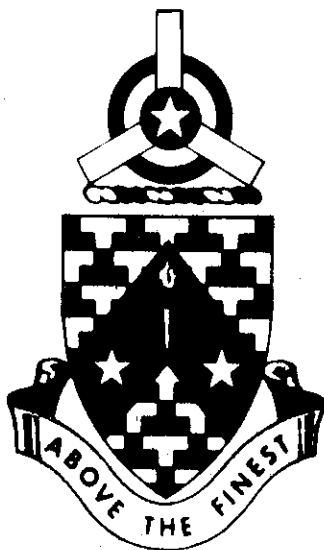


PROGRAMED TEXT

LOW LEVEL NAVIGATION

AM-68



MARCH 1969

**UNITED STATES ARMY
PRIMARY HELICOPTER SCHOOL
FORT WOLTERS, TEXAS**

PROGRAMED TEXT

PROGRAM TEXT

FILE NO:

PROGRAM TITLE

LOW LEVEL NAVIGATION

POI SCOPE: Map preparation, use of checkpoints, crew coordination, and safety techniques to be used in low level navigation.

INSTRUCTOR REFERENCES:

FM 21-26

TM 1-225

FM 57-35

PREPARED BY:

DATE:


CW2 J. B. CURTIS
FLT SUBJ BR

MARCH 1968

REVISED BY:

DATE:

APPROVED BY:


FREDERICK B. WELLER, LTC
Chief, TP&A

DATE:

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TABLE OF CONTENTS

PROGRAMED TEXT
FILE NO:

PROGRAM TITLE:
LOW LEVEL-NAVIGATION

CONTENTS	PAGE NUMBER
1. PREFACE _____	iii
2. PERFORMANCE OBJECTIVES _____	1
3. PROGRAM _____	2
a. _____	
b. _____	
c. _____	
d. _____	
e. _____	
4. SELF EVALUATION EXERCISE _____	11
5. ANSWERS TO SELF EVALUATION EXERCISE _____	14
6. ITEMS TO BE ISSUED WITH PROGRAM _____	
7. Palo Pinto, Texas 1:50,000 _____	
8. Student Required to bring to class navigation computer _____	
weems plotter _____	
9. _____	
10. _____	

PREFACE

Low-level navigation is a topic of great importance to the Army Aviator. As our tactics are proven on the battlefield, so are the tactics of Army Aviation being proven in low-level navigation, tactics used by successful military men throughout all time -- surprise, deception and speed.

Low-level operations pose uncommon and unique navigational problems and we must recognize these problems and compensate for them in our planning of missions.

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 1.

PERFORMANCE OBJECTIVES

Upon completion of this programed text, you will be able to:

1. Identify the accepted procedures used in planning and executing low level flight.
2. Given a 1:50,000 map and required preflight information, you will plan a low level flight properly utilizing the characteristics and techniques of low level navigation.

Before you can properly plan a low-level flight, there are certain definitions and characteristics of low-level flight that must be learned. So let's start with some of the definitions:

LOW-LEVEL FLIGHT: Flight conducted at an altitude to avoid or minimize detection. Your route is preselected and conforms generally to a straight line, and is normally flown at a constant altitude above the terrain.

Select the proper response.

When planning and flying a low-level flight you should

- a. fly as close to the earth's surface as possible, following the contours of the earth.
- b. direct your aircraft along a desired route, flying at an altitude between five-hundred and one-thousand feet.
- ☒ c. fly preselected route that conforms generally to a straight line and is to be flown at a constant altitude (500' and below) to avoid or minimize detection.
- d. plan a route that would let you fly at least one-thousand feet using dead reckoning, pilotage, and radio navigation.

TURN TO FRAME 2 PAGE 4

ANSWER: d- 1-3-5

FRAME #6

PREFLIGHT PLANNING is the KEY to successful low-level navigation. A small scale map (1:250,000 or 1:500,000) might be fine for flying from your departure point to your initial point, but a large scale map (1:50,000) will be needed for accurate low-level planning from your initial point to your drop zone and return.

When flying low-level you should use a map of

a. 1:1,000,000

b. 1:250,000

c. 1:500,000

(d.) 1:50,000

TURN TO FRAME 7 PAGE 5

ANSWER: c. Fly a preselected route that conforms generally to a straight line and is to be flown at a constant altitude (500' and below) to avoid or minimize detection.

FRAME #2

NAP-OF-THE-EARTH-FLIGHT: Flight as close to the earths surface as vegetation and obstacles will permit and following the contours of the earth. By giving maximum cover and concealment from enemy detection, observation and firepower, nap-of-the-earth flight exploits surprise and allows for evasive action.

What is a good definition of Nap-of-the-earth flight?

- a. Any flight conducted over the different types of terrain using dead reckoning, pilotage or radio navigational aids.
- ① b. Flight as close to the earths surface as vegetation and obstacles will permit.
- c. A technique of directing an aircraft along a desired course at a low altitude.
- d. Flying over easily distinguishable points which are used for control of aircraft by a flight commander.

