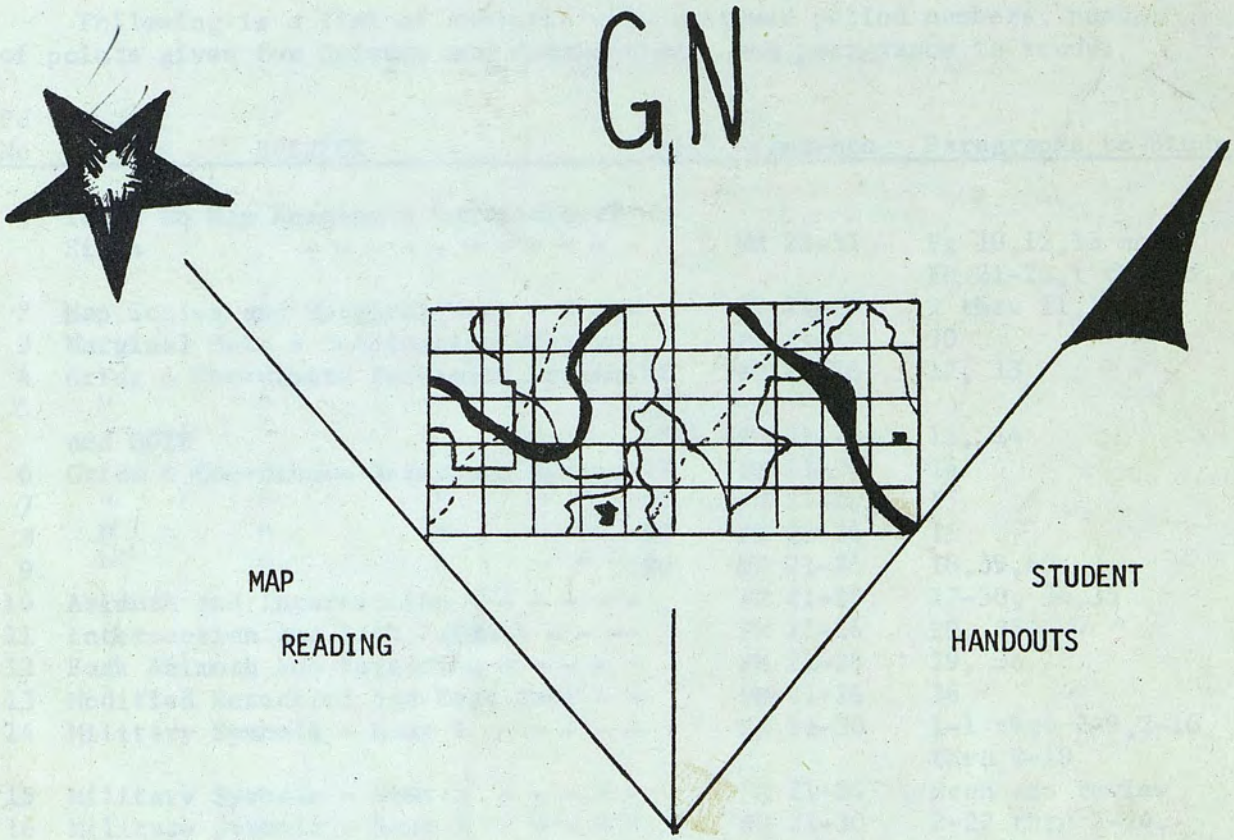

UNITED STATES ARMY PRIMARY HELICOPTER SCHOOL

Fort Wolters, Texas 76067

BRING THIS BOOKLET TO EVERY HOUR OF MAP READING INSTRUCTION

UNITED STATES ARMY PRIMARY HELICOPTER SCHOOL
Fort Wolters, Texas 76067

April 1967

MAP READING

Following is a list of subjects with assigned period numbers, number of points given for Quizzes and Examinations, and paragraphs to study:

Pd No	SUBJECT	(Pts)	Reference	Paragraphs to Study
1	Intro to Map Reading & Conventional Signs - - - - - - - - - - - -		FM 21-31	Pg 10,12,13 and FM 21-26,1 thru 8
2	Map Scales and Marginal Data - - - -		FM 21-26	9 thru 11,18,19
3	Marginal Data & Declination Diagram		FM 21-26	30
4	Grids & Coordinate Reference Systems #1		FM 21-26	12, 13
5	" " " " #2 and QUIZ	(21)	FM 21-26	13, 14
6	Grids & Coordinate Reference Systems #3		FM 21-26	14
7	" " " " #4		FM 21-26	15
8	" " " " #5		FM 21-26	15
9	" " " " #6		FM 21-26	16,39,60
10	Azimuth and Intersection - - - - - -		FM 21-26	27-30, 34,35
11	Intersection and Back Azimuth - - --		FM 21-26	29, 35
12	Back Azimuth and Resection - - - - -		FM 21-26	29, 36
13	Modified Resection and Prac Exer - -		FM 21-26	36
14	Military Symbols - Hour 1 - - - - -		FM 21-30	1-1 thru 2-9,2-16 thru 2-19
15	Military Symbols - Hour 2 - - - - -		FM 21-30	Scan and review
16	Military Symbols - Hour 3 - - - - -		FM 21-30	2-22 thru 2-24, Appendix VI
17	General Map Review #1 - - - - - - -		(All previous instruction)	
18	" " " #1 (2d Hour) - -		"	" "
19	First Phase Examination - - - - - -	(150)	"	" "
20	Examination and Critique - - - - - -		"	" "
21	Elevation and Relief - Hour 1 - - -		FM 21-26	22,23,26
22	" " " - Hour 2 - - -		FM 21-26	22 thru 24
23	" " " - Hour 3 - - -		FM 21-26	25
24	Principles of Land Navigation - - -		FM 21-26	37, 38
25	Aerial Photographs - Hour 1 - - - -		FM 21-26	52 thru 54,56,57
26	" " - Hour 2 - - - -		FM 21-26	59,60,61
27	" " - Hour 3 - - - -		FM 21-26	All previous assignments
28	Use of Lensatic Compass - - - - - -		FM 21-26	32, 33
29	Transitioning from Tactical Maps to Aeronautical Charts - - - - - - - -		Dallas Sectional,Abilene 1:250,000	
30	Transitioning - Hour 2 - - - - - - -		Mineral Wells Map 1:50,000	
31	General Map Review #2 - - - - - - -		(All previous instruction)	
32	" " " #2 (2d Hour)		"	" "
33	Final Map Reading Examination - - -	(180)	"	" "
34	Final Examination and Critique - - -		"	" "
	Spot Quizzes (Two)	(10)		

