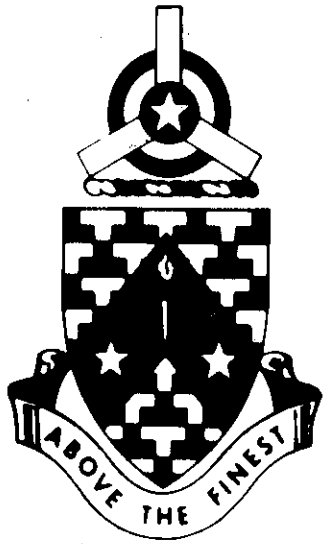
PROGRAMED TEXT

DISTANCE AND DIRECTION

AM-56



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UNITED STATES ARMY

PRIMARY HELICOPTER SCHOOL

FORT WOLTERS, TEXAS

PROGRAMED TEXT

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FILE NO: AM-56

PROGRAM TITLE DISTANCE AND DIRECTION

POI SCOPE: Basic information to measure map distance and direction. Guidelines for the selection of proper day and night check points for navigation.

INSTRUCTOR REFERENCES:

TM 1-225, Chapter 5

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Distance and Driection

PREFACE

This program will present the basic information needed to measure distance and direction, and to pick desirable check points for both day and night navigation.

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:

1. Measure distance and determine direction on sectional charts using the plotter.

2. Place distance tick-marks at their appropriate intervals.

3. Select the most desirable check points for day and night flights along a given route of flight.

FRAME 1

You have already learned to use the plotter but a short review is given to refresh your memory.

Things to remember about determining direction:

1. Always estimate the direction FIRST.

2. Always use the scale that has the arrow pointing in the same direction as your course line.

3. Always read from the small number to the higher numbers.

Things to remember about Distance:

1. Always use the scale that corresponds to the scale of your chart. The scale is found in the upper right hand corner of your chart.

2. Always measure from the center of your departure point to the center of your destination.

3. Always measure to the nearest 1/2 mile.

4. Distance can also be determined from the three scales at the bottom of your chart.

NOTE: Your answer must be within 1/2 mile either side of the answer given for distance and 2 degrees either side of the answer given for direction.

What is the scale of your Dallas Sectional?

a. 1:2,000,000
b. 1:1,000,000
c. 1:500,000
d. 1:250,000

TURN TO FRAME 2 PAGE 3

ANSWER: d. estimate 258°/43.5NM

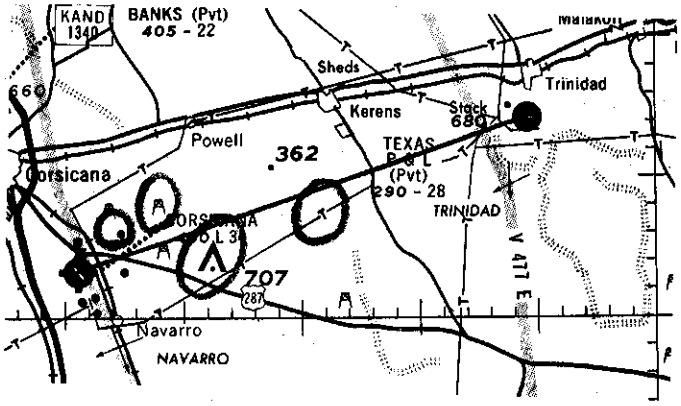
FRAME 6

After determining your TC and DISTANCE you should next survey your route of flight hazards. Look for such hazards as HIGH OBSTRUCTIONS, RESTRICTED AREAS, POWER LINES and HIGH TERRAIN. You should also check for airfields for landing in case of emergency.

ALL HAZARDS WITHIN 4 NM SHOULD BE CIRCLED.

Example:
The course between Corsicana and Texas P and L has been surveyed for hazards to flight.

1. oil tank
2. oil derrick
3. tower (707 ft. high)
4. power lines
5. stack (680 ft. high)



On your Dallas sectional survey the true course between Pope Ranch (32°53'N, 97°48'W) and Clark airfield (32°13'N, 98°11'W) for hazards to flight.

