO definition of standard atmosphere. It can be used directly to find density altitude (H_d) and density ratio when pressure altitude (H_p) and ambient air temperature (OATC) are given. Note the accuracy with which air temperature should be known. An error of 5°C will give an error in H_d of about 550 feet. The resultant error in $1/\sqrt{\sigma}$ will be about 1%, an error which would be reflected in computing true airspeed. Pressure altitude should be read from an instrument set at 29.92 in. Hg, the standard pressure at sea level.

ALTITUDE RELATIONSHIP



To fly at assigned flight level of 20,000 ft pressure altitude, 184 knots IAS, indicate 20,250 ft on altimeter to account for instrument and position error.



SAMPLE PROBLEMS.

Static System Used . . . . No. 2
Instrument Panel . . . . Pilot
Wing Flaps and Gear . . . . Up

Problem 1: To find pressure altitude (H_p).

Altimeter Reading . . . . 20,250 ft
(From instrument set at 29.92 in. Hg)

Instrument Correction (assumed) . . . . −340 ft
(Obtain from calibration card)

Indicated Pressure Altitude . . . . 19,910 ft
(Instrument reading + correction)

Position Error Correction . . . . +90
(From figure A1-4, ΔH_p)

Pressure Altitude (H_p) . . . . 20,000 ft
(Indicated pressure altitude + position error correction)

Problem 2: To find density altitude (H_d) and $1/\sqrt{\sigma}$.

Density Altitude (H_d) . . . . 21,050 ft
(From figure A1-12, read H_d at the intersection of pressure altitude, 20,000, and OATC, −15.5°C)

$1/\sqrt{\sigma}$ 1.395
(From figure A1-11 or A1-12, read $1/\sqrt{\sigma}$ opposite density altitude 21,050)

PSYCHROMETRIC CHART.

A Psychrometric Chart (figure A1-13) is included. This chart may be used to determine the dewpoint temperature value which is used in predicting maximum power available. The dewpoint may be determined with wet- and dry-bulb temperatures, vapor pressure, or specific humidity combined with the pressure altitude.

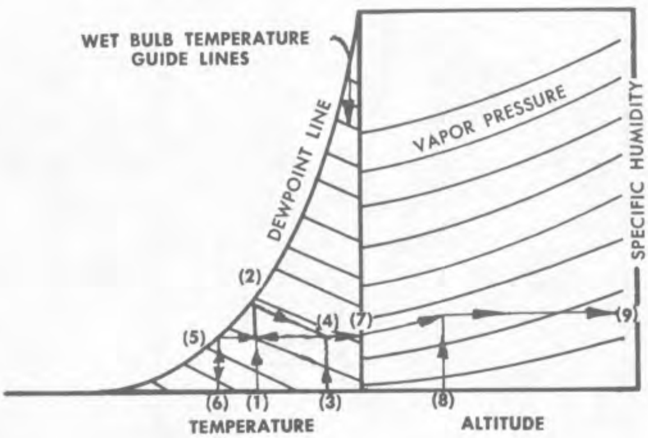
SAMPLE PROBLEM.

Use of the Psychrometric Chart (figure A1-13) provides dewpoint temperatures for prediction of maximum power for takeoff. The chart can also be used to find vapor pressure, specific humidity, and relative humidity.

If wet- and dry-bulb temperatures are given, find dewpoint by steps 1-6 in the following sequence. Enter the chart with wet-bulb temperature (1) and move to the dewpoint base line (2). Proceed diagonally parallel to a wet-bulb guide line nearest the pressure altitude to point (4) located above the dry-bulb temperature (3). Move left horizontally to the dewpoint line (5) and read dewpoint below at position (6). If wet-bulb temperature is 70°F and dry-bulb temperature is 95°F, the dewpoint is 57.7°F.

If vapor pressure only is given, enter the chart with vapor pressure at (7) and follow the step sequence 7, 5, 6. Dewpoint is 57.7°F when vapor pressure is 0.495.

USE OF THE PSYCHROMETRIC CHART



Follow step sequence 9, 8, 7, 5, 6 when specific humidity and pressure altitude are given. Proceed horizontally from specific humidity (9) to pressure altitude (8), then parallel to a vapor pressure guide line to the vapor pressure base line (7). Continue horizontally to the dewpoint line (5) and vertically to dewpoint at (6). Dewpoint is 57.7°F for a specific humidity of 0.012 and 3000-foot pressure altitude.

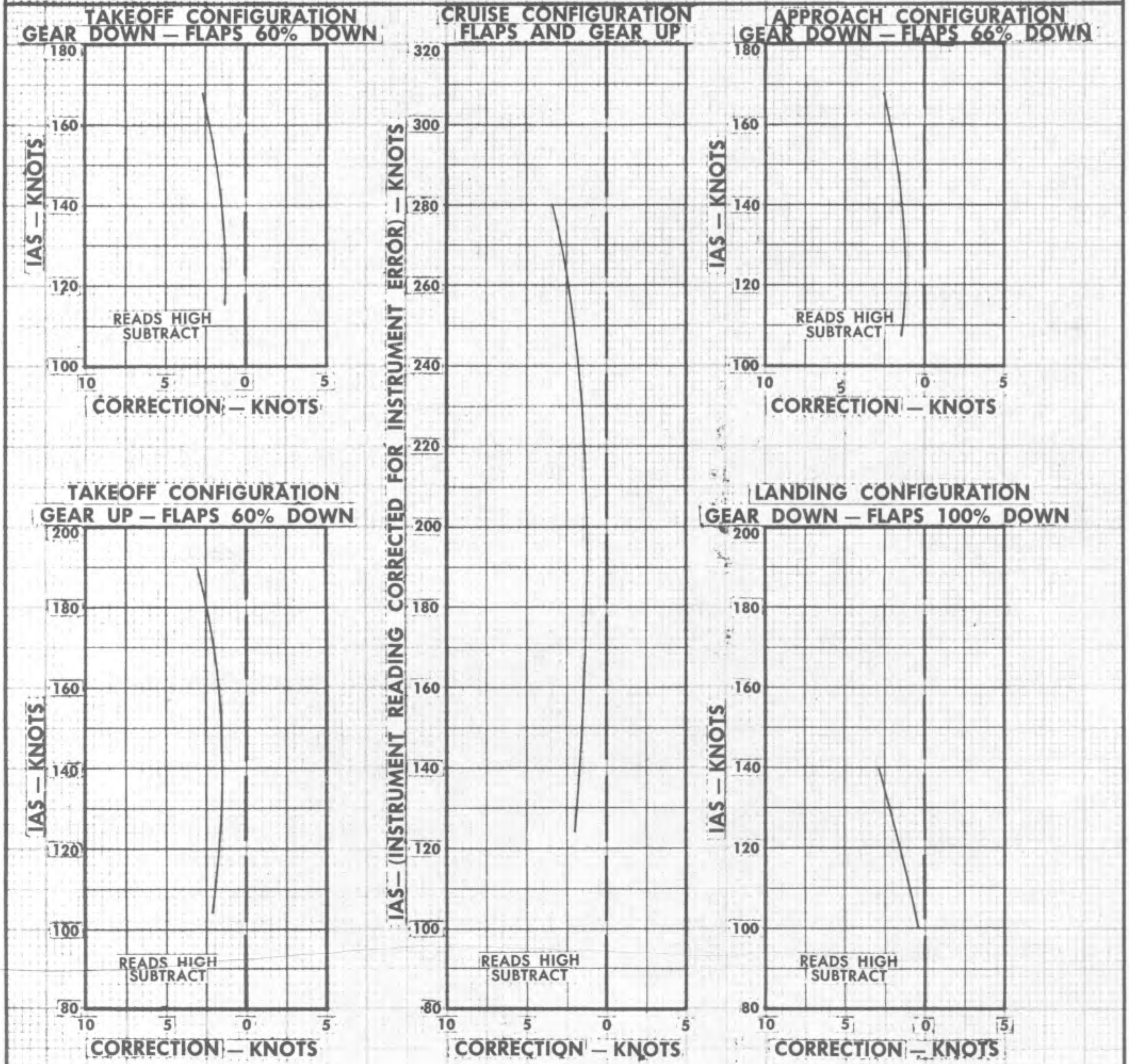
Relative humidity can be used with dry-bulb temperature to find the dewpoint. For 80% rh and 64°F dry-bulb temperature, locate a position 80% of the vertical distance from the temperature line to the dewpoint line. Proceed horizontally to the dewpoint line (5) and read dewpoint below at (6) of 57.7°F, or 14°C. Wet-bulb temperature would be 60°F for these conditions, since this is the intersection of a wet-bulb guide line drawn from (5) to the 80% relative humidity line.

