SAFETECH, INC.

NEWTOWN, PA. 18940

ECN 38108-387 Rev.A SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE 2/77

HOW TO USE YOUR

SAFETECH E-6B COMPUTER

FDF-51A/57/60 DEAD RECKONING COMPUTER

SAFETECH, INC.

TABLE OF CONTENTS

IMPORTANT NOTICE

For the purpose of simplicity, all the illustrations shown throughout this manual represent the FDF-57 computer. The only appreciable difference between the FDF-51A, 57 and 60 is physical appearance. The scales and calculations are identical for all three computers.

SECTION I. INTRODUCTION

1-1. History of the E-6B Computer

Originally designed by the late Lt. Philip Dalton, USNR, the E-6B computer was adopted by the Army Air Corps in 1942 and has appeared on the civilian market under different labels and variations. It has since been adopted for standard use by the U.S. Navy and now by the U.S. Army for helicopter pilots.

1-2. Construction and Purpose

A dead reckoning computer is a combination of two devices, one a specially designed instrument for solving wind triangles and the other a circular slide rule for solving arithmetical problems.

1-3. The E-6B Dead Reckoning (DR) Computer

Many different types of dead reckoning navigation computers exist, but the construction and design features of the major types are very similar. For illustrative purposes, the Safetech type E-6B Dead Reckoning Computer is used throughout this manual.

SECTION II. THE CIRCULAR SLIDE RULE

2-1. The Circular Slide Rule

a. Scales. The circular slide rule of the E-6B computer consists of two concentric circular scales. The outer scale is stationary and is called the MILES scale. The inner scale rotates and is called the MINUTES scale.

b. Scale Values. The numbers on any navigational computer scale, as on most slide rules, represent multiples of 10 of the values shown. For example, the number 24 on either scale (outer or inner) may represent 0.24, 2.4, 24, 240, or 2,400. On the inner scale, minutes may be converted to hours by reference to the adjacent hour scale. For example, 4 hours is found in Figure 1 adjacent to 24, in this case meaning 240 minutes. Relative values should be kept in mind when reading the computer. For example, the numbers 21 and 22 on either scale are separated by five spaces, each space representing two units. The second division past 21 would be read as 21.4, 2,140, etc. Spacing of these divisions should be studied, as the breakdown of dividing lines may be into units of 1, 2, 5, or 10.

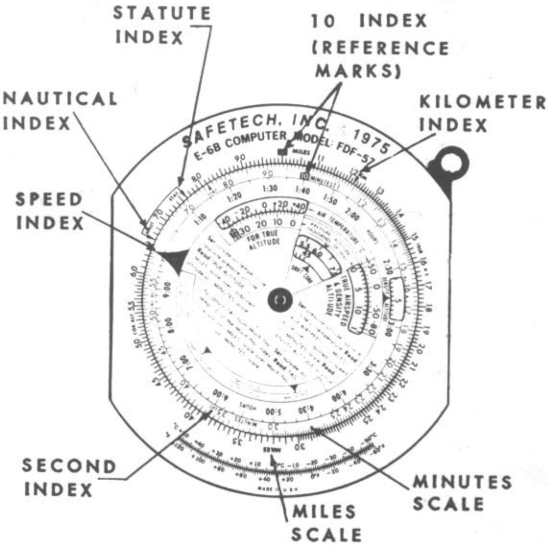

Figure 1. Circular Slide Rule

c. Indexes. Three of the indexes on the outer stationary scale are used for converting statute miles, nautical miles, and kilometers. These indexes are appropriately labeled "Naut" at 66, "Stat" at 76, and "Km" at 122. On the inner rotating scale are two rate indexes. The large black arrow at 60 (called the SPEED index) is the hour index, and the small arrow at 36 is the second ("Sec") index (3,600 seconds equal 1 hour). The "Stat" index (at 76) on the inner scale is used in "NAUT-STAT" mileage conversion. Each scale has a "10" index used as a reference mark for multiplication and division. The application of these scales in solving computer problems is illustrated in the specific problems that follow.

2-2. Distance Conversions

a. Problem. How many statute miles equal 90 nautical miles? How many kilometers equal 90 nautical miles?

b. Solution. Using the E-6B computer, refer to Figure 2 and solve as follows:

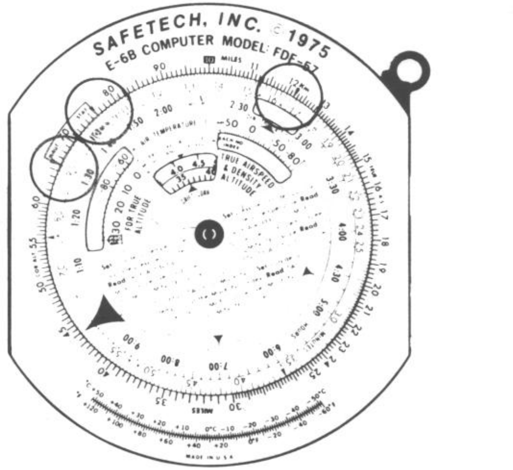

Figure 2. Distance Conversion

(1) Set 90 on inner scale to "Naut" index.

(2) Read 104 under "Stat" index (104 statute miles).

(3) Read 166 under "Km" index (166 kilometers).

NOTE

When several distance conversion problems are to be solved between statute and nautical miles, set the "Stat" index (at 76) on the inner scale under the "Naut" index (at 66) of the outer scale and read any ratio around the entire slide rule; i.e., 13 statute miles is 11.3 nautical miles, 13 nautical miles is 15 statute miles, etc. (Figure 3).

