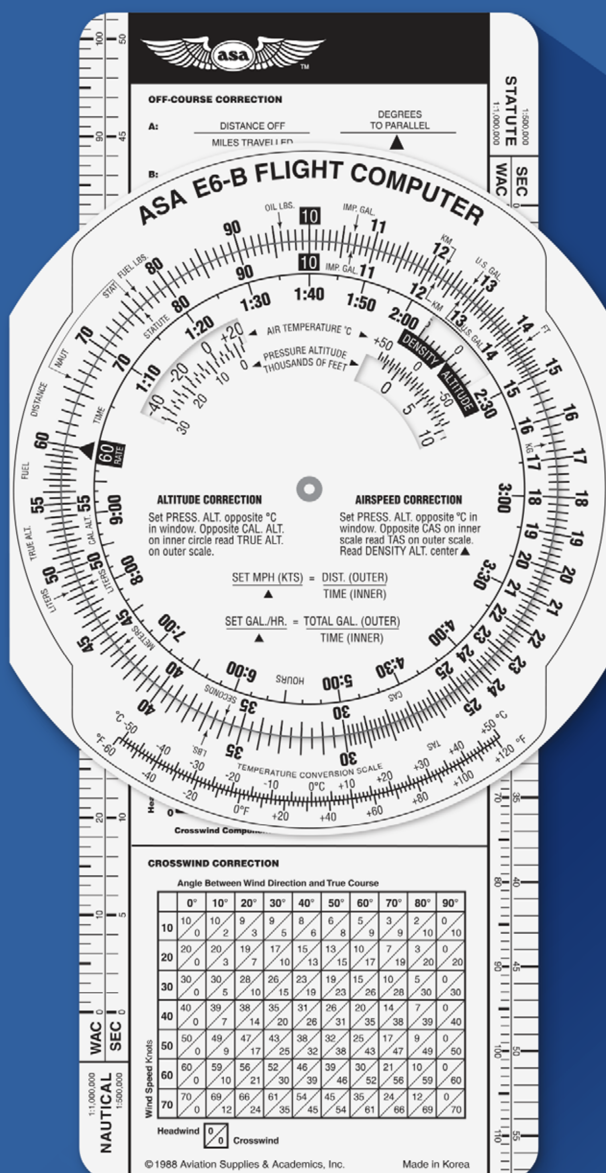
AirClassics®

E6-B Flight Computer

A STEM-Focused Teacher's Guide with Lesson Plans for Classroom Use



Instructor Manual

Contents

Introduction

The E6-B flight computer is an iconic tool in aviation. Every pilot—from a student working toward a private pilot certificate to airline crews—learns how to use an E6-B. It performs calculations that would otherwise require multiplication, division, trigonometry, unit conversions, and vector math, compressing all of this into a durable slide-rule system. Developed in the 1930s by US Naval Lieutenant Philip Dalton, the E6-B gave WWII flight crews a fast, portable way to compute navigation and fuel figures without bulky tables or error-prone mental arithmetic. Decades later, it remains in use because it is reliable, lightweight, inexpensive, and teaches the math behind navigation. Pilots taking the FAA written, practical, and flight tests are still expected to demonstrate proficiency using this tool. Many professional pilots carry an E6-B in their flight bags as a dependable backup to electronic devices.

What is the E6-B?

The E6-B is a mechanical, nonelectronic flight computer that uses rotating logarithmic scales to perform mathematical and navigational calculations. Your ASA E6-B Flight Computer has two main parts: (1) a circular slide rule side for quick calculations; and (2) a wind side for computing groundspeed and wind correction angle. The slide portion also includes quick-reference material.

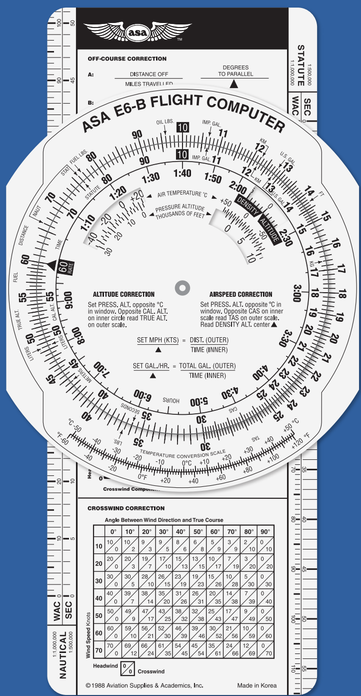


FIGURE 1.

E6-B circular slide rule side and slide portion.

Circular Slide Rule

Used to accomplish fast, common flight calculations such as the following:

- Time–speed–distance
- Fuel burn
- Unit conversions (e.g., nautical mile ⟷ statute mile, Celsius ⟷ Fahrenheit, liters ⟷ gallons)
- True airspeed
- Density altitude
- Mach number
- Pressure/temperature corrections

This side also contains quick-reference information printed on the slide and outer wheel.

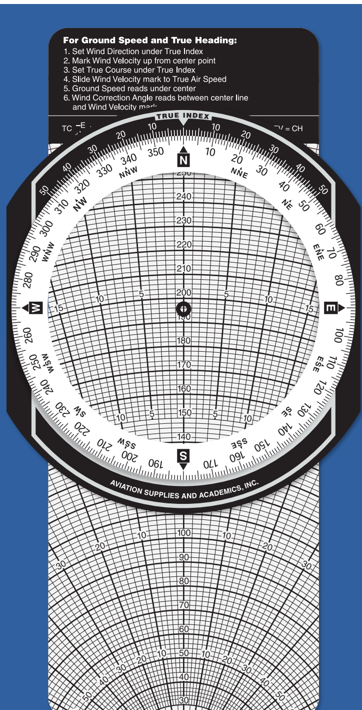


FIGURE 2.

E6-B wind correction side.

Wind Correction Side

Used for vector math problems such as the following:

- Determining wind correction angle (WCA)
- Determining groundspeed
- Plotting crosswind/headwind components relative to course

Physical Materials

ASA E6-B flight computers are constructed from durable, lightweight materials that hold up well to frequent handling in both classroom and flight deck environments. The main body is typically anodized aluminum, stiff composite plastic, or heavyweight fiberboard to provide rigidity and longevity. Scales and reference markings use high-contrast, scratch-resistant printing. Rotating elements are secured with smooth pivot joints for precise rotation. On the wind side, a clear sliding grid overlays the compass rose, enabling the accurate plotting of wind vectors, groundspeed, and wind-correction angles. This clear grid is designed to be drawn on using a pencil or erasable marker.

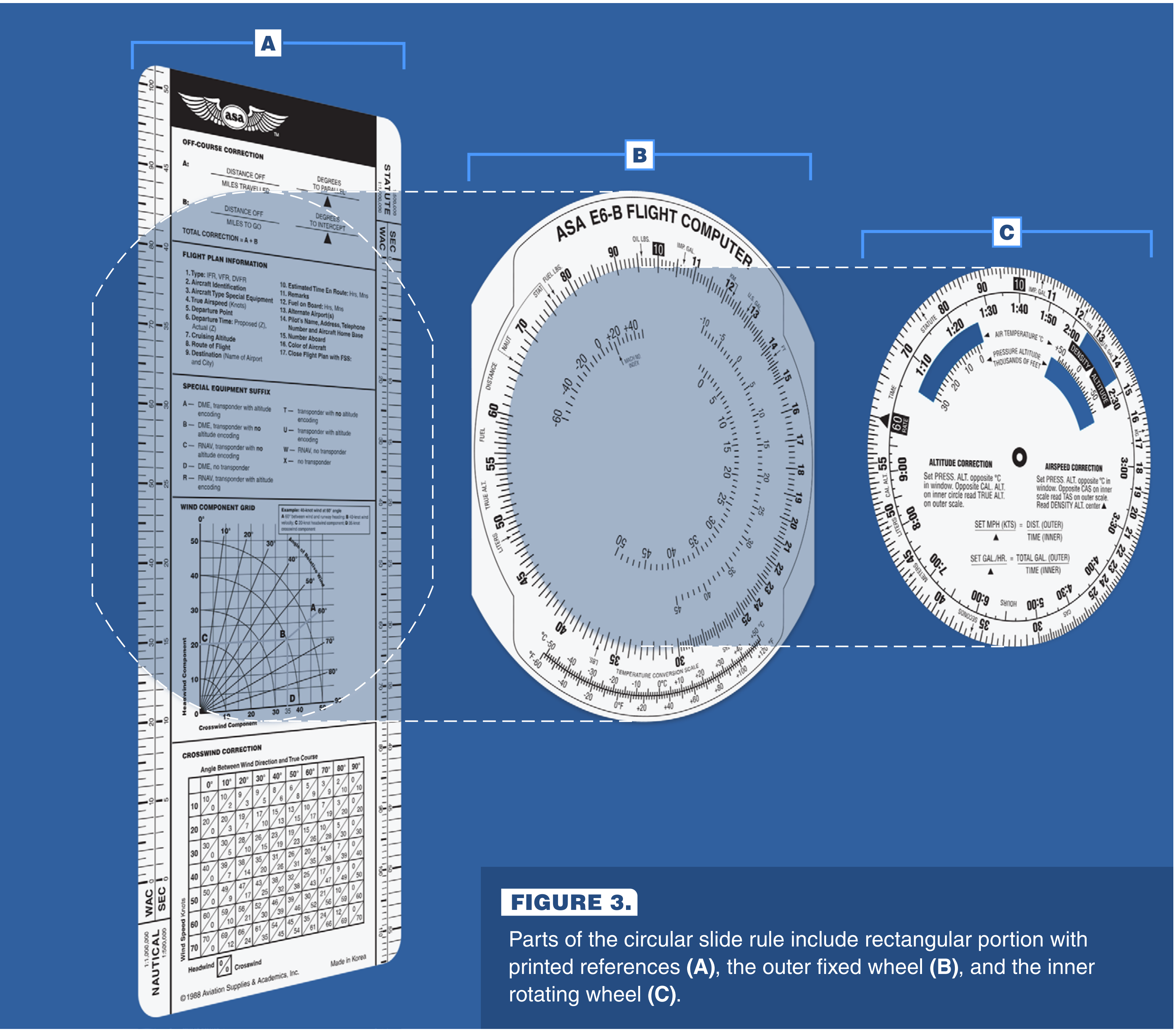


FIGURE 3.

