# PROGRAMED TEXT

NAVIGATIONAL COMPUTER

WIND FACE SIDE

AM-62

MARCH 1968


UNITED STATES ARMY

PRIMARY HELICOPTER SCHOOL

FORT WOLTERS, TEXAS

# PROGRAMED TEXT

**PROGRAM TEXT**

**FILE NO:** AM-62

**PROGRAM TITLE**

Navigational Computer
Wind Face Side

**POI SCOPE:** Use the navigation computer to plot known values such as wind, true course, ground speed, track, true airspeed, and true heading. Solve for wind, ground speed, drift correction, and true heading.

**INSTRUCTOR REFERENCES:**

TM 1-225 Ch. 8, Sec III

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**PROGRAMED TEXT** **PROGRAM TITLE:**

**FILE NO:** AM-62 Navigational computer - Wind Face

# PREFACE

Now that you have learned the slide rule side of the computer, it will be easier to learn the wind face side.

It is necessary that you know how to solve problems on the computer to accurately plan any flight.

Wind has a very definite affect on any aircraft, and must be considered when planning a flight. The wind face side of the computer enables you to do this quickly and accurately.

The last page of the program booklet has three diagrams on it. You should tear it out at this time and refer to it as necessary as you progress through the program.

Start with frame 1 and work each frame in succession. Each frame will usually ask you a question. The correct answer is printed on the top of the next frame. If you were incorrect, turn back and restudy the information before continuing on to the next frame. When you have finished the text, complete the self evaluation exercise. Now begin by studying the performance objectives on page iv.

# PERFORMANCE OBJECTIVES

Upon completion of this programed text, you will be able to use the wind face side of the computer to solve problems for:

1. Wind direction and speed
2. Track or true course (TR or TC)
3. True heading
4. True airspeed (TAS)
5. Ground speed (GS)

to an accuracy of $2^{o}$ in heading or 2 knots in speed.

FRAME 1

Study figure 2 of the diagrams.

The center line on the sliding grid passes directly under the true index and the small circle in the center of the plotting disc is called the gnomet. on fig 57 AM-61

TURN TO FRAME 2 PAGE 3

ANSWERS: TH = 176°
GS = 94K

Remember the tolerances are 2° in heading and 2 knots in speed.

---

FRAME 15

Suppose you plotted a TC of 194° and will fly a TAS of 75K on this course. A check with the weather forecast shows a wind of 322°/14k expected. What will your TH be to fly your intended path (TC)? Also your GS.

a. What do you always plot first? wind

b. Where does TC always go? under true index

c. Where does the wind dot always go? over true air speed

TC = 202°
GS = 183 K

TURN TO FRAME 16 PAGE 4

ANSWERS: true
grommet

---

FRAME 2

Assemble your computer as in figure 2 of the diagrams found ~~in the back of the booklet~~. in AM-61

The maximum speed arc on this side of the sliding grid is 270. Each heavy speed arc represents speeds at 10 knots intervals. The lines in between represent speeds at 2 knot intervals.

TURN TO FRAME 3 PAGE 5

ANSWERS: TH = 202°
GS = 83k
a. Wind
b. True Index
c. Over True Airspeed

---

FRAME 16

Think you know it now? Find TH and GS on the three problems below.

| | WIND | TC | TAS | TH | GS |
|---|---|---|---|---|---|
| a. | 200°/12k | 185° | 105k | 187° | 94K |
| b. | 140°/15k | 315° | 85k | 318° | 100K |
| c. | 190°/43k | 247° | 110k | 227° | 80K |

ANSWER: 2 knot intervals

---

FRAME 3

In planning or during a flight, you must know the ground speed in order to be able to figure your flight time and how much fuel will be needed. Ground speed is always found under the grommet

Note figure 3 on the back page of this booklet.

ANSWERS: a. TH = 187° GS = 94k
b. TH = 313° GS = 100k
c. TH = 227° GS = 80k

---

FRAME 17

Let us vary the problem slightly so you can find the TH and TAS. You must fly the next leg at a GS of 85k in order to reach a check point at a correct time. Therefore, you must find the TAS that will give you this GS with a given wind.