1. Weatherford radio towers 1361 power lines
2. 1627 tower
3. 1928 tower
4. air port.

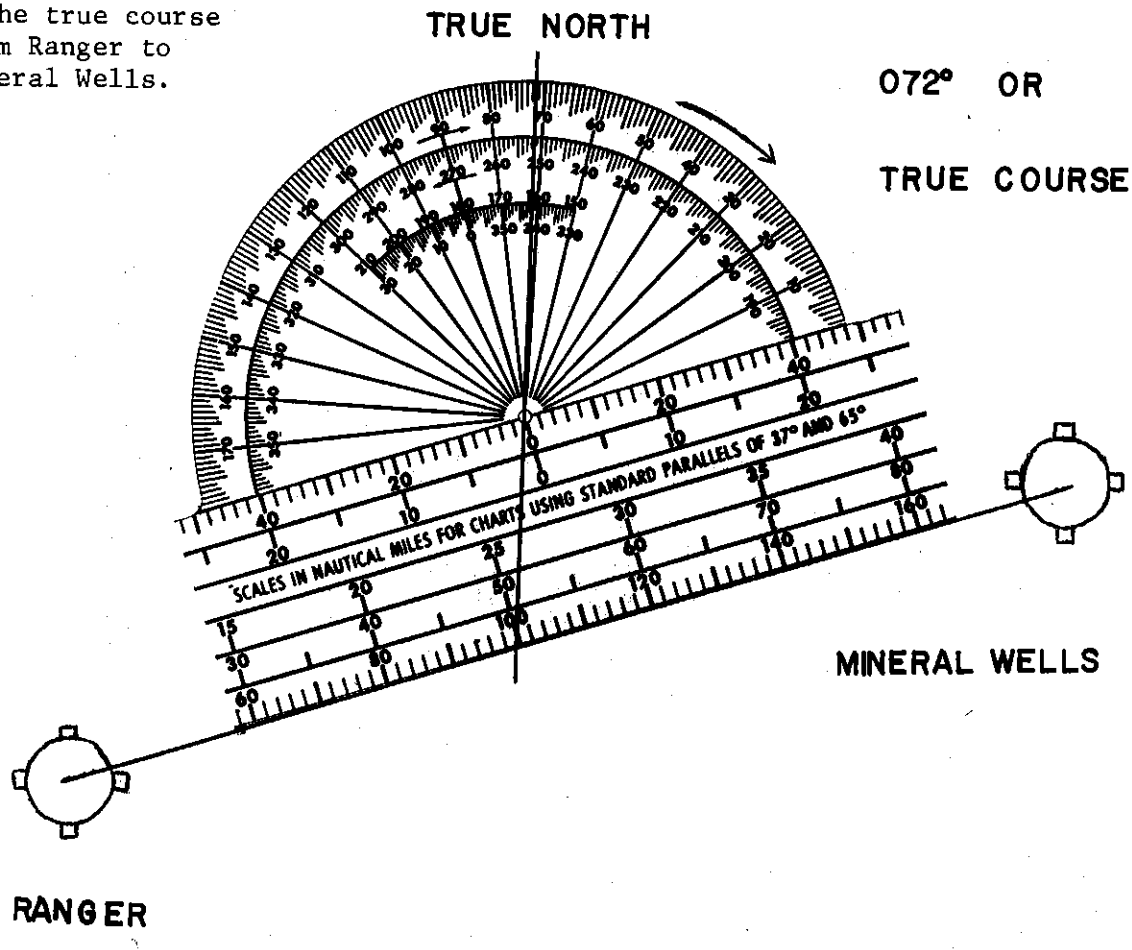
CONTINUE WITH FRAME 7 ON PAGE 4

ANSWER: c. 1:500,000

FRAME 2

True course is the angular measurement clockwise from true north to the intended path over the ground.

Example:
The true course from Ranger to Mineral Wells.