UNITED STATES ARMY PRIMARY HELICOPTER SCHOOL
Fort Wolters, Texas 76067

File No P-500-1(Sep66)

PERFORMANCE OBJECTIVES

INTRODUCTION TO MAP READING AND CONVENTIONAL SIGNS

1. KNOWLEDGES: Without the use of reference material the student will write the five (5) basic colors used on topographic maps and the type feature each color represents.

2. SKILLS: None.

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File No P-500-1(Sep66)

STUDENT OUTLINE

INTRODUCTION TO MAP READING AND CONVENTIONAL SIGNS

1. INTRODUCTION.

2. BODY.

   a. Administrative Details.

   b. Definition of a map.

   c. Care of maps.

   d. Five colors used on topographic maps:

      (1) Black - man made features - buildings, dams.

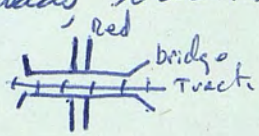
      (2) blue - water features

      (3) green - vegetation

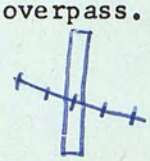
      (4) brown - relief features - contour lines.

      (5) Red - main roads, built up areas.

   e. Highway/Railroad overpass.



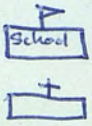
   f. Grade crossing.



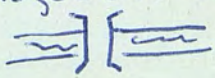
   g. Buildings

      (1) School

      (2) Church



Bridge over river



center mass is the exact location.

h. Water tower - storage tank - silo. If near pop. its a water tower - if in pasture, likely a silo, or near wells, storage tank.

i. Spot elevations:

(1) Checked 792 blade

(2) Unchecked 792 ~~stake~~ screen

g. Bench Marks

(1) Monumented BM 792 point. disregard circle

(2) Nonmonumented ⊗ 792

3. CONCLUSION.

UNITED STATES ARMY PRIMARY HELICOPTER SCHOOL
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File No P-502-1(Jul66)

PERFORMANCE OBJECTIVES

MAP SCALES AND MARGINAL DATA

1. KNOWLEDGES:

   a. Without the use of reference material the student will write the three (3) general categories of maps and upon seeing a map scale be able to classify the map according to the scale category.

   b. With the use of reference material the student will be able to determine representative fraction (RF) of a map, and ground distance.

   c. When given two maps, one of known scale and one of unknown scale, the student without the aid of other reference material will be able to compute the RF for the map of unknown scale.

2. SKILLS: None.

UNITED STATES ARMY PRIMARY HELICOPTER SCHOOL
Fort Wolters, Texas 76067

File No P-502-1(Jul66)

STUDENT OUTLINE

MAP SCALES AND MARGINAL DATA

1. INTRODUCTION.

2. BODY.

a. Classification of Maps.

(1) By Type:

(a) Planimetric - shows horizontal distances only.

(b) Topographic - shows horizontal and vertical distances.

(c) Photo Map - Series of aerial photos with grid systems and legend.

(d) Relief Models - three dimensional.

(2) By Scale:

(a) Small Scale - 1:600,000 and smaller.

(b) Medium Scale - Larger than 1:600,000 and smaller than 1:75,000. 10,000

(c) Large Scale - 1:75,000 and larger. 1,000 m Grid sq

(3) By Use:

(a) General - smaller than 1:1,000,000.

(b) Strategic - 1:1,000,000.

(c) Strategic-Tactical - 1:250,000.
Alternate: 1:500,000.

(d) Road - 1:250,000.

(e) Tactical - 1:50,000 Alternate - 1:100,000
Always topographic.

(f) Artillery - 1:50,000. Always topographic.

(g) Photo - 1:25,000 Alternate - 1:12,500.

(h) Town Plan - 1:12,500.

b. Representative Fraction.

(1) Computing RF.

$$RF = \frac{MD}{GD}$$

Example: MD = 3"
GD = 60,000

4"
5'
12 / 200,000
3" / 200,000

(2) Computing Ground Distance.