Parts of the circular slide rule include rectangular portion with printed references **(A)**, the outer fixed wheel **(B)**, and the inner rotating wheel **(C)**.

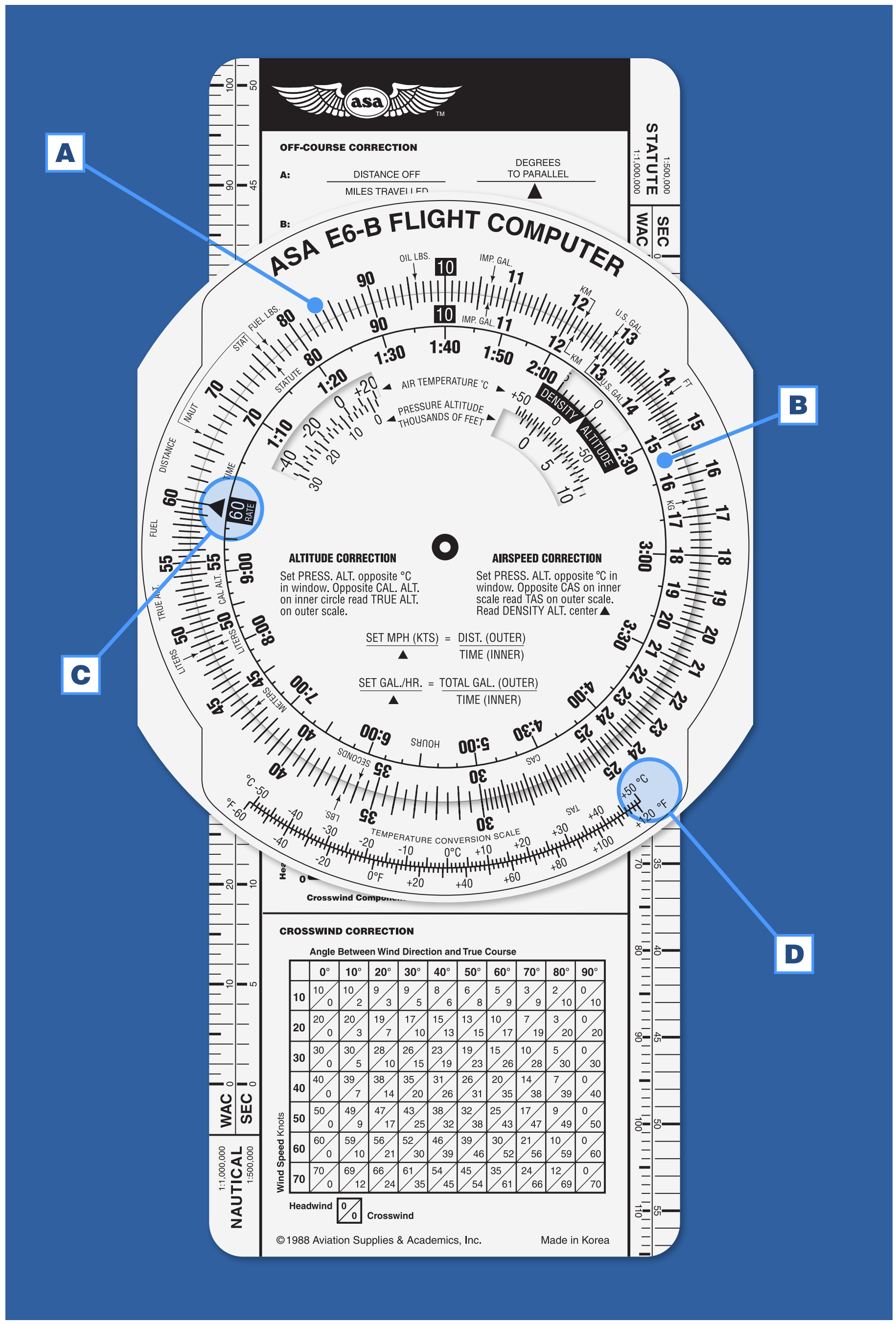
Circular Slide Rule: Components

This side consists of two physical components: (1) the outer fixed scale—printed around the edge, logarithmic 10–90, serving as the reference; and (2) the inner rotating wheel—also logarithmic 10–90, used to align ratios for multiplication, division, and time–speed–distance relationships. The wheel includes a time index (rate) marked 60 and representing 60 minutes.

Note: The two circular scales function like a straight slide rule wrapped in a circle. Static printed references include conversion tables (e.g., statute to nautical miles, Celsius to Fahrenheit, volume/weight), pressure altitude formulas, and density altitude correction windows.

FIGURE 4.

Circular slide rule side features outer fixed scale **(A)**; inner rotating wheel **(B)**; time index **(C)**; C° to F° printed reference **(D)**.



How to Use

The circular slide rule on the E6-B is simply a rotating disc aligned against a fixed outer scale, allowing you to solve common aviation problems such as time–speed–distance, fuel consumption, and unit conversions.

The rotating disc carries the middle scale graduated in minutes, while the smaller inner scale is marked in hours. Because most flight calculations involve rates—miles per hour, gallons per hour—the number 60 on the rotating disc is specially marked as the rate arrow.

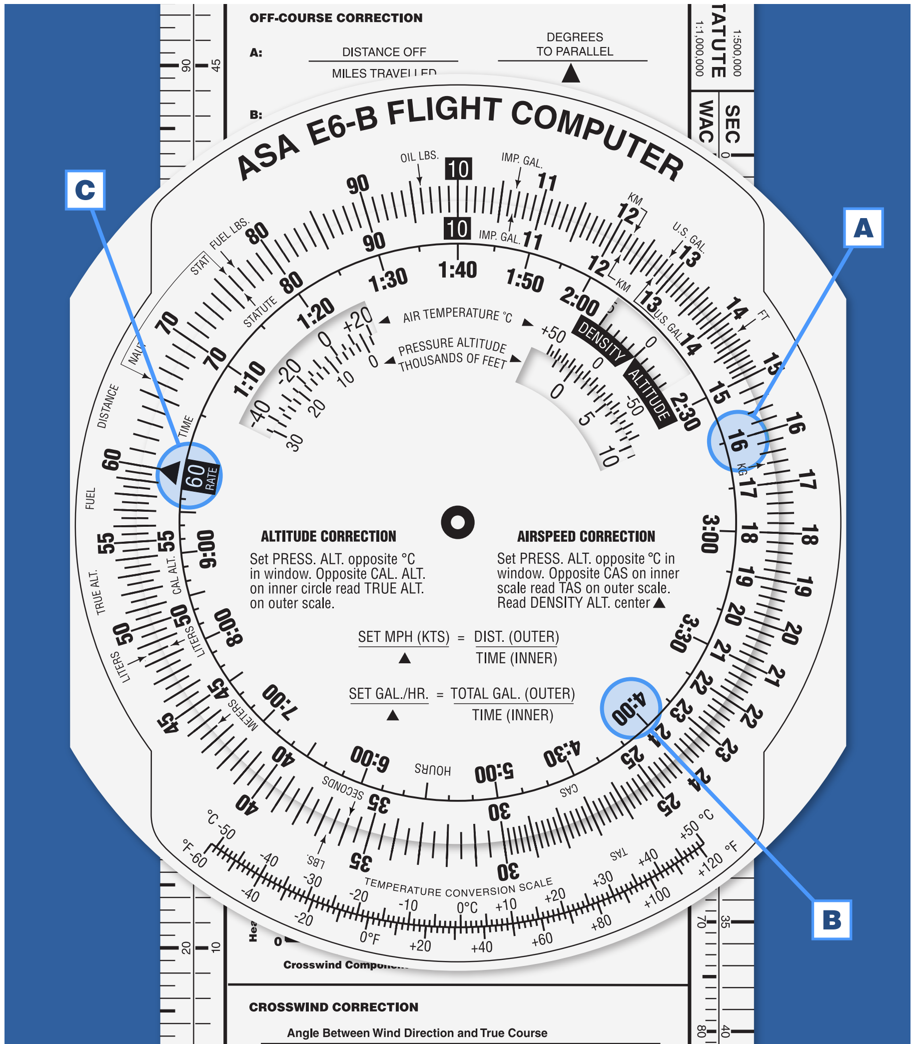


FIGURE 5.

Circular slide rule inner rotating wheel showing scale graduated in minutes **(A)**, smaller scale marked in hours **(B)**, rate arrow at 60 **(C)**.

Reading the scale correctly requires understanding how the calibration spacing changes: between 10 and 11 each mark represents 0.1, between 15 and 16 each mark represents 0.2, at 30 the spacing shifts to 0.5 per mark, and at 60 each mark equals 1. These values scale according to the problem. For example, "10" may represent 10, 1,000, or another factor depending on context. Setting the rate arrow (60) opposite a value such as 12 on the outer scale establishes a ratio, in this case 1:2 (6:12), which enables quick proportional calculations across the rest of the wheel.

The inner hour scale aligns with the minute scale to illustrate time equivalencies. For example, 1:10 sits below 70 minutes, and 5:00 aligns with 300 minutes. Even time to seconds conversions are accomplished by placing the rate arrow over the minutes and reading seconds on the seconds index.

