THE FLIGHT COMPUTER AND NAVIGATION PLOTTER

GOAL: HOW TO USE A MANUAL E6B FOR FLIGHT PLANNING AND ENROUTE NAVIGATION.

COMPUTING SIDE OF E6B
- Distance, Speed, and Time Enroute
- Fuel Consumption and Duration
- Computation of True Airspeed using Temperature and Altitude
- Determination of Density Altitude
- True Altitude Calculation & Interpellation techniques for interpreting temp/alt data

WIND SIDE OF E6B
- Determination of Wind Correction Angle, and True Heading
- Determination of Ground Speed, Variation and Magnetic Heading
- Use of Deviation to determine Compass Heading

NAVIGATION PLOTTER
- Plotting and determining
- True Course
- Distances

MANY EXERCISES ALONG THE WAY.....
THE FLIGHT COMPUTER

- Unit Indexes or 10 Indexes
- Speed Index or 60 Index
- Density Altitude Window
- Pressure Altitude Window
- A Scale
- B Scale
- C Scale
- Air Temperature Window
- Fahrenheit — Celsius Temperature Conversion Scale
THE FLIGHT COMPUTER
SPEED, DISTANCE, TIME, FUEL

No complex formulas – LEGENDS ON E6B

Speed, Distance

Time

A
B
C

Gallon per hour, Fuel Burned

Time

A
B
C

OR

THIS WILL BECOME LESS COMPLEX AS WE DO PRACTICE EXERCISE
**THE FLIGHT COMPUTER**

**DISTANCE** (Scale A, above the time) =

1. Speed (Scale A-speed index) *
2. Time (Scale B)

**SPEED 120**

**TIME 120 MINUTES**

**DISTANCE = 240 MILES**

*CAUTION: SCALABILITY* (12 can be 12, 120, 1200)

*APPLY COMMON SENSE*
THE FLIGHT COMPUTER
DISTANCE PRACTICE

<table>
<thead>
<tr>
<th>Problem</th>
<th>1. Speed</th>
<th>2. Time</th>
<th>Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>120 (A)</td>
<td>120 minutes (B)</td>
<td>240</td>
</tr>
</tbody>
</table>

SM or NM: What & Where
HOW TO CONVERT
#1 240 SM = 208 NM

*ALWAYS use KTS not MPH, and NM not SM
## THE FLIGHT COMPUTER

### DISTANCE PRACTICE

<table>
<thead>
<tr>
<th>Problem</th>
<th>1. Speed</th>
<th>2. Time</th>
<th>Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>105 MPH</td>
<td>1 HR 20 Minutes</td>
<td>140 SM</td>
</tr>
</tbody>
</table>
### THE FLIGHT COMPUTER
#### DISTANCE PRACTICE

<table>
<thead>
<tr>
<th>Problem</th>
<th>1. Speed</th>
<th>2. Time</th>
<th>Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>90 MPH</td>
<td>300 Minutes</td>
<td>450</td>
</tr>
</tbody>
</table>

![FLIGHT COMPUTER IMAGE]
# THE FLIGHT COMPUTER
## DISTANCE PRACTICE

<table>
<thead>
<tr>
<th>Problem</th>
<th>1. Speed</th>
<th>2. Time</th>
<th>Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>150 MPH</td>
<td>2 HRS 15 MIN</td>
<td>338</td>
</tr>
</tbody>
</table>
### THE FLIGHT COMPUTER
#### DISTANCE PRACTICE

<table>
<thead>
<tr>
<th>Problem</th>
<th>1. Speed</th>
<th>2. Time</th>
<th>Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>250 MPH</td>
<td>2 HRS 05 MIN</td>
<td>521</td>
</tr>
</tbody>
</table>
**THE FLIGHT COMPUTER**

**DISTANCE PRACTICE**

<table>
<thead>
<tr>
<th>Problem</th>
<th>1. Speed</th>
<th>2. Time</th>
<th>Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>500 MPH</td>
<td>15 MIN</td>
<td>125</td>
</tr>
</tbody>
</table>