Using the above example what is the true course from Mineral Wells to Ranger?

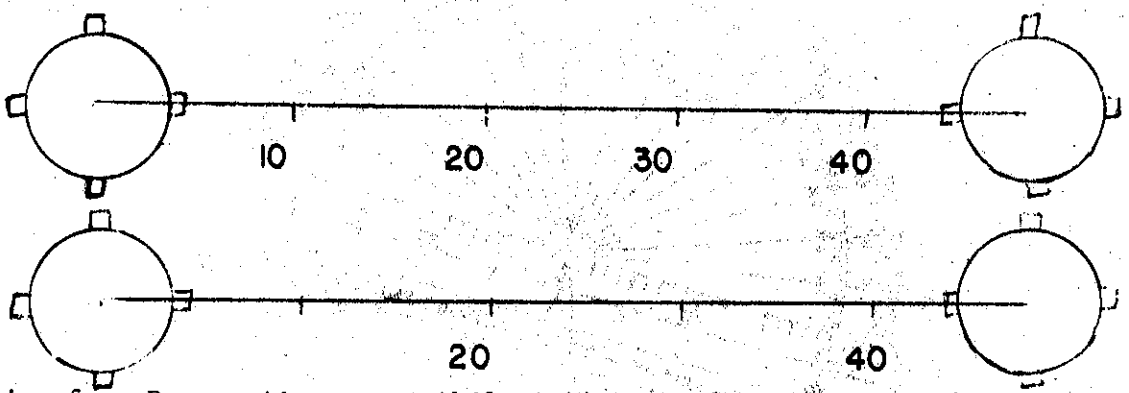
ANSWERS:
1. Two transmission lines
2. Tower north of Weatherford
3. Tank farm near Brock
4. Stacks near Stephenville

FRAME 7

After surveying the route and determining your true course and distance, the next thing that must be done is to place your distance tick-marks. These tick-marks are placed every 10 NM and labeled every 20 NM.

Which of the following is <u>labeled</u> correctly?

a.



Flying from Ranger Airport to Abilene Airport, determine T.C. (True Course) and distance, then place the distance tick-marks.

Ranger (32° 27' 98° 41')
Abilene (32° 25' 99° 41')

51.5 NM
267°

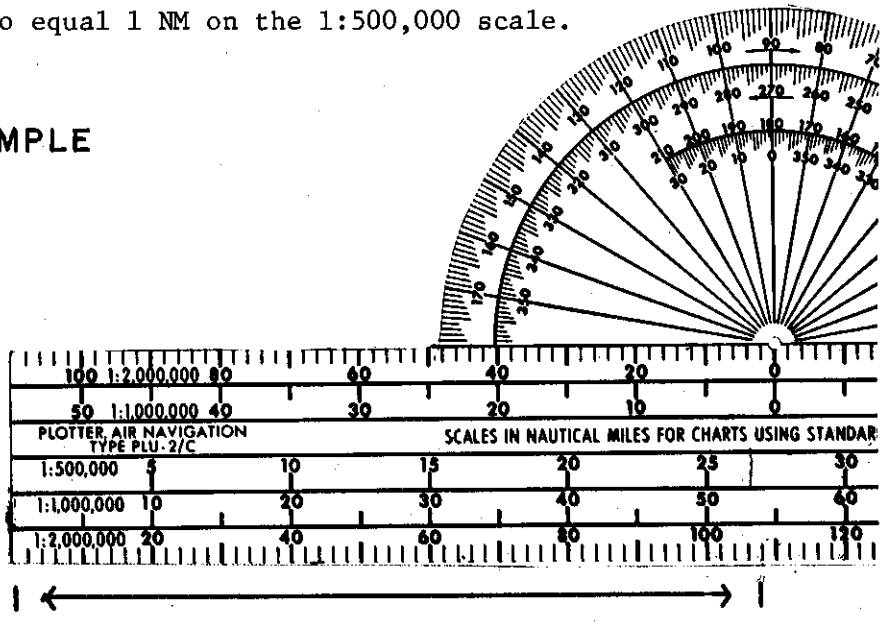
ANSWER: 252° Remember if you picked 268° you have read the scale from high to low. Always read from the low numbers to higher numbers.

