

INDEX

1 in 60 rule calculation	26
Addition or subtraction of drift to given heading	34
Altitude calculations.....	23
Before using your computer	4
Calculate fuel consumption	18
Calculate TAS (up to 300 kts)	22
Calculate the fuel required	17
Calculation of air speed.....	21
Calculation of density altitude	25
Calculation of the Speed of Sound.....	29
Calculation of true altitude	23
Conversion of distances in speeds	14
Conversions between imperial gallons, US gallons & liters	16
Conversions between nautical miles, statute miles and kilometers.....	14
Discover distance off track from a co-located VOR/DME	28
Discover the heading error	26
Distance travelled in a known time at a given speed.....	12
Division to divide A by B.....	10
Find heading and ground speed.....	32
Find track and groundspeed	36
Find wind and velocity	35
International Standard Atmosphere	23
Introduction	4
Multiplication & division	9

Multiplication to multiply A by B	9
Speed Conversions between.....	15
The wind triangle computer.....	30
Time to find the time to cover a distance at a speed	11
Time, distance and speed	11
To set the wind and velocity	30
Use of mach numberindex.....	29

Introduction

Congratulations with your ASE Flight Computer. This computer is designed for durability, easy use and precise calculations during training, preparation and flight.

This particular model of Flight Computer have been designed for General Aviation use but, in particular, as an inexpensive but accurate computer for the student pilot.

Before using your computer

Please be aware that all calculations have to be considered correct or not before you use it in real flight. The results you get from your calculations are based upon your input and the correct use of the computer.

The many different calculations you can make with the computer has a build in risk for using the calculator wrong. Please make sure you are familiar with the correct use and consult the manual or your flight instructor if needed.

Our computers are made of the best materials available and guaranteed to withstand temperatures up to 60°C. They are stable, non-inflammable and resistant to mold and moisture. Every care is taken in manufacture to ensure that the resulting products a high precision instrument both in accuracy and durability.

To maintain clarity and assure maximum life, do not allow chemicals and particularly solvents comes in contact with the computer. The computer should not be exposed to extreme of temperature and should be protected from prolonged exposure to sunlight. It is better to mark the computer, when this is

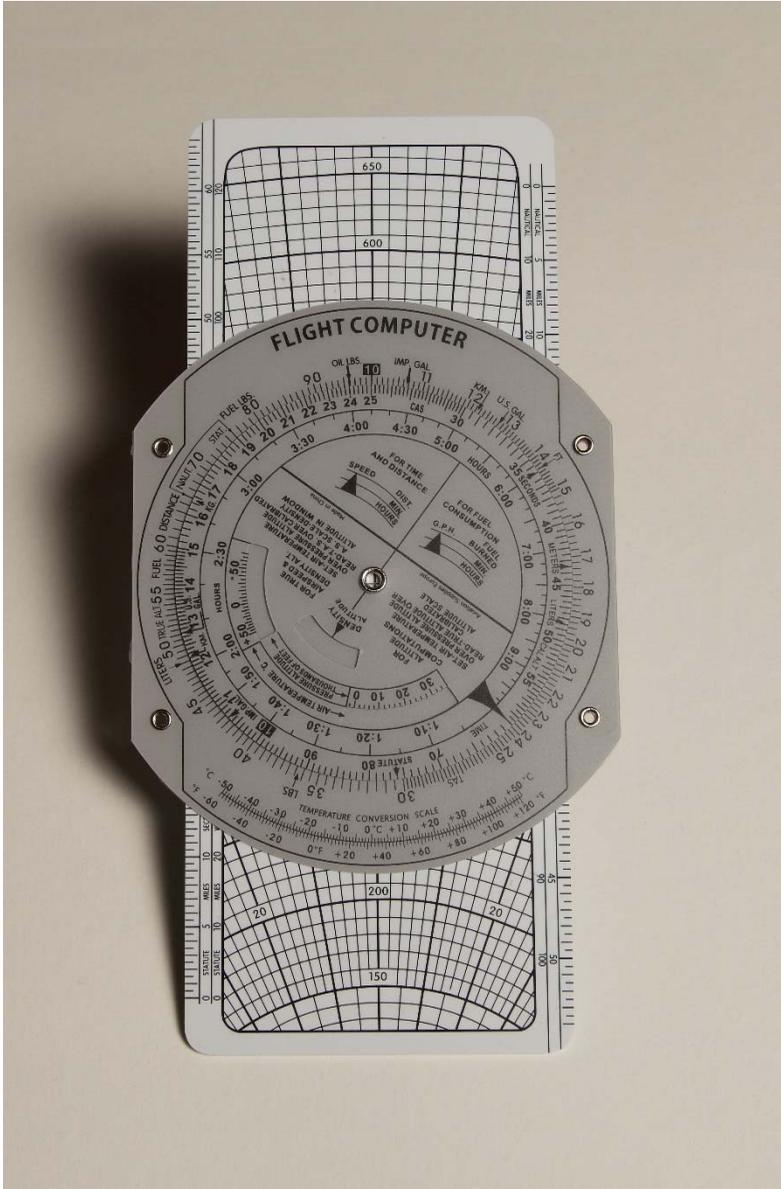
necessary, with a pencil as this easily can be erased with a soft rubber. Wiping off tusch and speedmarker marks eventually destroys the clarity of the window. On the Wind Calculation Side of the computer the marking with a pencil can be replaced by marking the a spot on a small piece of clear adhesive tape with a speedmarker, and then move the spot to the place to be marked.