GD = MD X D

Example: Map Scale = 1:25,000
MD = 6"

neat lines =

(3) Computing RF of a map of unknown scale by comparison to map of known scale.

$$RF = \frac{MD}{GD}$$

Example: MD (Map of unknown scale) = 5"
MD (Map 1:50,000)

First determine GD: GD = MD X D

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File No P-501-1(Sep66)

PERFORMANCE OBJECTIVES

MARGINAL DATA AND DECLINATION DIAGRAM

1. KNOWLEDGES:

   a. Without the aid of notes the student will be required to draw representative symbols for three base directions and state the definition of magnetic and grid declination and grid-magnetic angle.

   b. Without the aid of notes or reference material the student will be required to determine the grid declination, magnetic declination, and the grid-magnetic angle of a specified declination diagram.

   c. When given an angle and a declination diagram, the student without the aid of notes, will be able to convert to grid, magnetic, and true angles.

2. SKILLS: None.

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File No P-501-1(Sep66)

STUDENT OUTLINE

MARGINAL DATA AND DECLINATION DIAGRAM

1. INTRODUCTION.

2. BODY.

a. Marginal Data.

(1) General Information

(2) Grid Reference Box

(3) Contour Interval

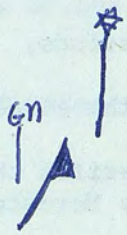
(4) Index to adjoining sheets

b. Base Directions.

(1) True North

(2) Grid North

(3) Magnetic North



c. Declination Diagram

(1) Magnetic Declination
∠ between Mag North & True North measured from T North.

(2) Grid Declination
The ∠ between GN and T North measured to from T North.

(3) G-M Angle
grid to magnetic ∠, measured G to M.

d. Conversion to True, Magnetic, and Grid Angles
By knowing definitions you can fill in the missing link.

UNITED STATES ARMY PRIMARY HELICOPTER SCHOOL
Fort Wolters, Texas 76067

File No P-518-6(Sep66)

PERFORMANCE OBJECTIVES

GRIDS AND COORDINATE REFERENCE SYSTEMS

1. PERIOD ONE of Six Periods.

   a. KNOWLEDGES: Without the aid of notes the student will be able to match one list of terms to another list of synonymous terms pertaining to geographic coordinates. No errors are allowed.

   b. SKILLS: Given a ruler and Sectional Chart the student will be able to write:

      (1) The proper noun name of a specific location identified by geographic coordinates.

      (2) The geographic coordinates, accurate to within 30" (seconds) of a location identified by a given noun name.

      (3) The exact linear distance in nautical miles between two given points.

2. PERIOD TWO and THREE of Six Periods. 21-26 12-13 read 14-15 Study

   a. KNOWLEDGES: From memory the student will be able to write:

      (1) At least four (4) specific characteristics of a UTM (Universal Transverse Mercator) tactical map.

      (2) The exact angular coverage of any given UTM grid zone.

   b. SKILLS: Using a tactical map, coordinate square, and ruler, the student will be able to work a practical exercise, as follows:

      (1) Write the complete GEOGRAPHIC COORDINATES of a known point, in the correct sequence, accurate to within one (1) minute of measurement.

      (2) Given the complete GEOGRAPHIC COORDINATES, the student will be able to write the noun name of the feature located at that point.

      (3) Given a known point by grid square number, the student will be able to write the UTM coordinates of that point in the proper sequence accurate to within ten (10) meters.

(4) Given an eight (8) digit UTM grid coordinate, the student will be able to locate and write the noun name of that position.

3. PERIOD FOUR and FIVE of Six Periods.

a. KNOWLEDGES: Without reference material the student will be able to write:

(1) In his own words, the one main purpose of the Military Grid Reference System (MGRS).

(2) Without error, the three (3) requirements for the MGRS.

(3) The purpose of the Grid Reference Box and, at least, three (3) items of information contained therein.

(4) In his own words, when the MGRS is used.

b. SKILLS: Given a strategic tactical UTM Map (1:250,000), the student will be able to work a practical exercise as follows:

(1) Determine the average G-M angle for the current year, accurate to within one (1) degree.

(2) Write the noun name of the feature located at a given MGRS coordinate.

(3) Give the MGRS coordinates of a known point accurate to within 100 meters.

4. PERIOD SIX of Six Periods.

a. KNOWLEDGES: From memory the student will be able to write:

(1) The exact angular coverage of the Universal Polar Stereographic Grid System.

(2) The primary difference between the MGRS and UPS Grid Zone Designators.

(3) The main purpose of the Point Designation Grid System (PDG).

(4) The three (3) requirements of Polar Coordinates.

b. SKILLS: Using maps and equipment previously issued, the student will be able to work a practical exercise on all grid systems discussed in previous instruction.

UNITED STATES ARMY PRIMARY HELICOPTER SCHOOL
Fort Wolters, Texas 76067

File No P-518-6(Sep66)

STUDENT OUTLINE

GRIDS AND COORDINATE REFERENCE SYSTEMS

1. Geographic Coordinates.

   a. Units of measure.

      Latitude, N. + S
      Longitude, E + W.

   b. Base Lines.

      (1) equater

      (2) prime meridian

   c. Structure of Grid.

   d. Reading Geographic Coordinates.

      linear grid
      all squares
      read it. + up

      UTM
      linear Grid
      read to right & up.
      Semple to use
      exact sqs.

9-22-67

2. The Universal Transverse Mercator Grid System.

a. Structure.

(1) Neat Lines.

On the outside of your grid sq.

(2) Area Coverage.

6- digits = 1,00 meter sq.
4 digits = 1,000 meter sq
2 digits 10,000 meter sq

(3) Grid Zone.