[Image of flight computer with various scales and indicators]
# THE FLIGHT COMPUTER

## DISTANCE PRACTICE

<table>
<thead>
<tr>
<th>Problem</th>
<th>1. Speed</th>
<th>2. Time</th>
<th>Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>123 MPH</td>
<td>4 HRS 04 MIN</td>
<td>500</td>
</tr>
</tbody>
</table>

---

The diagram shows an ASA E6-B flight computer used for calculating distance, speed, and time. The computer is a mechanical device used in aviation to calculate these values based on given inputs. The image includes a photo of the computer with various scales and indicators for different calculations.

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*Ground School 2011*

*Created by Steve Reisser*
# THE FLIGHT COMPUTER

## DISTANCE PRACTICE

<table>
<thead>
<tr>
<th>Problem</th>
<th>1. Speed</th>
<th>2. Time</th>
<th>Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>163 MPH</td>
<td>13 MIN</td>
<td>35</td>
</tr>
</tbody>
</table>
THE FLIGHT COMPUTER
SPEED

SPEED (Scale A, above the speed index) =
1. Distance (Scale A-put over time) *
2. Time (Scale B)

DISTANCE 240
TIME 120 MINUTES
SPEED = 120 MILES

where time is 10 minutes or greater
# THE FLIGHT COMPUTER

## SPEED

<table>
<thead>
<tr>
<th>Problem</th>
<th>Distance</th>
<th>Time</th>
<th>SPEED</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>240 SM (A)</td>
<td>2 HRS 00 MINS (B=120 &amp; C)</td>
<td>120</td>
</tr>
</tbody>
</table>
# THE FLIGHT COMPUTER

## SPEED

<table>
<thead>
<tr>
<th>Problem</th>
<th>Distance</th>
<th>Time</th>
<th>SPEED</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>25 SM</td>
<td>15 MIN</td>
<td>100</td>
</tr>
</tbody>
</table>

[Image of a flight computer.]
# THE FLIGHT COMPUTER

## SPEED

<table>
<thead>
<tr>
<th>Problem</th>
<th>Distance</th>
<th>Time</th>
<th>SPEED</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>135 SM</td>
<td>1 HR 10 MIN</td>
<td>116</td>
</tr>
</tbody>
</table>
# THE FLIGHT COMPUTER

## SPEED

<table>
<thead>
<tr>
<th>Problem</th>
<th>Distance</th>
<th>Time</th>
<th>SPEED</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>400 SM</td>
<td>3 HR 20 MIN</td>
<td>120</td>
</tr>
</tbody>
</table>
# THE FLIGHT COMPUTER

## SPEED

<table>
<thead>
<tr>
<th>Problem</th>
<th>Distance</th>
<th>Time</th>
<th>SPEED</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td>35 SM</td>
<td>12 MIN</td>
<td>175</td>
</tr>
</tbody>
</table>
# THE FLIGHT COMPUTER
## SPEED

<table>
<thead>
<tr>
<th>Problem</th>
<th>Distance</th>
<th>Time</th>
<th>SPEED</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>75 SM</td>
<td>1 HR 30 MIN</td>
<td>50</td>
</tr>
</tbody>
</table>
# THE FLIGHT COMPUTER
## SPEED

<table>
<thead>
<tr>
<th>Problem</th>
<th>Distance</th>
<th>Time</th>
<th>SPEED</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>15 SM</td>
<td>12 MIN</td>
<td>75</td>
</tr>
</tbody>
</table>
# THE FLIGHT COMPUTER

## SPEED

<table>
<thead>
<tr>
<th>Problem</th>
<th>Distance</th>
<th>Time</th>
<th>SPEED</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>375 SM</td>
<td>3 HR 00 MIN</td>
<td>125</td>
</tr>
</tbody>
</table>
THE FLIGHT COMPUTER
SPEED

Speed (A-speed index) = Distance (A) / Time (B) (underneath the distance) where time is <10 minutes

We treat the B scale as seconds and the C scale as Minutes. Instead of using the “Speed Index” we use a special point on the B scale found at 36 (SEC.)

