

SELF EVALUATION
EXERCISE 2

1. DISTANCE CONVERSIONS:

	<u>Nautical Miles</u>	<u>Statute Miles</u>
a.	140	<u>1612</u>
b.	<u>36.5</u>	42
c.	<u>365</u>	420
d.	168	<u>194</u>
e.	189 ¹⁹³	<u>218</u>
f.	<u>192.5</u>	222

2. TIME, SPEED, DISTANCE:

	<u>Time</u>	<u>GS</u>	<u>Distance</u>
a.	<u>72 min 1 hr 12 min</u>	80 k	96 nm
b.	<u>63.5</u> seconds	85 k	1.5 nm
c.	<u>20 min.</u>	108 k	36 nm
d.	1 hr + 18 min = <u>78 min</u>	75 k	<u>97.5 nm</u>
e.	1 hr + 20 min = <u>80 min</u>	<u>64.5</u> k	86 nm
f.	36 min	83 k	<u>49.5 nm</u>

Answers:

1. DISTANCE CONVERSIONS:

- a. 161
- b. 36.5
- c. 365
- d. 194
- e. 218
- f. 193

2. TIME, SPEED, DISTANCE:

- a. 1 hr + 12 min
- b. 63.5 seconds
- c. 20 min
- d. 97.5 nm
- e. 64 k
- f. 50 nm

Go to the top of page 31 and continue.

SECTION III

Frame 40

The computer is also used to solve fuel problems. When solving a fuel problem you are concerned with time - how long can you fly, rate - how many gallons per hour will you use, and amount - total gallons used or needed.

Frame 43

Now find the rate of consumption if you use 40 gallons in 2 hours and 10 minutes. Remember the fuel on the outer scale is over the time on the inner scale and the rate in this case is 18.5 gallon(s) per hour.

Frame 46

Army regulations require you as a pilot to plan for a 30 minute fuel reserve on all visual flights i.e., after landing at your destination your helicopter should still have enough fuel to fly for 30 more minutes. If your helicopter consumes 19 gallons/hour how much fuel would be required for this 30 minute reserve? Answer: 9.5 gals

or needed.

Answer: 18.5 Gallons per hour.

Now find the rate of consumption if you use 40 gallons in 2 hours and

10 minutes. Remember the fuel on the outer scale is over the time on the
inner scale and the rate in this case is 4.0 gallons per hour.

Answer: 2 1/2 Gallons per hour to plan (Shallag 2/16)

fuel reserve on all visual flights i.e., after landing at your destination

your helicopter should still have enough fuel to fly for 30 more minutes.

If your helicopter consumes 19 gallons/hour how much fuel would be

required for this 30 minute reserve? Answer: 5.75 Gallons

Frame 41

How long could you fly with 30 gallons if you were using 18 gallons per hour? Set the rate index () under the rate and under 30 on the outer scale you read 1 hour and 40 minutes.

Frame 44

Suppose you plan to fly for 1 hour and 55 minutes using 19 gallons per hour; find the fuel required. Start by setting the rate index () under the rate and read the fuel required over the time. Your answer: 36.8 gallon(s).

Frame 47

The distance between Da Nang and Quang Nhai is 39 statute miles and you have computed that your ground speed will be 63 knots. If your helicopter's fuel consumption is 20 gallons per hour how much fuel will be required for your flight from DA Nang to Quang Nhai? gallons (Don't forget the 30 minute reserve)

NOTE: To solve this problem will require 4 steps.

1. Find the distance in nautical miles. 33.8 KM
2. Find the flight time. 32.3 min.
3. Add the flight time and 30 minutes for fuel reserve. 62.3 min
4. Find the amount of fuel required. 20.8 gal.

Frame A1

How long could you fly with 30 gallons if you were using 18 gallons per hour? Set the rate index () under the rate and under 30 on the outer scale you read

Answer: 1 hr and 40 min.

minutes. 40 hours and 1

Answer: 36 1/2 gallons

Frame A2

Suppose you plan to fly for 1 hour and 35 minutes using 18 gallons per hour; find the fuel required. Start by setting the rate index () under the rate and read the fuel required over the time. Your answer: 25.5 gallon(s).