Note: Be careful interpreting the scales; numbers are scaled and not always read literally.

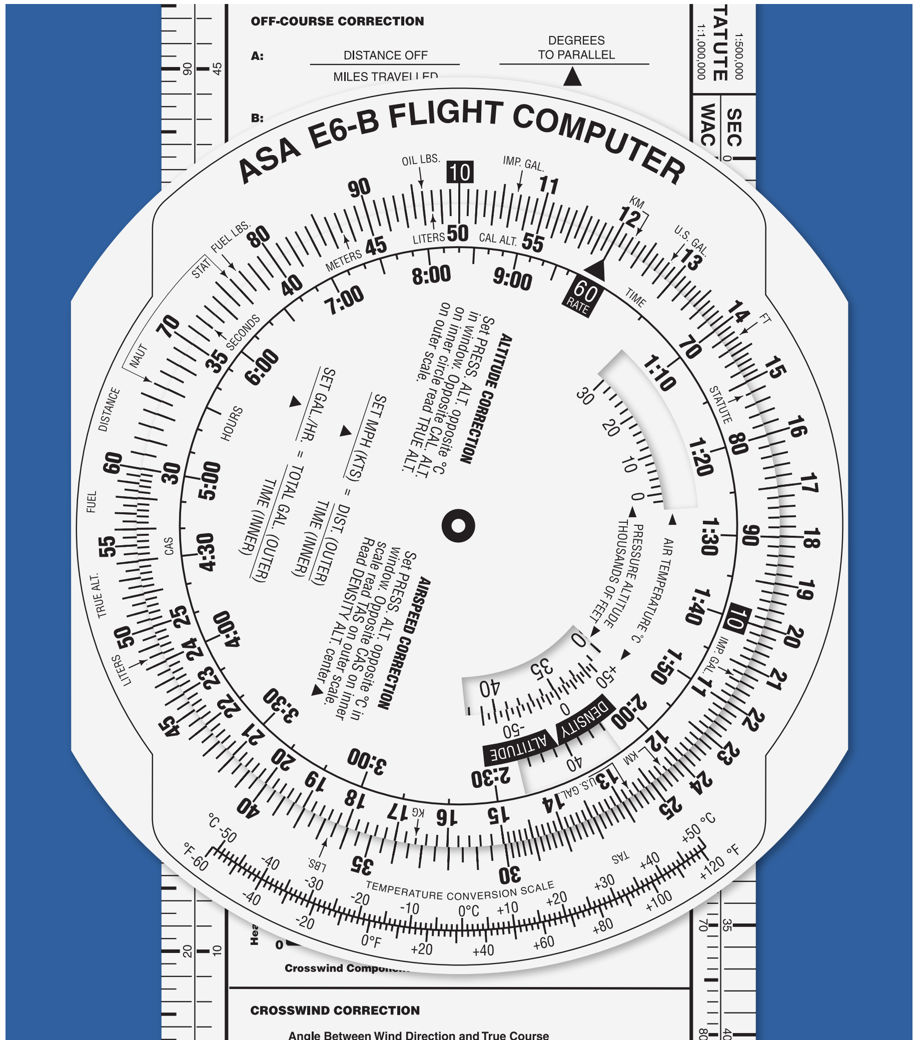


FIGURE 6.

Circular slide rule showing rate arrow (60) opposite 12. Long ticks indicate whole-number values (e.g., 25, 44, 65). Medium ticks mark 1-unit increments between whole numbers. Short tight ticks denote fractional values, typically in 0.1- or 0.2-unit increments in the early portion of the scale.

Although the markings may look intricate at first glance, the circular slide rule is simply a visual ratio tool that becomes intuitive with practice. The slide also includes windows used for airspeed and altitude computations.

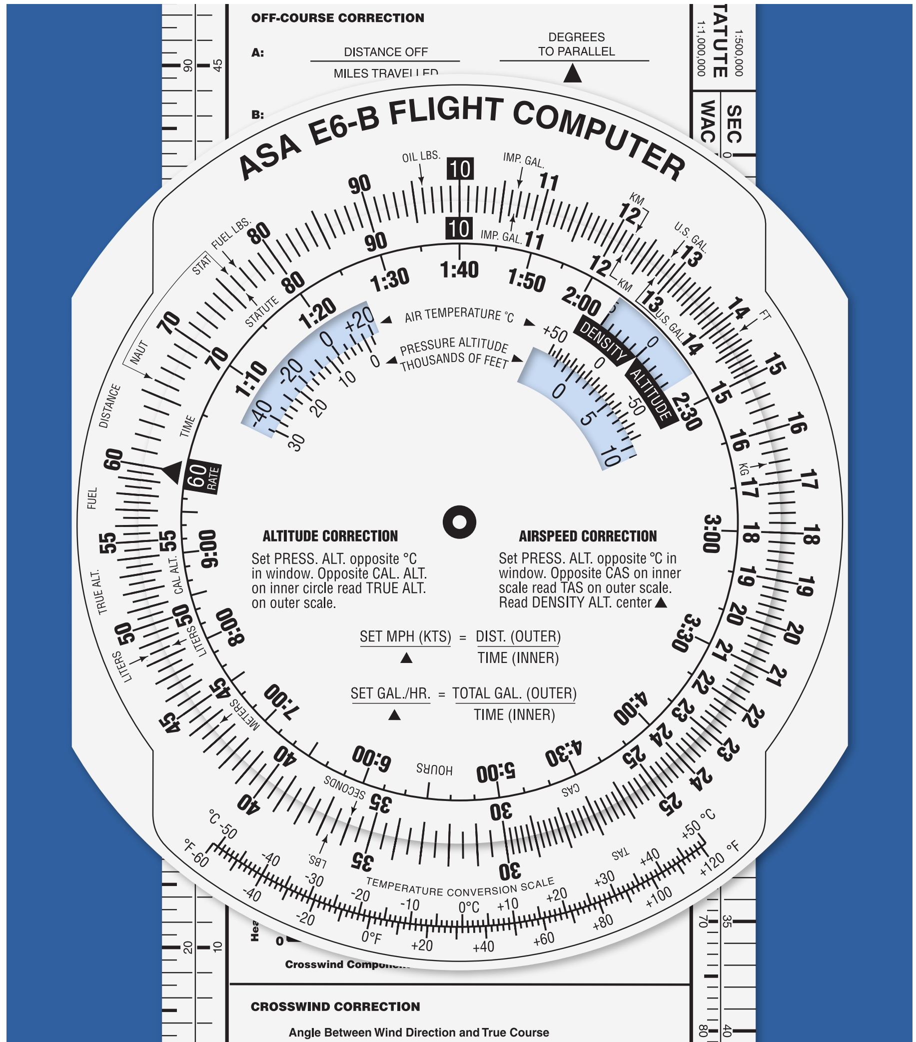


FIGURE 7.

Inner rotating disc windows used to calculate airspeed and altitude.

Sample Calculations

Time–Speed–Distance (TSD)

Use the following formulas:

- Distance = Speed × Time;
- Time = Distance ÷ Speed;
- Speed = Distance ÷ Time.

Example: At 120 knots, find time for 45 NM—Set 120 on the outer scale to the 60 rate mark; opposite 45 on the outer scale, read ~22.5 minutes on the inner scale. At 120 knots it would take you 22.5 minutes to fly 45 NM.

FIGURE 8.

Set 120 on the outer scale **(A)** set to the 60 rate mark **(B)**. Opposite 45 on the outer **(C)**, read ~22.5 minutes **(D)**.

Fuel Calculations

Treat fuel flow like speed.

Example: 8 GPH for 45 minutes—Set 80 (representing 8.0 GPH) on the outer scale opposite 60 (representing minutes) on the inner scale; at 45 minutes on the inner scale, read 60 on the outer scale. In this set-up, 60 represents 6.0 gallons of fuel. Over a 45 minute period at 8 GPH you would burn 6 gallons of fuel.

Note: Be sure to scale the numbers correctly. For example, if the aircraft is burning 8 gallons per hour over a 45-minute period, you would not burn 60 gallons. On the E6-B, the "60" on the outer scale represents 6.0 gallons in this context. Always interpret the scale based on proper placement of the decimal and the time interval being used.