Your computer is guaranteed against defective materials and workmanship and will be replaced free of charge should such faults occur. We trust that your ASE Computer will give you satisfactory service.

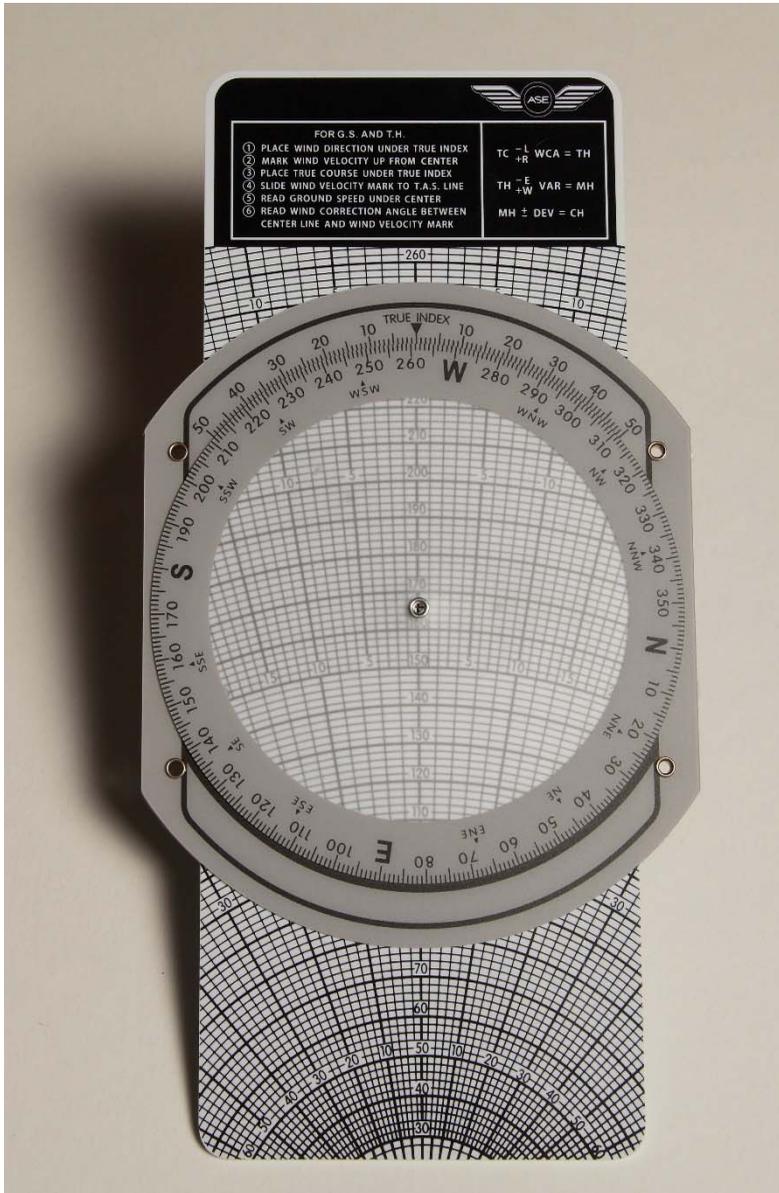
Good luck with your calculation and your aviation activities.