FRAME 3

On our plotter we can use the 1:2,000,000 scale with the 1:500,000 scale to measure distance with an accuracy of 1/2 mile.

Notice the 1:500,000 scale has increments no smaller than 5 miles. Also, notice that 20 NM on the 1:2,000,000 scale is equal to 5 NM on the 1:500,000 scale. We can use 2 of the small increments on the 1:2,000,000 scale to equal 1 NM on the 1:500,000 scale.

EXAMPLE



DISTANCE TO BE MEASURED

To measure this distance on a 1:500,000 map we can see it is between 25-30 NM. To get a closer measurement of the distance, look at the 1:2,000,000 scale and see that 5 NM on the 1:500,000 is divided into ten parts. The distance to be measured is 4 increments (2 NM) beyond 25 or the total is 27 NM.

QUESTION: Measure the distance between Palo Pinto (32° 46'N 98° 18'W) and Gordon (32° 34'N 98° 24'W).

13.5nm

ANSWER: b. TC 267°
Distance 51.5NM

FRAME 8

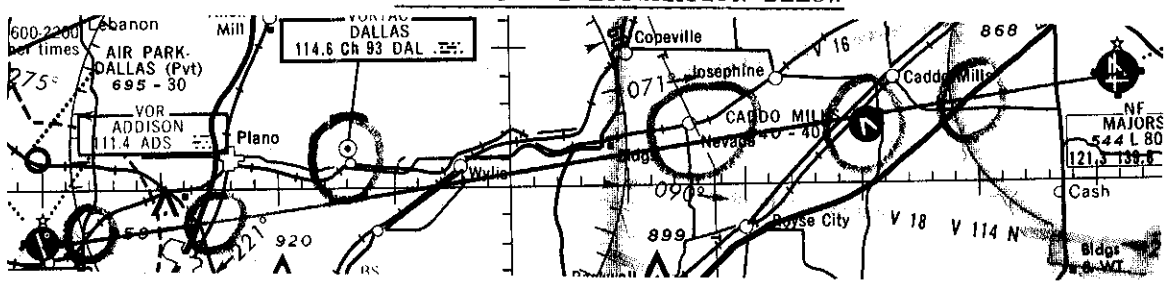
After you have determined your TC, DISTANCE and placed your tick-marks it becomes necessary to check your course for prominent check-points. Check-points are things that can be easily seen and identified from the air that will help you keep on course. There are two types, day check-points and night check-points.

Some very good DAY check-points are such things as:

1. Cities and towns
2. Highways and railroads
3. Rivers and lakes
4. Airports and drive-in theaters
5. Oil refineries and tank farms
6. Prominent terrain features

These are a few but many more can be found on your chart. EASILY SEEN AND IDENTIFIABLE is the important thing. In some areas such as a desert, the check-points might be further apart, in other cases closer together. On the average check points should be 10-15NM apart. After a check-point is selected it should be circled on your map.

STUDY THE ILLUSTRATION BELOW



On a flight from Ranger Airport (32° 27'N, 98°41'W) to Mineral Wells Airport (32°47'N, 98°04'W) determine the true course and the best DAY check-points.

58° 37 NM.

Strawn
open pit mine
tower
lake,
highway

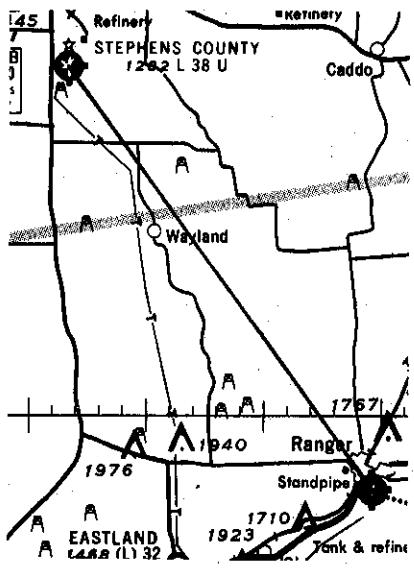
Brazos River
Hgwy 281

ANSWER: 13.5 NM

FRAME 4

To measure the distance and direction accurately, it is necessary that your course be drawn accurately. A course line drawn correctly is drawn from the center of the airfield you are departing, to the center of the airfield you are going to.