Example: Fly 1 mile in 45 seconds. Set 1 (A scale) over 45 (B scale) and locate the SEC points (36 on B scale). Groundspeed above is 80 on the A scale.

Practice

\[
\begin{align*}
17. & \quad 1 \text{ mile in 120 seconds (or 2:00 Minutes)} = 30 \\
18. & \quad 5 \text{ miles in 45 seconds} = 400 \\
19. & \quad 3 \text{ miles in 2 minutes 30 seconds} = 72 \\
20. & \quad 1 \text{ mile in 8 seconds} = 450 \\
21. & \quad 7.5 \text{ miles in 4 minutes and 30 seconds} = 100
\end{align*}
\]
Quick mental math on Airspeed
Are we there yet? How long?

If the groundspeed is 150 knots, multiply the distance by four and **drop the last zero**: 20 miles*4 = 80. It will take **eight** minutes at 150.

For 60, multiply the miles by 1 since your are traveling at 1 mile per minute.

For 90, divide miles by 1.5 since you are going 1.5 miles each minute.

For 100, multiply by six for 120, minus the zero for 12 minutes.

For 120, divide by two since you are traveling at 2 miles per minute.

For 150, divide by 2.5 since you are traveling at 2.5 miles per minute.

For 180, just divide by three since you are traveling at 3 miles per minute.

Etc, etc, etc.
THE FLIGHT COMPUTER

TIME

TIME (Scale B or C, below Distance) =
1. Speed (Scale A)
2. Distance (Scale A)

SPEED 120
DISTANCE = 240
TIME = 120 MIN or 2:00 HRS
THE FLIGHT COMPUTER
TIME

Time (B-minutes/C-hours & minutes)
= Distance (A) / Speed (A-index)

<table>
<thead>
<tr>
<th>Problem</th>
<th>SPEED</th>
<th>Distance</th>
<th>TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td>22</td>
<td>120</td>
<td>240</td>
<td>2 HR 00 MIN</td>
</tr>
</tbody>
</table>
# THE FLIGHT COMPUTER

## TIME

<table>
<thead>
<tr>
<th>Problem</th>
<th>SPEED</th>
<th>Distance</th>
<th>TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td>23</td>
<td>105</td>
<td>25</td>
<td>14:17</td>
</tr>
</tbody>
</table>
# THE FLIGHT COMPUTER

## TIME

<table>
<thead>
<tr>
<th>Problem</th>
<th>SPEED</th>
<th>Distance</th>
<th>TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td>24</td>
<td>200</td>
<td>135</td>
<td>40:30’</td>
</tr>
</tbody>
</table>

![The Flight Computer Image](image-url)
# THE FLIGHT COMPUTER

## TIME

<table>
<thead>
<tr>
<th>Problem</th>
<th>SPEED</th>
<th>Distance</th>
<th>TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td>24</td>
<td>135</td>
<td>400</td>
<td>2:57:47’</td>
</tr>
</tbody>
</table>
# THE FLIGHT COMPUTER

## TIME

<table>
<thead>
<tr>
<th>Problem</th>
<th>SPEED</th>
<th>Distance</th>
<th>TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>135</td>
<td>35</td>
<td>15:33</td>
</tr>
</tbody>
</table>
# THE FLIGHT COMPUTER

## TIME

<table>
<thead>
<tr>
<th>Problem</th>
<th>SPEED</th>
<th>Distance</th>
<th>TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td>26</td>
<td>90</td>
<td>75</td>
<td>50:00</td>
</tr>
</tbody>
</table>