(a) 6° X 6 4/10° numbered from 180° ~~4/5 30~~ meridian.

(b) 100,000 meter grid squares.

(c) broke down B to 10,000

(d) and broke C down to 1,000

100,000 m Grid Sq is small scale.
10,000 " " " is medium "
1,000 " " is large scale.

(4) Coordinate Square

(5) Grid Coordinates.

b. Advantages.

(1)

(2)

(3)

(4)

3. Military Grid Reference System.

a. Advantages.

Locates only one area in the world.
Use same zones,
use letters from N to S and numbers from E to W

b. Requirements.

6° X 8°

(1)

6°x8° sq letters — 14S = 6°x8° grid zone
2 letters — 14SNP = 100,000m sq.
14SNP52 = 10,000 " "
14SNP5325 = 1,000 " "
14SNP539256 = 100 " "
14SNP53962569 = 10 " "

(2)

8 numbers
Complete

(3)

for mag declination, etc.,
you add up both, divide by 2,

c. Complete Coordinates.

1843 5446

d. Medium Scale Maps.

9/25

4. Universal Polar Stereographic Grid.

a. starts at 84°N and 80°S. Uses 100,000 m sqs. read right + up. Same Zone Size 4 Zones. Yankee + Zulu in North, Alpha + Bravo in South.

b. UPS precedes every set - zone, 100,000 m sq, and your area.

c.

d.

5. Point Designation Grid.

a. Purpose.

Point location only for air photographs.

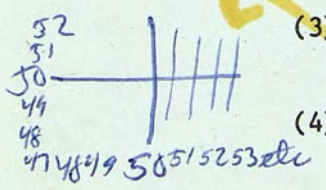
b. Construction.

(1) Hold photo so to read marginal info.

(2) Draw 2 center intersecting lines.

(3) Use grid sq - 1:25,000 and set 4 cm. sqs - 1000 meter mark = 4 cm.

(4) label center lines 50. increase to right + up



(5)

very important, can be just plain anywhere.

6. Polar Coordinates. Not a grid system + nothing to do with UPS.

a. Purpose.

Fastest means of point location.

b. Requirements.

(1) You need a pt. of origin - know where you are.

(2) You need a direction and a

(3) distance from point to point.

Geographic 33° 41' N 32° 10' E
Grid, UTM 31436154
~~UTM~~
Mil. Grid 15D1= 13586

UNITED STATES ARMY PRIMARY HELICOPTER SCHOOL
Fort Wolters, Texas 76067

File No P-510-1

PERFORMANCE OBJECTIVES

AZIMUTH AND INTERSECTION

1. KNOWLEDGES: Without the aid of notes and with no errors, the student will be able to write:

   a. The definition of azimuth to include the point to be measured from, the plane of measurement, and the direction of measurement.

   b. The name and number of degrees assigned to each of the four cardinal directions.

2. SKILLS: When given a military map, protractor, pencil, grid coordinate square, and two magnetic azimuths, the student will locate a point on the map, accurate to within 10 meters, by the use of intersection.

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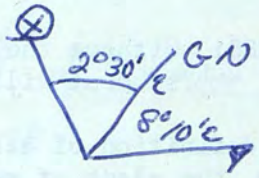
File No P-510-1(Jul66)

STUDENT OUTLINE

AZIMUTH AND INTERSECTION

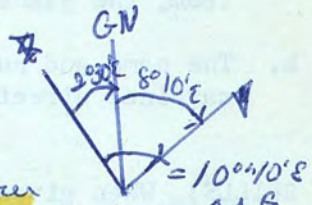
1. INTRODUCTION.

2. BODY.



a. Declination diagram.

Mag. declination
Grid angle, Grid declination



b. Azimuth.

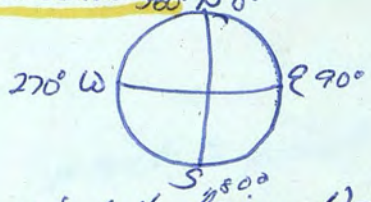
Grid Azimuth - you use your grid lines - you can't fly grid lines, you can

(1) Definition. ~~mag. compass.~~

A horizontal angle, measured in a clockwise manner from a base line. Base line determines named azimuth.

(2) Converting.

Grid + Mag. Azimuth



(3) Cardinal Directions. Cardinal Headings - N=0°, E=90°, S=180°, & W=270° & N=360°. Quadrant is a section either N, S, east or west.

c. Protractor. Plotter

(1) Purpose.

(2) Use.

(a) Draw line to pt B from A. Line up index hole on N-S Grid line.

(b) North South use outer edge. East West, course line 30° within north & south. Inside scale.

d. Intersection. location of unknown point by successively occupying 2 known position and sighting unknown pt.

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File No P-512-1(Jul66)

PERFORMANCE OBJECTIVES

INTERSECTION AND BACK AZIMUTH

1. KNOWLEDGES: Given a sample declination diagram and a true azimuth, the student, without the aid of reference material and with no errors, will write:

   a. Magnetic azimuth

   b. Magnetic back azimuth

   c. Grid azimuth

   d. Grid back azimuth

2. SKILLS: None.

azimuth horizontal ∠ measured clockwise from angular baseline.

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Fort Wolters, Texas 76067

File No P-512-1(Jul66)

STUDENT OUTLINE

INTERSECTION AND BACK AZIMUTH

1. INTRODUCTION.

2. BODY.

   a. Intersection.

   course lines from 2 points, where they cross.

   b. Straightedge Method.