Answer: 20.5 gallons

The distance between Da Nang and Quang Nhai is 39 statute miles

and you have computed that your ground speed will be 63 knots. If

your helicopter's fuel consumption is 50 gallons per hour how much fuel

will be required for your flight from Da Nang to Quang Nhai?

gallons (Don't forget the 30 minute reserve)

NOTE: To solve this problem will require 4 steps.

1. Find the distance in nautical miles. 32.8 KM

2. Find the flight time. 32.3 min

3. Add the flight time and 30 minutes for fuel reserve. 62.3 min

4. Find the amount of fuel required. 20.5 gal

Suppose on another flight you are using 20 gallons per hour. How long would it take to use 15 gallons? Again set the rate index (▲) under the rate and read 45 minute(s) under the fuel - (remember fuel is on the outer scale).

Next try these:

1. Rate = 18 GPH (gal/hour)
Fuel = 46 gal.
Find Time 2 hr 33 min.
2. Fuel = 35 gal
Time = 1 hour and 45 min.
Find rate 20 GPH.
3. Rate = 19 GPH
Time = 2 hours and 10 min.
Find fuel required: 41.5 gal.

Your helicopter is on the ground at Downing and the IP wants to fly to Jacksboro and back. The IP told you that you will be able to average 63 knots ground speed. To Jacksboro and back to Downing is 54 nm and your helicopter burns 20 gallons/hour. With 28 gallons in the helicopter would you tell the IP:

- a. "We should get some fuel first."
- b. "We have enough fuel plus a reserve."

Clue No. 1 - What's the total flight time?

Clue No. 2 - How much flight time will 28 gallons allow?

51.5
+ 30
81.5 min
1 hr 21.5 min
24 hrs
27.2 gals

Answer: 45 Min.

RETURN TO PAGE 31, FRAME 43

Answers: 1. 2 hr. + 33 min.

2. 20 gal/hr

3. 41 gal.

RETURN TO PAGE 31, FRAME 46

Answers: b. "We have enough fuel plus a reserve."

GO TO SELF EVALUATION EXERCISE ON THE NEXT PAGE

SELF EVALUATION
EXERCISE 3

1. Given: Dist: 27 nm
Time: 20 minutes

Find: GS
a. 95 knots
b. 81 knots
c. 65 knots
d. 87 knots

2. Given: 138 Statute miles

Find: Nm Km
a. 12 22
b. 160 225
c. 120 221
d. 16 25

3. Given: Fuel before take-off = 46 gal. Find: Time Remaining
Time elapsed after take-off = 37 min. **b. 1 hr. + 45 min.**
83 gal. c. 1 hr. + 20 min.
d. 1 hr. + 20 min.

*1.85
2.25
0.37
1.43*

fuel used 120 gal.
Given: Distance from Fort Wolters to Breckenridge-43 nm
Average GS - 63k
Fuel Consumption - 19 GPH

4.1 min to

1.3 gal.

4. If you leave Fort Wolters at 0900 when will you arrive at Breckenridge.

- a. 0939
b. 0941
c. 0944
d. 0950

5. Allowing for a 30 minute fuel reserve how much fuel will be required to fly from Fort Wolters to Breckenridge and return?

- a. 46 gal
b. 38 gal
c. 48 gal
d. 36 gal

*26
9.5
35.5*

GO TO ANSWERS ON PAGE 38

Answers:

SELF EVALUATION
EXERCISE 3

1. b
2. c
3. a
4. b
5. d

Find: 62
a. 92 knots
81 knots
c. 65 knots
d. 87 knots
Find: 110
a. 110
b. 160
c. 120
d. 16

Dist: 27 nm
Time: 20 minutes
138 statute miles

Fuel before take-off = 46 gal.
Time elapsed after take-off = 37 min
a. 1 hr. + 45 min
b. 2 hr. + 20 min
c. 1 hr.
d. 1 hr. + 20 min

Distance from Fort Wolters to Breckenridge = 43 nm
Average GS = 63k
Fuel Consumption = 19 GPH