The two sides

The Flight Computer consist of two sides. The calculations side and the wind calculations side. It is important that you get familiar with the functions of the two sides and the different windows and their function. See next page.



The Calculations Side of the Flight Computer



The Wind Triangle side of the Flight Computer



The Altitude Window



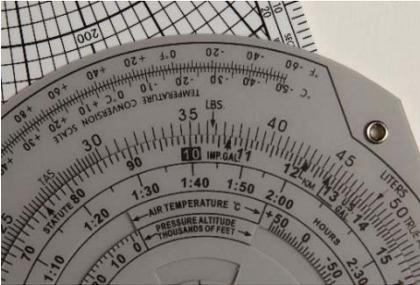
The Airspeed Window

Multiplication & division

MULTIPLICATION to multiply A by B

Set 1 (shown as 10) on the inner scale against A on the outer scale. Opposite B on the inner scale, read off the answer on the outer scale.

For example: Multiply 3.5 by 1.8



Set 1 (shown as 10) on the inner scale against 3.5 on the outer scale.



Opposite 1.8 on the inner scale, read off the answer 6.3 on the outer scale.

DIVISION to divide A by B

Set B on the inner scale against A on the outer scale. Opposite 1(10) on the inner scale, read off the answer on the outer scale.

For example: Divide 6.3 by 3.5



Set 3.5 on the inner scale against 6.3 on the outer.



Opposite 1 on the inner scale, read off the answer 1.8 on the outer.

Time, distance and speed

TIME to find the time to cover a distance at a speed

Set the index mark on the inner scale against speed ON the outer. Opposite distance on the outer scale, read off the time on the inner scale.

For example: Find the time taken to fly 225 nautical miles at 90 knots.



Set the index mark on the inner scale against the speed 90, on the outer.



Opposite 225 on the outer scale read off the answer 150 minutes or 2 hours 30 minutes on the inner.

Note that the time ring converts minutes to hours.

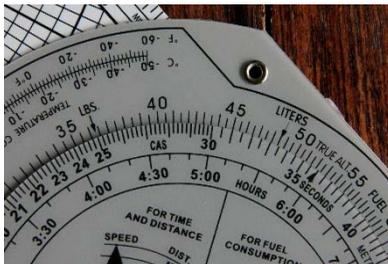
DISTANCE to find distance travelled in a known time at a given speed

Set the index mark on the inner scale against the speed on the outer. Opposite the time on the inner scale, read of the distance on the outer scale.

For example: Find the distance travelled in 29 minutes at 87 knots.



Set the index mark on the inner scale against the speed, 87, on the outer.



Against 29 minutes on the inner scale, read of the answer, 42 Nautical miles, on the outer scale.

SPEED to find the speed from a known distance over a known time

Set the time on the inner against the distance ON the outer.
Read of the speed on the outer against the index mark on the inner.

For example: Find the speed in 23 nautical miles are covered in 10 minutes.



Set 10 minutes on the inner scale against 23 nautical miles on the outer.



Read of the speed, 138 knots, against the index mark.

Conversions of distances in speed

Use the indices which are printed in red on the outer scale.

CONVERSIONS between nautical miles, statute miles and kilometers

Set the known quantity on the inner scale against its index on the outer scale. Against the other indices on the outer, read of the answer on the inner scale.

For example: Convert 66 nautical miles to statue miles and kilometers.



Set 66 on the inner against the NAUT index on the outer scale.



Opposite the STAT index on the outer read of 76 statue miles on the inner.