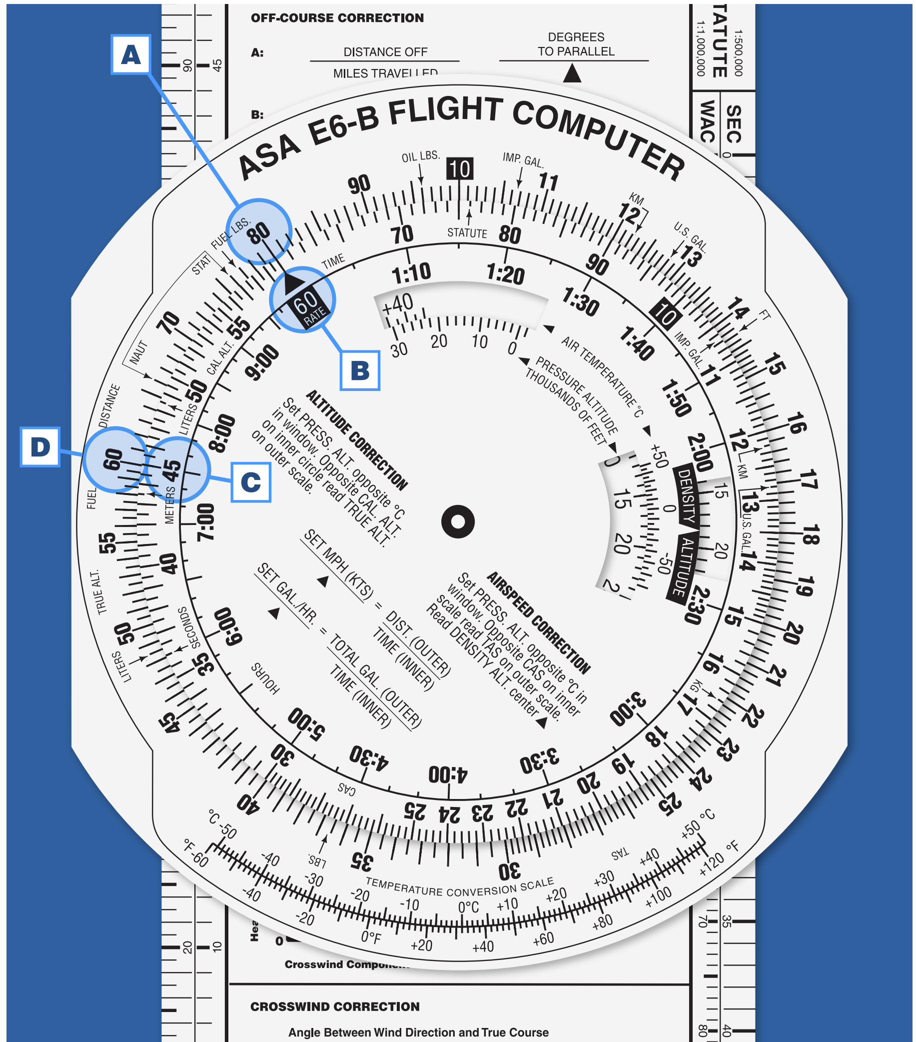


FIGURE 9.

Set 8 on the outer scale **(A)** set to the 60 rate mark **(B)**. Opposite 45 on the inner **(C)**, read 6 gallons on the outer scale **(D)**.

Unit Conversions

Use labeled conversion marks (NAUT/STAT/KM; U.S. GAL/IMP. GAL; LBS/KG).

Example: Convert 70 statute miles to nautical miles—Align 70 with STAT; opposite NAUT read ~61 NM.

Note: Distances for the ground are given in SM (weather, visibility, runway distance) while distance in the air are given in NM (flight planning, navigation).

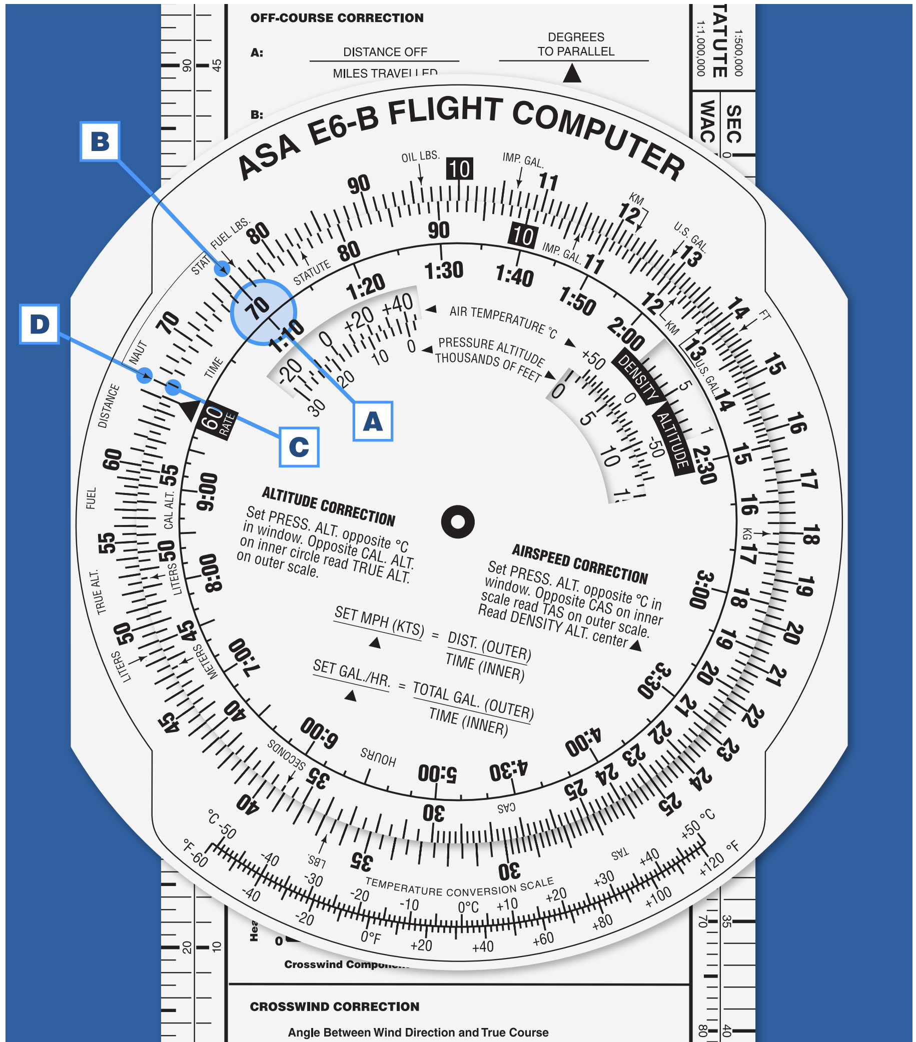


FIGURE 10.

Align 70 on the inner scale **(A)** with STAT mark **(B)**. Opposite NAUT mark on the outer **(C)**, read ~61 NM **(D)**.

Rectangular Slide: Quick References

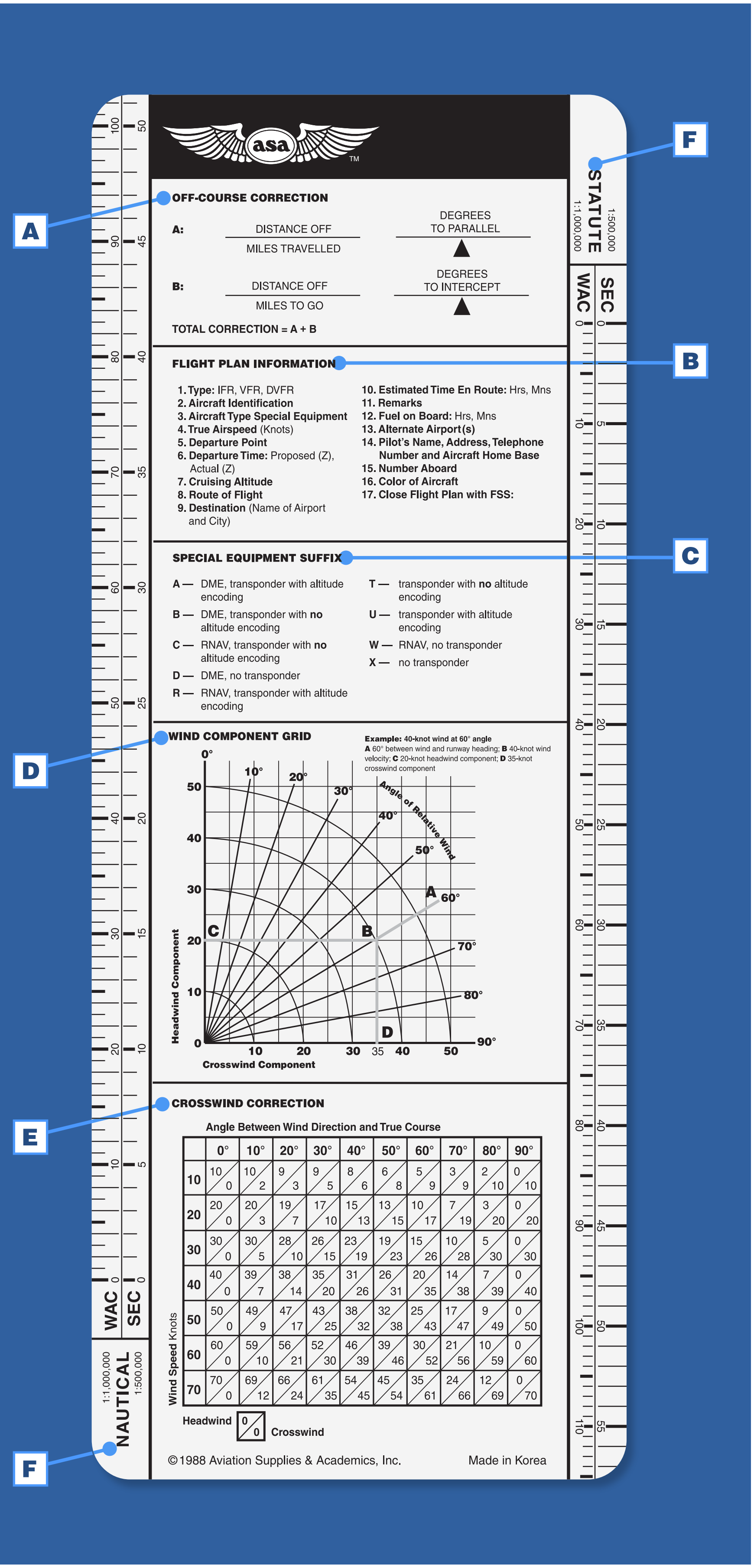
Front-side references include the following:

1. **Off-Course Correction Equations**—Formulas for calculating heading adjustments due to wind or navigation errors.
2. **Flight Plan Information**—Fields or references for filling in details like departure/arrival, times, fuel, and distance.
3. **Special Equipment Suffixes**—Abbreviations used in flight plans to indicate things like RNAV, GPS, or other onboard systems.
4. **Wind Component Grid**—A graphical tool to determine headwind, tailwind, and crosswind components based on wind direction and speed.
5. **Crosswind Correction Table**—Tables to quickly calculate crosswind components for takeoff and landing.
6. **NM (Nautical Mile) and SM (Statute Mile) Scales**—Used for measuring distances on sectional aeronautical charts.