![Image of flight computer display](image-url)
## THE FLIGHT COMPUTER

### TIME

<table>
<thead>
<tr>
<th>Problem</th>
<th>SPEED</th>
<th>Distance</th>
<th>TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td>27</td>
<td>300</td>
<td>15</td>
<td>03:00</td>
</tr>
</tbody>
</table>
# THE FLIGHT COMPUTER

## TIME

<table>
<thead>
<tr>
<th>Problem</th>
<th>SPEED</th>
<th>Distance</th>
<th>TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td>28</td>
<td>90</td>
<td>375</td>
<td>4:10:00</td>
</tr>
</tbody>
</table>
THE FLIGHT COMPUTER
FUEL CONSUMPTION AND RATE

RATE OF CONSUMPTION → TOTAL GALLONS
(WORK LIKE SPEED)

G.P.H. 5

TIME 120 MINUTES

FUEL BURNED = 10 GALLONS

FUEL BURNED 10

TIME 120 MINUTES

RATE = 5 G.P.H.
## THE FLIGHT COMPUTER

### FUEL

<table>
<thead>
<tr>
<th>Problem</th>
<th>1. GPH</th>
<th>2. TIME</th>
<th>FUEL CONSUMPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>29</td>
<td>5 (A)</td>
<td>120 minutes (B)</td>
<td>(A) = 10 GALLONS</td>
</tr>
</tbody>
</table>
# THE FLIGHT COMPUTER

## FUEL

<table>
<thead>
<tr>
<th>Problem</th>
<th>1. GPH</th>
<th>2. TIME</th>
<th>FUEL CONSUMPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>8.5 GPH</td>
<td>1 HR 20 Minutes</td>
<td>11.3 G</td>
</tr>
</tbody>
</table>

![E6-B Flight Computer](image)
## THE FLIGHT COMPUTER

### FUEL

<table>
<thead>
<tr>
<th>Problem</th>
<th>1. GPH</th>
<th>2. TIME</th>
<th>FUEL CONSUMPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>31</td>
<td>90 GPH</td>
<td>300 Minutes</td>
<td>450.0 G</td>
</tr>
</tbody>
</table>
# THE FLIGHT COMPUTER

## FUEL

<table>
<thead>
<tr>
<th>Problem</th>
<th>1. GPH</th>
<th>2. TIME</th>
<th>FUEL CONSUMPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>32</td>
<td>13.5 GPH</td>
<td>2 HRS 15 MIN</td>
<td>30.4 G</td>
</tr>
</tbody>
</table>
# THE FLIGHT COMPUTER

## FUEL CONSUMPTION RATE

<table>
<thead>
<tr>
<th>Problem</th>
<th>1. GALLONS</th>
<th>2. TIME</th>
<th>RATE OF CONSUMPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>33</td>
<td>10 (A) G</td>
<td>120 minutes (B)</td>
<td>(A)= 5 GPH</td>
</tr>
</tbody>
</table>
THE FLIGHT COMPUTER

FUEL

<table>
<thead>
<tr>
<th>Problem</th>
<th>1. GALLONS</th>
<th>2. TIME</th>
<th>RATE OF CONSUMPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>34</td>
<td>12 G</td>
<td>1 HR 20 Minutes</td>
<td>9 GPH</td>
</tr>
</tbody>
</table>
# THE FLIGHT COMPUTER

## FUEL

<table>
<thead>
<tr>
<th>Problem</th>
<th>1. GALLONS</th>
<th>2. TIME</th>
<th>RATE OF CONSUMPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>35</td>
<td>35 G</td>
<td>300 Minutes</td>
<td>7 GPH</td>
</tr>
</tbody>
</table>
THE FLIGHT COMPUTER
FUEL

<table>
<thead>
<tr>
<th>Problem</th>
<th>1. GALLONS</th>
<th>2. TIME</th>
<th>RATE OF CONSUMPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>36</td>
<td>13.5 G</td>
<td>2 HRS 15 MIN</td>
<td>6 GPH</td>
</tr>
</tbody>
</table>
THE FLIGHT COMPUTER
AIRSPEED