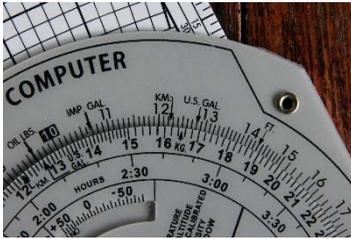


Similarly, opposite the KM-M-LTR index on the outer, read of 122 kilometers on the inner scale.

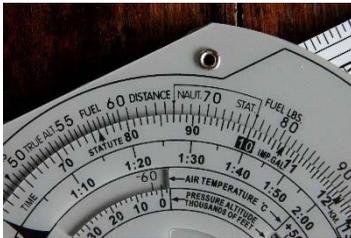
SPEED CONVERSIONS between knots, mph& kph

Use the same method as shown on page 14.

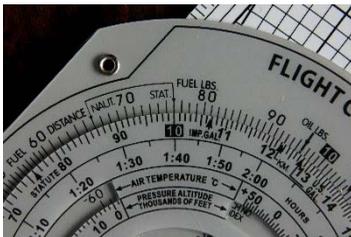
For example: Convert 161 kph into both knots and mph.



Set 161 on the inner against the KM index on the outer.



Against the NAUT index on the outer, read off 87 knots on the inner scale.



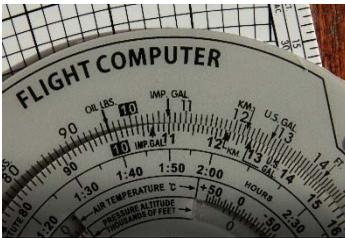
Against the STAT index on the outer, read of 100 mph on the inner.

Fuel calculations

CONVERSIONS between imperial gallons, US gallons and liters

Proceed as in 6, using the KM-M-LTR index and the US. GALL and IMP. GALL indices.

For example: Convert 110 imperial gallons to US gallons and liter.



Set 110 on the inner against the IMP GALL index on the outer.



Against the US GALL index on the outer, read off 132 on the inner.



Against the LTR index on the outer, read off 500 on the inner scale.

Calculate the fuel required

Set the index mark on the inner scale against the fuel consumption per hour on the outer scale. Against the time on the inner scale, read off the fuel required on the outer scale.

For example: At a consumption of 12 gallons per hour.

How much fuel is required for 80 minutes?

Set the index mark on the inner scale against 12 on the outer scale. Against 80, or 1 hour 20, read off 16 gallons on the outer scale.

For example: At a consumption of 22 KGS per hours.

How much fuel is required for 110 minutes (1:50).

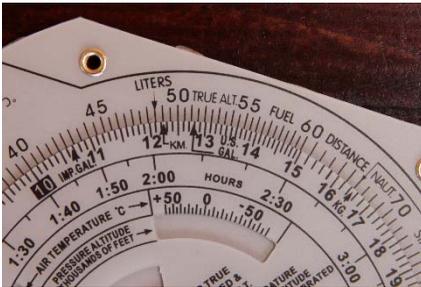
Set the index mark on the inner scale against 22 on the outer scale. Against 1:50 read of 40,5 KGS on the outer scale.

Calculate fuel consumption

Set the time on the inner scale against the fuel used on the outer scale. Against the index mark. On the inner scale, read off the fuel consumption on the outer scale.

For example: If 52 gallons are used in 130 minutes.

What is the fuel consumption?



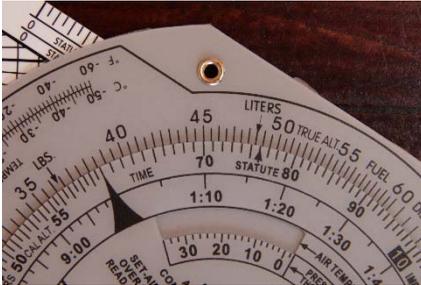
Set 130 on the inner scale against 52 on the outer.