Continue with frame 49. you leave Fort Wolters at 0900 when will

0939
0941
0944
0950

allowing for a 30 minute fuel reserve how much fuel will be required
fly from Fort Wolters to Breckenridge and return

46 gal
38 gal
48 gal
36 gal

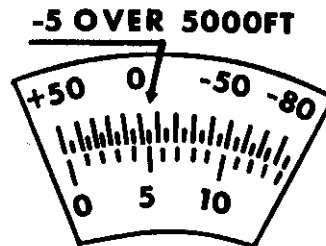
GO TO ANSWERS ON PAGE 38

Now let's talk about airspeeds. In preflight you know the indicated airspeed (IAS) you will get with normal cruise power settings and you also know from the weather forecast the expected temperature at your flight altitude. Therefore you can compute the True Airspeed (TAS) since it is needed for the flight plan. The computer is used to correct or change IAS to True Airspeed.

Frame 55

During preflight planning you select 5000 feet as the flight altitude. The temperature at 5000 feet is expected to be minus (-) 5 degrees. You plan to cruise at an IAS of 80 knots. What TAS will you put on the flight plan? Now use the computer to find TAS.

Set your computer like this:



**FOR AIRSPEED AND
DENSITY ALTITUDE
COMPUTATIONS**

Continue on page 41 frame 56.

Frame 61

- Try these three:
1. Altitude = 7,000 feet
 Temperature = ~~50~~
 IAS = 65k
 TAS = 72 k
 2. Altitude = 6,500 feet
 Temperature = 15°
 IAS = 105k
 TAS = 118 k
 3. Altitude = 4,000 feet
 IAS = 85k
 TAS = 90 k

Answer: TAS

Now let's talk about airspeeds. In preflight you know the altitude (IAS) you will get with normal cruise power settings and you also know from the weather forecast the expected temperature at your flight altitude. Therefore you can compute the True Airspeed (TAS) since it is needed for the flight plan. The computer is used to correct or change

IAS to

Frame 50
min 05 sec 10

During preflight planning you select 5000 feet as the flight altitude. The temperature at 5000 feet is expected to be minus (-) 5 degrees. You plan to cruise at an IAS of 80 knots. What TAS will you put on the flight plan? Now use the computer to find TAS.



FOR AIRSPEED AND
DENSITY ALTITUDE
COMPUTATIONS

Answers: 1. 71k

2. 118 k

3. 90k

Try these three:

- Altitude = 7,000 feet
Temperature = 5°
IAS = 80k
TAS = 71k
- Altitude = 6,500 feet
Temperature = 15°
IAS = 100k
TAS = 90k
- Altitude = 4,000 feet
Temperature = 35°
IAS = 80k
TAS = 77k

Frame 50

IAS differs from TAS because of temperature and altitude. Therefore when you correct IAS to TAS you are correcting for the error caused by

temp and altitude.

Frame 56

Now look at 80 on the inner scale and read the TAS directly above it on the outer scale. In this case the TAS is 85 K k.

Frame 62

While you are working with the airspeed window you should learn to solve for DENSITY ALTITUDE. Although you are solving for density altitude you still use the AIRSPEED window. Read the instructions under the AIRSPEED WINDOW of the computer.

Continue on page 43 frame 63

IAS differs from TAS because of temperature and altitude. Therefore
Answer: temperature and altitude.

when you correct IAS to TAS you are correcting for the error caused by

altitude

and

temp

Answer: 85k

Now look at 80 on the inner scale and read the TAS directly above it.

on the outer scale. In this case the TAS is 82k correct?

While you are working with the airspeed window you should learn to

solve for DENSITY ALTITUDE. Although you are solving for density

altitude you still use the AIRSPEED window. Read the instructions

under the AIRSPEED WINDOW of the computer.

Continue on page A3 frame 53

Look around the outer scale of the computer and you will notice the label True A. S. On the inner scale is labeled Cal A. S. meaning calibrated airspeed. These labels are between the number 15 and 17 on the MB-4 type computer. On other models they may be elsewhere. The scales are labeled so you won't forget to read TAS from the (outer-inner) scale.