EXAMPLE: Note the course line from Stephens County Airport to Ranger Airport.



On your Dallas Sectional draw a course line from Sweetwater Airport (32° 28'N, 100° 28'W) to Winston Airport (32° 42'N, 100° 57'W), and measure the distance.

285 NM

ANSWER: TC 058°

Drive in theatre
Town of Strawn and railroad
Lake
Brazos river

FRAME 9

NIGHT check-points are not much different from day check-points with the exeption that, on a dark night, some of the check-points used for day flights may be much harder if not impossible to see.

Some good NIGHT check-points are:

1. Cities and large towns
2. Major, well traveled highways
3. Oil refineries, at night they are normally well lighted
4. Large lakes and rivers and railroads are good checkpoints if there is a moon. On dark nights they may be missed

Select the best night checkpoints on the route from Lake Murray State Park (34°09'N, 97°07'W) to Jones airport (33°37'N 96°11'W).

1. Lake Murray
2. Water near Lebanon
3. Lake Texoma and becons
4. Denison and railroad intersection
5. Red River near Ambrose

ANSWER: If you measured 26 NM you did not measure from center to center, 27.5NM is the correct distance.

FRAME 5

Draw in a correct course line and measure the distance and direction, remembering that once the course line is drawn the first thing you must do before determining the direction is to estimate it.

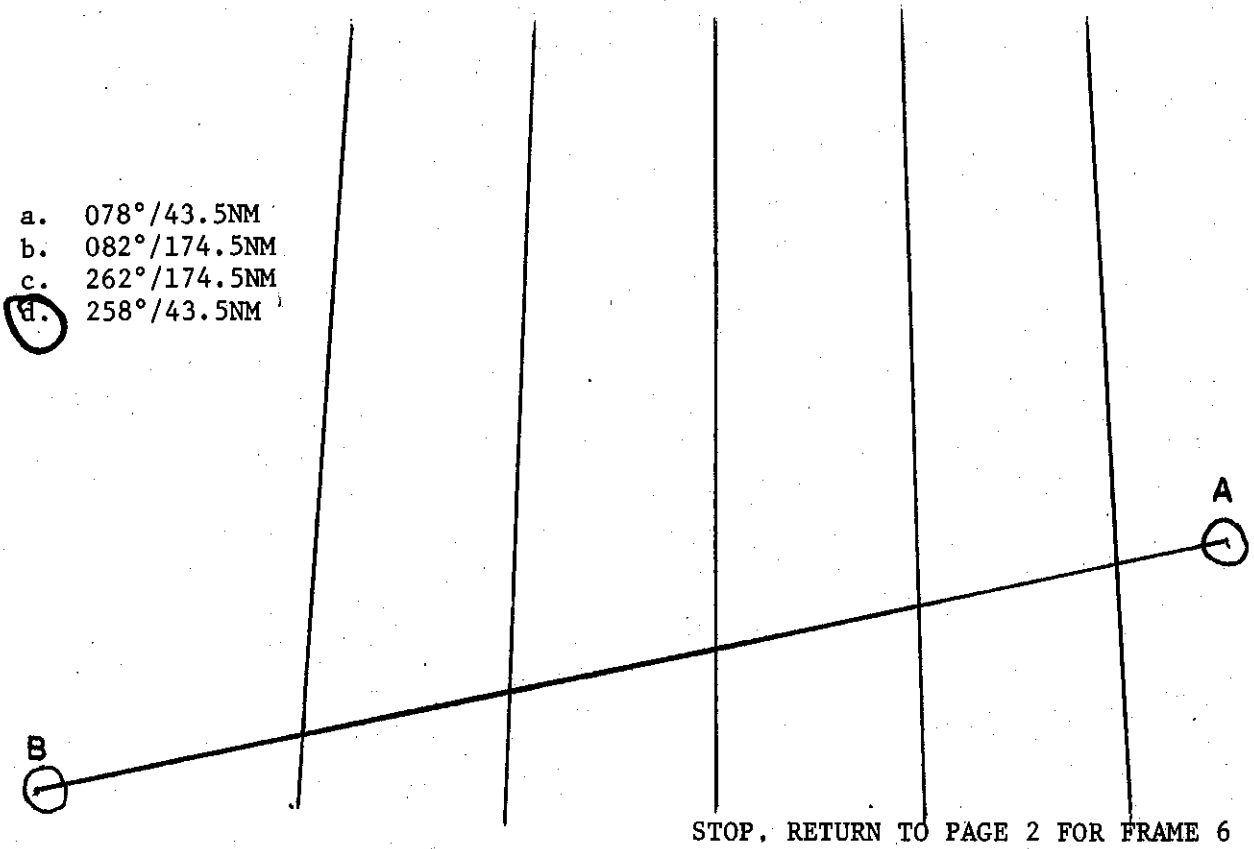
Draw course line and determine True Course and distance from A to B.