TURN TO FRAME 3 PAGE 6

ANSWER: d - 1:50,000

FRAME #7

In selecting your route, the most important aspect of preflight planning, consideration must be given to mission, terrain, weather, and location of enemy forces and air defense weapons. Three means are used to ensure enroute orientation; these are:

1. Air Control Points - a standard means of control and coordination.
2. Check Points - points adjacent to or along your flight path to assist you in constant orientation.
3. Barriers - linear features such as lakes, main highways and rivers, used at turning points to help in navigation.

In selecting your route why are ACP's, check points, and barriers used?

- ☐ a To select turning points
- ☐ b To insure enroute orientation
- ☐ c To help in navigation
- ☒ d All of the above

ANSWER: b. Flight as close to the earths surface as vegetation and obstacles will permit.

FRAME #3

LOW-LEVEL NAVIGATION: The technique of directing an aircraft along a desired course at low altitudes (generally below 500' absolute) using one or more of the following navigational techniques: dead reckoning, pilotage or radio navigation.

Low-level navigation could be termed:

- a. Flight conducted at an altitude to avoid or minimize detection.
- b. Flight as close to the earths surface as vegetation and obstacles will permit.
- c. The technique of directing an aircraft along a desired route at low altitudes.
- d. All of the above

ANSWER: d - All of the above

FRAME #8

In map preparation, there are certain essential items that must be placed on the face of the map. These are ACP's, course lines, magnetic headings, and time tic marks.

1. ACP's are marked with a circle around the feature.
2. Course lines are indicated with a sharp line (blue or black) and indicates your intended track over the ground.
3. Magnetic headings are indicated along the course line for each leg. Make sure you add or subtract your magnetic variation for your area of operation.
4. Time tic marks should be indicated along your course at uniform time intervals. Space time tic marks about every 5 minutes.

Other information that may be marked on your chart is:

1. Check points
2. Distance between legs
3. Barriers for each leg

What are the four mandatory items that must appear on your map?

- a. Marked check points, leg and total distance, marked barriers
- b. Heading, distance for each leg, barriers
- ☒ c. Marked ACP's, course lines, magnetic headings, time tic marks
- d. Time tic marks, check points, distance and magnetic headings

ANSWER: c. The technique of directing an aircraft along a desired route at low altitudes.

FRAME #4

AIR CONTROL POINTS (ACP): are easily identifiable points on the terrain or points marked with a electronic navigational aid to provide necessary control during air movement.

CHECK POINTS: A predetermined point on the ground that is used as a means of controlling movement.

INITIAL POINT (IP): An easily distinguished point at which a flight is formed and comes under the control of a flight commander.

RELEASE POINT (RP): A clearly defined point on a route at which specified elements of a flight of aircraft return to the control of their own commander.

What do air control points, check points, initial points, and release points have in common?

- a. All are marked with a navigational aid.
- b. They are lines on the chart and are used in determining headings.
- (c.) They are points that should be easily distinguishable from the air and are used to control movement of aircraft.
- d. All are points or lines on a chart which you should not fly past.

ANSWER: c. Marked ACP's, course lines, magnetic headings, time tic marks

FRAME #9

Should you find it necessary to deviate from your desired course due to enemy concentrations or Air Defense locations, the following procedure is recommended:

1. Determine the degree of bearing change required to safely by-pass the area.
2. Turn to this heading and fly for a given time.
3. To return to your course, double the degree of bearing change and apply it in the opposite direction.
4. Ascertain your correct flight path by rechecking your map with the terrain.

While flying a low-level mission on a heading of 160° you find it necessary to deviate 25° right for 10 minutes in order to avoid an enemy anti-aircraft weapon in the area. To by-pass the weapon and return to your original course, you would

- a. turn to 185° for 10 minutes, then 135° for 20 minutes.
- b. turn to 135° for 10 minutes, then 185° for 10 minutes.
- c. turn to 185° for 10 minutes, then 160° for ~~10~~ minutes.
- ☒ d. turn to 185° for 10 minutes, then 135° for 10 minutes.

CONTINUE TO THE SELF EVALUATION EXERCISE

ANSWER: c. They are points that should be easily distinguishable from the air and are used to control movement of aircraft.

FRAME #5

There are certain advantages to conducting low-level tactical missions; these are:

- (1) Restriction of enemy observations
- (2) Limits aircraft exposure time
- (3) Deception
- (4) Reduced radar detection time
- (5) Element of surprise

Along with the advantages of low-level flight there are also disadvantages; these are:

- (1) Reduction of your observation capabilities
- (2) Reduced reaction time, aviators must react quickly to changing situations
- (3) Radio reception is poor
- (4) Turbulence is stronger
- (5) Visual perspective is greatly changed

Select three advantages from the following examples.

- 1. Your aircraft is visible to fewer enemy personnel.
- 2. Your visual field is restricted.
- 3. Your exact location and route of flight is more difficult for the enemy to ascertain.
- 4. Reduced reaction time.
- 5. You are more likely to surprise enemy units at your objective.