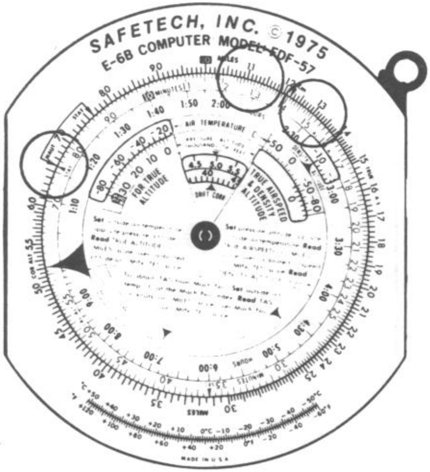

Figure 3. Converting Several Distances Simultaneously

2-3. Simple Proportion Problems

The slide rule face of the E-6B computer is so constructed that any relationship between two numbers, one on the stationary scale and one on the movable scale, will hold true for all other numbers on the two scales. For example, if the two 10 indexes are placed opposite each other (Figure 4), all other numbers around the entire circle will be identical. If 20 on the inner scale is placed opposite the 10 index on the outer scale, all numbers on the inner scale will be double those on the outer scale. If 12 on the outer scale is placed opposite 16 on the inner scale, all numbers will be in a 3 to 4 (3/4) relationship. This scale design enables the aviator to find the fourth term of any arithmetical proportion when three of the values are known.

2-4. Speed-Distance-Time Problems

Speed-distance-time problems are worked on the inner (MINUTES) scale and the outer (MILES) scale.

a. Problem. If 50 minutes are required to travel 120 nautical miles, how many minutes are required to travel 85 nautical miles at the same rate?

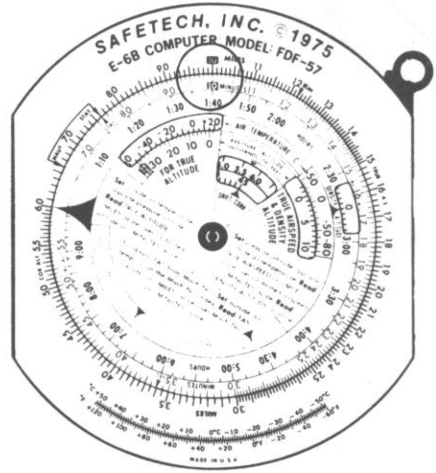

Figure 4. Numerical Relationship Between the Two Scales

b. Solution. Using the E-6B computer, refer to Figure 5 and solve as follows:

(1) Set 50 (inner scale) under 120 (outer scale).

(2) Under 85 (outer scale), read 36 (inner scale) minutes required.

2-5. Determining Ground Speed

Ground speed equals distance divided by time.

a. Problem. What is the ground speed if it takes 35 minutes to fly 80 nautical miles?

b. Solution. Using the E-6B computer, refer to Figure 6 and solve as follows:

(1) Set 35 (inner scale) opposite 80 (outer scale).

(2) Over 60 index read ground speed (137 knots).

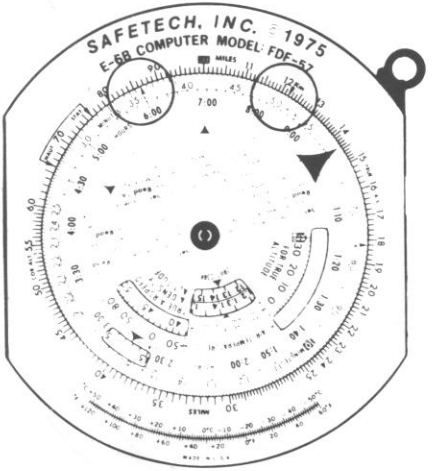

Figure 5. Time and Distance

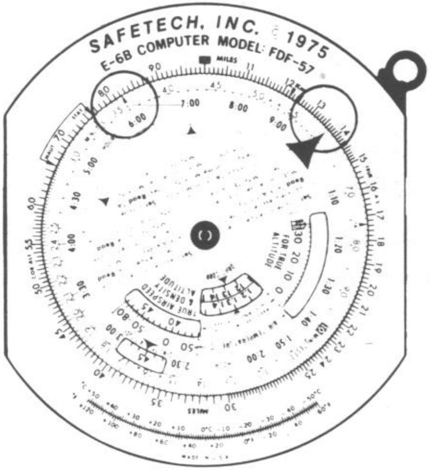

Figure 6. Determining Ground Speed

2-6. Determining Time Required

Time equals distance divided by ground speed.

a. Problem. How much time is required to fly 333 nautical miles at a ground speed of 174 knots?

b. Solution. Using the E-6B computer, refer to Figure 7 and solve as follows:

(1) Set rate or 60 index on 174 (outer scale).

(2) Under 333 (outer scale) read 115 minutes (inner scale) or 1:55 on the HOUR scale.

2-7. Determining Distance

Distance equals ground speed multiplied by time.

a. Problem. How far does an aircraft travel in 2 hours, 15 minutes at a ground speed of 138 knots?

Figure 7. Determining Time

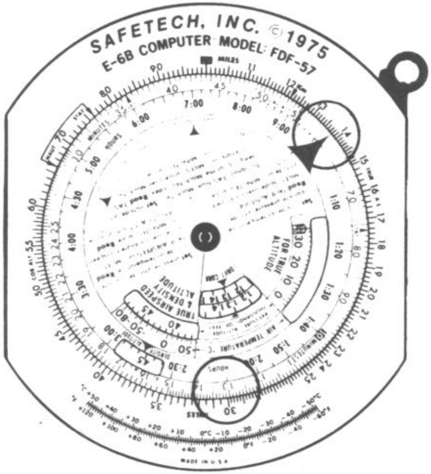

Figure 8. Determining Distance

b. Solution. Using the E-6B computer, refer to Figure 8 and solve as follows:

(1) Set 60 index at 138 (outer scale).

(2) Over 135 (inner scale) or 2 hours, 15 minutes (hours scale), read 310 nautical miles (outer scale).