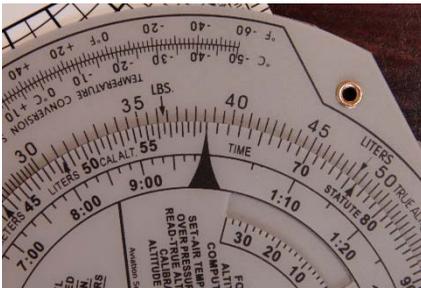
Against the index mark on the inner scale read of the consumption of 24 gallons per hour on the outer.

For example: If 45 liters are used in 70 minutes.

What is the fuel consumption?



Set 70 on the inner scale against 45 on the outer scale.



Against the index mark on the inner scale read of 38,5 on the outer scale.

To calculate endurance

Set the index mark on the inner scale against the consumption on the outer. Opposite the fuel quantity on the outer, read off the endurance on the inner.

For example: If the fuel consumption is 22 kg per hour.

How long will 55 kg fuel last?



Set the index mark on the inner scale against 22 on the outer.



Against 55 on the outer, read off 150 minutes on the inner.

The above mentioned example can also be done with other units as Gallons per hour or Liter per hour.

Calculations of air speed

The speed indicated on the Air Speed Indicator is Indicated Air Speed (IAS). When this is corrected for position and instrument error, the result is Rectified Air Speed (RAS). Variation from the International Standard Atmosphere can be compensated for on the computer thus converting RAS to True Air Speed (TAS).

Given the pressure altitude and the outside air temperature, the conversion from RAS to TAS can be made. Pressure altitude is indicated on the altimeter when the sub-scale is set to 1013.2 HPa.

The temperature indicated on the outside air thermometer will always be higher than the correct air temperature due to kinetic heating. This rise is a function of speed and the table below gives the value of the rise for various speeds. This value should be subtracted from the indicated outside temperature to give the correct air temperature.

TAS (KTS)	100	140	175	200	225	245	265	280	300
Temp. rise °C	1	2	3	4	5	6	7	8	9

Note: That the calculation described in 16 is only valid for a TAS up to 300 kts, though generally the TAS is higher than the RAS, at low temperatures and low levels the TAS can be less than the RAS.

Calculate TAS (up to 300 kts)

Using the AIR SPEED window, set the temperature against the pressure altitude. Opposite the RAS ON the inner scale, read off the TAS ON the outer.

For example: RAS is 150 Kts. Pressure altitude is 18,000 ft. Corrected temperature is -30°C .

What is the TAS?



Using the AIR SPEED window, set -30°C opposite pressure alt 18 (18,000).



Opposite the RAS 150 on the inner scale, read off the TAS, 195, on the outer.

Altitude calculations

The altimeter measures:

HEIGHT when the sub-scale is set to QFE.

ALTITUDE when the sub-scale is set to QNH and

PRESSURE ALTITUDE when the sub-scale is set to 1013.2 HPa.

PRESSURE ALTITUDE divided by 100 is FLIGHT LEVEL.

Indications of height and altitude are subject to temperature error when the temperature varies from that defined in the International Standard Atmosphere (ISA). Pressure Altitude, which is not subject to temperature error, is used on the computer as the basis for calculation.

The International Standard Atmosphere (ISA)

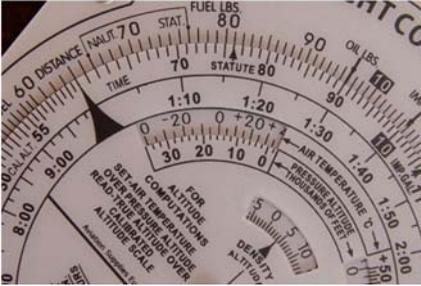
Air temperature of 15° Celsius by Mean Sea Level (MSL) and an air pressure of 1013.2 HPa

Calculation of true altitude

Using the Altitude window, set the corrected temperature against the pressure altitude. Opposite the indicated altitude on the inner scale, read off the true altitude on the outer.

For example: The indicated altitude is 17,400 feet. The pressure altitude is 18,000 feet. The corrected temperature is -5°C.

What is the true altitude?



Using the Altitude window, set the temperature, -5°C , against the pressure altitude 18 (18,000).