SCALE 1:500,000

43.5 NM

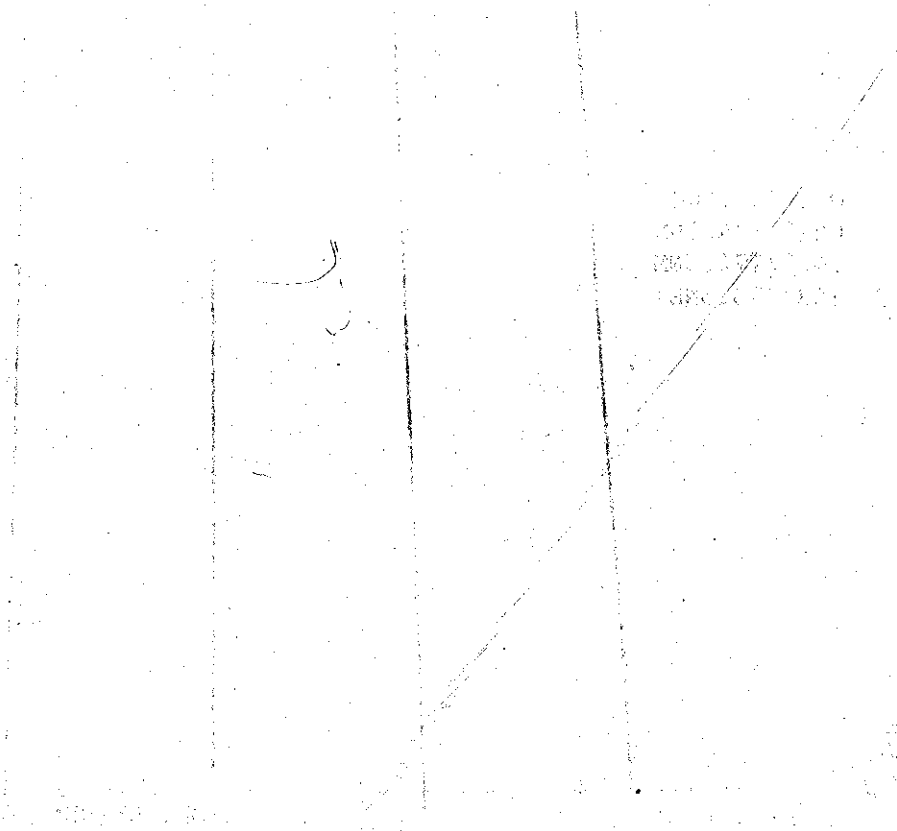
260°

a. 078°/43.5NM
b. 082°/174.5NM
c. 262°/174.5NM
d. 258°/43.5NM



STOP. RETURN TO PAGE 2 FOR FRAME 6

ANSWER:
1. Lake Murray
2. Over the water south of Lebanon.
3. Over the lake directly between the rotating beacons at Lake Texoma and Perrin AFB.
4. Over the highway and railroad north of Denison.
5. Over the river east of Ambrose.