AIRSPEED POSITION ERROR CORRECTION

NO. 1 STATIC SYSTEM
POWER FOR LEVEL FLIGHT

MODEL: EC-121R/C-121G
DATA AS OF: 31 MARCH 1967
DATA BASIS: FLIGHT TEST

ENGINE: (4) R3350-93A
PROPS: HAM. STD. 43H60/6959B-O



Total Head Location: 4 inches below fuselage skin, to the left of bottom centerline, at fuselage station 155.70

Flush Static Location: fuselage station 335.70, water line 194.19 (right and left teed together)

Figure A1-1

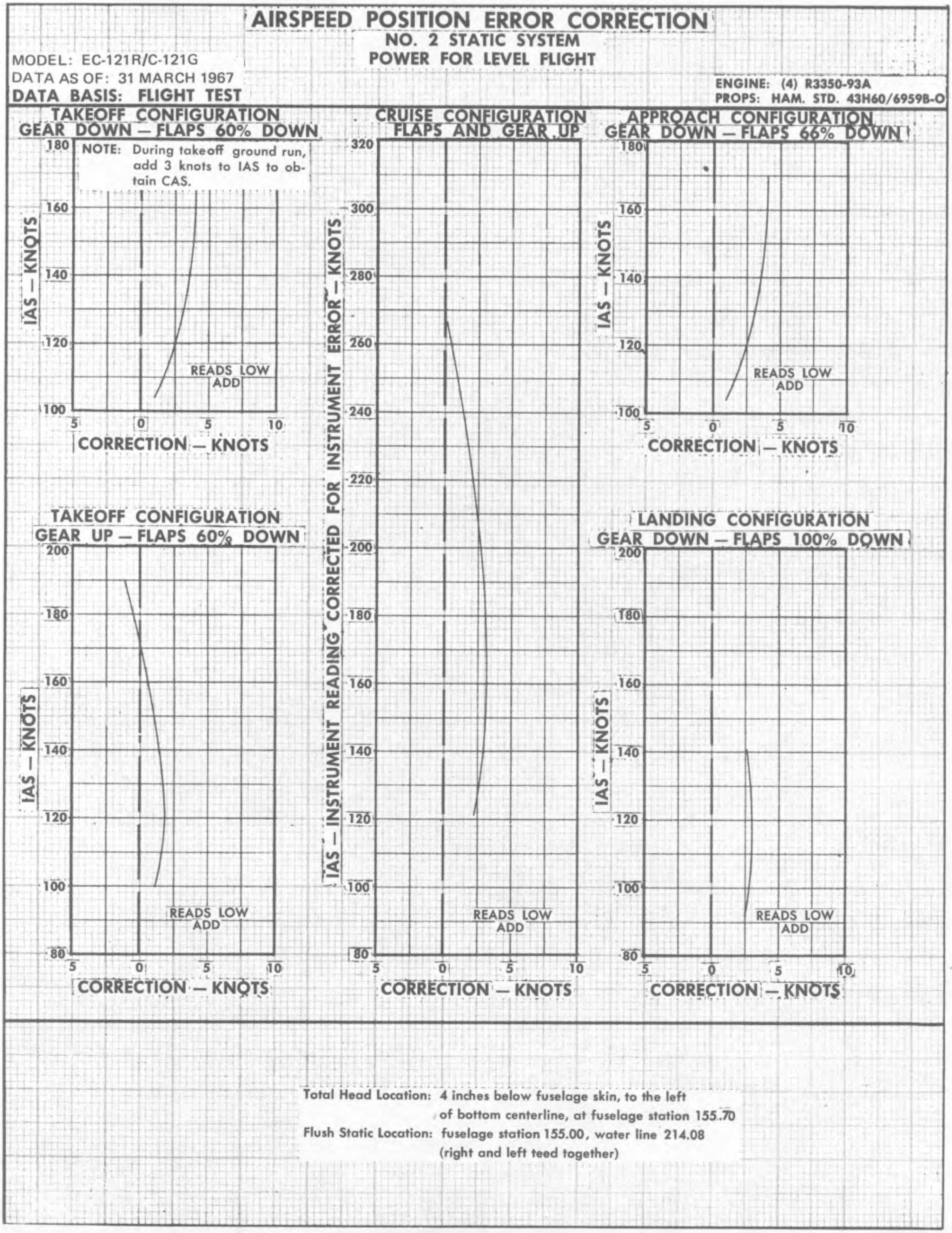

AIRSPEED POSITION ERROR CORRECTION
NO. 2 STATIC SYSTEM
POWER FOR LEVEL FLIGHT
MODEL: EC-121R/C-121G
DATA AS OF: 31 MARCH 1967
DATA BASIS: FLIGHT TEST
ENGINE: (4) R3350-93A
PROPS: HAM. STD. 43H60/6959B-O
TAKEOFF CONFIGURATION
GEAR DOWN — FLAPS 60% DOWN
NOTE: During takeoff ground run, add 3 knots to IAS to obtain CAS.
IAS — KNOTS
READS LOW
ADD
CORRECTION — KNOTS
CRUISE CONFIGURATION
FLAPS AND GEAR UP
IAS — INSTRUMENT READING CORRECTED FOR INSTRUMENT ERROR — KNOTS
APPROACH CONFIGURATION
GEAR DOWN — FLAPS 66% DOWN
TAKEOFF CONFIGURATION
GEAR UP — FLAPS 60% DOWN
LANDING CONFIGURATION
GEAR DOWN — FLAPS 100% DOWN
Total Head Location: 4 inches below fuselage skin, to the left of bottom centerline, at fuselage station 155.70
Flush Static Location: fuselage station 155.00, water line 214.08 (right and left teed together)