   Compass "
   Orient map by inspection method. Use land features. Pivot ruler looking out at target, then draw line, repeat to another plot.

   c. Back Azimuth.

   Map + compass
   Orient the map - set mag. north. Declination line, pt., and map are on a line.

UNITED STATES ARMY PRIMARY HELICOPTER SCHOOL
Fort Wolters, Texas 76067

File No P-514-1(Jul66)

PERFORMANCE OBJECTIVES

BACK AZIMUTH AND RESECTION

1. KNOWLEDGES: None

2. SKILLS: When given a military map sheet, protractor, pencil, grid coordinate square and two magnetic azimuths, the student will be able to locate a point on the map accurate to within 50 meters by the use of resection.

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File No P-514-1(Jul66)

STUDENT OUTLINE

BACK AZIMUTH AND RESECTION

1. INTRODUCTION.

2. BODY.

a. Back Azimuth.

b. Resection.

(1) Definition.
Sight on 2 known points you find your location. Back azimuth.

(2) Compass and Protractor Method.

(a) Site on points, take back azimuth.

(b)

(c)

(d)

(3) Straightedge Method
Site st. edge on map, etc.

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File No P-516-1(Jul66)

PERFORMANCE OBJECTIVES

MODIFIED RESECTION

1. KNOWLEDGES: None

2. SKILLS: Given a military map, protractor, pencil, grid coordinate square, and a magnetic azimuth, the student will be able to locate a point along a linear terrain feature on the map, accurate to within 50 meters by the use of modified resection.

UNITED STATES ARMY PRIMARY HELICOPTER SCHOOL
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File No P-516-1(Jul66)

STUDENT OUTLINE

MODIFIED RESECTION

1. INTRODUCTION.

½ of a resection:
Must be located on linear terrain feature take mag. sighting to a known object.
linear terrain feature - road, river, bridge, R.R., etc.

2. BODY.

a. Resection.

b. Modified Resection.

you site object, take mag. heading, change to grid, take back azimuth, & intersection point is the location.

UNITED STATES ARMY PRIMARY HELICOPTER SCHOOL
Fort Wolters, Texas 76067

File No P-506-3(Sep66)

PERFORMANCE OBJECTIVES

MILITARY SYMBOLS

1. PERIOD ONE of Three Periods.

   a. KNOWLEDGES: The student, without the aid of notes or other references, will draw from memory:

      (1) Eleven (11) different unit size symbols.

      (2) Six (6) unit symbols when type unit is given.

      (3) At least ten (10) different Branch symbols.

      (4) At least five (5) special unit symbols.

   b. SKILLS: None.

2. PERIOD TWO and THREE of Three Periods.

   a. KNOWLEDGES: None.

   b. SKILLS:

      (1) PERIOD TWO of Three Periods: Without the aid of notes or reference material the student will be able to

         (a) Identify eight (8) of ten (10) PARENT UNITS from written descriptions of specific organizations.

         (b) Identify in writing the SIZE and TYPE of at least nine (9) of twelve (12) military symbols.

      (2) PERIOD THREE of Three Periods: Without the aid of notes or reference material the student will be able to

         (a) Draw at least five (5) military symbols without error.

         (b) Identify each of the five (5) symbols drawn without error.

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Fort Wolters, Texas 76067

File No P-506-3(Sep66)

STUDENT OUTLINE

MILITARY SYMBOLS

1. General Information.

2. Branch, units, size, location.

3. Lower and higher echelons of command.

4. Organization by command structure.

5. Parent Units and CARS.

6. Construction.

UNITED STATES ARMY PRIMARY HELICOPTER SCHOOL
Fort Wolters, Texas 76067

File No P-520-2(Nov66)

PERFORMANCE OBJECTIVES

GENERAL MAP REVIEW #1

1. KNOWLEDGES:

See Performance Objectives for previous map reading instruction.

2. SKILLS:

See Performance Objectives for previous map reading instruction.

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File No P-520-2(Nov66)

STUDENT OUTLINE

GENERAL MAP REVIEW #1

1. Introduction to Map Reading and Marginal Data.

2. Map Scales.

3. Grids and Coordinate Reference Systems.

4. Azimuth and Point Location.
→ a horizontal angle, measured in a clockwise manner, from a base line.
Pt. location is for maps. 4/cm. = 1,000 m scale.
Back ajimuth = azimuth ± 180

5. Conventional Signs.

6. Military Symbols.

7. Intersection, Resection, and Modified Resection.

UNITED STATES ARMY PRIMARY HELICOPTER SCHOOL
Fort Wolters, Texas 76067

File No P-522-2(Jul66)

PERFORMANCE OBJECTIVES

MAP READING - FIRST PHASE EXAMINATION

1. KNOWLEDGES: Attain a minimum score of 70 on the examination.

2. SKILLS: Complete the examination without the use of reference materials or notes.

UNITED STATES ARMY PRIMARY HELICOPTER SCHOOL
Fort Wolters, Texas 76067

File No P-534-3(Jul66)

PERFORMANCE OBJECTIVES

ELEVATION AND RELIEF

1. PERIOD ONE of Three Periods.

   a. KNOWLEDGES: Without the aid of reference material or notes, the student will be required to:

      (1) State orally at least four of the six methods of depicting elevation.

      (2) State orally the five types of contour lines.

      (3) Write six of the eight characteristics of contour lines.