These aid planning and quick calculations without full slide-rule setups.

FIGURE 11.

The rectangular portion of the slide rule includes references, including off-course correction equations **(A)**; flight plan information **(B)**; special equipment suffixes **(C)**; wind component grid **(D)**; crosswind correction table **(E)**; and NM (nautical mile) and SM (statute mile) scales **(F)**.



Wind Side: Components

Components on the wind side are (1) the rotating azimuth ring (compass rose) labeled 0°–360°; (2) the True Index (fixed reference mark); (3) the sliding wind grid with parallel lines and centerline; (4) the center grommet/pivot; and (5) knot-spaced horizontal grid lines for measuring wind speed, groundspeed, and drift.

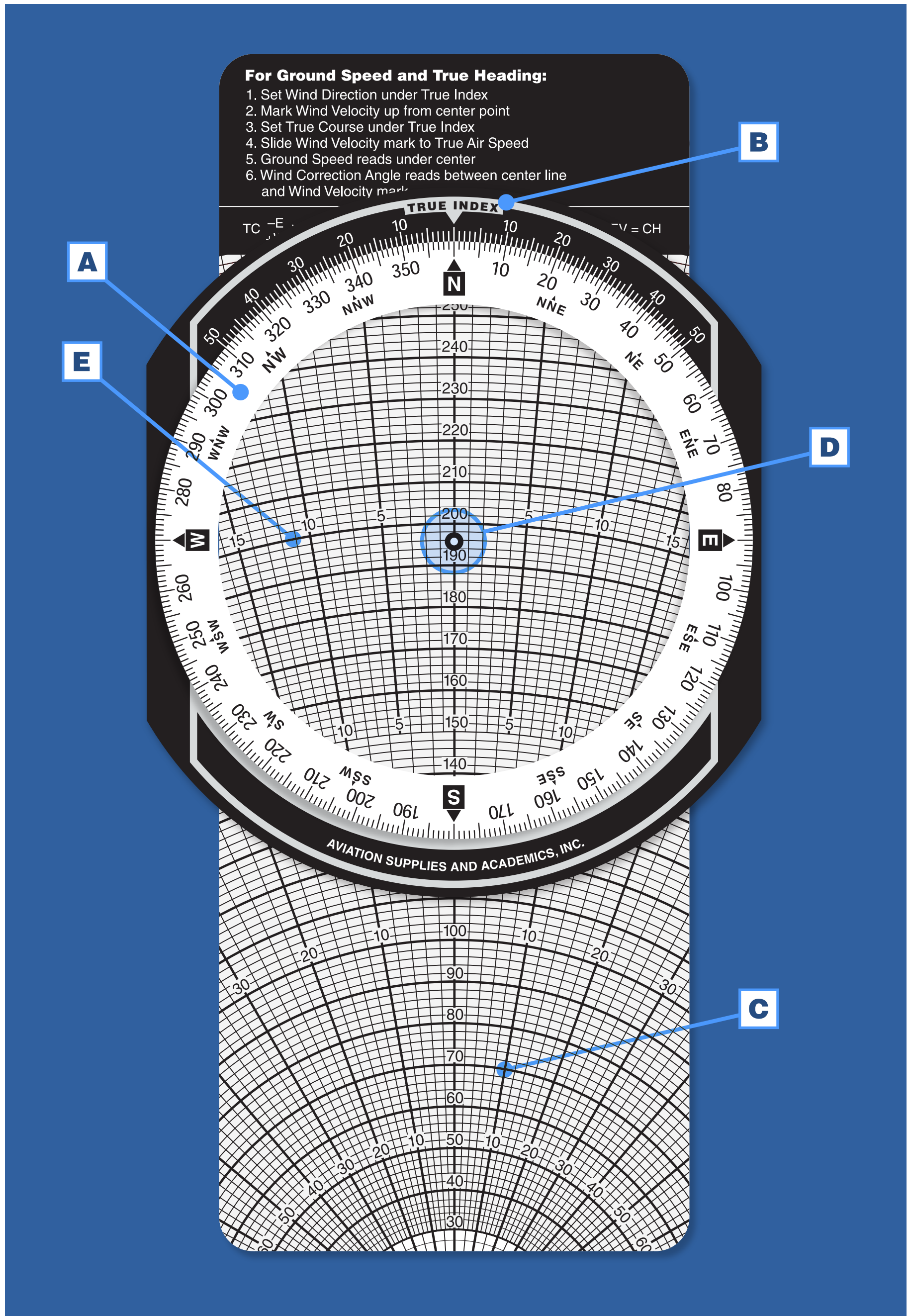


FIGURE 12.

The wind side includes the rotating azimuth ring (compass rose) **(A)**, the True Index **(B)**, the sliding wind grid **(C)**, the center grommet/pivot **(D)**, and knot-spaced horizontal grid lines **(E)**.

How to Use

The wind side of the E6-B provides a graphic method for solving trigonometry problems and displaying the results in a practical aviation format. To determine groundspeed and wind correction angle (WCA), you need the following four inputs:

1. True course
2. True airspeed
3. Wind direction
4. Wind velocity

The winds aloft forecast provides wind direction and velocity. True course is measured directly from your sectional chart, and true airspeed is either converted from indicated airspeed in flight or obtained from the aircraft performance charts during preflight planning.

Begin by entering the wind (140°). Rotate the transparent disc until the reported wind direction is aligned with the TRUE INDEX. Place the center grommet over your true airspeed (120 knots). From the grommet, measure upward and place a dot (some users prefer to draw a line upwards to represent the wind velocity) representing the wind velocity using a pencil or erasable marker (if the wind velocity was 10 knots you would draw up from 120 to 130).

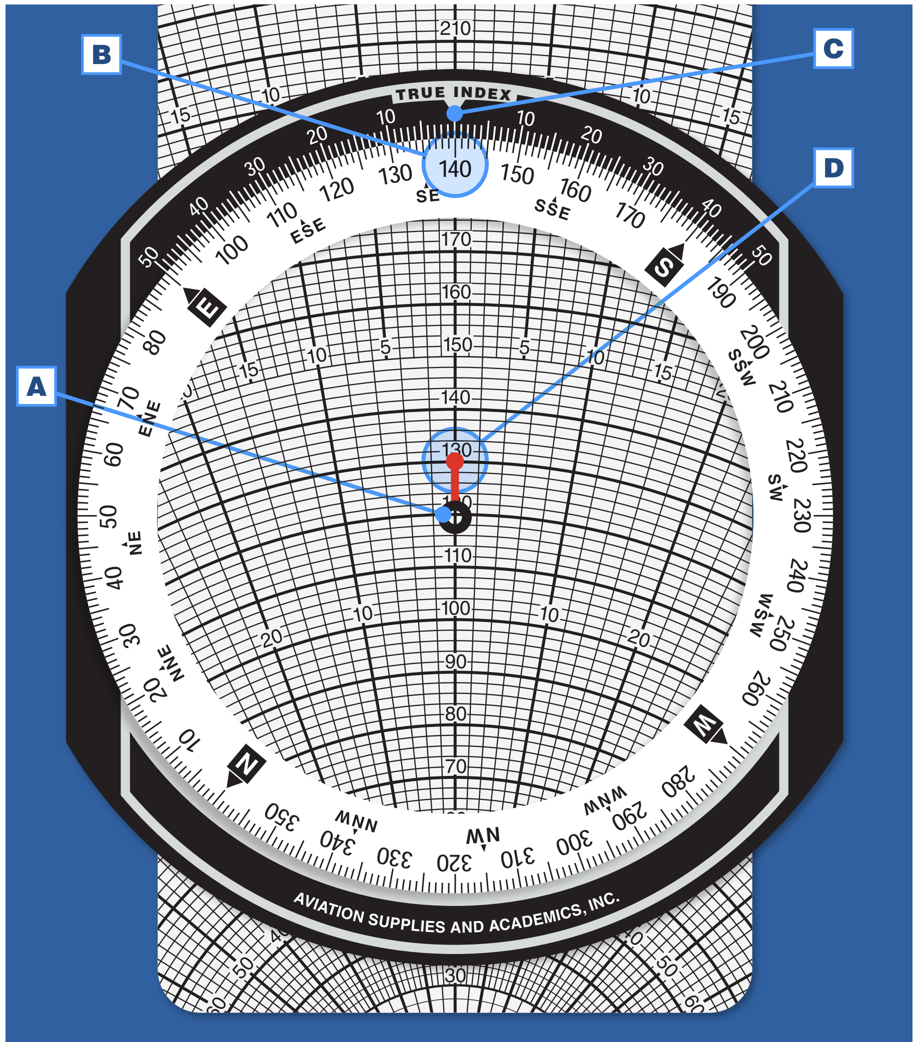


FIGURE 13.

Center grommet over true windspeed 120 knots **(A)**, wind direction 140° **(B)** aligned with the True Index **(C)**, a dot representing the wind velocity 10 knots up from the grommet **(D)**.

Next, rotate the transparent disc so your true course (100°) aligns with the TRUE INDEX. Slide the grid up or down until the wind dot lies on the arc that corresponds to your true airspeed (120 knots). Your groundspeed is read directly under the grommet (112 knots). The wind correction angle is the number of degrees the wind dot lies to the left or right of the centerline (3°). Take care to read the degree spacing correctly—each line represents a different number of degrees depending on your model.