2-8. Use of the 36 Index

The number 36 on the inner scale is used in solving speed-distance-time problems in instrument flight when time must be calculated in seconds and minutes instead of minutes and hours. For example, determine the time required to fly from the outer marker to the middle marker or from the middle marker to the point of touchdown during an instrument approach.

a. Formula. Problems where seconds must be used as a unit of time may be solved by the formula

$$\frac{GS}{36} = \frac{\text{Distance}}{\text{Seconds}}$$

in which GS is the ground speed; 36 represents the number of seconds in 1 hour (3,600); distance is the number of miles or decimal parts of miles to be flown; and seconds is the time required to fly that distance.

b. Problems involving less than 60 seconds.

(1) Problem. What is the time required from the middle marker to the point of touchdown if the ground speed is 100 knots and the distance between these points is 0.5 nautical miles?

(2) Solution. Set 36 (SEC index-inner scale) under the ground speed of 100 knots (10 on the outer scale). Under 50 (0.5 nautical miles) on the outer scale, read 18 seconds on the inner scale (Figure 9).

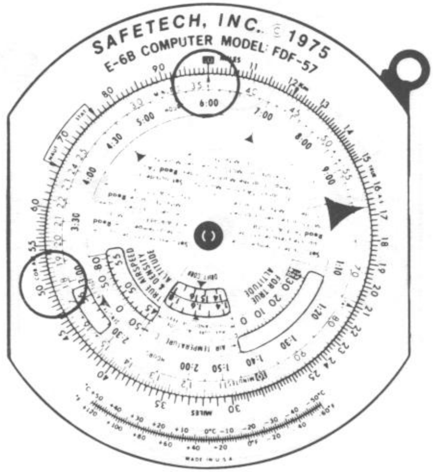

Figure 9. Speed-Distance-Time Problems Using Minutes

c. Problems involving more than 60 seconds.

(1) Problem. What is the time required to fly from the outer marker to the middle marker if the ground speed is 95 knots and the distance between the two points is 5 nautical miles?

(2) Solution. Set 36 (SEC index-inner scale) under the ground speed of 95 knots (95 on the outer scale). Under 50 (5 nautical miles) on the outer scale, read 19 (190 seconds), or 3 minutes, 10 seconds on the inner scale (Figure 10).

NOTE

When using the minutes scale as a second scale, the hour scale becomes a minute scale.

2-9. Determining Gallons or Pounds Used in a Given Time

Place the 60 index under rate (GPH) and read gallons used over the given time. To convert gallons to pounds or pounds to gallons, the following conversion factors are used in simple proportion (paragraph 2-3):

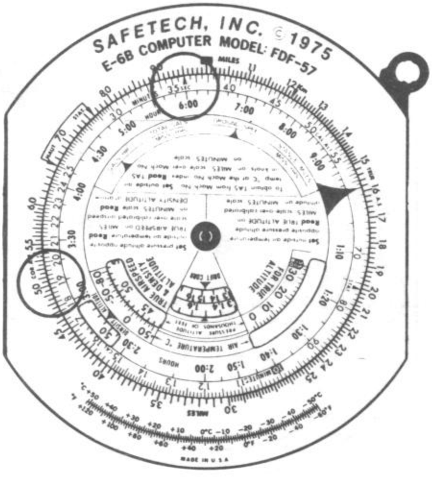

Figure 10. Speed-Distance-Time Problems Using Seconds

a. Gasoline 6.0:1.

b. Kerosene 6.5:1.

2-10. Determining Rate of Fuel Consumption

Rate of fuel consumption equals gallons of fuel consumed divided by time.

a. Problem. What is the rate of fuel consumption if 30 gallons of fuel are consumed in 111 minutes? (1 hour and 51 minutes)?

b. Solution. Using the E-6B computer, refer to Figure 11 and solve as follows:

(1) Set 111 (inner scale) under 30 on outer scale (in this case, outer scale is used to represent gallons).

(2) Opposite the 60 GPH index, read 16.2 gallons per hour (GPH).

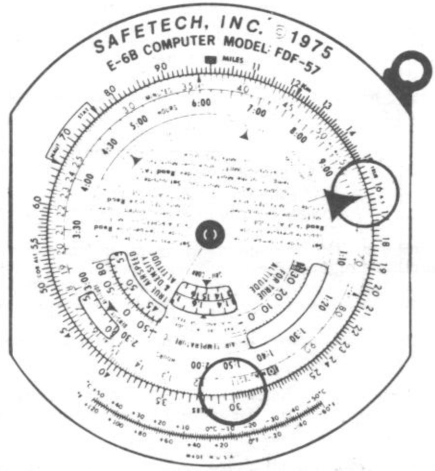

Figure 11. Determining Rate of Fuel Consumption

2-11. Fuel Consumption Problem

Use same scales as used with the speed-distance-time problems discussed in paragraph 2-4 and solve the following fuel consumption problem:

a. Problem. Forty gallons of fuel have been consumed in 135 minutes (2 hours and 15 minutes) flying time. How much longer can the aircraft continue flying if 25 gallons of available fuel (usable fuel not including reserve) remain and the rate of consumption remains unchanged?

b. Solution. Using the E-6B computer, refer to Figure 12 and solve as follows:

(1) Set 135 (inner scale) under 40 (outer scale).

(2) Under 25 (outer scale), read 84.5 (inner scale) minutes fuel remaining.

2-12. Fuel Consumption (Distance, Weight, Time)

Aircraft performance data charts used in determining maximum flying range sometimes base fuel consumption rates on nautical miles flown per pound or gallon of fuel consumed. The aviator often desires to compute maximum flying range based on fuel consumption rate in pounds or gallons per hour. This conversion is accomplished as follows:

a. Formula. The relationship between nautical miles per pound and pounds per hour is expressed as:

$$\frac{\text{Nautical miles per pound (or gallon)}}{\text{1 pound (or gallon)}} = \frac{\text{TAS (miles flown per hour)}}{\text{Pounds (or gallons) per hour}}$$

b. Problem. The maximum flying range based on fuel consumption is indicated on the aircraft performance chart as .232 nautical miles per pound. At a true airspeed of 196 knots, what is the aircraft fuel consumption rate in pounds per hour?

c. Solution. Using the E-6B computer, refer to Figure 13 and solve as follows:

(1) Set .232 (nautical miles per pound) on the outer scale over the 10 index (1 pound) on the inner scale.