WHAT YOU SEE (INDICATED AIRSPEED) IS NOT EXACTLY TRUE

<table>
<thead>
<tr>
<th>V speeds</th>
<th>KCAS (Knots <strong>Calibrated AS</strong>)</th>
<th>KIAS (Knots <strong>Indicated AS</strong>)</th>
</tr>
</thead>
<tbody>
<tr>
<td>V NE</td>
<td>158</td>
<td>160</td>
</tr>
<tr>
<td>V NO</td>
<td>126</td>
<td>128</td>
</tr>
<tr>
<td>V A</td>
<td>96</td>
<td>97</td>
</tr>
<tr>
<td>2300 lbs</td>
<td>96</td>
<td>97</td>
</tr>
<tr>
<td>1950</td>
<td>88</td>
<td>89</td>
</tr>
<tr>
<td>1600</td>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>V FE</td>
<td>86</td>
<td>85</td>
</tr>
</tbody>
</table>

TRUE AIRSPEED (TAS) - Calibrated airspeed **must be corrected for altitude and the outside air temperature**. (temperature & pressure impact airspeed indicator)

TAS IS HOW FAST YOU ARE MOVING THRU THE AIR NOT HOW FAST YOU ARE MOVING OVER THE GROUND (need wind info for GS)
THE FLIGHT COMPUTER
TRUE AIRSPEED (TAS)

POSITION THE TEMPERATURE OVER THE ALTITUDE

Temperature Celsius Above

Density Altitude

Altitude below

FIND CALIBRATED AIRSPEED ON “B”, THE TAS IS JUST ABOVE
# THE FLIGHT COMPUTER
## TRUE AIRSPEED (TAS)

<table>
<thead>
<tr>
<th>Problem</th>
<th>ALT</th>
<th>TEMP C</th>
<th>CAS</th>
<th>TAS</th>
<th>Density Alt.</th>
</tr>
</thead>
<tbody>
<tr>
<td>37</td>
<td>5,000</td>
<td>0</td>
<td>100</td>
<td>107</td>
<td>4389</td>
</tr>
</tbody>
</table>
THE FLIGHT COMPUTER
TRUE AIRSPEED (TAS)

<table>
<thead>
<tr>
<th>Problem</th>
<th>ALT</th>
<th>TEMP C</th>
<th>CAS</th>
<th>TAS</th>
<th>Density Alt.</th>
</tr>
</thead>
<tbody>
<tr>
<td>38</td>
<td>3,500</td>
<td>+10</td>
<td>105</td>
<td>111</td>
<td>3728</td>
</tr>
</tbody>
</table>
## THE FLIGHT COMPUTER
### TRUE AIRSPEED (TAS)

<table>
<thead>
<tr>
<th>Problem</th>
<th>ALT</th>
<th>TEMP C</th>
<th>CAS</th>
<th>TAS</th>
<th>Density Alt.</th>
</tr>
</thead>
<tbody>
<tr>
<td>39</td>
<td>8, 500</td>
<td>-20</td>
<td>120</td>
<td>132</td>
<td>6253</td>
</tr>
</tbody>
</table>

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# THE FLIGHT COMPUTER
## TRUE AIRSPEED (TAS)

<table>
<thead>
<tr>
<th>Problem</th>
<th>ALT</th>
<th>TEMP °C</th>
<th>CAS</th>
<th>TAS</th>
<th>Density Alt.</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>12,000</td>
<td>-30</td>
<td>250</td>
<td>285</td>
<td>9350</td>
</tr>
</tbody>
</table>

---

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THE FLIGHT COMPUTER
TRUE ALTITUDE

TRUE ALTITUDE : Indicated altitude corrected for temperature & altitude.