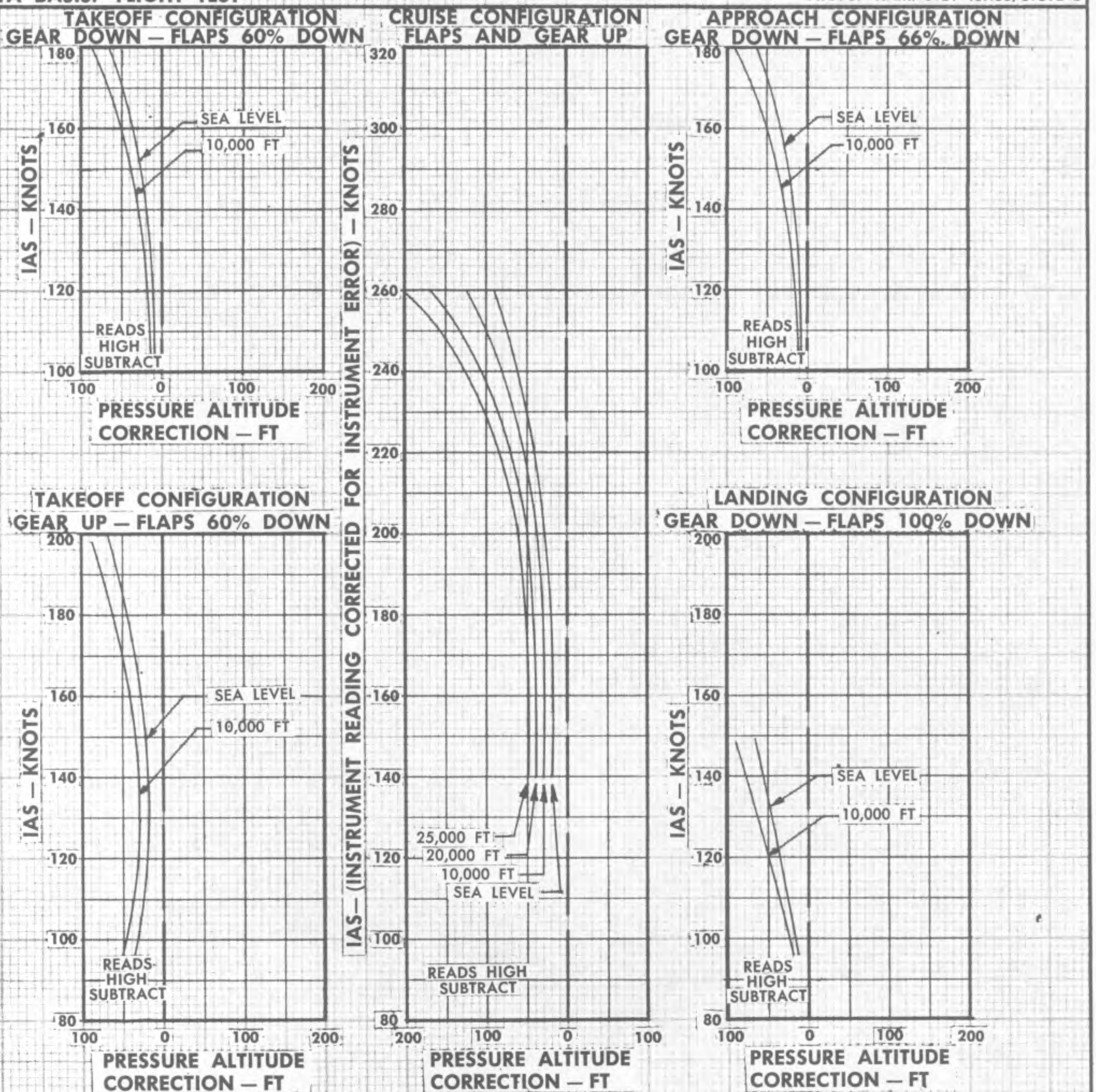
Figure A1-2

ALTIMETER POSITION ERROR CORRECTION

NO. 1 FLUSH STATIC SYSTEM
POWER FOR LEVEL FLIGHT

MODEL: EC-121R/C-121G
DATA AS OF: 31 MARCH 1967
DATA BASIS: FLIGHT TEST

ENGINE: (4) R3350-93A
PROPS: HAM. STD. 43H60/6959B-O



Flush Static Location: fuselage station 335.70, water line 194.19 (right and left teed together)