Suppose you are flying at 8000 feet with an air temperature of 10° and the airspeed indicator shows 100 knots. What is the TAS (True Airspeed) Set the airspeed window so that 10° is over 8000 feet. Now locate 100 knots on the inner scale and read 145.2 K TAS.

To check yourself on following instruction, work this:

Pressure Altitude = 10,000 feet

Temperature = -10°

Find Density Alt. = 9500

A. 11,800

B. 9,300

C. I don't get it

See page 45 frame 64

See page 49 frame 66

See page 47 frame 65

Look around the outer scale of the computer and you will
 label True A. 2. On the inner scale is labeled Cal A. 2. meaning calibrated
 airspeed. These labels are between the number 15 and 17 on the MB-4 type
 computer. On other models they may be elsewhere. The scales are labeled
 so you won't forget to read TAS from the outer-inner scale.

Answer: 115k 141

Suppose you are flying at 8000 feet with an air temperature of 10°
 and the airspeed indicator shows 100 knots. What is the TAS (True Airspeed)
 Set the airspeed window so that 10° is over 8000 feet. Now locate 100 knots
 on the inner scale and read 115k TAS.

To check yourself on following instructions, see chart 1. a. reverse
 Pressure Altitude = 10,000 feet
 Temperature = -10°
 Wind Density Alt. = 9500
 A. 11,800
 B. 9,700
 C. I don't get it
 See page 45 frame 64
 See page 49 frame 66
 See page 47 frame 65

NOTE: IAS and CAS are not the same due to instrument error, but we will use them as the same for the purpose of this program since the error, or difference, is small. For most Army aircraft the aviator can ignore this difference between CAS and IAS.

Continue on page 46 frame 53

Suppose your flight altitude is 4,000 feet with a temperature of 0° and IAS of 85K. Set the temperature over the altitude and read

89 K TAS over 85.

Your answer: A. 11,800

You are following instructions O. K., but the temperature is (-) 10 degrees. Now go back to page 43 and use -10° on the computer.

NOTE: IAS and CAS are not the same due to instrument error, but we will use them as the same for the purpose of this program since the error, or difference, is small. For most Army aircraft the aviator can ignore this difference between CAS and IAS.

Continue on page 46 frame 52

Suppose your flight altitude is 4,000 feet with a temperature of

0° and IAS of 85K. See the temperature over the altitude and read

Answer: 89k

IAS over 85.

Your answer: A. 11,800

You are following instructions O. K., but the temperature is (-)

10 degrees. Now go back to page 43 and use -10° on the computer.

Next look at the computer and locate the window marked FOR AIRSPEED AND DENSITY COMPUTATIONS. The airspeed window has a temperature range from plus 50 to -80 degrees centigrade and by moving the disc you see the altitude range in the window is from minus 2000 feet. ~~to~~

+ 80,000',

Minus 2000feet.



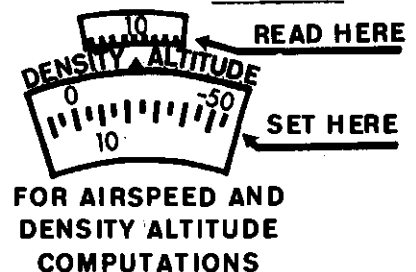
There will be times when you won't be able to obtain the forecast temperature at your flight altitude. This can be critical if your helicopter is not equipped with an outside air temperature gauge. In this case you will use the standard sea level temperature. (+ 15°C) and the normal lapse rate (subtract 2° for every thousand feet of altitude). Using the standard temperature and normal lapse rate the temperature at 4000 feet can be estimated at 7° (15° minus 8).

Estimate the temperature at the following altitudes:

- a. 6000 feet $\sim 12 = 3^{\circ}$
- b. 5000 feet $\sim 10 = 5^{\circ}$
- c. 8000 feet $\sim 16 = -1^{\circ}$
- d. 7000 feet $\sim 14 = 1^{\circ}$

Your answer: C. I don't get it.

O, K., set your computer according to this diagram:



Go to page 49 frame 66

Answers: -80 (minus 80)

80,000 feet

Answers: +3°

+5°

-1°

+1°

Frame 54

To correct airspeed for temperature and altitude error you should use the airspeed window.