      (4) Determine, within 10 feet, the elevation of a given location on a tactical map.

   b. SKILLS: None.

2. PERIOD TWO of Three Periods.

   a. KNOWLEDGES: Without the aid of reference material or notes, the student will be required to:

      (1) Visually determine the four types of slopes by examination on a tactical map.

      (2) Recognize and state orally the five types of terrain features on a tactical map.

      (3) State orally the difference between a topographic crest and a military crest.

   b. SKILLS: None.

3. PERIOD THREE of Three Periods.

   a. KNOWLEDGES: None.

   b. SKILLS: Given a tactical map and Performance Check the student, using any material necessary, will be required to construct a relief profile of a given area in a given amount of time.

UNITED STATES ARMY PRIMARY HELICOPTER SCHOOL
Fort Wolters, Texas 76067

File No P-534-3(Mar66)

STUDENT OUTLINE

ELEVATION AND RELIEF

1. INTRODUCTION.

2. BODY.

a. Definitions.

(1) Relief.
is the configuration or shape of the ground.

* (2) Elevation.
is the vertical distance of an object above or below a datum plane. (mean sea level)

(3) Datum Plane.
is a reference from which measurements may be taken.

b. Elevation and Relief on a Map.

(1) Spot elevations and bench marks.

(a) monumented BM X 1339 Black

(b) Monumented Bench Mark + H.C.P. BM △ 1259

(c) Non-monumented Bench Marks. 1237 X

(d) Checked spot elevation
a) 1091
b.) X 1112

(e) Unchecked Spot Elevation
a.) 1101 all red
b X 1111

(2) Contour lines. To accurate location contour lines are the best means to reflect. Connect points of equal elevation.

(a) Types.

1. Index contour line —— 785 —— heavy line.
2. intermediate —— 4 lines between each index, 20' apart - thus 100' from index
3. supplemental - - - - - , 1/2 normal contour interval. 10'
4. Depression contour - closed mark, with ticks pointing in.
5. approximate - - - - - = only in poorly charted areas. These are educated guesses. Never on same maps with supplemental

(b) Characteristics.

1. If any part of an object touches a line, you will use that contour line.
2. Smooth curves - no geometric angles.
3. The "V" points upstream, or uphill
4. The U on hills points downhill.
5. They tend to parallel eachother
6. They tend to " eachother
7. contour lines will never cross.
8. never fork or form Y's
9. always close on themselves.

If inbetween two lines you either add or subtract 1/2 the interval.

(3) Hachures.

real close at top, and go further at bottom.

(4) Layer Tinting.
Used in air charts, not accurate, gives general elevation.
Colors upon colors.

(5) Ridge and Stream Lines.

(6) Relief Models and Maps.
Are good, but expensive + can't be folded.

c. Slopes.

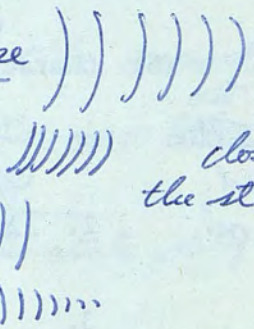
(1) Types of slopes.

Uniform, gentle slope

Uniform, steep slope

Concave slope

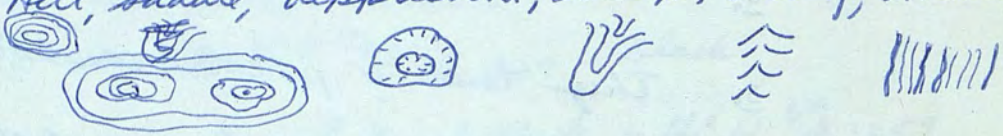
Convex slope



closer the lines, the steeper slope.

(2) Shape of slopes.

d. Terrain Features.
Hill, saddle, depression, ridge, valley, or draw.



e. Crests.

(1) Topographic crest.
The top of the hill, you'd be seen + shot.

(2) Military crest.
The best point on the forward slope of a hill from which the base of the hill may be seen but where the observer will not be silhouetted against the sky.

f. Defilade.

(1) Sight.

Can't see you, but a flat projectile will hit you.

(2) True.

Cover & concealment. Protection, ie, you can't be hit by flat projectile.

g. Steps in constructing a Relief Profile:

(1) Connect points with St. lines
Determine extremes of elevation
Draw horizontal lines & number each one.
Drop perpendiculars
Draw profile.

(2)

(3)

(4)

(5)

(6)

(7)

(8)

UNITED STATES ARMY PRIMARY HELICOPTER SCHOOL
Fort Wolters, Texas 76067

File No P-530-1(Jul66)

PERFORMANCE OBJECTIVES

PRINCIPLES OF LAND NAVIGATION

1. KNOWLEDGES: The student, without the aid of notes and with no errors, will write:

   a. The five (5) most common terrain features.

   b. The definition of terrain association.

   c. The reason terrain features make better navigational aids than secondary roads and trails.

   d. The terrain feature easiest to recognize.

   e. The four (4) principles of land navigation.

2. SKILLS: None.

UNITED STATES ARMY PRIMARY HELICOPTER SCHOOL
Fort Wolters, Texas 76067

File No P-530-1(Jul66)

STUDENT OUTLINE

PRINCIPLES OF LAND NAVIGATION

1. INTRODUCTION.

2. BODY.

a. Terrain Association.

Your ability to compare a map to the actual terrain that is visible.

b. Common Terrain Features.

Hill, ridge, depression, saddle, valley or draw.
secondary roads and trails aren't so accurate.
Continually changing.

c. Orienting a Map.