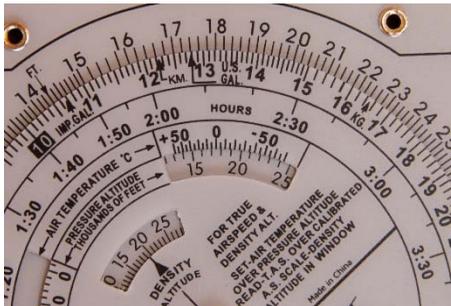
Opposite the indicated 17,400 on the inner scale, read off the true altitude, 18,500 ft.

Calculation of density altitude

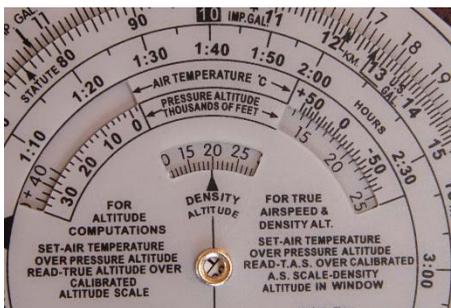
As aircraft performance figures are quoted in relation to the International Standard Atmosphere (ISA), it may be necessary to convert a pressure altitude to a density altitude. This can be done by using the Air Speed window. Set the temperature against the pressure altitude. The density altitude can be read off in the Density Altitude window.

For example: Given a pressure altitude of 18,000 ft and a corrected air temperature of -5°C .

What is the density altitude?



Using the Air Speed window, set -5°C against the pressure altitude 18 (18,000).



Read off the density altitude of 20,000 ft in the density altitude window.

1 in 60 rule calculation

Discover the heading error

Set the distance flown on the inner scale against the distance off track on the outer. Read off the heading error against the index mark on the inner.

This will give the heading correction to avoid any further error. Set the distance remaining to be flown on the inner scale against the distance off track on the outer.

Read off the correction on the outer against the index mark on the inner.

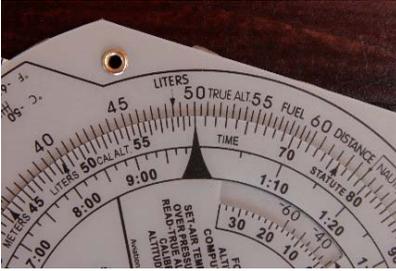
Adding the two corrections will give the total correction to arrive at the destination.

For example: After flying 36 miles of a flight of 81 miles, the aircraft is 3 miles to the right of track.

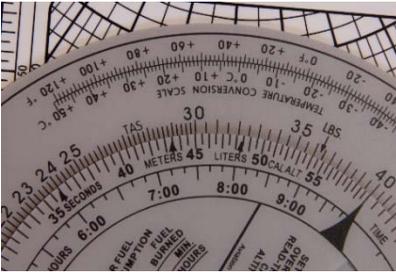
What total correction to heading must be made to arrive at the destination?



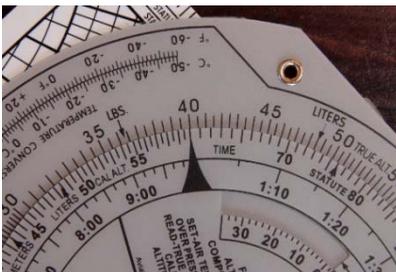
Set 36, distance flown, ON the inner scale against 3, distance off track ON the outer.



Read off the first correction on the outer against the index mark on the inner. This is 5°.



Now set the distance to fly, 45 miles, against the distance off track, 3, on the outer.



Read off 4 on the outer scale against the index mark on the inner scale.

Add the two corrections, 5° and 4°, together to give a total of 9°. Alter heading to 9° to the left.

Discover distance off track from a co-located VOR/DME

The difference between the actual radial and the desired radial is the radial error. Set the index mark on the inner scale against the radial error on the outer. Opposite the DME distance on the inner scale, read off the distance off track on the outer.

For example: The actual radial is 248 and the desired radial is 241. The DME range is 43 miles.

How far is the aircraft off track?



Set the index mark on the inner scale against the radial error 7 on the outer scale.



Opposite the DME range of 43 on the inner scale, read off the distance off track 5 on the outer scale.