Frame 60

Your flight altitude is 5000 feet and your IAS is 75k. Estimate the temperature and find the TAS. 81 k

Frame 66

Your answer: B. 9,300 ft is correct. Continue below-----

A pressure altitude of 6,000 feet and a temperature of -5° will give a density altitude of 6000 feet.

Answer: airspeed

RETURN TO PAGE 39 FRAME 55

Answer: 81

RETURN TO PAGE 39 FRAME 61

Answer: 5000

CONTINUE WITH THE SELF-EVALUATION EXERCISE 4 ON THE NEXT PAGE

SELF EVALUATION
EXERCISE 4

1. If you use 27 gallons of fuel in 1 hour and 25 minutes, what is the rate of consumption?

- a. 19.1 GPH
- b. 5.1 GPH
- c. 20 GPH
- d. 18.4 GPH

2. 90 km = Naut 48.5 Stat 56

- | | | |
|----|-------------|-----------|
| a. | 55 | 64 |
| b. | <u>48.5</u> | <u>56</u> |
| c. | 29 | 33.5 |
| d. | 42 | 51 |

3. Compute the time required to fly 78 nm at a GS of 96 k.

- a. 49 minutes
- b. 52 minutes
- c. 46 minutes
- d. 1 hour and 14 minutes

4. Given: Pressure Altitude = 6000 feet
Temperature = +5°

Find: Density Altitude

- a. 6200 feet
- b. 5000 feet
- c. 1000 feet
- d. 6800 feet

5. Given: Pressure Altitude = 4000 feet
Temperature = +30°

Find: Density Altitude

- a. 2000 feet
- b. 5000 feet
- c. 6500 feet
- d. 4500 feet

6. Given: Indicated Altitude = 6000 feet
Indicated Airspeed = 70k

Find: TAS

- a. 72k
- b. 60k
- c. 64k
- d. 76k

7. Given: Indicated Altitude = 4000 feet
Indicated Airspeed = 65k
Temperature = +24°

Find: TAS

- a. 71k
- b. 60k
- c. 64k
- d. 68k

8. Given: Indicated Altitude = 5000 feet
Indicated Airspeed = 70k
Temperature = -10°

Find: TAS

- a. 74k
- b. 67k
- c. 76k
- d. 64k

Answers:

1. a 19.1 GPH
2. b 48.5 56
3. a 49 minutes
4. a 6200 feet
5. c 6500 feet
6. d 76k
7. a 71k
8. a 74k

TEXT COMPLETED

KEEP PAGE 57 FOR USE WITH AM-62

NOW COMPLETE THE FINAL SELF EVALUATION EXERCISE ON PAGE 53:

Indicated Altitude = 6000 feet
Indicated Airspeed = 70K

Indicated Altitude = 4000 feet
Indicated Airspeed = 65K
Temperature = +34°

Indicated Altitude = 2000 feet
Indicated Airspeed = 50K
Temperature = +10°

FINAL
SELF EVALUATION EXERCISE

1. Given: 45 nm

Find: Stat. Km
a. 52 ~~88~~
b. 39 72
c. 28 74
d. 49 79

2. Given: 150 Stat. miles

Find: NM Km
a. 167 268
b. 173 278
c. 130 ~~242~~
d. 113 204

3. Given: 200 Km

Find: NM Sm
a. 65 75
b. 108 ~~124~~
c. 250 290
d. 120 137

4. Given: GS 76k
Dist 95 nm

Find: Time
a. ~~1 hr + 15 min~~
b. 48 min
c. 1 hr + 35 min
d. 1 hr + 25 min

5. Given: Dist 60 nm
Time 53 min

Find: GS
a. 75k
b. ~~68k~~
c. 57k
d. 79k

6. Find the time to fly 112 nm at a GS of 64k.

a. 3 + 04
b. 34 min
c. ~~1 + 45~~
d. ~~1 + 54~~

7. If you fly 46 nautical miles in 38 minutes what is your ground speed?

a. 50k
b. ~~73k~~
c. 80k
d. 61k

8. Find the fuel required to fly 1 hr + 20 minutes (includes reserve) if fuel consumption is 18 GPH.

- a. 13.5 gal
- b. 90 gal
- c. 9 gal
- d. 24 gal

9. Given: Dist 2 nm
GS 87k

Find: Time to the second
a. 1 min + 10 sec
b. 1 min + 23 sec
c. 1 min + 38 sec
d. 1 min + 17 sec