1. Adjust wheel so that “indicated altitude” is under the outside air temperature (C)
2. Find “pressure altitude” on the B scale and read the TRUE ALTITUDE above on the A scale. [GET PRESSURE ALTITUDE BY ADJUSTING THE KOLLSMAN WINDOW TO READ 29.92]

<table>
<thead>
<tr>
<th>Problem</th>
<th>P Alt</th>
<th>TEMP C</th>
<th>TRUE ALTITUDE</th>
</tr>
</thead>
<tbody>
<tr>
<td>41</td>
<td>5,000</td>
<td>0</td>
<td>4900</td>
</tr>
</tbody>
</table>
## THE FLIGHT COMPUTER
### TRUE ALTITUDE

<table>
<thead>
<tr>
<th>Problem</th>
<th>P Alt</th>
<th>TEMP C</th>
<th><strong>TRUE ALTITUDE</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>43</td>
<td>8, 500</td>
<td>-20</td>
<td>7930</td>
</tr>
</tbody>
</table>

![Image of flight computer display]

---

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THE FLIGHT COMPUTER
TRUE ALTITUDE

<table>
<thead>
<tr>
<th>Problem</th>
<th>P Alt</th>
<th>TEMP C</th>
<th>TRUE ALTITUDE</th>
</tr>
</thead>
<tbody>
<tr>
<td>44</td>
<td>12,000</td>
<td>-30</td>
<td>11037</td>
</tr>
</tbody>
</table>

![Image of true altitude calculation tool](image-url)
THE FLIGHT COMPUTER
INTERPOLATION FOR WINDS ALOFT

VFR HEADING  0-179→
FLY odd + 500 above 3000 AGL

You tell me WA@ 5500
.83 DIFFERENCE
19740+04

VFR HEADING  180-359←
FLY even + 500 above 3000 AGL

Step 1  3000-6000 Difference
Direction  200-180=20
Velocity  45-15=30
Temperature 12-2=10

Step 2 Cruise Difference
(Example@4500)
Direction  .5 x20=10
Velocity  .5 x30=15
Temperature  .5 x10=5

Step 3 Add Cruise Difference
Direction  180+10=190
Velocity  15+15=30
Temperature  12-5=7

Wa@4500= 19030+07
# THE FLIGHT COMPUTER
## MULTI-PART COMPUTATIONS

How much fuel is burned in each of the following? (Assumption: IAS and CAS are the same for the below problems). Find the time and then apply to the rate of fuel consumed.

<table>
<thead>
<tr>
<th>Conditions</th>
<th>Time</th>
<th>Fuel Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wind = 0, Ground Speed = 129 MPH, Distance = 320 SM, Fuel Consumption Rate = 9 GPH</td>
<td>2:29</td>
<td>22.5 GALS</td>
</tr>
<tr>
<td>Altitude = 7,500, Indicated Airspeed = 105 MPH, Temperature = +15°C, Distance = 256 SM, Fuel Consumption Rate = 11.5 GPH</td>
<td>2:07</td>
<td>24.4 GALS</td>
</tr>
<tr>
<td>Altitude=7,500, IAS=115, Temperature=-10°C, Distance=335, Fuel Consumption Rate=8.5 GPH</td>
<td>2:38</td>
<td>22.4 GALS</td>
</tr>
<tr>
<td>Ground Speed = 135, Wind = 0, Temperature = -20°C, Altitude = 9,000, Distance = 425, Fuel Consumption Rate = 12 GPH</td>
<td>3:09</td>
<td>37.8 GALS</td>
</tr>
</tbody>
</table>
THE FLIGHT COMPUTER
WIND SIDE

FOR G.S. AND T.H.
1. Place wind direction under true index
2. Mark wind velocity up from center
3. Place true course under true index
4. Slide wind velocity mark to T.A.S. line
5. Read ground speed under center
6. Read wind correction angle between center line and wind velocity mark

TC - L WCA = TH
TH - E +W VAR = MH
MH ± DEV = CH
Use wind side to determine / GS resulting from winds aloft.
THE FLIGHT COMPUTER
DETERMINING WIND CORRECTION & GROUND SPEED