(2) Under the TAS (196 knots) on the outer scale, read pounds per hour (845) on the inner scale.

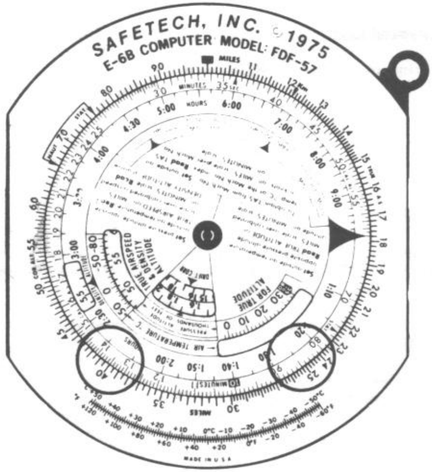

Figure 12. Fuel Consumption

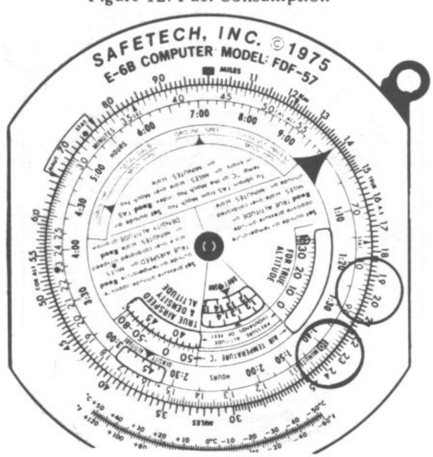

Figure 13. Converting Nautical Miles Per Pound to Pounds Per Hour

2-13. Airspeed Computations

The window marked TRUE AIRSPEED AND DENSITY ALTITUDE provides a means for computing true airspeed when indicated airspeed, temperature, and altitude are known or vice versa. To change from one to the other, it is necessary to correct for altitude and temperature differences existing from those that are standard at sea level. Free air temperature is read from a free air thermometer and the pressure altitude is found by setting the altimeter at 29.92" Hg and reading the altimeter directly.

a. Problem. The indicated airspeed is 125 knots, free air temperature is -15°C. and the pressure altitude is 8,000 feet. What is the true airspeed?

b. Solution. Using the E-6B computer, refer to Figure 14 and solve as follows:

(1) Set 8,000 against -15°C. in the TRUE AIRSPEED computation window.

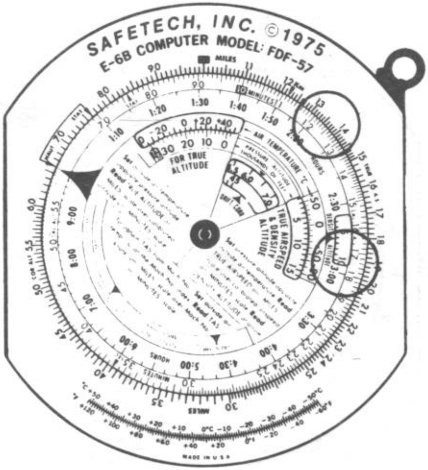

Figure 14. Airspeed Computation

(2) Over 125 knots (inner scale), read true airspeed 138 knots (outer scale).

NOTE

In solving for IAS when TAS is known, locate TAS on outer scale and read answer (IAS) on inner scale.

2-14. Density Altitude Computations

Density altitude is that altitude in the standard atmosphere at which a given air density exists. Because of variations of temperature and pressure, the density of the air on a given day at any given pressure altitude may be that density found several thousand feet higher or lower in the standard atmosphere. Such conditions can be critical in aircraft operations, especially in the operation of helicopters. To compute density altitude, rotate the movable scales of the E-6B so that the free air temperature is set above the pressure altitude in the window labeled TRUE AIRSPEED AND DENSITY ALTITUDE. When set in this manner, the density altitude is read above the pointer in the window labeled DENSITY ALTITUDE (Figure 14) as 6,000 feet. Accurate results can only be obtained by using pressure altitude.

2-15. Altitude Computations

The window marked FOR TRUE ALTITUDE provides a means for computing corrected altitude by applying variations from standard temperature and pressure altitude.

a. Problem. The pressure altitude is 9,000 feet, and the free air temperature is -15°C. What is the corrected or true altitude?

b. Solution. Using the E-6B computer, refer to Figure 15 and solve as follows:

(1) Set 9,000 against -15°C. in the FOR TRUE ALTITUDE window.

(2) Above 9,100 feet calibrated altitude on the scale (marked "CAL ALT" between 50 and 60), read corrected altitude 8,700 on the outer scale.