10. Given: Altitude 3000 feet
Temperature 10°
IAS 80k

Find: TAS
a. 81k
b. 84k
c. 76k
d. 79k

11. Given: Altitude 5000 feet
Temperature 30°
IAS 65k

Find: TAS
a. 73k
b. 58k
c. 66k
d. 64k

12. Given: Altitude 4000 feet ¹⁵/₈ +
IAS 70k

Find: TAS
a. 82k
b. 61k
c. 66k
d. 74k

13. Given: Pressure Altitude
4000 feet
Temperature 25°

Find: Density Altitude
a. 4000 feet
b. 4900 feet
c. 7100 feet
d. 5400 feet

INTENTIONALLY LEFT BLANK

ANSWERS TO EXERCISE

1. a 52 Stat 83 Km
2. c 130 Stat 242 Km
3. b 108 NM 124 Stat miles
4. a 1 hr + 15 min
5. b 68k
6. c 1 + 45
7. b 73k
8. d 24 gal
9. b 1 min + 23 sec
10. b 84k
11. a 73k
12. d 74k
13. a 6000 feet

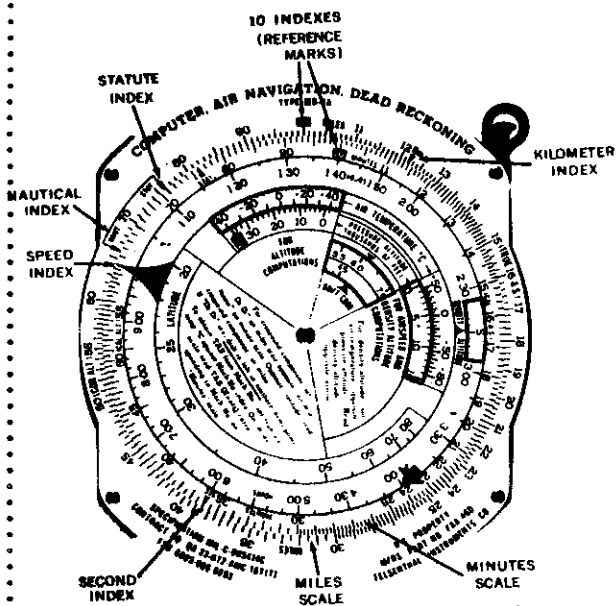


FIGURE 1

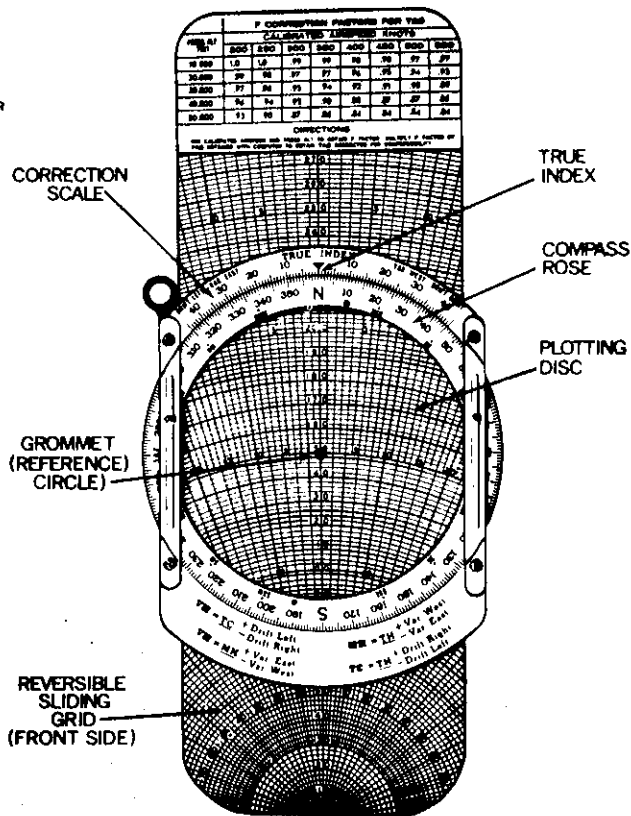


FIGURE 2

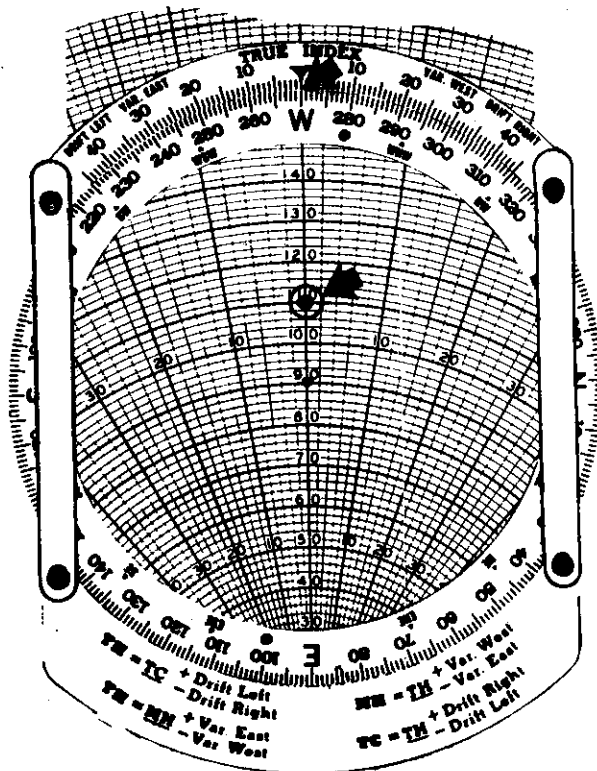


FIGURE 3

OUT-OF- CLASS PRACTICAL EXERCISE

AM 61

(1) TIME	SPEED (KNOTS)	DIST (NM)	(2) TIME	RATE (GPH)	FUEL (GALS)
1. _____	145	128	1. 0:35	_____	17
2. 1:17	150	_____	2. _____	28	113
3. _____	164	196	3. _____	43	73
4. 33	_____	78	4. 1:10	_____	35
5. 36	139	_____	5. 2:17	31	_____
6. 18	_____	47	6. 1:56	41	_____