The wind direction and velocity result in a quartering headwind from the right resulting in a groundspeed of 112 knots and a true heading of 103° (100° + 3°)

Note: Left wind correction is subtracted, and right wind correction is added (–L, +R) to or from true course to determine your true heading

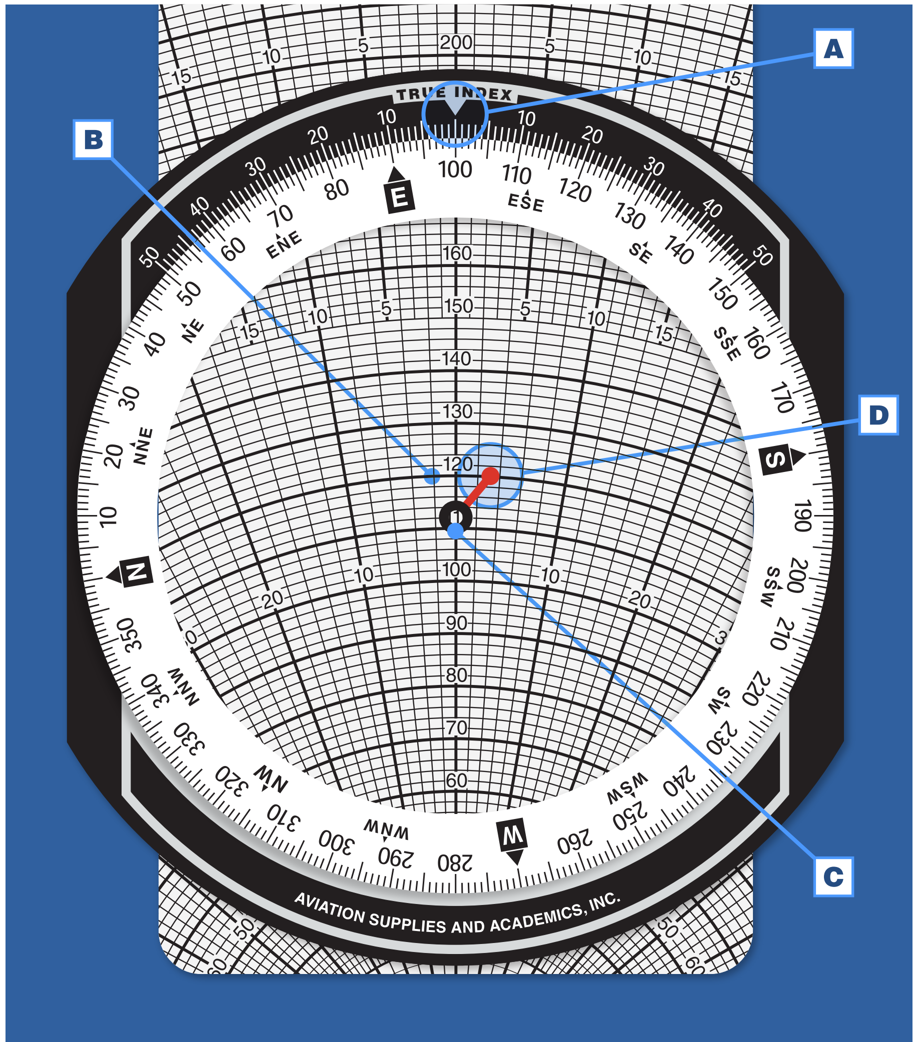


FIGURE 14.

True course (100°) aligns with the true index **(A)**, dot **(B)** lies on the arc of true airspeed (120 kt), read the groundspeed (112 kt) under the grommet **(C)**. Wind correction angle, 3° right of the centerline **(D)**.

Sample Calculation

Example: Solve for heading and groundspeed with the following inputs:

- True Course (TC): 090°
- TAS: 110 kt
- Wind: 030° at 20 kt

Step 1: Set wind direction at the True Index.

Rotate the compass disc so the wind direction (030°) is under the top "True Index" mark.

This tells the E6B: "*The wind is coming from here*."

Step 2: Plot the wind speed.

1. On the transparent grid, find the center grommet (your aircraft's nose).
2. Move up from the center the number of knots of wind. Mark a dot or draw a line up from the nose to your windspeed.
   - » For 20 knots → place a dot 20 units up the vertical line.

This dot = wind direction + wind speed vector.

Step 3: Rotate the disc to your True Course.

Now rotate the compass disc so your course (090°) is at the top (True Index).

The grid stays fixed, but the compass rotates underneath your plotted dot.

This "moves" your wind relative to your course, just like on a real map.

Step 4: Slide the grid so your dot sits on your airspeed arc.

Slide the transparent grid up or down until your wind dot lies on the TAS line (often the heavy semicircle).

This places your plotted wind in relation to your aircraft's true airspeed.

For this problem, this is 110 kt.

Step 5: Read the results.

Find wind correction angle (WCA):

Look at how far LEFT or RIGHT the dot is from the centerline.

- Dot right of center → wind pushes you right → you must turn right to compensate (add)
- Dot left of center → wind from left → correct left (subtract)

The number of degrees off-center = WCA. Dot is 9° left → WCA = 9° left

- Heading = True Course ± WCA → 090° – 9° = 081°

Groundspeed:

Look at how HIGH or LOW the grommet is relative to the TAS arc.

- Grommet above TAS arc = tailwind → higher GS
- Grommet below TAS arc = headwind → lower GS

Grommet ends up slightly below 100 → gives about 99 kt GS.

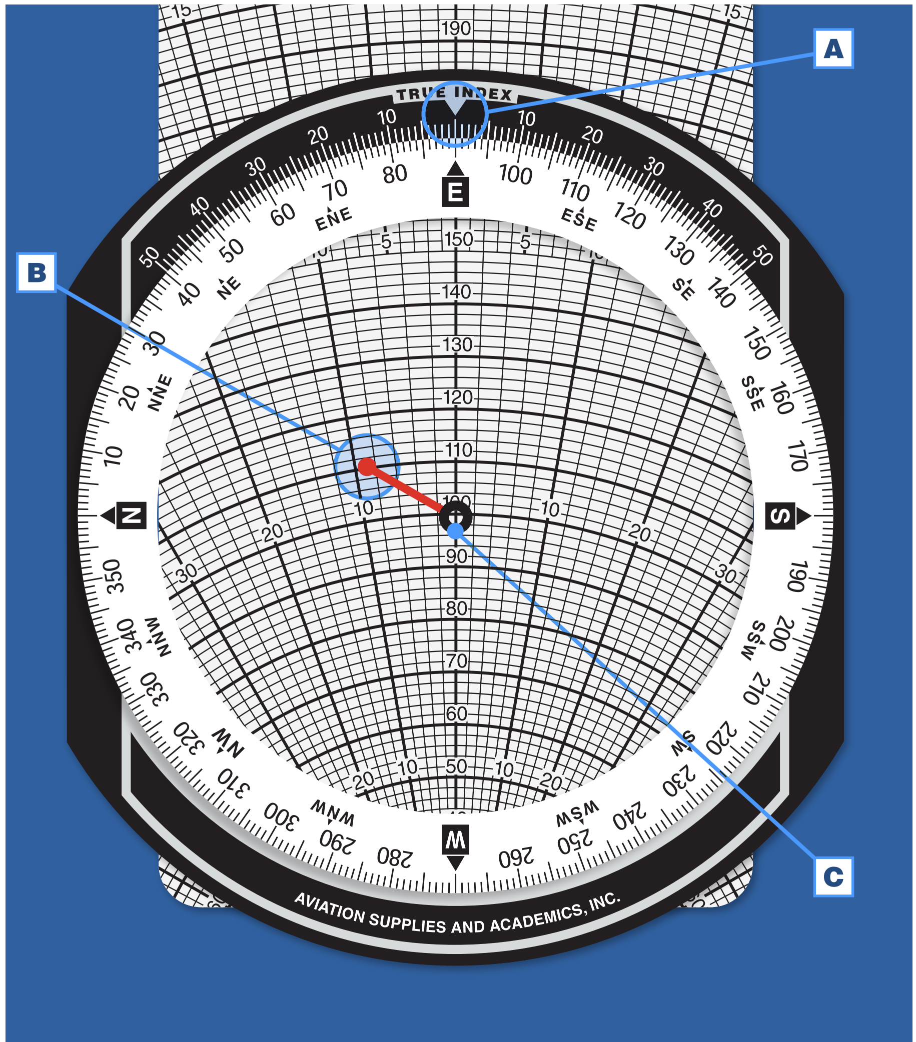


FIGURE 15.

True course (090°) is at true index **(A)**, dot is 9° left **(B)**, and grommet **(C)** is slightly lower than 100.

Instructional Lesson Plans

This course outline adapts the ASA E6-B Flight Computer instruction manual into a STEM-focused curriculum for middle- or high-school classrooms. Using the circular slide rule and wind side, students practice proportional reasoning, unit conversions, and trigonometry while exploring atmospheric science concepts like true airspeed and density altitude. Activities and assessments support single-period lessons or a multi-week unit culminating in a flight-planning capstone. Recommended pacing: 1–2 weeks (5 core lessons + project), 50–60 minute periods.

Contents

Learning Objectives

- Apply ratios and proportional reasoning to solve time–speed–distance problems.
- Convert among measurement systems: nautical/statute miles, gallons/liters, pounds/kilograms, and Fahrenheit/Celsius.
- Explain how temperature and pressure influence air density; compute density altitude and true airspeed using E6-B correction windows.
- Use trigonometry to determine wind correction angle and ground speed from true wind and course.
- Translate between representations (tables, diagrams, graphs) and validate results with estimation and unit sense.
- Collaborate to design a simple flight plan, justify assumptions, and communicate findings with clarity.

Materials & Setup

- ASA E6-B Flight Computer (any ASA model; methods are consistent across variants).
- Optional: ASA plotter and a sectional chart excerpt for local area (or teacher-provided printed chart).
- Whiteboard/projector for worked examples.
- Calculator for numerical verification (optional).
- Student handouts (provided in Appendix).