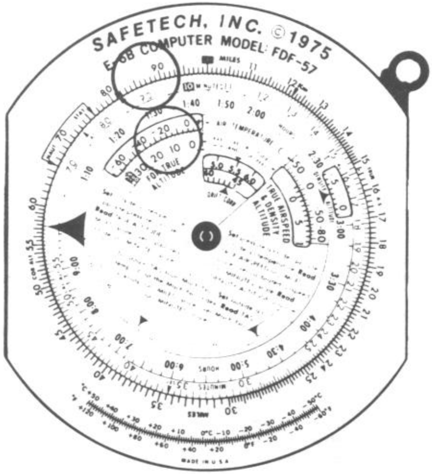

Figure 15. Altitude Computation

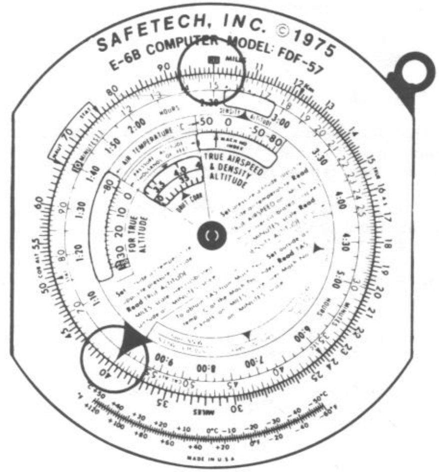

Figure 16. Off-Course Correction to Parallel

2-16. Off-Course Correction (Rule of 60)

An aircraft headed 1° off course will be approximately 1 mile off course for each 60 miles flown. This is the rule of 60. Inversely, for each mile an aircraft is off course after each 60 miles of flight, 1° of correction in the opposite direction will be required to parallel the intended course. Applied to other distances (multiples of 60), such as 1.5 miles off course in 90 miles, 2 miles off course in 120 miles, or 2.5 miles off course in 150 miles, a correction of 1° will be required to parallel the intended course. To converge at destination, an extra correction must be made based on the same rule of 60.

a. Formulas. The degrees correction required to converge at destination is determined by adding the results of the following formulas: Correction to parallel course.

$$\frac{\text{miles off course}}{\text{miles flown}} = \frac{\text{degrees correction}}{60}$$

Additional correction to converge.

$$\frac{\text{miles off course}}{\text{miles to fly}} = \frac{\text{degrees correction}}{60}$$

b. Problem. An aircraft is 10 nautical miles to the left of course when 150 nautical miles from departure point A. How many degrees correction are required to parallel course? If 80 nautical miles remain to destination B, how many additional degrees are required to converge? In what direction is the correction applied?

c. Solution. Using the E-6B computer, refer to Figures 16 and 17 and solve as follows:

(1) Set 150 (inner scale) under 10 (outer scale) (Figure 16).

(2) Over the 60 index, read 4° (correction required to parallel).

(3) Set 80 (inner scale) under 10 (outer scale) (Figure 17).

(4) Over 60 index, read 7.5° to converge.

(5) 4° + 7.5° = 11.5°, total correction to converge at destination. Since aircraft is off course to the left, correction will be made to the right or added to the original heading. For example, if the original heading was 090°, the new heading is 101.5° or 102° to the nearest degree.

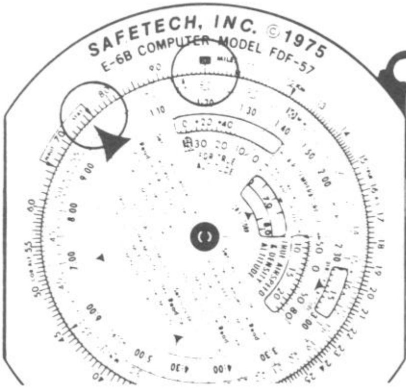

Figure 17. Off-Course Correction to Converge

2-17. Off-Course Correction (DRIFT CORR Window)

The two scales in the "DRIFT CORR" window of the E-6B computer are a refinement of the rule of 60 (paragraph 2-16). Actually an arc of 1 mile subtends an angle of 1° at a distance of approximately 57.3 miles rather than 60 miles. The "DRIFT CORR" window scale incorporates this relationship correctly. (NOTE — the top scale in the "DRIFT CORR" window is used for drift correction angle to parallel course; the bottom scale is used for drift correction angle to intercept desired course.)

a. Problem. After traveling 400 miles, and the aircraft is 30 miles off course.

(1) What drift correction angle is necessary to parallel the desired course?

(2) What drift correction angle is necessary to intercept the desired course in 150 additional miles?

b. Solution.

(1) Set the miles off course (30) on the outer scale over the distance traveled (400) on the inner scale and read the correction angle to parallel the desired course on the upper scale in the DRIFT CORR window (4.3°) (Figure 18).

Figure 18. Drift Correction Computation to Parallel

Figure 19. Drift Correction Computation to Converge

(2) To find the angle to intercept the desired course, place the miles off course (30) on the outer scale over the course miles to interception point (150) on the inner scale. Read the additional angle to intercept on the lower scale in the DRIFT CORR window (11.3°) (Figure 19). The total correction angle to intercept the desired course is therefore 15.6° (4.3 + 11.3).

2-18. Radius of Action (Fixed Base)

Radius of action to the same base refers to the maximum distance an aircraft can be flown on a given course and still be able to return to the starting point within a given time. The amount of available fuel (not including reserve fuel) is usually the factor determining time.

a. Problem. The ground speed on the outbound leg of the flight is 160 knots; on the return leg, 130 knots. Available fuel permits 4.5 hours (270 minutes) total time for the flight. How many minutes will be available for the outbound leg of the flight? How many minutes will be required for the return leg of the flight? What is the radius of action?

b. Solution. The sum of the ground speed out (GS_1) and the ground speed on the return leg (GS_2) is to the total time in minutes (T), as the ground speed on the return leg (GS_2) is to the time in minutes on the outbound leg (t_1). Minutes on the outbound leg of the flight can be calculated by the formula $\frac{GS_1 + GS_2}{T} = \frac{GS_2}{t_1}$. The formula for calculating time required for the return leg of the flight is $\frac{GS_1 + GS_2}{T} = \frac{GS_1}{t_2}$, in which t_2 is the time required for the return leg of the flight. These formulas can be calculated on the E-6B computer as ratio and proportion problems and appear on the E-6B computer as they appear in mathematical form. To solve radius of action fixed base problems with the E-6B computer, use the problem given in a above, referring to Figure 20 and 21, and proceed as follows:

(1) Find the sum of the ground speeds (160 + 130 = 290).

(2) Set the total time (T = 4.5 hours or 270 minutes) under the sum of the ground speeds (290) (Figure 20).