For example: Wind - 210°/30k
TC - 170°
GS - 85k

As before, the first step is to plot the wind. The second step is to put TC under the true index. The third step, which is different, is to plot GS under the grommet since GS is known, but the TAS is not known. TAS falls under the wind dot. Now read TH (as before) 180° and TAS 110 k. (Read TAS under wind dot.)

ANSWER: grommet

---

FRAME 4

Solve for TH and GS first. The wind (W/V) is 270°/20k, True Course (TC) is 310°, and True Airspeed (TAS) is 150k.

If given, always plot the wind first. Rotate the compass rose until the wind direction is under the true index. You now have 270° under the true index.

Go to the next frame and plot the speed of the wind.

ANSWERS: TH = 180°
TAS = 109k

---

FRAME 18

With a wind of 135°/22k, a desired GS of 70k and TC of 095° what will your TH and TAS be?

104

Remember - Plot the wind
Plot TC
Plot GS

a. TAS = 88 K
b. TH = 104°

ANSWER: 270°

---

FRAME 5

To measure the speed of wind, move the grid card so the grommet is over any 80, 90, 100, or 110 heavy speed arc. Count 20 knots up to the center line from the grommet and place a small dot. Not a mark, but a dot. Hold the pencil straight and press downward. Circle the small dot (.) so it can be easily found.

You have now plotted the wind and this dot is called a wind. dot. Does this look like figure #3 on page 38 of AM-61?

ANSWERS: a. 88k
b. 104°

TAS is always found under the wind dot.

---

FRAME 19

You know the wind to be forecast at 324°/23k, and you determine your GS will have to be 70k to land on the objective on time. You measure your TC, finding it to be 044°. You now have to compute the TH and TAS needed to maintain the 70k GS.

As always, you plot the wind first, then place TC at the true index.

a. Where does GS always go?

Now simply read TAS and TH from the wind dot.

b. TH = 27°

$$\begin{array}{r} 44 \\ -17 \\ \hline 27 \end{array}$$

c. TAS = 78K

ANSWERS: wind
Yes. If your computer does not look similar to figure 3, rework the frame.

---

FRAME 6

You have now plotted two of the four types of known information. The next step is to plot TC (310°).

The rule is to <u>always</u> plot TC under the true index.

Now you must rotate the compass rose so that 310 ° is under the true index.

ANSWERS: a. Under the grommet
b. TH = 027°
c. TAS = 78k

TAS is always found under the wind dot.

---

FRAME 20

Solve the next three problems for practice. All we allow is 2° heading and 2 knots in speed.

| | WIND | TC | GS | TAS | TH |
|---|---|---|---|---|---|
| a. | 090°/15k | 060° | 75k | 88 K | 65° |
| b. | 330°/20k | 212° | 82k | 76 K | 225° |
| c. | 292°/18k | 284° | 90k | 108K | 285° |

ANSWER: TC (310°)

You are not done; so do not solve for TH and GS yet. Make sure your wind dot is very small so that your answer will be as accurate as possible.

---

FRAME 7

Be sure to have TC (310°) under the true index.

The last thing to plot is TAS (150k). The rule is to always place the TAS under the wind dot. Slide the grid card up or down until the wind dot is directly over the 150 knot speed arc. Not the grommet, but the wind dot over the 150 knot arc.

Do not move it as both TH and GS can be read. What is your GS? 134k

ANSWERS:
a. TH - 065° TAS - 88k
b. TH - 225° TAS - 75k
c. TH - 285° TAS - 108k

---

FRAME 21

Of the six factors, you have solved TH, TAS, and GS. TC (intended path) will be known or you can find your TR (track is your actual path) on the map. For wind solution, use TR since you have not flown where you intended due to the wind.

Suppose on another leg you were unable to get an accurate forecast wind or the winds had changed. You must now learn to solve for wind.

Go to the next frame.

ANSWER: 134k

Remember the rule. GS is <u>always</u> found under the grommet.

---

FRAME 8

In measuring degrees between the wind dot and the center line to find drift correction, you will find that you use the straight converging lines. These are called <u>heading lines</u> and determine the number of degrees the wind dot is, left or right of the center line.

