THE FLIGHT COMPUTER
TRUE AIRSPEED (TAS)

POSITION THE TEMPERATURE OVER THE ALTITUDE

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>
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</tbody>
</table>

![Image of flight computer](image-url)
THE FLIGHT COMPUTER
TRUE AIRSPEED (TAS)

<table>
<thead>
<tr>
<th>Problem</th>
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<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>
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</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>
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</table>
# THE FLIGHT COMPUTER

## TRUE AIRSPEED (TAS)

<table>
<thead>
<tr>
<th>Problem</th>
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<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>

---

**Density Altitude Correction Chart**

- **AIRSPEED CORRECTION**: Set PRESS. ALT opposite °C in window. Opposite CAS on inner scale, read TAS on outer scale. Read DENSITY ALT center.
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>
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</thead>
<tbody>
<tr>
<td>41</td>
<td>5,000</td>
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<td>4900</td>
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# THE FLIGHT COMPUTER
## TRUE ALTITUDE

<table>
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<th>TEMP C</th>
<th>TRUE ALTITUDE</th>
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</thead>
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<td>43</td>
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<td>-20</td>
<td>7930</td>
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THE FLIGHT COMPUTER
TRUE ALTITUDE

<table>
<thead>
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<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>

![Flight Computer Diagram](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

---

<table>
<thead>
<tr>
<th>3000</th>
<th>6000</th>
</tr>
</thead>
<tbody>
<tr>
<td>18015+12</td>
<td>20045+02</td>
</tr>
</tbody>
</table>

INTERPOLATE 4500

.5 difference 3000-6000

**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>Description</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 VAR = MH
MH ± DEV = CH
THE FLIGHT COMPUTER
WIND SIDE

Use wind side to determine GS resulting from winds aloft

Uncorrected flight path
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) ____________

TRUE HEADING (TC +/- WCA)? ____________

GROUND SPEED (KTS) ? ____________

135 KTS

+7

057

142 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
THE FLIGHT COMPUTER
PRACTICE WIND CORRECTION & GROUND SPEED

TC=095
IAS=111 KTS
TEMPERATURE = +25 C
ALTITUDE = 7,500
WIND=360 @ 10 KTS

TAS
130 KTS

WCA (Wind Correction Angle)
-4

TRUE HEADING (TC+/-WCA)?
091

GROUND SPEED (KTS)?
130 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>
</tr>
</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>
<td>-1</td>
<td>-1</td>
</tr>
</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 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

<table>
<thead>
<tr>
<th></th>
<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>TAS</td>
<td>124</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GS</td>
<td>144</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>WCA</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>TH (TC +/- WCA)</td>
<td>191</td>
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<td>MH (TH +/- VARIATION)</td>
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<td></td>
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<td></td>
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<tr>
<td>DEVIATION</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>+1</td>
<td></td>
</tr>
<tr>
<td>CH (MH +/- DEV)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td>196</td>
</tr>
</tbody>
</table>

-1-10+1+2+200-1-2-1
360330300270240210180150120090060030
124

191
# THE FLIGHT COMPUTER NAVIGATION PROBLEMS

**SAME FLIGHT – DIFFERENT DAY**  
CAS 115, CRUISING 4500  
WIND 200 @ 25, TEMP = +20 C  
TC=197

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>TAS</td>
<td>127</td>
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<tr>
<td>GS</td>
<td>102</td>
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<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>WCA</td>
<td>+1</td>
</tr>
<tr>
<td>TH</td>
<td>198</td>
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<table>
<thead>
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</thead>
<tbody>
<tr>
<td>VAR</td>
<td>+4</td>
</tr>
<tr>
<td>MH</td>
<td>202</td>
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<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>DEV</td>
<td>+1</td>
</tr>
<tr>
<td>CH</td>
<td>203</td>
</tr>
</tbody>
</table>

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

<p>| | |</p>
<table>
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<tbody>
<tr>
<td>TAS</td>
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<td>016</td>
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<th></th>
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</thead>
<tbody>
<tr>
<td>VAR</td>
<td>+4</td>
</tr>
<tr>
<td>MH</td>
<td>022</td>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
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<td>-1</td>
</tr>
<tr>
<td>CH</td>
<td>021</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 Zephyrhills Airport.

LEG 2. Zephyrhills to Crystal River Airport

LEG 3. Crystal River to Tampa Executive Airport
PRACTICE EXERCISE 2

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.

We will discuss putting your “True Course and Distance for each leg on a Navigation Log on the 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”