Figure A1-3

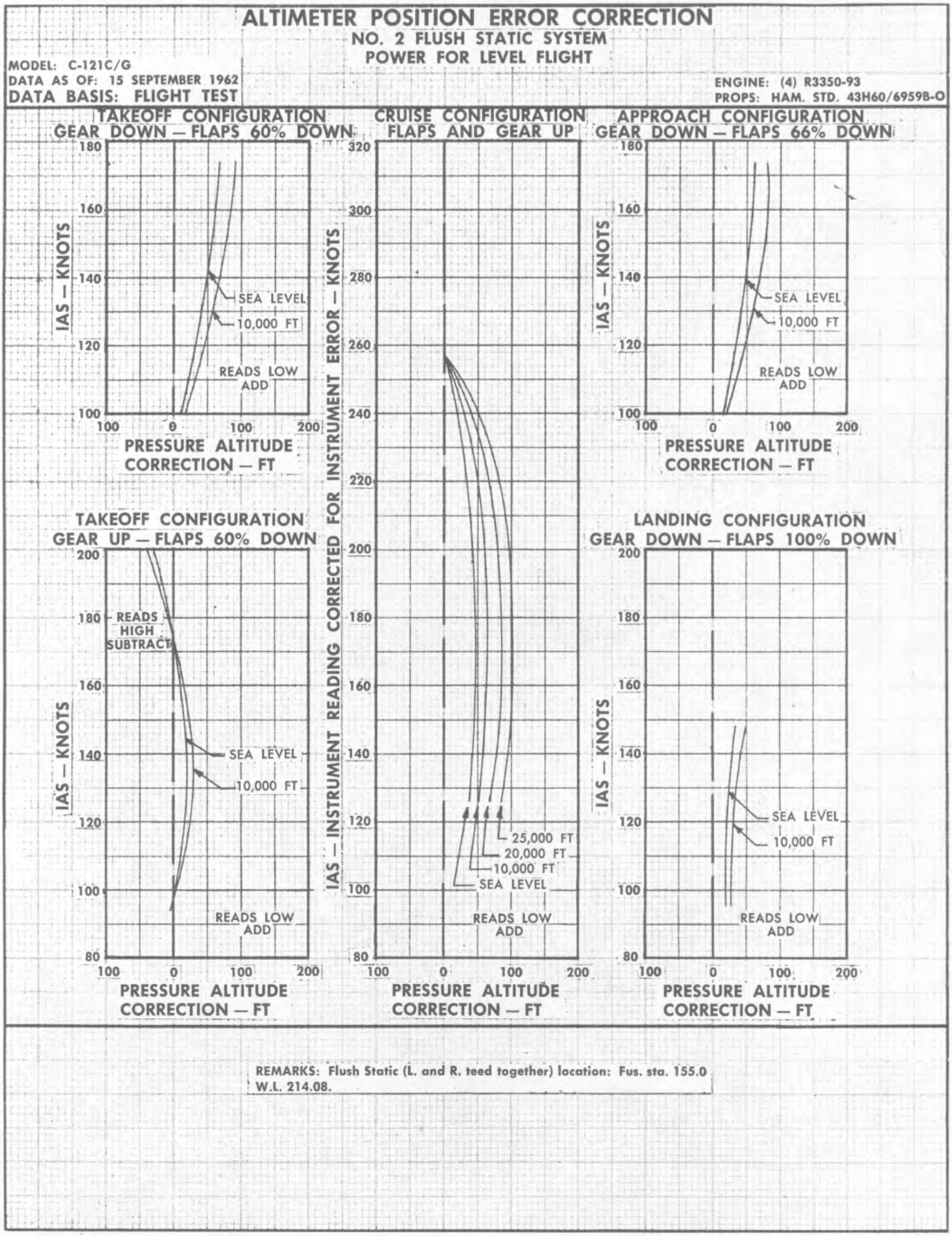

ALTIMETER POSITION ERROR CORRECTION
NO. 2 FLUSH STATIC SYSTEM
POWER FOR LEVEL FLIGHT
MODEL: C-121C/G
DATA AS OF: 15 SEPTEMBER 1962
DATA BASIS: FLIGHT TEST
ENGINE: (4) R3350-93
PROPS: HAM. STD. 43H60/6959B-O
TAKEOFF CONFIGURATION
GEAR DOWN — FLAPS 60% DOWN
CRUISE CONFIGURATION
FLAPS AND GEAR UP
APPROACH CONFIGURATION
GEAR DOWN — FLAPS 66% DOWN
IAS — KNOTS
SEA LEVEL
10,000 FT
READS LOW
ADD
PRESSURE ALTITUDE
CORRECTION — FT
IAS — INSTRUMENT READING CORRECTED FOR INSTRUMENT ERROR — KNOTS
25,000 FT
20,000 FT
10,000 FT
SEA LEVEL
TAKEOFF CONFIGURATION
GEAR UP — FLAPS 60% DOWN
READS
HIGH
SUBTRACT
LANDING CONFIGURATION
GEAR DOWN — FLAPS 100% DOWN
REMARKS: Flush Static (L. and R. teed together) location: Fus. sta. 155.0
W.L. 214.08.

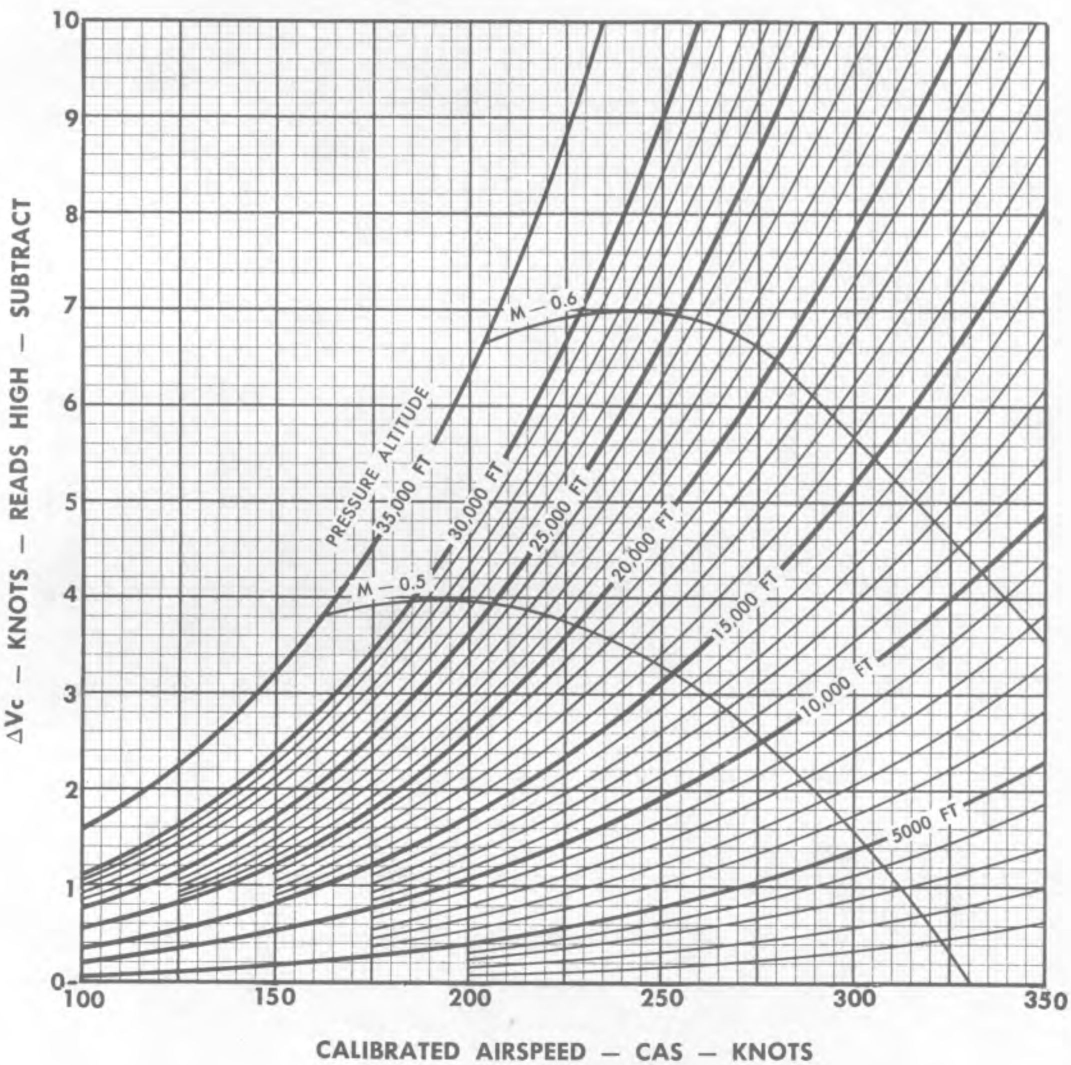
Figure A1-4

AIRSPEED COMPRESSIBILITY CORRECTION CHART

CORRECTION TO CALIBRATED AIRSPEED TO OBTAIN EQUIVALENT AIRSPEED

REMARKS:

1. Equivalent airspeed (EAS) equals IAS corrected for instrument error, installation error, and the altitude compressibility correction shown above.
2. True speed through the air (TAS) equals (EAS) $\times 1/\sqrt{\sigma}$



$EAS = CAS - \Delta V_c$
$TAS = EAS \times 1/\sqrt{\sigma}$
M = MACH NUMBER
$\sigma = \rho/g$