Notice that above the 150 knot speed arc each heading line equals one degree. Below 150 knots, each line equals 2 °.

FRAME 22

Given: TR - 330°
GS - 100k
TH - 340°
TAS - 120k

Normally you plot the wind first, but this is unknown. The first step is to plot TR under the true index. Second, GS always goes under the grommet. Third, to find DC, find the difference between TH and TR and apply this to the left or right of the center line. Since TR is the center line, TH will be 10° right of the center line.
(left or right)

ANSWER: 2°

---

FRAME 9

In finding TH, you will find that TH must be computed using the wind dot. The wind dot is 5° left of the center line and this 5° is your Drift Correction (DC).

In subtracting 5° (DC) from 310° (TC), we find the TH will be 305°. If the wind dot has been 10° to the right of the center line (310°), TH would have been 320°.

ANSWER: right

---

FRAME 23

You know the wind dot will be on a heading line 10° to the right, but where on that line? Your TAS is 120 knots and the speed arc crosses the heading line. Put your wind dot where these two lines cross and make the wind dot small.

Go to the next frame.

ANSWER: 320°

---

FRAME 10

An easier method of computing ~~TH is to figure (DC)~~ dir to figure DC, drift correction ~~and to to the drift~~ on the correction scale. If you are not sure where the DC scale is located, look at ~~figure 2~~ AM-61 pg 57

Do not move the compass rose again. Since DC is 5° to the left, go 5° left of the true index on the correction scale. TH is on the compass rose directly below the left 5° mark. Again it is 315 °.

What would your TH be if the DC was 28° right with a TC of 317°? It is 345 °.

28
345

FRAME 24

To find the wind, rotate the wind dot so it is above the grommet on the center line.

Now you can read under the true index the wind direction of 18 °.

For wind speed, place the grommet over any heavy speed arc and count up to the wind dot. Wind speed is 27 k.

ANSWERS: TH = 305°
TH = 345°

---

FRAME 11

a. The wind was plotted first by placing the direction under the true index and plotting the wind speed up from the grommet.

b. The TC is always placed under the true index.

c. The TAS is always placed under the wind dot.

d. The GS is always found under the grommet.

e. The DC was determined by the number of degrees left of the center line.

ANSWER: 017°
28k

---

FRAME 25

Review where the information was found or placed and the sequence in which it was used.

a. TR was placed under the true index.

b. GS was placed under the grommet.

c. The wind dot was placed where the TH and A/S 20 arc cross.

d. You read wind direction under the true index and wind speed up from the grommet

ANSWERS: 1. true index
2. true index
3. wind dot
4. grommet
5. center line

---

FRAME 12

Practice finding TH and GS. Follow the rules and their sequence. Always erase the old wind dot before starting a new problem.

Given: Wind - 095°/30k
TC - 60°
TAS - 120k

Step 1 - Plot the wind direction under true index and count the wind speed up from the grommet. Place a <u>small</u> wind dot and circle it.

Step 2 - Rotate the compass rose so TC is under true index.

Step 3 - Place wind dot over the correct TAS arc and read GS and figure TH.

GS 94 k TH 68 °

ANSWERS: a. true index
b. grommet
c. speed
d. true index, grommet

---

FRAME 26

Solve for wind if your TR is 220° and TH is 208°. You have been flying 94 knots for TAS and figure for your ground speed to be 80 knots. Your wind is 163°/22k

First, locate TR under true index.

Second, place GS.

Third, make wind dot where TAS and heading line cross.

Fourth, rotate wind dot and read wind direction and speed.

ANSWERS: GS 95k (under the grommet)
TH 068° (8° right of center line)

NOTE: The computer may be off, so you are allowed a tolerance of 2° in heading and 2 knots in speed.

---

FRAME 13

Wind - 020°/30k
TC - 180°
TAS - 120k

Find TH 178° and GS 149 k

Remember to plot the wind first, rotate TC under true index, and place TAS under wind dot.

Be accurate!