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

STOP RETURN TO FRAME 6 PAGE 3

ANSWER: d. turn to 185° for 10 minutes, then 135° for 10 minutes.

LOW-LEVEL NAVIGATION
SELF EVALUATION EXERCISE

1. The technique of directing an aircraft along a desired course at or below 500 feet would best be described as
 - a. air navigation.
 - b. nap-of-the-earth flight.
 - ☒ c. low-level navigation.
 - d. low-level flight.
2. Any linear feature that is established as a point over which a pilot must not pass is called a
 - a. check point.
 - ☒ b. barrier.
 - c. air control point.
 - d. release point.
- X 3. On a given mission you are told to cross a certain bridge at low-level on a heading of 270°. At this time the command and control ship will take over and direct you into the landing zone. The bridge would be called a
 - a. release point.
 - ☒ b. initial point.
 - c. air control point.
 - d. check point.
- X 4. A point on the ground over which you must pass at a given time would be called a
 - a. release point.
 - ☒ b. check point.
 - c. barrier.
 - ☒ d. air control point.
- X 5. A pre-selected point on the ground that would be used to maintain your course would be a
 - ☒ a. check point.
 - ☒ b. air control point.
 - c. initial point.
 - d. release point.

6. There are certain advantages to conducting low-level tactical missions. Select three of the advantages from the following examples.

- ①. Limits aircraft exposure time.
- 2. Increased observation capabilities.
- 3. Reduced reaction time.
- ④. Surprise.
- ②. Deception.

- a. 1-2-3
- b. 1-3-4
- ⑥. 1-4-5
- d. 2-4-5

7. In planning a low-level mission you would probably choose a map of

- a. 1:250,000 scale.
- b. 1:500,000 scale.
- ⑥. ① 50,000 scale.
- d. 1:1,000,000 scale.

8. When you prepare your map for a low-level flight, four (4) items that must appear on the map are:

- ①. Marked ACP's.
- ④. Course lines.
- ③. Check points.
- 4. Marked barriers.
- ⑤. Magnetic headings.
- ⑥. Distance.
- ⑦. Time tick marks.

- ⑧. ① 1-2-5-7 ✓
- b. 1-2-6-7
- c. 1-2-3-4
- d. 3-4-5-6

9. Time tick marks are placed along the course line at

- a. 15 minute intervals.
- ⑧. ① 5 minute intervals.
- c. 10 minute intervals.
- d. 30 minute intervals.

10. While flying a low-level mission on a heading of 215° you find it necessary to deviate 25° right for 15 minutes in order to avoid an obstacle. To return to your original course you would

- a. turn to 215° for 15 minutes, then to 240° .
- b. turn to 215° for 30 minutes, then to 225° .
- ☒ c. turn to 190° for 15 minutes, then to 215° .
- d. turn to 190° for 30 minutes, then to 215° .

Present heading 240°

Handwritten calculations:
 240°
 $- 25^\circ$
 215°
 240
 $- 50$
 190

LOW-LEVEL NAVIGATION KEY TO SELF-EVALUATION EXERCISE

1. c
2. b
3. b
4. d
5. a
6. c
7. c
8. a
9. b
10. c

LOW-LEVEL NAVIGATION
PRACTICAL EXERCISE

You as a section leader, have been given the mission to deliver some supplies to an artillery unit. Due to the type of supplies it is decided that three ships would be used on the mission. Route of flight would be from Palo Pinto to LZ ARTY and return.

Type A/C UH-1D
TAS 80K
Winds 240/12

Departure Point
Destination

LZ "ARTY"

Palo Pinto
65702610
57104650

328° TH
-8° MH
320°

1. What is the MH on the first leg?

- ☒ A. 319
- B. 337
- C. 147
- D. 328

2. What two terrain features would make good ACP's?

- A. Brazos River
- B. Road junction

3. What is the highest point on the 1st leg?

- ☒ A. 1356
- B. 1250
- C. 1400
- D. 1338

4. What is the lowest point on the 1st leg?

- A. 1104
- ☒ B. 830
- C. 750

5. How long will it take you to fly this 1st leg?

- ☒ A. 0:09
- B. 1:30
- C. 0:40
- D. 0:15

-9° EAST

6. What are several good checkpoints?

7. What would be a good barrier to let you know you've overflowed LZ ARTY?

Possum Runyon Lake

8. Assuming you fly the same route on return flight, what would be a good RP for the other aircraft in your flight? _____

LOW-LEVEL NAVIGATION
PRACTICAL EXERCISE ANSWERS

1. MH = 319°
2. We picked: Kyle mountain and RJ 254&16
3. A = 1356 ft.
4. B = 830 ft.
5. A = 0.09
6. We picked: (1) Kyle Mountain, (2) Dalton Bend, (3) Cliff (61203690)
(4) hill at 59504060, (5) RJ 254&16
7. We chose highway 254 & Possum Kingdom Lake
8. We chose junction of highways 16 & 254 since it is on your return flight path and very prominent.