Figure A1-5

AIRSPEED COMPRESSIBILITY CORRECTION TABLE

Add correction to calibrated airspeed to obtain equivalent airspeed

PRESSURE ALTITUDE — 1000 FEET	CALIBRATED AIRSPEED — KNOTS											
	150	160	170	180	190	200	210	220	230	240	250	260
Sea Level	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	–0.5
2	0	0	0	0	0	0	0	0	–0.5	–0.5	–0.5	–0.5
3	0	0	0	0	0	–0.5	–0.5	–0.5	–0.5	–0.5	–0.5	–0.5
4	0	0	0	0	0	–0.5	–0.5	–0.5	–0.5	–0.5	–0.5	–1.0
5	0	0	0	0	0	–0.5	–0.5	–0.5	–1.0	–1.0	–1.0	–1.0
6	–0.5	–0.5	–0.5	–0.5	–0.5	–1.0	–1.0	–1.0	–1.0	–1.0	–1.0	–1.0
7	–0.5	–0.5	–0.5	–0.5	–0.5	–1.0	–1.0	–1.0	–1.0	–1.0	–1.5	–1.5
8	–0.5	–0.5	–0.5	–0.5	–0.5	–1.0	–1.0	–1.0	–1.0	–1.5	–1.5	–1.5
9	–0.5	–0.5	–0.5	–0.5	–1.0	–1.0	–1.0	–1.0	–1.5	–1.5	–2.0	–2.0
10	–0.5	–0.5	–0.5	–1.0	–1.0	–1.0	–1.0	–1.0	–1.5	–1.5	–2.0	–2.0
11	–0.5	–0.5	–0.5	–1.0	–1.0	–1.0	–1.0	–1.5	–2.0	–2.0	–2.0	–2.5
12	–0.5	–0.5	–0.5	–1.0	–1.0	–1.0	–1.5	–1.5	–2.0	–2.0	–2.5	–2.5
13	–0.5	–1.0	–1.0	–1.0	–1.5	–1.5	–1.5	–1.5	–2.0	–2.0	–2.5	–3.0
14	–1.0	–1.0	–1.0	–1.0	–1.5	–1.5	–2.0	–2.0	–2.5	–2.5	–3.0	–3.0
15	–1.0	–1.0	–1.0	–1.0	–1.5	–2.0	–2.0	–2.0	–2.5	–2.5	–3.0	–3.5
16	–1.0	–1.0	–1.0	–1.0	–1.5	–2.0	–2.0	–2.5	–3.0	–3.0	–3.5	–4.0
17	–1.0	–1.0	–1.0	–1.5	–2.0	–2.0	–2.0	–2.5	–3.0	–3.0	–4.0	–4.0
18	–1.0	–1.0	–1.0	–1.5	–2.0	–2.5	–2.5	–2.5	–3.0	–3.5	–4.0	–4.5
19	–1.0	–1.0	–1.0	–1.5	–2.0	–2.5	–2.5	–3.0	–3.5	–3.5	–4.5	–5.0
20	–1.5	–1.5	–1.5	–1.5	–2.0	–2.5	–3.0	–3.0	–4.0	–4.0	–5.0	–5.5
21	–1.5	–1.5	–1.5	–2.0	–2.5	–3.0	–3.0	–3.5	–4.0	–4.5	–5.0	–6.0
22	–1.5	–1.5	–2.0	–2.0	–2.5	–3.0	–3.5	–4.0	–4.5	–5.0	–5.5	–6.0
23	–1.5	–2.0	–2.0	–2.0	–2.5	–3.0	–3.5	–4.0	–4.5	–5.0	–6.0	–6.5
24	–2.0	–2.0	–2.0	–2.5	–3.0	–3.5	–4.0	–4.5	–5.0	–5.5	–6.5	–7.0
25	–2.0	–2.0	–2.0	–2.5	–3.0	–3.5	–4.0	–4.5	–5.0	–6.0	–6.5	–7.5

AIRSPEED POSITION ERROR CORRECTION — WING FLAPS AND GEAR UP

Add correction to indicated airspeed to obtain calibrated airspeed.

IAS — Knots	120	130	140	150	160	170	180	190	200	210	220	230
No. 1 Static	–2.0	–1.5	–1.5	–1.5	–1.5	–1.0	–1.0	–1.0	–1.5	–1.5	–1.5	–2.0
No. 2 Static	2.0	2.5	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2.5	2.0	2.0

Figure A1-6

TEMPERATURE COMPRESSIBILITY CORRECTION TABLE

DEGREES CENTIGRADE

Add correction to indicated temperature to obtain approximate free-air temperature

PRESSURE ALTITUDE — 1000 FEET	CALIBRATED AIRSPEED — KNOTS											
	150	160	170	180	190	200	210	220	230	240	250	260
Sea Level	−3	−3	−4	−4	−5	−5	−6	−6	−7	−8	−8	−9
1	−3	−3	−4	−4	−5	−5	−6	−7	−7	−8	−9	−9
2	−3	−3	−4	−4	−5	−6	−6	−7	−7	−8	−9	−9
3	−3	−3	−4	−5	−5	−6	−6	−7	−8	−8	−9	−10
4	−3	−3	−4	−5	−5	−6	−6	−7	−8	−9	−9	−10
5	−3	−4	−4	−5	−5	−6	−7	−7	−8	−9	−9	−10
6	−4	−4	−4	−5	−5	−6	−7	−8	−8	−9	−10	−10
7	−4	−4	−5	−5	−6	−6	−7	−8	−8	−9	−10	−10
8	−4	−4	−5	−6	−6	−7	−7	−8	−9	−10	−10	−11
9	−4	−4	−5	−6	−6	−7	−7	−8	−9	−10	−11	−11
10	−4	−4	−5	−6	−6	−7	−8	−8	−9	−10	−11	−12
11	−4	−4	−5	−6	−6	−7	−8	−9	−9	−10	−11	−12
12	−4	−4	−5	−6	−7	−7	−8	−9	−10	−11	−12	−13
13	−4	−5	−6	−6	−7	−8	−8	−9	−10	−11	−12	−13
14	−5	−5	−6	−7	−7	−8	−9	−10	−11	−12	−12	−14
15	−5	−5	−6	−7	−7	−8	−9	−10	−11	−12	−13	−14
16	−5	−5	−6	−7	−8	−8	−9	−11	−11	−12	−13	−14
17	−5	−5	−6	−7	−8	−9	−10	−11	−12	−13	−14	−15
18	−5	−5	−7	−7	−8	−9	−10	−11	−12	−13	−14	−15
19	−5	−6	−7	−8	−9	−10	−11	−12	−13	−14	−15	−16
20	−5	−6	−7	−8	−9	−10	−11	−12	−13	−14	−15	−17
21	−6	−6	−7	−8	−9	−10	−11	−12	−13	−15	−16	−17
22	−6	−7	−8	−8	−10	−10	−12	−13	−14	−15	−16	−18
23	−6	−7	−8	−9	−10	−11	−12	−13	−14	−16	−17	−19
24	−6	−7	−8	−9	−11	−11	−13	−14	−15	−16	−17	−19
25	−7	−8	−9	−10	−11	−12	−13	−14	−16	−17	−18	−20