Calculations of the speed of sound

True speed of sound is solely a function of temperature and is referred to as MACH 1.0.

Use of Mach number index

The Mach No. Index can be found in the Air Speed window by setting the index mark on the inner scale against 40 on the outer. Using the Air Speed window, set the Mach No. Index against the corrected temperature. Opposite the 1(10) ON the inner scale, read off the speed of sound ON the outer.

For example: What is the speed of sound at a corrected air temperature of -35°C ?

Set the Mach No. Index against -35°C in the Air Speed window.

Opposite the 1 on the inner, read off the speed 600 knots on the outer scale. Having set the scales, conversions of TAS to Mach Number can be made.

For example: With the scales set as in the above example, convert 330 knots to a Mach No against 330 on the outer, read off Mach 0.55. conversely Mach 0.8 gives a TAS of 480 knots.

The Wind Triangle computer

(see page 7)

Throughout the following paragraphs, reference will be made to the rotating scale, which is the one on the rotating window and to the index mark on the fixed part of the computer. This is the black arrowhead under True Heading.

The slide is two sided, one gives a low and the other a high speed range. These are marked L and H at the top right hand corners. The slide should be inserted with the appropriate speed range showing through the window. The following examples are only based on the low speed range.

To set the wind and velocity

Set the wind direction on the rotating scale against the index mark. By moving the slide, set the center dot over one of the thicker speed arcs. Since the speed arcs are equal distant, it does not matter which arc. Use a soft pencil to mark a cross on the centerline at a distance representing the wind speed. You can also mark the point with a pen on a piece of removable clear tape. The mark should either be up or down from the center dot depending on the problem to be solved.

For example: Set a wind velocity of 230/35.

Set 230 on the rotating scale against the index mark.

Set the center dot over a speed arc -use the 70. Mark a cross on the centerline over the 105 arc. This would be wind mark UP.

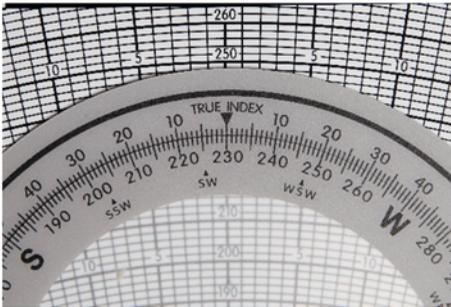
If wind mark down were required, place the cross over the 35 speed arc. In the example problems which follow, it will be clearly stated whether the wind mark goes UP or DOWN.

Find heading and ground speed

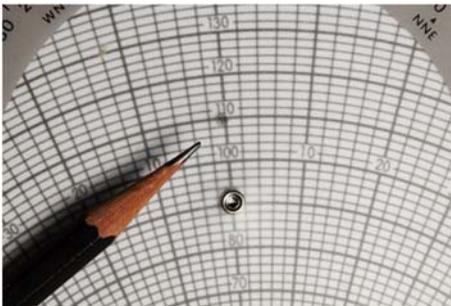
Set the wind velocity with the wind mark up. Set Track on the rotating scale against the index mark. Set TAS under the wind mark. Read of Ground Speed under the center dot. Read off which drift line the wind mark is over and to which side of the centerline it is. If the wind mark is to the left of the centerline, subtract the value of the drift line from the track to give the Heading, if to the right add it to give the Heading.

For example: W/V = 230/20, Track = 020, TAS = 90.

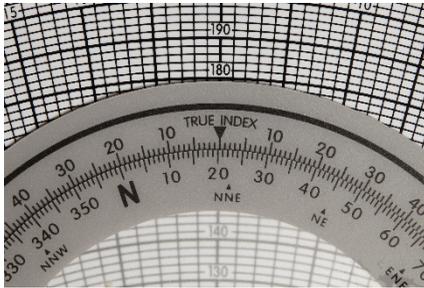
What is the Heading and Ground Speed?