Lesson Overview (At a Glance)

Lesson	Focus	Key Skills	Assessment
Lesson 1	Time–Speed–Distance (TSD)	Ratios, proportional reasoning	Quick problems + estimation check
Lesson 2	Fuel Consumption & Endurance	Rates, units, endurance	Worked examples + unit sense
Lesson 3	Unit Conversions	Conversions, dimensional analysis	Conversion set + reflection
Lesson 4	Atmospheric Science	TAS, DA windows	Scenario read-outs + explanation
Lesson 5	Wind Side	Vector reasoning, WCA, GS	Two-leg solutions + discussion

Lesson 1: Time–Speed–Distance (TSD)

Objective: Solve for time, speed, or distance on the slide rule side and develop estimation skills.

Key E6-B references: Slide rule middle/outer scales; rate arrow at 60; interpreting calibrations (pp. 5–10).

Quick Reference: Set rate arrow to speed (outer). Read time opposite distance (inner). For unknown speed, set time opposite distance; read rate arrow.

Activity: Demonstrate setting the rate arrow to a known speed (e.g., 150 knots). Read time opposite distance; or read speed opposite time. Students complete 3–5 practice problems (pp. 10).

Formative Assessment: Require students to state units and magnitude reasonableness before recording answers (e.g., does 80 represent 0.8, 8, 800?).

Extension: Provide worksheets with partially completed problems for emerging learners.

Lesson 2: Fuel Consumption & Endurance

Objective: Compute endurance (time), total fuel used, and average burn rates.

Key E6-B references: Fuel consumption using outer (gallons/hour) and inner (hours) scales (pp. 11–12).

Quick Reference: Rate arrow to GPH; read hours opposite gallons. Or set time opposite gallons; read GPH at rate arrow.

Activity: Demonstrate setting rate arrow to gallons per hour on the outer scale; read time on inner and fuel on outer, and vice versa. Students complete 3–5 practice problems (pp. 12).

Formative Assessment: Require unit labeling (minutes, hours, gallons, liters).

Extension: Discuss climb fuel bias. Provide worksheets with partially completed problems for emerging learners.

Lesson 3: Unit Conversions & Dimensional Analysis

Objective: Convert temperatures, distances, volumes, and masses.

Key E6-B references: NAUT/STAT/KM markings; U.S. GAL/IMP. GAL; LBS/KG arrows (pp. 13–17).

Quick Reference: Use NAUT/STAT/KM arrows; U.S. GAL/IMP. GAL; LBS/KG; align arrows and read opposite scales.

Activity: Demonstrate NM ⟷ SM; students complete 3–5 conversions (pp. 14); build a conversion map showing available conversions.

Formative Assessment: Discuss when each unit is used in aviation and typical conversion triggers.

Extension: Provide conversion worksheets for emerging learners.

Lesson 4: Atmospheric Science—True Airspeed & Density Altitude

Objective: Use correction windows to convert calibrated airspeed (CAS) to true airspeed (TAS) and compute density altitude (DA).

Key E6-B references: TAS vs. CAS; setting pressure altitude opposite OAT (°C) (pp. 18–20).

Quick Reference: Set pressure altitude opposite OAT (°C) in window; read TAS (outer) opposite CAS (middle); read DA under density altitude arrow.

Activity: Provide pressure altitude and temperature scenarios; students read TAS and DA and explain performance changes. Use windows to determine DA for various scenarios (pp. 19) and TAS opposite CAS.

Safety note: Emphasize caution when using nonstandard lapse rates; computer solutions are approximations.

Formative Assessment: Identify tick-mark values in windows and temperature scale.

Extension: Provide worksheets with partially completed problems for emerging learners.

Lesson 5: Wind Side—Ground Speed & Wind Correction Angle

Objective: Determine ground speed and wind correction angle (WCA) from true course, true wind, and TAS.

Key E6-B references: Wind side setup, TRUE INDEX, wind dot placement, TAS arcs, grommet readings (pp. 28–32).

Quick Reference: Enter wind direction at TRUE INDEX, mark wind velocity; set true course; slide to TAS arc; read GS under grommet and WCA offset.

Activity: Students solve two legs with differing winds; compare results and discuss drift geometry.

Formative Assessment: Identify dot position relative to grommet for headwind/tailwind and left/right crosswind.

Extension: Off-course problems and crosswind components; use ratio setups to parallel/recapture course (pp. 24–26); apply crosswind table to landing scenarios (pp. 27–28).

Classroom Activities

Data Validation: Compare E6-B estimates with calculator computations; discuss rounding and discrepancies.

Flight Plan Mini-Project: In teams, choose city pairs ~100–200 NM apart. Compute TSD, endurance, conversions, TAS, DA, WCA, and GS for the route. (Requires sectional chart and plotter; flight plan form in Appendix).

Accommodations

Use ASA E6B instructional videos, enlarged overlays of E6-B scales or ASA E6-B Classroom visuals. Provide guided worksheets with highlighted arrows and partially completed setups. Allow calculator checks and pair work.

Teacher Notes

Remind students that the E6-B uses logarithmic scales; emphasize estimation and unit sense. Encourage students to explain reasoning verbally and in writing.

Additional Teacher Background: Each increment represents a multiplicative factor, enabling proportional reasoning across large ranges. Build estimation and ratio sense before precise readings.

Tips:

- Emphasize estimation before precise reading to build number sense.
- Use real-world scenarios (local airports, weather reports) for engagement (aviationweather.gov).
- Troubleshooting: misalignment of scales is the most common error; verify with a reasonableness check.

Course Assessment

Section 1: Circular Slide Rule Basics

1. **What is the primary purpose of the circular slide-rule side of an E6B?**
   A) Calculating fuel grade
   B) Performing multiplication and division
   C) Measuring altitude
   D) Reading charts

2. **If you line up "10" on the inner scale with "12" on the outer scale, what mathematical operation have you done?**
   A) Added 10 and 12
   B) Divided 12 by 10
   C) Multiplied 10 × 12
   D) Subtracted 10 from 12

3. **The "60" on the outer scale is important because it represents:**
   A) Seconds in an hour
   B) A pilot's age
   C) Minutes in an hour
   D) A standard glide ratio

4. **To convert minutes to hours on the E6B, you would use:**
   A) The temperature correction table
   B) The time/speed/distance scale
   C) The wind correction grid
   D) The density altitude window

5. **You set your speed index over 120 on the outer scale. If the arrow points to 30 minutes, what distance have you traveled?**
   A) 30 nm
   B) 60 nm
   C) 90 nm
   D) 120 nm

Section 2: Time / Speed / Distance Problems

6. If your ground speed is 100 knots, how long does it take to fly 50 nautical miles?

A) 15 min

B) 20 min

C) 30 min

D) 45 min

7. You need to fly 80 NM and have 40 minutes available. What ground speed do you need?

A) 80 kt

B) 100 kt

C) 120 kt

D) 160 kt

8. Your aircraft burns 8 gallons per hour. On the E6B, you would calculate fuel use on the:

A) Wind side

B) Circular slide rule side

C) Altitude density chart

D) Temperature conversion window

9. With a fuel burn of 9 GPH for a 1 hour 20 minute flight, how much fuel is used?

A) 10 gallons

B) 12 gallons

C) 15 gallons

D) 18 gallons

10. If you travel 150 NM in 1 hour 30 minutes, your average ground speed is:

A) 90 kt

B) 100 kt

C) 150 kt

D) 180 kt

Section 3: Wind Side / Wind Triangle Basics

11. The wind side of an E6B is mainly used to find:

A) Engine horsepower

B) Wind correction angle and ground speed

C) Fuel mixture

D) Compass variation

12. The vertical grid on the wind side allows you to plot:

A) Temperature changes

B) Wind direction and speed

C) Airport elevation

D) Magnetic variation

13. True course is:

A) The direction you point the airplane

B) The direction of the wind

C) The direction you want to fly over the ground

D) Your compass reading after corrections

14. The wind dot represents:

A) The aircraft

B) The wind velocity

C) The destination

D) The magnetic variation

15. If your true airspeed increases, your ground speed will:

A) Always stay the same

B) Always decrease

C) Usually increase unless you're flying into a headwind

D) Become equal to the wind speed

Section 4: Applied Wind Triangle Problems

16. **True Course = 090°, TAS = 100 kt, Wind = 180° @ 20 kt. What approximate wind correction angle will you apply?**

    A) 2° left

    B) 6° left

    C) 2° right

    D) 6° right

17. **Using the same data as above, what is your approximate ground speed?**

    A) 80 kt

    B) 90 kt

    C) 100 kt

    D) 120 kt

18. **True Course = 360°, TAS = 110 kt, Wind = 270° @ 30 kt. Expected correction?**

    A) Crab left

    B) Crab right

    C) No correction

    D) Turn around

19. **True Course = 045°, TAS = 90 kt, Wind = 090° @ 20 kt. Ground speed will:**

    A) Increase slightly

    B) Decrease slightly

    C) Stay the same

    D) Drop to zero

20. **True Course = 270°, TAS = 115 kt, Wind = 270° @ 25 kt. What type of wind is this?**

    A) Headwind

    B) Tailwind

    C) Crosswind

    D) No wind effect

Course Assessment Answer Key

Question 1: B

Explanation: The circular slide-rule side of an E6-B is used for calculations like multiplication, division, conversions, and flight planning computations.

Question 2: C

Explanation: Aligning 10 on the inner scale with 12 on the outer scale allows you to multiply 10 × 12 using the E6-B's logarithmic scale.

Question 3: C

Explanation: The "60" on the outer scale represents minutes in an hour, important for time/speed/distance calculations.

Question 4: B

Explanation: The time/speed/distance scale allows conversion between minutes and hours for flight planning.

Question 5: B

Explanation: If speed is 120 knots and the arrow points to 30 min, distance traveled = 120 × 0.5 hours = 60 NM.