AIRSPEED POSITION ERROR CORRECTION — WING FLAPS AND GEAR UP

Add correction to indicated airspeed to obtain calibrated airspeed

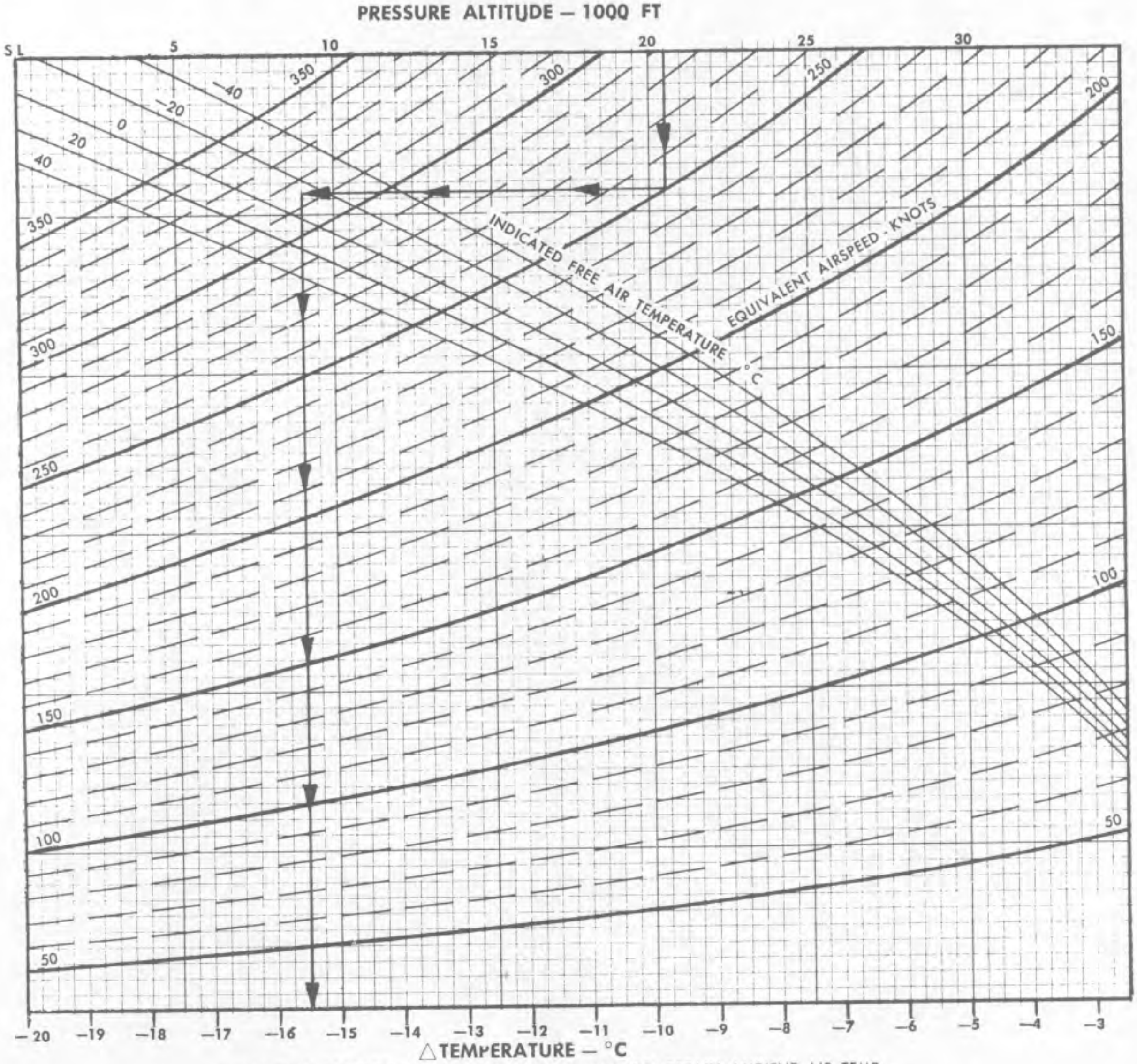
IAS — Knots	120	130	140	150	160	170	180	190	200	210	220	230
No. 1 Static	−2.0	−2.0	−1.5	−1.5	−1.5	−1.5	−1.5	−1.5	−1.5	−1.5	−1.5	−2.0
No. 2 Static	2.0	2.5	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2.5	2.0	2.0

Figure A1-7

TEMPERATURE COMPRESSIBILITY CORRECTION CHART

CORRECTION TO INDICATED AMBIENT AIR TEMPERATURE
TO OBTAIN APPROXIMATE FREE AIR TEMPERAURE

REMARKS:
1. 100% adiabiatic temperature rise assumed.
2. Indicated temperatures read high.
3. Data based on NACA standard day conditions.
4. Sensing element: resistance bulb located in externally ventilated box at fus sta 220.65 w l 179.71.



APPLY THIS CORRECTION TO INDICATED AIR TEMP TO OBTAIN AMBIENT AIR TEMP

Figure A1-8

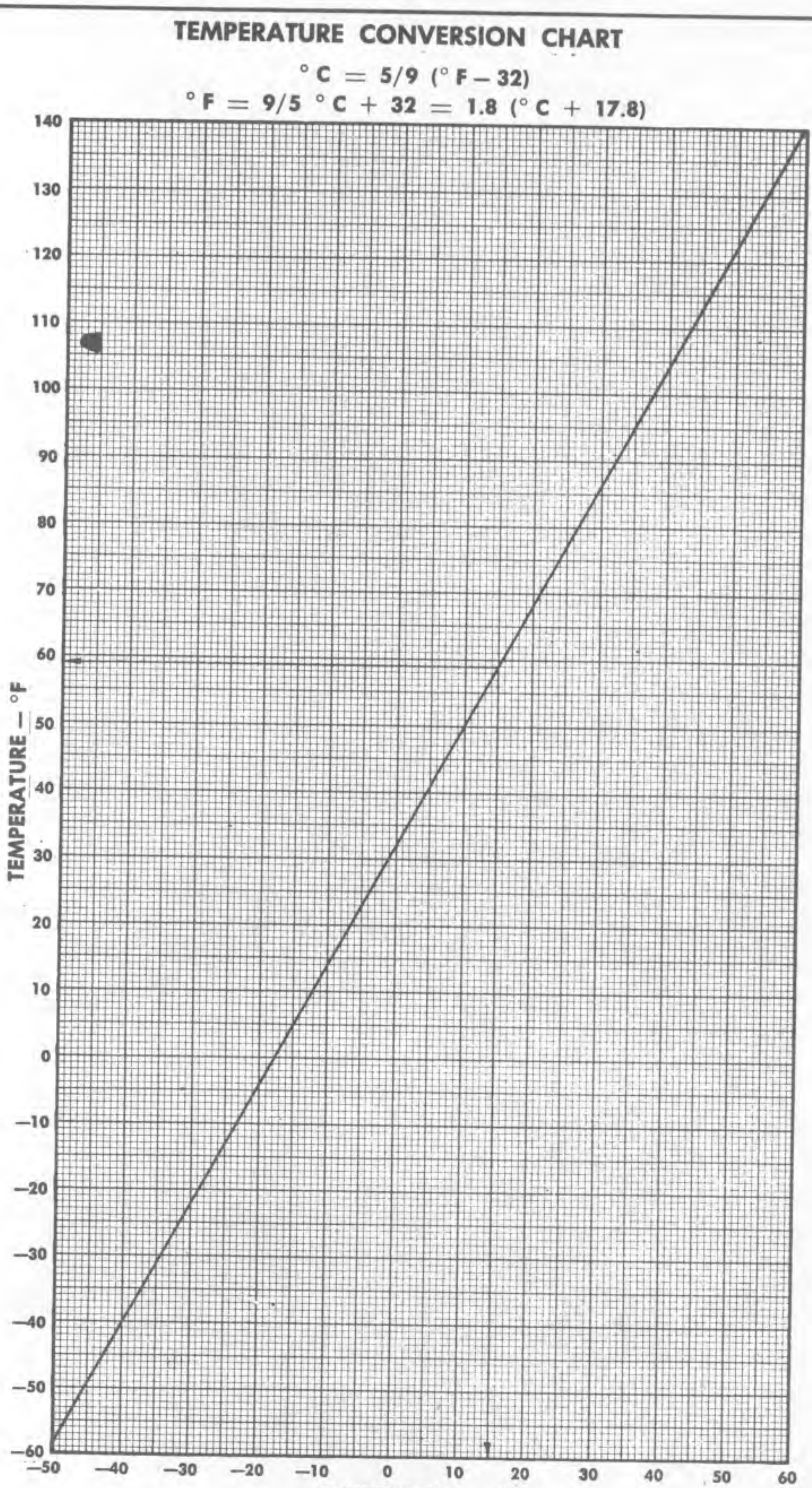

TEMPERATURE CONVERSION CHART
° C = 5/9 (° F – 32)
° F = 9/5 ° C + 32 = 1.8 (° C + 17.8)
TEMPERATURE — °F
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
–10
–20
–30
–40
–50
–60
–50
–40
–30
–20
–10
0
10
20
30
40
50
60
TEMPERATURE — °C