DISTANCE AND DIRECTION
SELF EVALUATION EXERCISE

1. When measuring distance the one most important thing to do is:

   a. Estimate the distance.
   b. Draw a straight line.
   c. Use the scale on the plotter that corresponds to the scale on the chart being used.
   d. Check your flight path.

2. When determining the direction of your flight what should be done first?

   a. Use the proper scale.
   b. Estimate the course or direction.
   c. Read from low to high numbers.
   d. Course arrow and course line pointing in same direction.

3. After drawing the course line one of the most important things you should do is:

   a. Measure the distance.
   b. Survey your course for obstructions, airspace reservations and emergency airfields.
   c. Determine heading.
   d. Check for variation.

4. Distance tick marks should be placed every 10 NM and labeled every 20 NM.

   a. 5 - 10
   b. 10 - 10
   c. 10 - 20
   d. 5 - 20

5. Which of the following is not a good check point for day Navigation.

   a. City
   b. Lake
   c. Streams
   d. Railroads

6. One of the best night navigational aids would be:

   a. Towns
   b. Lakes
   c. Rotating Beacon
   d. Rivers

7. Flying from Mineral Wells A/P (32°47'N - 98°03'W) to Denton A/P (33°12'N - 97°12'W). What is the distance and true course

a. 50NM / 060° .
b. 200 NM / 060°
c. 200 NM / 240°
d. 50 NM / 240°

8. List 5 good check points on this leg.

a. Lake Mineral Wells Spanner + Railroad track
b. Power line
c. Springtown
d. stream + Railroad track, and lake to north
e. Rhome + Railroad track
railroad tracks + tower

9. How many obstructions to flight and emergency airfields are within 4NM of your flight path?

	OBT	EMER A/P
a.	2	2
b.	3	4
c.	3	3
d.	3	2

10. After dark you leave Denton to fly to Sheppard/Wichita Falls (33°59'N - 98°29'.5W). What is your true course and distance?

a. 126° / 75 NM
b. 305° / 80 NM
c. 134° / 75 NM
d. 314° / 80 NM

11. List four good check points on this leg.

a. transmission lines
Bowie airport + towers and town
b. rail road tracks
c. tower
d. Henrietta + railroad

12. How many hazards to flight are within 4 NM of your flight path on this leg?

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

13. What would be your best check point on this leg?

Bowie with the towers

14. Returning to Mineral Wells the next day what is your TC and distance?

a. 177° / 75.5 NM
b. 177° / 70.5 NM
c. 163° / 75.5 NM
d. 163° / 70.5 NM

15. List 4 good check points on this leg.

a. Lake Arrowood
b. Jacks borrow + railroad tracks
c. Transmission lines
d.

ANSWERS TO SELF EVALUATION EXERCISE

1. c
2. b
3. b
4. c
5. c
6. c
7. a
8. a. Railroad overpass east of Mineral Wells.
   b. Over the road at Peaster.
   c. Over Springtown.
   d. Over the highway and railroad north of Rhome.
   e. Over the highway and railroad south of Ponder.
9. d
10. b
11. a. The highway overpass south of Krum.
    b. Over the road south east of Greenwood.
    c. Over the road between Bowie A/P and Bowie.
    d. Henrietta
12. d
13. The rotating beacon at Bowie A/P.
14. c
15. a. Over the highway and railroad south east of Wichita Falls.
    b. Over Lake Arrowhead 18 NM Out.
    c. Over the highway and railroad south west of Jacksboro.
    d. Over the road north west of Salesville.

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