(3) INDICATED ALTITUDE	FREE AIR TEMPERATURE	INDICATED AIR SPEED	TRUE AIR SPEED
1. 6500	+5	145	_____
2. 5500	+10	188	_____
3. 14000	-25	245	_____
4. 22000	-20	324	_____
5. 6000	_____	195	_____
6. 8000	_____	160	_____
(4)			DENSITY ALTITUDE
1. 4000	+15°		_____
2. 2000	+20°		_____
3. 9000	-10°		_____
4. 3500	+10°		_____
5. 7000	0		_____
6. 8500	+5°		_____

REVIEW PROBLEMS

(5) GIVEN

FIND

1. Ground Speed

85k

ETA

Distance

200 NM

Departure

0954

2. Ground Speed

55k

Distance in SM

Time

2:10

3. Indicated Airspeed

90k

True Airspeed

Altitude

5500 ft

Temperature

+25° C

4. Indicated Altitude

6000 ft

Density Altitude

Temperature

+20° C

5. Fuel Consumption

17 gph

Flight Time

Fuel Available

60 gal

6. Compass Heading

135°

TH

Deviation

+2°

Variation

10°E

ANSWERS TO PRACTICAL EXERCISE

(1) 1. 53

(2) 1. 29

(3) 1. 161

(4) 1. 5000

(5) 1. 12:16

2. 192

2. 4:02

2. 207

2. 3100

2. 137SM

3. 1:12

3. 1:42

3. 297

3. 8200

3. 101K

4. 141.5

4. 30

4. 468

4. 3900

4. 8100

5. 83.5

5. 70.5

5. 214

5. 6900

5. 3:32

6. 157

6. 79

6. 180

6. 9300

6. 143°