~~Four methods~~ Compass - method.
Linear method - Terrain feature
prominent feature method.
key feature.

d. Principles of Land Navigation.

1.) know your location.
2.) plan your route to take from point to point.
3.) execute your planned route
4.) when you reach your objective make sure you are at the right place. Double check.

UNITED STATES ARMY PRIMARY HELICOPTER SCHOOL
Fort Wolters, Texas 76067

File No P-524-3(Sep66)

PERFORMANCE OBJECTIVES

AERIAL PHOTOGRAPHS

1. PERIOD ONE of Three Periods.

KNOWLEDGES and SKILLS: Without the aid of notes or reference material the student will be required to complete a performance check that will include:

a. Identification of the three (3) types of aerial photographs with respect to camera position.

b. The units of measure used for camera focal length and flight altitude.

c. Application of aerial photograph characteristics that will be used to determine a specific type of photo.

d. Determination of the scale or RF of an aerial photograph using the Camera Focal Length/Flight Altitude Method and the Photo/Ground Distance Method.

e. The ability to read, understand, and apply marginal information data in working RF (scale) problems.

2. PERIOD TWO of Three Periods.

KNOWLEDGES and SKILLS: Without the use of notes or reference material the student will be required to complete a performance check that will include:

a. Orientation of a vertical and an oblique photo for reading.

b. The use of the five (5) clues for identification of objects on an aerial photograph.

c. The three (3) methods of orientating an aerial photo for direction.

3. PERIOD THREE of Three Periods.

KNOWLEDGES and SKILLS: Without the use of notes or reference material the student will be required to complete a practical exercise and construct a point designation grid in a prescribed time frame.

UNITED STATES ARMY PRIMARY HELICOPTER SCHOOL
Fort Wolters, Texas 76067

File No P-524-3(Sep66)

STUDENT OUTLINE

AERIAL PHOTOGRAPHS

1. INTRODUCTION.

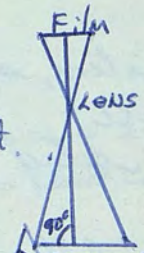
updating large maps, supplements, etc

2. BODY.

a. Types.

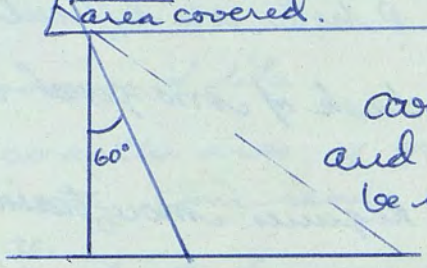
(1) Vertical

relief is not apparent.



only one where accurate RF may be determined.

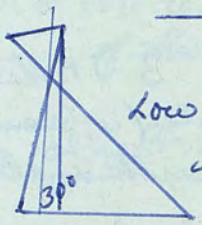
(2) High Oblique



covers large area, and horizon will be seen - Trapezoid.

(3) Low Oblique

relief is most apparent in this type view is similar.



Low Oblique Trapezoid shape no RF can be accurate.

(4) Composite

made up of a vertical + two or more obliques.

b. Advantages.

(1) wealth of detail

(2) accuracy to form. all on the ground.

(3) up to date.

(4) pictures of areas otherwise inaccessible for physical or military reasons.

(5) shows military feature not seen on a map.

(6) permits a day to day comparsion of military features.

(7) provides a permanent record of day to day changes of an area.

c. Limitations

(1) some features may be obscured or hidden by other detail.

(2) Position, location, scale and elevations are only approximate

(3) Realitive relief is not readily apparent.

(4) Photos are difficult to use in poor lite.

(5) Lack of marginal data. altitude, time & focal length.

(6) Requires more training to use.

d. Marginal Information 3 JAN 56 1540Z 12" 10,000'

Date, time, given Zulu (ie, Greenwich mean) subtract time from it. 12" = focal length & altitude.

e. Finding the RF (scale) of an aerial photo.

(1) Focal length over flight altitude method.

RF= Focal Length / Flight Altitude

will have to correct your altitude from mean sea level

(2) Comparison to ground method.

of photo

$RF = \frac{PD}{GD}$ = Photo distance / ground distance

(3) Comparison to map method.

Photo D = 5
Map D = 3
RF = 1/25,000

Determine GD - GD = MD X the RF

f. Orienting photo for reading.

(1) Verticals

1.) face toward source of light (sunrise)
2.) turn photos so that shadows stab stomach.

(2) Obliques

1.) face toward source of lite.
2.) turn photo so as the area of greatest distortion is away from reader.

g. Clues to identification of objects.

(1) relative size of the object. (compare it to known object)

(2) shape of the object - can determine what it is.

(3) shadow - most high features will throw a reasonable shadow.

(4) Relative tone - is lite or dark. Smoother the object, the lighter it will show up.

(5) Relationship to surrounding objects.

h. Orienting for direction.

Sun-time - shadow method.

(1) For every hr. sun moves shadow moves 15°.

(2) Which way does shadow point, and tells us what time it is.

(3)

i. Photomaps.

j. Point Designation Grid.

Steps in Construction

(1)

(2)

(3)

(4)

UNITED STATES ARMY PRIMARY HELICOPTER SCHOOL
Fort Wolters, Texas 76067

File No P-532-1(Jul66)

PERFORMANCE OBJECTIVES

USE OF LENSATIC COMPASS

1. KNOWLEDGES: Without the use of notes or reference material, the student will be required to:

   a. State orally the accuracy of the lensatic compass.

   b. State orally three precautions or special considerations in the use of the lensatic compass.

   c. State orally the three steps involved in the use of the lensatic compass during the hours of darkness.