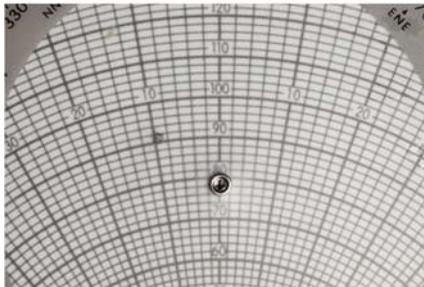
Set the wind, 230/20



with the wind mark UP.



Set track, 020 against the index mark.



Set TAS, 90, under the wind mark.

Read off the ground speed which is 76 under the center dot.

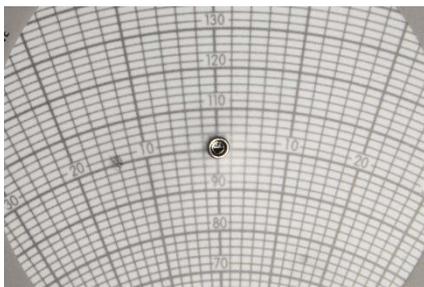
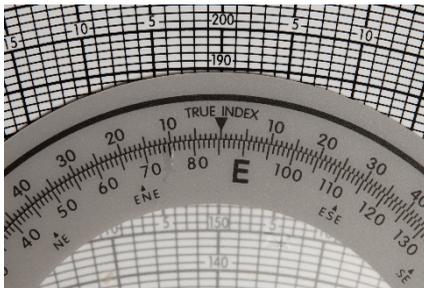
Note: The wind mark is on the 10° drift line to the left of the centerline. Subtract this from the Track 020, gives Heading of 010.

Addition or subtraction of drift to given heading

To either side of the index mark on the fixed part, degrees are marked from 0 to 50 and can be used to convert the Track to Heading.

Note: The value of the drift line covered by the wind mark and look for this value on the fixed part of the same side of the center line as the wind mark lies. Read off the Heading on the rotating scale.

For example: Set Track 085 against the index mark.



Assume wind mark is one the 15 drift line to the left of the center mark.

Opposite 15 on the fixed part and to the left of the index mark. Read of the Heading 070.

Find wind and velocity

Set the Track against the index mark. Set Ground Speed under center dot. Determine whether Heading is to left or right of Track and by how much. If left of Track, wind mark lies to the centerline on the appropriate drift line.

If Heading is to the right of Track, the wind mark will be on a drift line to the right of the centerline. Place wind mark over the selected drift line where the speed arc to the value of the TAS intersects it.

Rotate the window to place the wind mark on the center line UP from the center dot. Read off the wind direction against the index mark and the Wind Speed is the difference between the center dot and the wind mark.

For example: Track = 040, Heading = 030,
Ground Speed = 74 and TAS = 90.

Find the wind/velocity

Set Track 040 against the index mark. Set the Ground Speed, 74 under the center dot. Heading is 030 which is 10° to the left of Track. Wind mark is on the 10° drift line to the left of the centerline. Since the TAS is 90, place the wind mark where the 90 speed arc intersects the 10° drift line to the left of the center line. Rotate the window to place the wind mark above the center dot and on the centerline. Read off the wind direction 350 against the index mark. Read off the Wind Speed which is $96 - 74$, 22 knots.

Find track and groundspeed

Set the wind but with the wind mark DOWN from the center dot. Set heading against the index mark. Set the TAS under the center dot. Read off Ground Speed under the wind mark. Read off the drift to give the resulting Track. If the drift is to the right of the centerline, add the resulting drift to the Heading; if to the left subtract it.

For example: W/V = 300/20, Heading = 270, TAS = 90.

Set W/V with the wind mark DOWN 300/20.

Set Heading 270 against the index mark.

Set TAS 90 under the center dot.

Read off Ground Speed under the wind mark, 72 knots.

Drift is 8° left so the resulting Track is 262.

Temperature conversion

At the bottom of the fixed outer scale, there is a conversion scale for temperatures between centigrade and Fahrenheit.

The scale can be used for calculations from Fahrenheit to Celsius and opposite.



Aviation Supplies Europe

Lufthavnsvej 28

DK-4000 Roskilde

www.aviation-supplies-europe.com

© Aviation Supplies Europe (ASE)

Printed in Denmark