(3) Under 130 (GS_2), read the time on the outbound leg, 2 hours + 1 minute or 121 minutes (Figure 20).

(4) Without changing the setting of the computer, under 160 (GS_1), read the time required for the return leg, 2 hours + 29 minutes or 149 minutes (Figure 20).

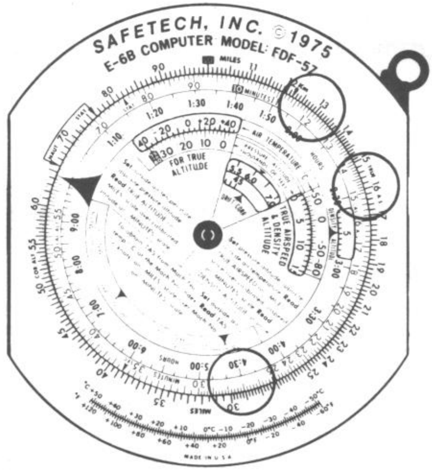

Figure 20. Radius of Action Time Computation

Figure 21. Radius of Action Distance Computation

(5) These two amounts of time should be equivalent to the total amount of time of the flight.

(6) Place the 60 index under 160 (GS_1) and over 121 minutes (time on the outbound leg), read the radius of action, 324 nautical miles (Figure 21).

SECTION III. WIND SIDE OF THE DR COMPUTER

3-1. Plotting Disc and Correction Scales

The wind vector side of the E-6B computer (Figure 22A) enables the aviator to solve wind correction problems. It consists of a translucent, rotatable plotting disc mounted in a frame on the reverse side of the circular slide rule. A compass rose is located around the plotting disc. The correction scale on the top frame is graduated in degrees right and left of the TRUE INDEX. This scale is used for applying wind correction angles and is labeled WCA right and WCA left. Next to the "WCA Left" and "WCA Right" markings are the designations "Var East" and "Var West". These are compass corrections which are applied in the same manner as wind correction. In other words, West variation and deviation are added to the True Course (TC) to obtain True Heading (TH). East variation and deviation are subtracted from True Course to obtain True Heading. (Refer to the formulas indicated on the lower section of the computer — Figure 22.) A small reference circle, or grommet, is located at the center of the plotting disc.

3-2. Sliding Vector Card

A reversible sliding vector card (Figure 22B) inserted between the circular slide rule and the plotting disc is used for graphic wind corrections. The slide has converging lines spaced 2° apart between the concentric arcs marked 0 to 100 and 1° apart above the 100 arc. The concentric arcs are used for calculations of speed and are spaced 2 units (usually knots or miles per hour) apart. Direction of the center line coincides with the true index. The common center of the concentric arcs and the point at which all converging lines meet is located at a point below the lower end of the slide. On one side of the slide the speed arcs are numbered from 30 to 264, on the reverse side, from 120 to 730. The low range of speeds on one side is especially helpful in solving navigational problems for aircraft having slow-speed flight characteristics.

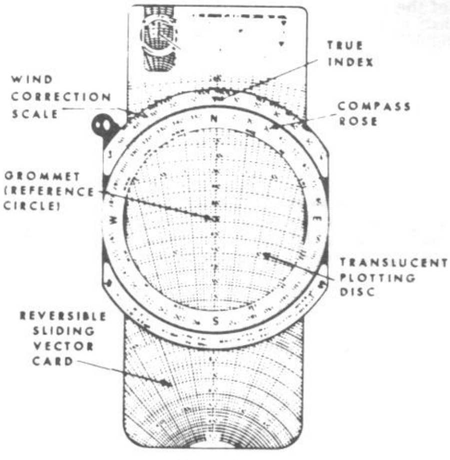

Figure 22A

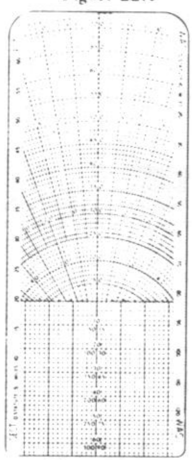

Figure 22B

E-6B Computer

a. Rectangular Grid. The rectangular grids on the reverse side of the vector cards (Figure 22B) are designed so that the left half can be used for calculations on the 0 to 300 side of the sliding grid and the right half can be used with the 0 to 90 side of the sliding grid. On the left half, each small division has a value of 10 units; each large division has a value of 50 units. On the right half, the small squares have a value of 3 units; the large squares, a value of 15 units. This grid is used for solving problems, such as off-course correction, air plot, radius of action and for correcting reported wind.

b. Sliding vector cards. Various configurations of the E-6B computer call for different configurations of the vector card. Figure 22A illustrates the front side of the vector card which is most popular with student pilots. Figure 22B illustrates the rear side of the vector card which likewise is popular with student pilots.

SECTION IV. WIND VECTOR TRIANGLES

4-1. Wind Vector Construction

a. Problems involving wind effects can be solved by constructing a wind vector triangle. In its simple form, this triangle is made up of three vectors (six vector quantities) whose elements are always the same. The vectors (Figure 23) are:

(1) A wind vector, consisting of the wind direction and speed.

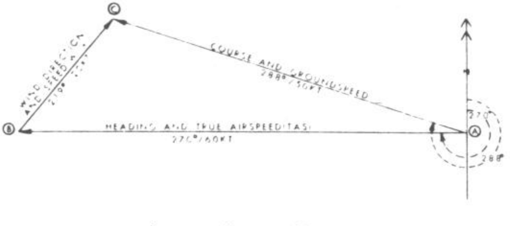

Figure 23. Wind Vector Triangle Quantities

(2) A ground vector, representing the movement of the aircraft with respect to the ground, and consisting of the course (or track) and the ground speed.