2. SKILLS: The student will be required to determine the azimuth of a given point to within two (2) degrees by use of the lensatic compass.

UNITED STATES ARMY PRIMARY HELICOPTER SCHOOL
Fort Wolters, Texas 76067

File No P-528-2(Sep66)

PERFORMANCE OBJECTIVES

TRANSITIONING FROM A TACTICAL MAP

TO AN AERONAUTICAL CHART

1. PERIOD ONE of Two Periods.

   a. KNOWLEDGES: Without the aid of notes and reference material the student will know what type of map projection is associated with aeronautical charts. Referring to the Dallas Sectional 1:500,000, the student will complete the following:

      (1) Select the exact name of a given feature by using the marginal information.

      (2) Write the exact length and type of the longest runway at a given facility.

      (3) Differentiate between prohibited, restricted, and caution areas.

      (4) State the approved VFR cruising altitudes for any specific direction of flight.

   b. SKILLS: Using the Dallas Sectional 1:500,000, and a ruler, the student will be able to work a practical exercise as follows:

      (1) Determine the correct magnetic declination and draw a declination diagram of a given point accurate to within thirty (30") seconds.

      (2) Determine the elevation of obstructions along specified flight routes on the Dallas Sectional to the nearest foot.

      (3) Determine the elevation of a given point accurate to within 1000' and ascertain the height of the highest terrain obstacles on any sectional chart.

2. PERIOD TWO of Two Periods.

   a. KNOWLEDGES: Without the aid of notes or reference material the student will know how to fill in FAA Form 398 (Flt Pln). The student will be able to state the UHF and VHF emergency frequencies correctly.

   b. SKILLS: None.

UNITED STATES ARMY PRIMARY HELICOPTER SCHOOL
Fort Wolters, Texas 76067

File No P-528-2(Sep66)

STUDENT OUTLINE

TRANSITIONING FROM A TACTICAL MAP

TO AN AERONAUTICAL CHART

1. Type of Projection.

Meridians - North to South.

Parallels - East to West

grid squares are trapezoidal.

2. Coordinates.

3. Magnetic Declination.

Variation - amber lines give the declination over the area.

~~Isogonic line - no variation~~

~~Isogonic lines~~

4. Elevation and Relief.

Relief is not shown by contour lines

Contour interval is 1000'

5. Air Space Reservation

A - tower

a. prohibited area - must get prior approval to fly over that area.

b. restricted area - be careful, usually training. above or below these min. + max.

c. Caution area, or warning area.

maintain contact to tower or F.A.A.

6. Topographic Symbols.

Size of cities, etc, and if desperate read water towers, road signs, anything.

Reading aerodromes - size, altitude - repairs

7. Omni Radials.

8. Cruising Altitude.

VFR - Visible flight regulations.

IFR - Instrument " "

VFR - East - odd thousands above 2,000 or +500's,

IFR - West - " " plus 500's.

IFR - West - even thousands.

East - odd thousands.

9. Radio Frequencies.

* VHF... 121.5 mc. VHF you must maintain your altitude. Never be out of air space.

for Emergency.

UHF - 5 frequencies for Towers.

* 243.0 mc military emergency & frequency. Built in guard on all UHF equipment, just a switch.

Beacons

continuous white - civilian

split white - military base

257.8 mc Far control towers for military airfields.

UNITED STATES ARMY PRIMARY HELICOPTER SCHOOL
Fort Wolters, Texas 76067

File No P-536-2(Nov66)

PERFORMANCE OBJECTIVES

GENERAL MAP REVIEW #2

1. PERIOD ONE of Two Periods.

   KNOWLEDGES and SKILLS: Without any notes or texts, the student will complete the Practical Exercise on page 13.

2. PERIOD TWO of Two Periods.

   KNOWLEDGES and SKILLS: Without any notes or texts, the student will complete the Practical Exercise on page 16.

Flight plan.

DA - 175 - Cross Country
DA - 1050 - local

purpose: for civilians it is not mandatory for VFR, but it is for IFR.

In military it is required at all times. Stick to your flight plans or you can call in FAA and give the change - Flight Filing Service.

In E variation you would add to your true to get your Mag

W you subtract -

if across a success change area you take middle, or the average between points.

UNITED STATES ARMY PRIMARY HELICOPTER SCHOOL
Fort Wolters, Texas 76067

File No P-536-2(Nov66)

STUDENT OUTLINE

GENERAL MAP REVIEW #2

1. Introduction to Map Reading and Marginal Data.

2. Map Scales.

3. Grids and Coordinate Reference Systems.

4. Azimuth and Point Location.

5. Conventional Signs and Military Symbols.

6. Elevation and Relief.

7. Aerial Photographs.

8. Lensatic Compass, Aeronautical Charts and Land Navigation.

UNITED STATES ARMY PRIMARY HELICOPTER SCHOOL
Fort Wolters, Texas 76067

File No P-538-2(Jul66)

PERFORMANCE OBJECTIVES

MAP READING - FINAL EXAMINATION

1. KNOWLEDGES: Attain a minimum score of 70% on the examination.

2. SKILLS: Complete the examination without the use of reference materials or notes.

 L 500 Army-Ft. Sill, Okla.