1-Set Wind direction 360
2-Grommet to any speed line
3-Mark above Wind speed (10)
4-Set TC 240
5-Slide card so mark Is on TAS (105)
6-Grommet = GS (110)
7-WCA (right=+) = +5

WIND 360
VELOCITY = 10
TRUE COURSE = 240
TAS = 105
TRY THIS…

TC = 310
TAS = 120
WIND = 180 @ 16

WCA (Wind Correction Angle) = -6
TRUE HEADING (TC+/WCA)? = 304
GROUND SPEED? = 130
THE FLIGHT COMPUTER
PRACTICE WIND CORRECTION & GROUND SPEED

TC=178
TAS=135
WIND=045 @ 23
WCA (Wind Correction Angle) -7
TRUE HEADING (TC+/-WCA)? 171
GROUND SPEED? 150
THE FLIGHT COMPUTER
PRACTICE WIND CORRECTION & GROUND SPEED

TC=050

TAS=155 MPH

WIND=165 @ 18 KTS

WCA (Wind Correction Angle) +7

TRUE HEADING (TC+/-WCA)? 057

GROUND SPEED (KTS)? 142 KTS

135 KTS
THE FLIGHT COMPUTER
PRACTICE WIND CORRECTION & GROUND SPEED

TC=270
TAS=130 KTS
WIND=344 @ 18 KTS
WCA (Wind Correction Angle) +8
TRUE HEADING (TC+/-WCA)? 278
GROUND SPEED? 124 KTS
Determining Wind Direction and Speed using the E6B when enroute.

Basically you work the wind problem backwards on the E6B.

1. Put your groundspeed under the grommet
2. On the True Airspeed Arc, put a dot to reflect right or left wind correction angle you are holding.
3. Rotate the ring so that your mark is on the centerline 
   Read the wind direction under the E6B True Index
   Read the wind speed as the distance up from the grommet to your mark.

Try this:
Your Heading is 310, but you holding course 304 to maintain the heading.
Your TAS is 120, and your ground speed is 130.
Determine Wind Direction and speed. Slide 55 to confirm your answer.

Wind Direction 180, Wind Speed 16
THE FLIGHT COMPUTER
NAVIGATION PROBLEMS

You only need 2 more pieces of the puzzle to plot and compute full navigation problems (Deviation and Variation)

WHAT AND WHERE DO YOU FIND DEVIATION?

Corrections for instrument errors printed (a) in the POH & (b) on the Magnetic Compass

N6585J Deviation

<table>
<thead>
<tr>
<th>030</th>
<th>060</th>
<th>090</th>
<th>120</th>
<th>150</th>
<th>180</th>
<th>210</th>
<th>240</th>
<th>270</th>
<th>300</th>
<th>330</th>
<th>360</th>
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</thead>
<tbody>
<tr>
<td>-1</td>
<td>-2</td>
<td>-1</td>
<td>-1</td>
<td>0</td>
<td>0</td>
<td>+2</td>
<td>+2</td>
<td>+1</td>
<td>0</td>
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<td>-1</td>
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</tbody>
</table>

WHAT IS AND WHERE DO YOU FIND VARIATION?

Variation between TRUE and MAGNETIC North located on Sectional Charts as dashed vertical lines (E & W)

ADD (+) if “W”
SUB (-) if “E”
THE FLIGHT COMPUTER NAVIGATION PROBLEMS

PUTTING IT ALL TOGETHER.... IT’S ON YOUR E6B

➢ TAS, you must know the Winds Aloft, outside air temperature and velocity at altitude

➢ WCA is the offset to the TC due to the winds aloft

➢ GS is the correction of TAS for the winds aloft

➢ TH is the TC correction of WCA (TH = TC +/- WCA)

➢ MH is the TH correction of Variation (MH = TH +/- VAR)

➢ CH is the MH correction of Deviation (CH = MH +/- DEV)
THE FLIGHT COMPUTER
PRACTICE WIND CORRECTION & GROUND SPEED

TC=095

IAS=111 KTS

TEMPERATURE = +25 C

ALTITUDE = 7,500

WIND=360 @ 10 KTS

TAS

WCA (Wind Correction Angle)

TRUE HEADING (TC+/WCA)?