(3) An air vector, representing the movement of the aircraft with respect to the air mass, and consisting of the heading and the true airspeed.

b. The direction of such vectors is shown by the direction of a line with reference to north. The magnitude of the vector is shown by comparing the length of a line with an arbitrary scale. For example, if 1 inch represents 20 knots, then a speed of 50 knots would be shown by a line 2-1/2 inches long (Figure 23).

c. Necessary steps for drawing the wind triangle are:

(1) Draw a vertical reference line with an arrow at the top indicating north.

(2) Draw in the known vectors.

(3) Close the triangle to determine two unknown factors. (Known and unknown factors will vary; but each factor can be determined, provided each vector includes its own factors, namely direction and length.)

4-2. Wind Vector Triangle Solution

Figure 24 illustrates the construction of a wind vector triangle to solve for true heading and ground speed when the true course, wind velocity (W/V), and TAS are known. Similar triangles are used to solve for true heading and TAS or for wind velocity.

a. Plot the wind vector first (AB).

b. Plot the course for an indefinite distance from the point of origin (AD).

c. Swing an arc from the end of the wind vector (B) (using the TAS as the arc radius) to intersect the course line (C). Draw the air vector (BC).

d. Measure the heading by determining the angle formed between the vertical referenced line and the air vector.

e. Measure ground speed along the ground vector (AC).

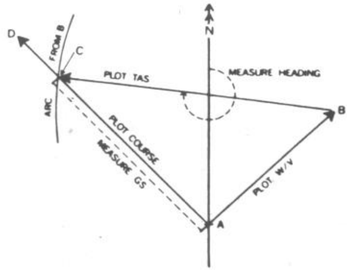

Figure 24. Solving for True Heading and Ground Speed

4-3. General

In solving wind problems on the computer, part of a triangle is plotted on the translucent matted surface of the circular disc. Lines printed on the slide are used for the other two sides of the triangle. The center of the concentric speed circles (Figure 25) is also one vertex of the triangle. There are many methods applicable for computing any one problem, but the following method of each type of problem is standard for use by the civilian aviator. This section includes problems where the center line is used as ground vector and the wind vector is plotted above the grommet.

NOTE

Directions used in solving wind problems must be compatible; i.e., all in references to true noth or all in references to magnetic north. Likewise, all speeds must be in the same units such as "knots" or "MPH".

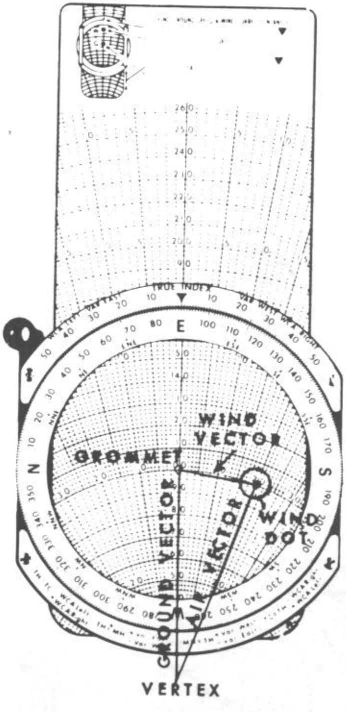

Figure 25. Wind Triangle on E-6B Computer

4-4. True Heading and Ground Speed Computation

a. Problem. The wind is from 160°/30 knots, the true airspeed 120 knots, true course 090°. What is the true heading and ground speed?

b. Solution. Using the E-6B computer, refer to Figures 26 and 27 and solve the problem as follows:

(1) Set 160° (direction from which the wind is blowing) to the TRUE INDEX (Figure 26).

(2) Move the slide to place any convenient number under the grommet (such as 100). Plot the wind vector above the grommet 30 units (wind speed) and place a dot within a circle at this point.

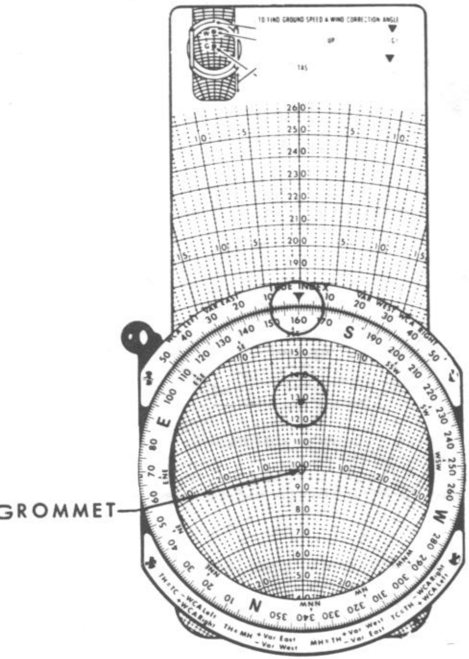

Figure 26. Plotting the Wind Vector to Solve for True Heading and Ground Speed

(3) Set 090° true course at the TRUE INDEX (Figure 27).

(4) Adjust sliding vector card so that the true airspeed (120 knots) is under the wind dot.

(5) Note that the wind dot is at the 14° converging line to the right of center line.

(6) Under the 14° correction scale (labeled WCA right) to the right of center at the top of the computer. read the true heading (104°).

(7) Under the grommet, read the ground speed (106 knots).

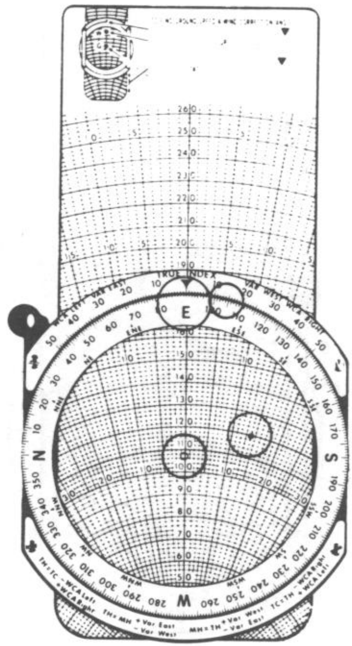

Figure 27. Reading True Heading, Wind Correction, and Ground Speed

4-5. True Heading and True Airspeed Computation

a. Problem. The wind is from 090°/20 knots, true course 120°, ground speed 90 knots. What is the true heading and true airspeed?

b. Solution. Using the E-6B computer, refer to Figures 28 and 29 and solve as follows:

(1) Set 90 (090° wind direction) under the TRUE INDEX and plot wind vector 20 units above the dot within arc (Figure 28).