ANSWER: 162°/22k

---

FRAME 27

Solve the three problems below. When comparing answers make sure they are within tolerance.

| | TR | GS | TH | TAS | W/V |
|---|---|---|---|---|---|
| a. | 060° | 110k | 075° | 100k | 176°/29K |
| b. | 130° | 75k | 115° | 95k | 74°/30K |
| c. | 025° | 87k | 033° | 95k | 87°/15K |

ANSWERS: TH = 174°
GS = 148k
DC was about 5 3/4° so you should have rounded it off to 6° left.

---

FRAME 14

Determine the TH when given the following information:

TAS - 100k
TC - 165°
Wind - 240°/20k

The TH will be 174° to stay on your TC and GS will be 94k as a result of the wind.

If you are confused, go back to frames 13 and 14 to determine your steps to follow.

STOP RETURN TO FRAME 15 PAGE 2

ANSWERS: a. W/V - 176°/30k
b. W/V - 074°/30k
c. W/V - 086°/16k

You can now solve for W/V, TH, GS, and TAS.

Congratulations!

CONTINUE TO THE SELF EVALUATION EXERCISE

## SELF EVALUATION EXERCISE

1. Find the True Heading (TH) and the Ground Speed (GS).

Given: Wind - 194°/25k
TAS - 75k
TC - 212°

| | TH | GS |
|---|---|---|
| a. | 216° | 50k ✓ |
| b. | 210° | 45k |
| c. | 198° | 58k |
| (d.) | 206° | 51k |

2. If you were going to fly a TC of 270° at an airspeed (TAS) of 70 knots and told to expect a wind of 340°/12k at your altitude, what TH would you fly to stay on your TC of 270° and what would your GS be?

| | TH | GS |
|---|---|---|
| a. | 258° | 60k |
| (b.) | 279° ✓ | 65k ✓ |
| c. | 283° | 70k |
| d. | 260° | 69k |

3. Find TH and TAS.

Given: GS - 94k
TC - 216°
Wind - 159°/08k

| | TH | TAS |
|---|---|---|
| a. | 208° | 99k |
| b. | 220° | 99k ✓ |
| (c.) | 212° ✓ | 99k |
| d. | 210° | 89k |

4. Suppose you were over RP "A" and you were told to maintain a GS of 80k to RP "B". You had measured a TC of 120° and had winds of 228°/14k. What TH and TAS would you fly to maintain a GS of 80k?

| | TH | TAS |
|---|---|---|
| a. | 129° | 76k |
| b. | 119° | 86k |
| c. | 122° | 65k |
| d. | 119° | 75k |

5. Find the wind direction and velocity.

Given: TR - 351°
TAS - 85k
GS - 102k
TH - 002°

a. 129°/25k
b. 129°/35k
c. 121°/15k
d. 102°/20k

6. You are on the third leg of your flight and notice that you are off course. You have been flying a TH of 019° at 85 knots (TAS). Locating yourself on the map and drawing a line to your position, you can figure your track of 033° and distance to figure a GS of 93 knots. What is your wind? 19°/14

a. 264°/20k
b. 278°/29k
c. 265°/18k
d. 275°/23k

Solve the following problems.

Given:

Wind 090°/20k TC 120° GS 90k

Find:

7. TH

a. 120°

b. 090°

c. 115°

d. 110°

8. TAS

a. 108k

b. 90k

c. 120k

d. 75k

Given:

Wind 020°/30k TC 180° TAS 120k

Find:

9. TH

a. 174°

b. 160°

c. 191°

d. 156°

10. GS

a. 74k

b. 96k

c. 145k

d. 148k

Given:

Wind 090°/15k TC 060° GS 75k

Find:

| 11. | TH | TAS |
|---|---|---|
| a. | 065° | 88k |
| b. | 055° | 75k |
| c. | 060° | 75k |
| d. | 073° | 67k |

12. Ground speed is always read:

a. Under the true index
b. Under the wind dot
c. Under the grommet
d. You can't read ground speed on this side of the computer

13. Always plot

a. the wind first, if its given.
b. the drift correction first.
c. TH under the true index.

14. True airspeed is always read

a. under the true index.
b. under the grommet.
c. under the wind dot.