Figure A1-9

STANDARD ATMOSPHERE TABLE

STANDARD S L CONDITIONS:
TEMPERATURE 15°C(59°F)
PRESSURE 29,921 IN.HG 2116.216 LB/SQ FT
DENSITY .0023769 SLUGS/CU FT
SPEED OF SOUND 1116.39 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 M P H
1 KNOT 1.688 FT/SEC

ALTITUDE FEET	DENSITY RATIO σ	$\frac{1}{\sqrt{\sigma}}$	TEMPERATURE		SPEED OF SOUND KNOTS	PRESSURE	
			DEG. C	DEG. F		IN. OF HG	RATIO δ
-4000	1.1224	0.94390	22.925	73.265	670.7	34.5072	1.15327
-3000	1.0908	0.95748	20.943	69.698	668.5	33.3107	1.11328
-2000	1.0598	0.97136	18.962	66.132	666.2	32.1481	1.07442
-1000	1.0296	0.98552	16.981	62.566	664.0	31.0185	1.03667
0	1.0000	1.00000	15.000	59.000	661.7	29.9213	1.00000
1000	0.97106	1.0148	13.019	55.434	659.4	28.8557	0.96439
2000	0.94277	1.0299	11.038	51.868	657.1	27.8210	0.92981
3000	0.91512	1.0454	9.056	48.302	654.8	26.8167	0.89624
4000	0.88808	1.0611	7.075	44.735	652.5	25.8418	0.86366
5000	0.86167	1.0773	5.094	41.169	650.2	24.8959	0.83205
6000	0.83586	1.0938	3.113	37.603	647.9	23.9782	0.80138
7000	0.81064	1.1107	1.132	34.037	645.6	23.0881	0.77163
8000	0.78601	1.1279	-0.850	30.471	643.2	22.2249	0.74278
9000	0.76196	1.1456	-2.831	26.905	640.9	21.3881	0.71481
10000	0.73848	1.1637	-4.812	23.338	638.5	20.5769	0.68770
11000	0.71555	1.1822	-6.793	19.772	636.2	19.7909	0.66143
12000	0.69317	1.2011	-8.774	16.206	633.8	19.0293	0.63598
13000	0.67133	1.2205	-10.756	12.640	631.4	18.2917	0.61133
14000	0.65002	1.2403	-12.737	9.074	629.0	17.5773	0.58745
15000	0.62923	1.2606	-14.718	5.508	626.7	16.8858	0.56434
16000	0.60896	1.2815	-16.699	1.941	624.2	16.2164	0.54197
17000	0.58919	1.3028	-18.680	-1.625	621.8	15.5687	0.52032
18000	0.56991	1.3246	-20.662	-5.191	619.4	14.9421	0.49938
19000	0.55112	1.3470	-22.643	-8.757	617.0	14.3360	0.47913
20000	0.53281	1.3700	-24.624	-12.323	614.5	13.7501	0.45954
21000	0.51496	1.3935	-26.605	-15.889	612.1	13.1836	0.44061
22000	0.49758	1.4176	-28.586	-19.456	609.6	12.6363	0.42232
23000	0.48065	1.4424	-30.568	-23.022	607.1	12.1074	0.40464
24000	0.46416	1.4678	-32.549	-26.588	604.6	11.5967	0.38757
25000	0.44811	1.4938	-34.530	-30.154	602.2	11.1035	0.37109
26000	0.43249	1.5206	-36.511	-33.720	599.6	10.6274	0.35518
27000	0.41729	1.5480	-38.493	-37.286	597.1	10.1681	0.33983
28000	0.40250	1.5762	-40.474	-40.852	594.6	9.7249	0.32502
29000	0.38812	1.6052	-42.455	-44.419	592.1	9.2975	0.31073
30000	0.37413	1.6349	-44.436	-47.985	589.5	8.8854	0.29696

Figure A1-10

DENSITY ALTITUDE AND $1/\sqrt{\sigma}$

ALTITUDE FEET	$1/\sqrt{\sigma}$	ALTITUDE FEET	$1/\sqrt{\sigma}$	ALTITUDE FEET	$1/\sqrt{\sigma}$	ALTITUDE FEET	$1/\sqrt{\sigma}$	ALTITUDE FEET	$1/\sqrt{\sigma}$
0	1.000	6000	1.0938	12000	1.2011	18000	1.3246	24000	1.4678
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	1.1227	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	1.5174
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	1.2526	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	1.3203	23800	1.4627	29800	1.6289
5900	1.0921	11900	1.1992	17900	1.3224	23900	1.4652	29900	1.6319