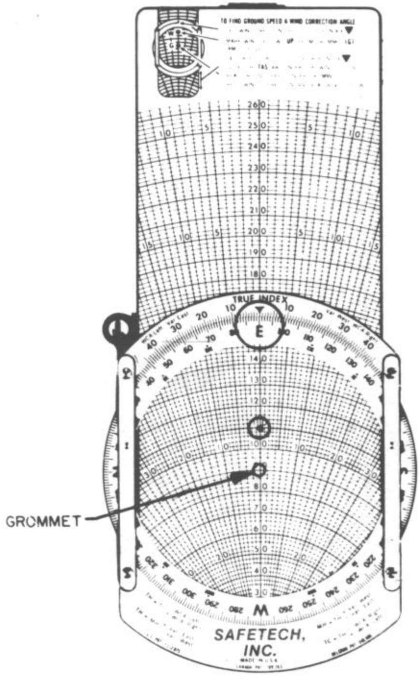

Figure 28. Plotting the Wind Vector to Solve for True Heading and True Airspeed

(2) Set course 120° under the TRUE INDEX (Figure 29).

(3) Move sliding vector card so that ground speed (90 knots) concentric arc is at the grommet.

(4) The wind dot is now on the converging line 5° to the left of center line. Read the true heading (115°) 5° left of TRUE INDEX on correction scale.

(5) Under the wind dot, read the true airspeed (108 knots).

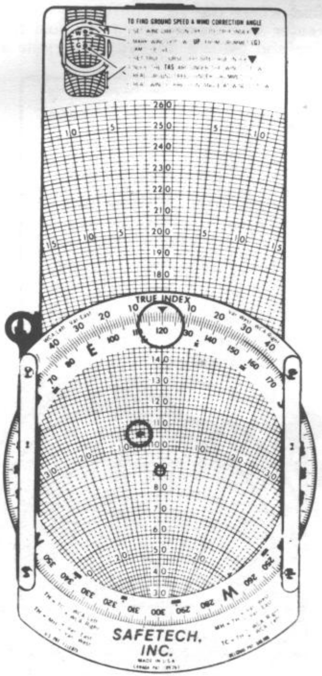

Figure 29. Reading True Heading, Drift Correction, and True Airspeed

4-6. Wind Velocity Computation (Wind Direction and Speed)

a. Problem. True Heading 130°, true airspeed 100 knots, track 140°, ground speed 90 knots. What is the wind velocity?

b. Solution. Using the E-6B computer, refer to Figures 30 and 31 and solve as follows:

(1) Set track (140°) at TRUE INDEX and grommet over the ground speed (90 knots).

(2) Since the true heading is 10° less than the track, find where the 10° converging line to the left of center line crosses the 100 knots (true airspeed) line and place a dot within a circle at this point (Figure 30).

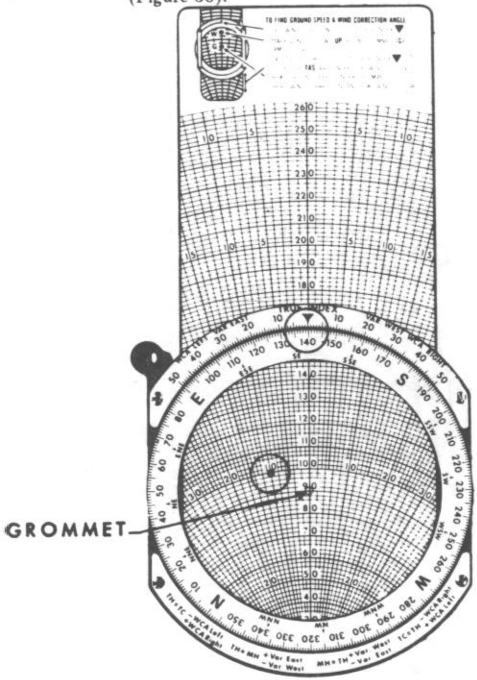

Figure 30. Solving for Wind Velocity

(3) Turn circular plotting disc until the dot is directly above the grommet (Figure 31).

(4) Under the TRUE INDEX, read direction from which the wind is blowing (075°). The distance in units between the dot and the grommet indicates the speed of the wind (20 knots).

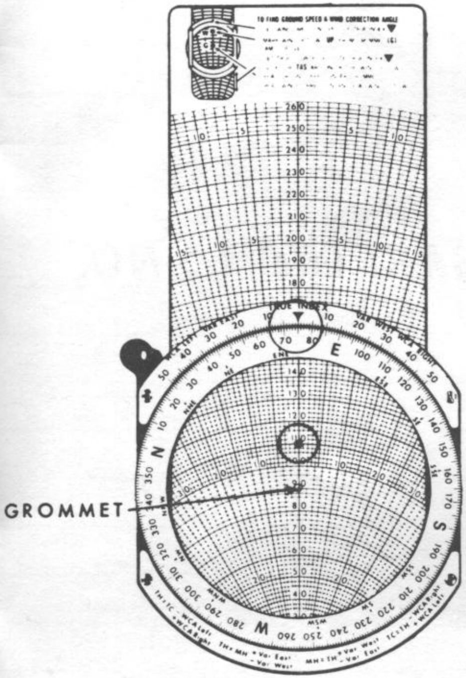

Figure 31. Reading Wind Velocity