Check your answers on page 34

OUT-OF-CLASS
PRACTICAL EXERCISE
AM-62

| | WIND DIR. | WIND SPEED | TRUE COURSE | GROUND SPEED | TRUE HEADING | TRUE AIR SPEED |
|---|---|---|---|---|---|---|
| 1. | 220° | 20 | 340° | 160 | 342° | 151K |
| 2. | 50° | 15 | 274° | 153 | 270° | 143K |
| 3. | 150° | 25 | 183° | 135 | | |
| 4. | 230° | 10 | 5° | 154 | | |
| 5. | 70° | 20 | 112° | 126 | | |
| 6. | 320° | 30 | 266° | 153 | | |
| 7. | 190° | 35 | 97° | 198 | | |
| 8. | 110° | 10 | 355° | 179 | | |
| 9. | 280° | 30 | 58° | 236 | | |
| 10. | 20° | 20 | 246° | 197 | | |

| | TRUE HEADING | TRUE AIR SPEED | TRACK | GROUND SPEED | WIND DIRECTION | WIND SPEED |
|---|---|---|---|---|---|---|
| 1. | 75° | 140 | 87° | 141 | | |
| 2. | 240° | 155 | 247° | 173 | | |
| 3. | 352° | 145 | 340° | 116 | | |
| 4. | 115° | 170 | 101° | 161 | | |
| 5. | 26° | 200 | 28° | 224 | | |
| 6. | 173° | 160 | 169° | 132 | | |
| 7. | 230° | 180 | 218° | 176 | | |
| 8. | 190° | 165 | 178° | 168 | | |
| 9. | 80° | 150 | 70° | 152 | | |
| 10. | 310° | 140 | 305° | 169 | | |

## ANSWERS TO SELF EVALUATION EXERCISE

1. d. 206° 51k
2. b. 279° 65k
3. c. 212° 99k
4. a. 129° 76k
5. a. TH 129° TAS 25k
6. d. 275°/23k
7. c. 115°
8. a. 108k
9. a. 174°
10. d. 148k
11. a. 65° 88k
12. c. Under the grommet
13. a. the wind first, if its given.
14. c. under the wind dot.

## RULES TO REMEMBER

1. If wind is given, always plot this first.
2. TC or TR always goes under the true index.
3. TAS will always go under the wind dot.
4. GS will always go under the grommet.
5. Center line always represents TC or TR.

| | WIND DIR. | WIND SPEED | TRUE COURSE | TRUE AIR SPEED | TRUE HEADING | GROUND SPEED |
|---|---|---|---|---|---|---|
| 1. | 148° | 32 | 80° | 170 | _____ | _____ |
| 2. | 300° | 18 | 10° | 130 | _____ | _____ |
| 3. | 15° | 26 | 160° | 190 | _____ | _____ |
| 4. | 225° | 15 | 275° | 140 | _____ | _____ |
| 5. | 180° | 35 | 50° | 200 | _____ | _____ |
| 6. | 78° | 30 | 190° | 175 | _____ | _____ |
| 7. | 110° | 38 | 28° | 300 | _____ | _____ |
| 8. | 45° | 25 | 292° | 165 | _____ | _____ |
| 9. | 60° | 35 | 130° | 180 | _____ | _____ |
| 10. | 310° | 36 | 206° | 145 | _____ | _____ |

## ANSWERS TO PRACTICAL EXERCISE

| | TH | TAS | | WD | WS | | TH | GS |
|---|---|---|---|---|---|---|---|---|
| 1. | 333° | 152K | 1. | 349° | 29K | 1. | 090° | 155K |
| 2. | 278° | 142K | 2. | 113° | 28K | 2. | 002° | 123K |
| 3. | 178° | 156K | 3. | 029° | 40K | 3. | 155° | 211K |
| 4. | 002° | 148K | 4. | 185° | 41K | 4. | 270° | 130K |
| 5. | 106° | 142K | 5. | 224° | 25K | 5. | 058° | 220K |
| 6. | 274° | 172K | 6. | 191° | 30K | 6. | 181° | 183K |
| 7. | 107° | 200K | 7. | 308° | 38K | 7. | 035° | 295K |
| 8. | 358° | 175K | 8. | 279° | 35K | 8. | 300° | 173K |
| 9. | 052° | 215K | 9. | 169° | 27K | 9. | 119° | 165K |
| 10. | 250° | 184K | 10. | 103° | 32K | 10. | 220° | 150K |