GROUND SPEED (KTS)?

130 KTS

-4

091

130 KTS
# THE FLIGHT COMPUTER NAVIGATION PROBLEMS

Flight from Vandenberg to Venice FL, TRUE COURSE (TC)=197
WINDS ALOFT = 050 @ 25 KTS, TEMPERATURE ALOFT +10C

**IAS = 115 = CAS**
ALTITUDE 4,500  DISTANCE = 38 SM

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<tr>
<th>030</th>
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<td>-1</td>
<td>0</td>
<td>0</td>
<td>+2</td>
<td>+2</td>
<td>+1</td>
<td>0</td>
<td>-1</td>
<td>-1</td>
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TAS  
GS   
WCA  
TH (TC +/- WCA)  
VARIATION 4W  
MH (TH+/- VARIATION)  
DEVIATION =  
CH (MH +/- DEV) =

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</table>
# THE FLIGHT COMPUTER NAVIGATION PROBLEMS

**SAME FLIGHT – DIFFERENT DAY**

CAS 115, CRUISING 4500  
WIND 200 @ 25, TEMP = +20 C  
TC= 197

**RETURN FLIGHT**

WIND 200 @ 25, TEMP = +20 C  
TC= 017

<table>
<thead>
<tr>
<th></th>
<th>TAS</th>
<th>GS</th>
<th>WCA</th>
<th>TH</th>
<th>VAR</th>
<th>MH</th>
<th>DEV</th>
<th>CH</th>
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</thead>
<tbody>
<tr>
<td>TC</td>
<td>127</td>
<td>102</td>
<td>+1</td>
<td>198</td>
<td>+5</td>
<td>203</td>
<td>+1</td>
<td>204</td>
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</table>

<table>
<thead>
<tr>
<th></th>
<th>TAS</th>
<th>GS</th>
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<th>VAR</th>
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</thead>
<tbody>
<tr>
<td>TC</td>
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<td>152</td>
<td>-1</td>
<td>016</td>
<td>+5</td>
<td>021</td>
<td>-1</td>
<td>020</td>
</tr>
</tbody>
</table>
THE NAVIGATION PLOTTER

1. Use as straight edge to draw course line between airports/navaids
2. Measure DISTANCE
3. Determine TRUE COURSE

CAUTION
USE THE CORRECT SIDE (SECTIONAL)
USE APPROPRIATE UNITS OF DISTANCE (NM)
USE PENCIL – NOT PEN UNLESS YOUR ABSOLUTELY SURE
NAVIGATION PLOTTER PRACTICE

PRACTICE EXERCISE 1

DRAW COURSE LINE AND RECORD DISTANCE (NM) BETWEEN

LEG 1. Tampa Executive to Sebring Airport.
LEG 2. Sebring Airport to Wachula Airport
LEG 3. Wachula Airport to Tampa Executive Airport
Mark and measure Checkpoints for each leg. It is a visual marker of your choice to assist you to recognize if you are on course. It should be a point easy to recognize. Give careful consideration if night – checkpoints will differ at night.

1. Mark your **CHECKPOINTS** for each leg of the flight.
2. Record the distances on each leg of the flight. True Courses discussed next class.
Next Session – Cross Country Planning & Navigation

- Study for exam on use of E6B and PN-1.
- Read Chapters 9, Section A and 5, Section A.

*BRING A SECTION CHART, E6B, AND PN-1 TO THE NEXT CLASS. Also, in the “Jewel” folder for the “Cross Country-COMM” Section 05, Print 2 “NAVLOGPlan.pdf sheets for our exercises in class.*

“That’s All Folks”