Figure A1-11

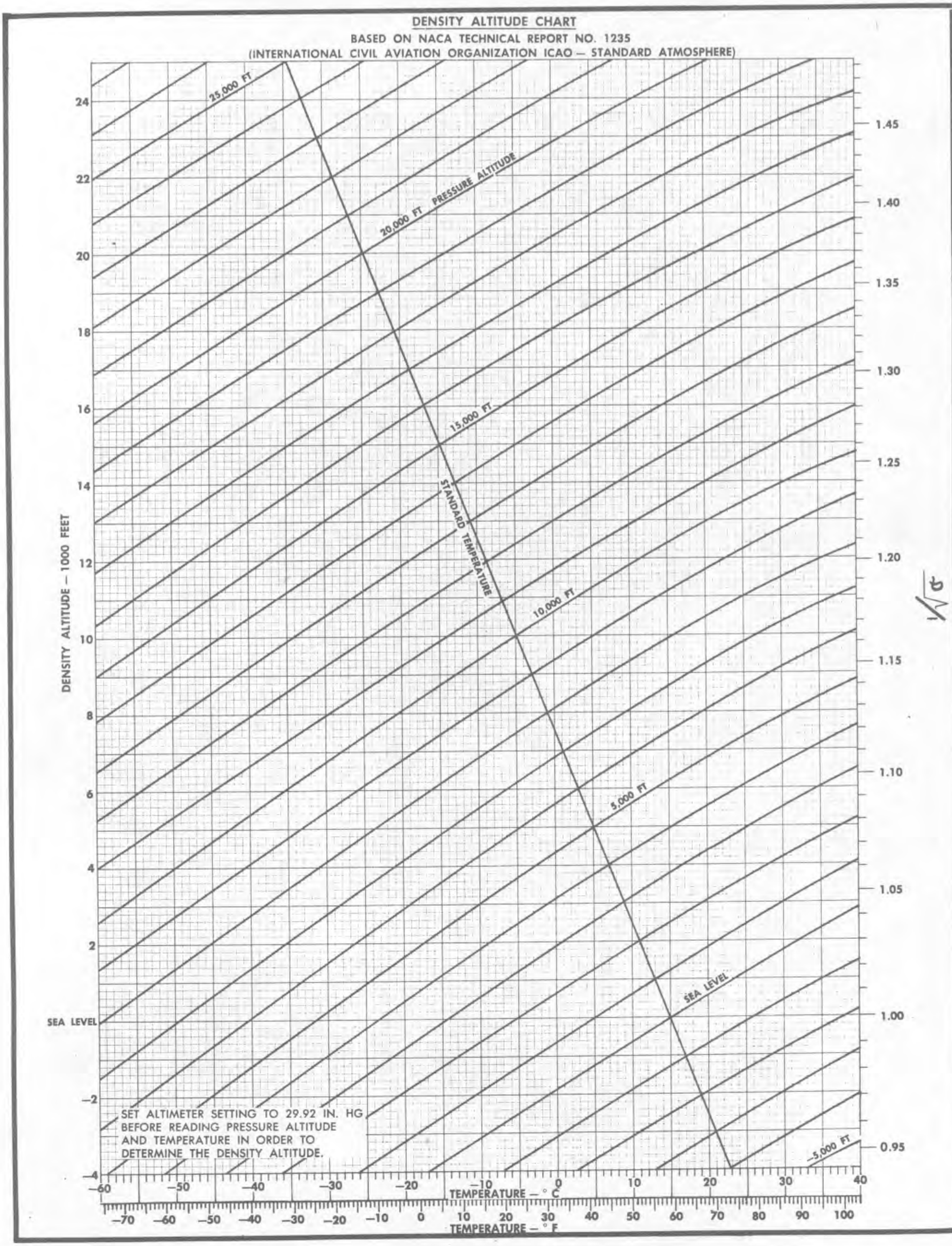

DENSITY ALTITUDE CHART
BASED ON NACA TECHNICAL REPORT NO. 1235
(INTERNATIONAL CIVIL AVIATION ORGANIZATION ICAO — STANDARD ATMOSPHERE)
25,000 FT
20,000 FT PRESSURE ALTITUDE
15,000 FT
10,000 FT
5,000 FT
SEA LEVEL
−5,000 FT
STANDARD TEMPERATURE
DENSITY ALTITUDE — 1000 FEET
24
22
20
18
16
14
12
10
8
6
4
2
SEA LEVEL
−2
−4
1.45
1.40
1.35
1.30
1.25
1.20
1.15
1.10
1.05
1.00
0.95
1/√σ
SET ALTIMETER SETTING TO 29.92 IN. HG BEFORE READING PRESSURE ALTITUDE AND TEMPERATURE IN ORDER TO DETERMINE THE DENSITY ALTITUDE.
−60 −50 −40 −30 −20 −10 0 10 20 30 40
TEMPERATURE — °C
−70 −60 −50 −40 −30 −20 −10 0 10 20 30 40 50 60 70 80 90 100
TEMPERATURE — °F

Figure A1-12

PSYCHROMETRIC CHART

VAPOR PRESSURE AND SPECIFIC HUMIDITY DETERMINATION

When wet and dry bulb temperarures are given:
Find dew point:
- enter at wet bulb temperature (1)
- proceed vertically to dew point line (2)
- draw a vertical line through dry bulb temperature (3)
- proceed parallel to the wet bulb temperature guide line to the vertical line through the dry bulb temperature (4)
- from this intersection (4) proceed horizontally to the dew point line (5)
- proceed vertically and read the dew point temperature at (6)

When specific humidity and pressure altitude are given:
Find vapor pressure and dew point:
- enter at the specific humidity (9)
- proceed horizontally to the pressure altitude (8)
- follow the vapor pressure guide lines to the base line (7) and read the vapor pressure
- continue horizontally to the dew point line (5)
- read the dew point at (6)

When dew point is given:
Find vapor pressure:
- enter at the dew point (6)
- proceed vertically to the dew point line (5)
- proceed horizontally to the base line (7) and read vapor pressure

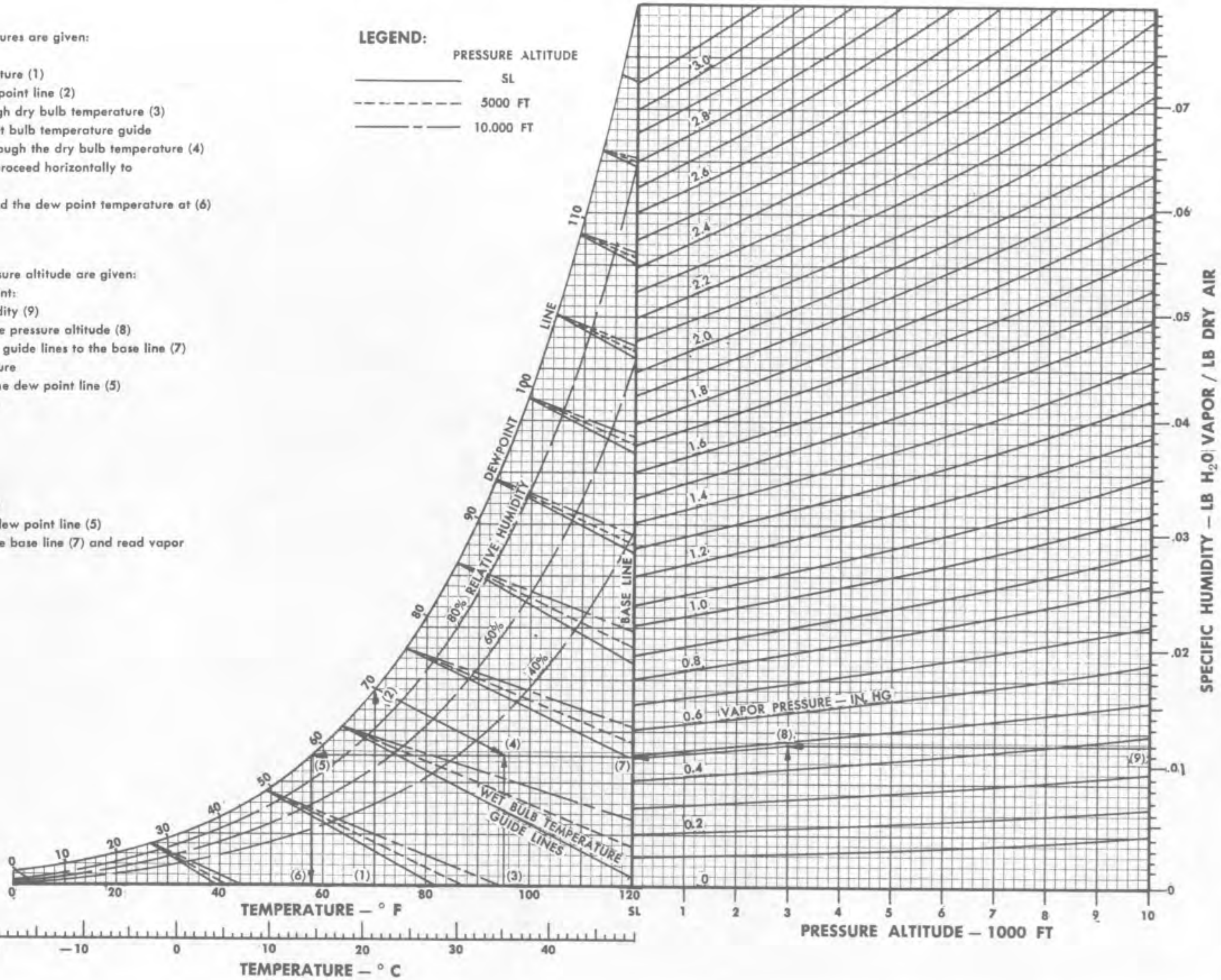


Figure A1-13