# PRACTICE NAVIGATION PROBLEMS
## AM-62

1. TC 005°
   Wind 250°/30K
   GS 140K
   Dev. -2°
   Var. 10°E
   Alt 10,000 ft
   Temp. 0°C
   TH 352° 354
   TAS 80K 83

2. TR 122°
   GS 154K
   TH 118°
   TAS 160K
   Wind ____/____

3. CH 085°
   Dev. -5°
   Var. 15°W
   Temp. +35°C
   Alt. 2000 Ft
   TR 087°
   Dist. 94NM
   Time :40
   TAS 166K
   WD/WS ____/____

4. GIVEN: TOTAL FUEL ABOARD 780 lbs 510
   RESERVE 210 lbs
   DEPARTURE TIME 1535
   R/C 180 PPH 3:10

   FIND: Without using reserve you can fly until 1845 1845

5. GS 68K
   Time 00:01.5
   Distance 123 NM

6. GIVEN: Dist to Destination 130 NM
   Departure Time 1734
   Distance to 1st Ck Pt 45 NM
   ATA at 1st Ck Pt 1753

   FIND: _____ETA at Destination

7. Wind 320/30K
   TAS 180K
   TC 175°
   TH _____
   GS _____

8. GIVEN: IND ALT 13,000 ft
   TEMP -32°C
   FIND: _____Density Alt.

9. IAS 180K
   ALT. 7500 ft
   TAS _____K

10. Fuel Consumed 58 gallons
    Time 1:27
    Fuel Remaining 148 gallons
    Time Remaining _____

11. GIVEN: TOTAL FUEL 828 lbs
    DEPART TIME 2316
    ATA 0247
    FUEL REMAINING 96 lbs

    FIND: _____PPH, R/C

12. W/V 55°/25K
    TC 340°
    GS 84K
    Temp. +15°C
    Alt. 4,000 ft
    TH _____
    IAS _____

13. Fuel Used 185 lbs
    Time 1:28
    R/C _____ lbs per hr
    Dist. 143 SM
    GS 92K
    Time _____

15. TC 87
    IAS 125K
    I. ALT. 5,000 ft.
    Temp. +5°C
    Wind 305/42K
    TH-GS _____

16. TC 065
TAS 148 MPH
Wind 117/17 MPH
Distance 278 SM
ETE_____

17. TC 113
GS 167K
Wind 005/23K
TH-TAS_____

18. CH 269
I. ALT 7000 ft
Temp. +20°C
Var. 11W
Track 251
GS 143K
IAS 145K
Dev. +2
Wind_____/_____

19. Wind 275/25K
TC 115
TAS 180K
TH-GS_____

20. TC 77
GS 177K
Wind 335/20K
I. ALT. 12,000 ft
Temp. -20°C
IAS_____K

21. CH 85
VAR. 3W
Dev +3
IAS 151K
I. ALT 5000 ft
Temp +15°C
Track 67
Distance 80 NM
Time 25 min.
WD/WS_____

22. WV 240/30K
TC 195
TAS 180K
TH-GS_____

23. GS 148 MPH
Time :45
Dist._____NM

1. TH = 353° TAS = 130 K
2. Wind = 059°/13K
3. Wind = 027°/40K
4. 18:45
5. 1.7 NM
6. 18:29 ETA
7. TH = 180° GS = 204K
8. 10,050 ft.
9. 202 K
10. 3:42
11. 209 PPH
12. TH = 355° IAS = 87K
13. 134 PPH
14. 1:21
15. TH = 075° GS = 166K
16. 2:03 ETE
17. TH = 105° TAS = 162K
18. Wind = 282°/28K
19. TH = 118° GS = 204K
20. IAS 148
21. Wind 197°/46K
22. TH = 202° GS = 158K
23. 96.5 NM

L2535 Army-Ft. Sill, Okla.