Question 6: C

Explanation: Time = Distance ÷ Speed → 50 NM ÷ 100 kt = 0.5 hr = 30 min

Question 7: C

Explanation: Speed = Distance ÷ Time → 80 NM ÷ (40/60 hr) = 120 kt.

Question 8: B

Explanation: Fuel use is calculated on the circular slide-rule side using time and fuel burn rate.

Question 9: B

Explanation: Fuel used = 9 GPH × 1.33 hr = 12 gallons.

Question 10: B

Explanation: Ground speed = Distance ÷ Time → 150 NM ÷ 1.5 hr = 100 kt.

Question 11: B

Explanation: The wind side is used to find the wind correction angle and ground speed by plotting wind vectors.

Question 12: B

Explanation: The vertical grid allows you to plot wind speed and direction for vector calculations.

Question 13: C

Explanation: True course is the intended path over the ground, measured in degrees.

Question 14: B

Explanation: The wind dot represents wind velocity in the wind triangle plot.

Question 15: C

Explanation: If TAS increases, ground speed usually increases unless flying into a headwind.

Question 16: B

Explanation: Using the wind side, a wind from 180° at 20 kt against a course of 090° results in a small left correction (~6°).

Question 17: B

Explanation: Ground speed decreases due to headwind component; approximate GS ~90 kt.

Question 18: A

Explanation: Wind from 270° while flying 360° requires crabbing left to compensate.

Question 19: B

Explanation: Wind from 090° (right) slows the aircraft along the 045° course; ground speed decreases slightly.

Question 20: B

Explanation: Wind from behind (270°) helps the aircraft along 270° course; tailwind.

Practice Worksheets

Name:

Date: **Score:**

Lesson Plan 1 Worksheet: Time / Speed / Distance (TSD)

Label units.

1. **At 120 kt, how long to fly 45 NM?** minutes

   Notes:

2. **At 95 kt for 38 minutes, how far do you go??** NM

   Notes:

3. **Fly 78 NM in 36 minutes. What speed??** kt

   Notes:

4. **At 140 kt, how long to fly 105 NM??** minutes

   Notes:

5. **At 110 kt for 52 minutes, how far do you go??** NM

   Notes:

6. **Fly 120 NM in 50 minutes. What speed??** kt

   Notes:

7. **At 90 kt, how long to fly 67 NM??** minutes

   Notes:

8. **At 130 kt for 24 minutes, how far do you go??** NM

   Notes:

9. **Fly 210 NM in 84 minutes. What speed??** kt

   Notes:

10. **At 150 kt, how long to fly 62 NM??** minutes

    Notes:

Name:

Date: Score:

Lesson Plan 2 Worksheet: Fuel Consumption & Endurance

Label units.

1. **Fuel burn 8.5 GPH for 45 minutes. Fuel used?** gal

   Notes:

2. **24 gal on board at 7.5 GPH. Endurance?** hr min

   Notes:

3. **Used 12 gal in 95 minutes. Average burn rate?** GPH

   Notes:

4. **Fuel burn 10.2 GPH for 78 minutes. Fuel used?** gal

   Notes:

5. **18 gal on board at 9 GPH. Endurance?** hr min

   Notes:

6. **Used 30 gal in 180 minutes. Average burn rate?** GPH

   Notes:

7. **Fuel burn 6.7 GPH for 32 minutes. Fuel used?** gal

   Notes:

8. **12 gal on board at 8 GPH. Endurance?** hr min

   Notes:

Name:

Date: Score:

Lesson Plan 3 Worksheet: Unit Conversions

Convert and include units.

1. **NM → SM: 68 →**
2. **SM → NM: 125 →**
3. **US gal → L: 11.5 →**
4. **L → US gal: 42 →**
5. **lb → kg: 85 →**
6. **kg → lb: 32 →**
7. **°C → °F: –12 →**
8. **°F → °C: 86 →**
9. **NM → SM: 152 →**
10. **SM → NM: 60 →**
11. **US gal → L: 3.8 →**
12. **L → US gal: 19 →**

Name:

Date: Score:

Lesson Plan 4 Worksheet: True Airspeed (TAS) & Density Altitude (DA)

Use the E6-B correction windows. Record DA and TAS.

1. **PA 0 ft, OAT 20 °C, CAS 100 kt →**
   DA: ft; **TAS:** kt

   Notes:

2. **PA 3,500 ft, OAT 5 °C, CAS 110 kt →**
   DA: ft; **TAS:** kt

   Notes:

3. **PA 6,500 ft, OAT 25 °C, CAS 105 kt →**
   DA: ft; **TAS:** kt

   Notes:

4. **PA 8,000 ft, OAT -5 °C, CAS 95 kt →**
   DA: ft; **TAS:** kt

   Notes:

5. **PA 4,500 ft, OAT 30 °C, CAS 115 kt →**
   DA: ft; **TAS:** kt

   Notes:

6. **PA 10,000 ft, OAT -10 °C, CAS 120 kt →**
   DA: ft; **TAS:** kt

   Notes:

Name:

Date: Score:

Lesson Plan 5 Worksheet: Wind Side—Groundspeed & Wind Correction Angle

Enter wind at TRUE INDEX, plot wind, set true course, slide to TAS arc, then read GS and WCA.

1. **TC 090°, TAS 110 kt; Wind 030° @ 20 kt →**
   WCA: ° (L/R); **Heading:** °; **GS:** kt

   Diagram:

2. **TC 270°, TAS 100 kt; Wind 220° @ 15 kt →**
   WCA: ° (L/R); **Heading:** °; **GS:** kt

   Diagram:

3. **TC 135°, TAS 95 kt; Wind 180° @ 25 kt →**
   WCA: ° (L/R); **Heading:** °; **GS:** kt

   Diagram:

4. **TC 045°, TAS 120 kt; Wind 330° @ 18 kt →**
   WCA: ° (L/R); **Heading:** °; **GS:** kt

   Diagram:

5. **TC 210°, TAS 105 kt; Wind 160° @ 12 kt →**
   WCA: ° (L/R); **Heading:** °; **GS:** kt

   Diagram:

6. **TC 005°, TAS 90 kt; Wind 085° @ 30 kt →**
   WCA: ° (L/R); **Heading:** °; **GS:** kt

   Diagram:

Name:

Date: Score:

Mini Project: Flight Plan (Team Activity)

Choose two airports ~100–200 NM apart. Complete this form and attach your computations.

Route (From → To):

True Course (TC): ° **Distance:** NM

Planned TAS: kt **Cruise Altitude:** ft

Forecast Winds Aloft: ° **@** kt (at cruise altitude)

Fuel Burn (GPH): **Fuel On Board:** gal

Estimated Time Enroute (ETE): hr min

DA at Departure: ft **DA at Destination:** ft

WCA: ° **(L/R) Heading:** ° **Groundspeed:** kt

Reserve Fuel Plan: gal / min

Notes/Ass

Practice Worksheets Answer Key

Worksheet 1: TSD—Answers

1. 22.5 minutes
2. 60.2 NM
3. 130.0 kt
4. 45.0 minutes
5. 95.3 NM
6. 144.0 kt
7. 44.7 minutes
8. 52.0 NM

Worksheet 2: Fuel—Answers

1. 150.0 kt
2. 24.8 minutes
3. 6.38 gal
4. 3 hr 12 min
5. 7.58 GPH
6. 3.26 gal
7. 2 hr 0 min
8. 10.0 GPH
9. 3.57 gal
10. 1 hr 30 min

Worksheet 3: Conversions—Answers

1. **78.25**
2. **108.62**
3. **43.53**
4. **11.1**
5. **38.56**
6. **70.55**
7. **10.4**
8. **30.0**
9. **174.92**
10. **52.14**
11. **14.38**
12. **5.02**

Worksheet 4: TAS & DA—Answers (Approximate)

DA computed by DA ≈ PA + 120 × (OAT − ISA_temp). TAS approximated as ≈ CAS × [1 + 0.02 × (DA/1000)]. Accept E6-B window readings within reasonable ranges.

1. **DA ≈ 600 ft; TAS ≈ 101.2 kt**
2. **DA ≈ 3,140 ft; TAS ≈ 116.9 kt**
3. **DA ≈ 9,260 ft; TAS ≈ 124.4 kt**
4. **DA ≈ 7,520 ft; TAS ≈ 109.3 kt**
5. **DA ≈ 7,380 ft; TAS ≈ 132.0 kt**
6. **DA ≈ 9,400 ft; TAS ≈ 142.6 kt**

Worksheet 5: Wind Side—Answers

WCA sign: positive (R) = turn right; negative (L) = turn left.
GS uses GS = TAS·cos(WCA) + W·cos(β), β = wind from − TC.

1. **TC 090°, TAS 110 kt; Wind 030° @ 20 kt →**
   WCA ≈ 9.1° (Left); Heading ≈ 081°; GS ≈ 118.6 kt

2. **TC 270°, TAS 100 kt; Wind 220° @ 15 kt →**
   WCA ≈ 6.6° (Left); Heading ≈ 263°; GS ≈ 109.0 kt

3. **TC 135°, TAS 95 kt; Wind 180° @ 25 kt →**
   WCA ≈ 10.7° (Right); Heading ≈ 146°; GS ≈ 111.0 kt

4. **TC 045°, TAS 120 kt; Wind 330° @ 18 kt →**
   WCA ≈ 8.3° (Left); Heading ≈ 037°; GS ≈ 123.4 kt

5. **TC 210°, TAS 105 kt; Wind 160° @ 12 kt →**
   WCA ≈ 5.0° (Left); Heading ≈ 205°; GS ≈ 112.3 kt

6. **TC 005°, TAS 90 kt; Wind 085° @ 30 kt →**
   WCA ≈ 19.2° (Right); Heading ≈ 024°; GS ≈ 90.2 kt