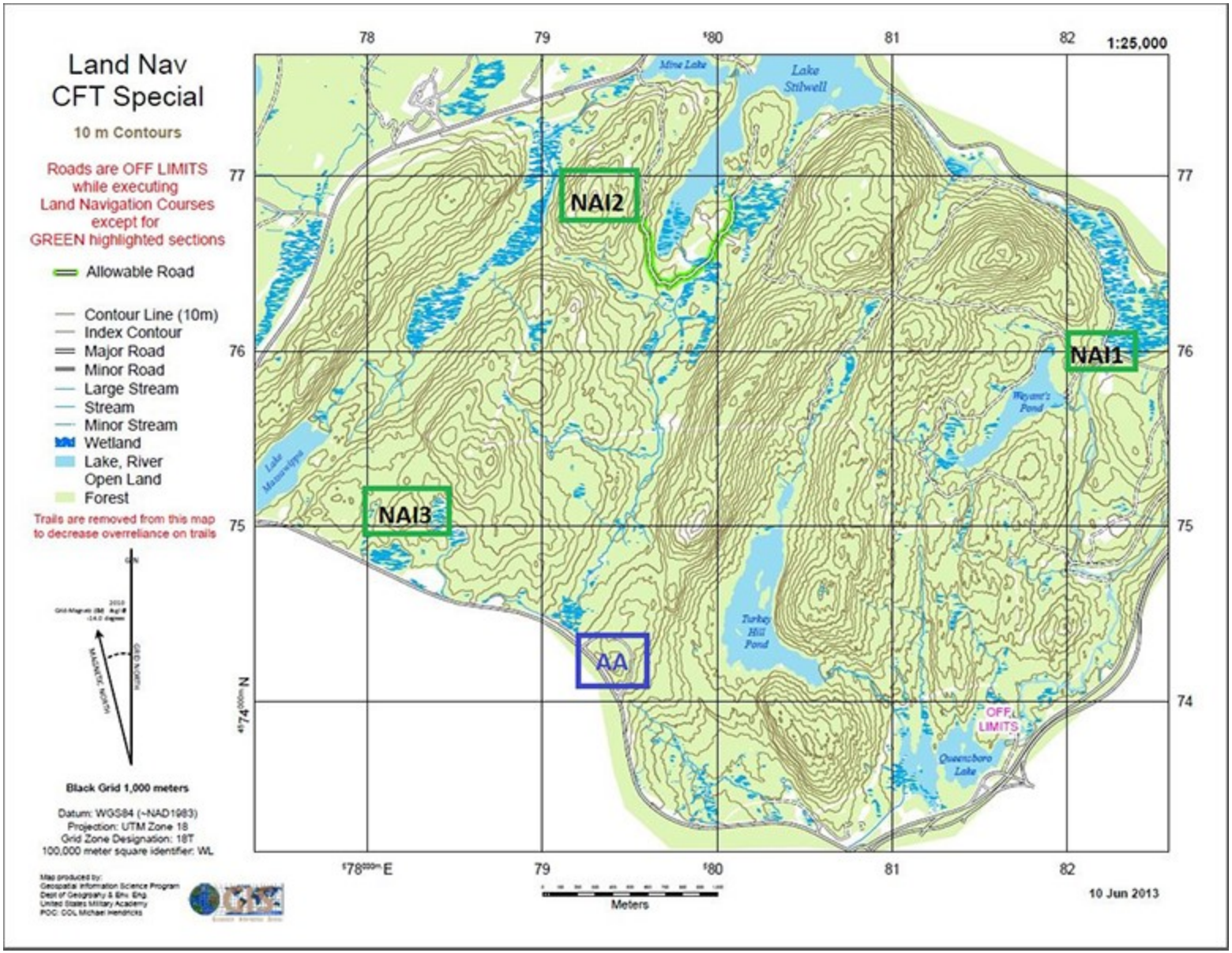
You have recently graduated from the United States Military Academy, and successfully completed Military Intelligence BOLC. Your first assignment is the Platoon Leader for the Brigade's Unmanned Aerial Vehicle Platoon. This summer, your Battalion is serving as the Task Force supporting Cadet Summer Training at Camp Natural Bridge and Camp Buckner. One of your roles will be to train the other Platoon Leaders in the Task Force in the use and implementation of their Platoon UAV, the RQ-11 Raven. The Raven is a very useful tool, but such a light vehicle is easily impacted by winds during flight. Your Battalion Commander is a former math instructor, and kindly developed an applet for you to practice with while you train other Lieutenants. Make sure you and your fellow Lieutenants understand how to accurately fly the Raven around Camp Natural Bridge and Camp Buckner. The applet has an Assembly Area (AA) where your Ravens are templated to begin their flights. The Task Force S3 (Operations Officer) has also templated some Named Areas of Interest (NAIs) to attempt to fly your Raven towards. Now you can knock the rust from your MA103 skills, and plan some Raven flights to maximize the use of the Ravens while you train Cadets. In addition to planning flights, we must also be cognizant of potential anti-aircraft threats when working with any kind of aircraft. In order to be able to answer questions about such threats, review section 2.4.2 in MRCW. (Pages 197-198 in Print and Pages 198-199 in the PDF on the Course Website.)


Using the practice applet (`http://kaylablyman.com/drone.html`) to check your answers, use vectors to determine the correct duration (magnitude) and heading (direction) for each of the following.

1. Leave the wind settings at 0 km/min out of 0 (degrees). Completing these tasks and everything above will prepare you to earn a C on the DLA.
   (a) Fly from AA to NAI2.
   (b) Fly from AA to NAI1.
   (c) Fly from AA to NAI3.
   (d) Fly from AA to NAI1 to NAI2 to NAI3 back to AA.

2. Fly from AA to NAI2 with the following wind settings. Completing these tasks and everything above will prepare you to earn an A on the DLA.
   (a) Set the wind speed at 0.25 km/min out of 0 (degrees).
   (b) Set the wind speed at 0.25 km/min out of 180 (degrees).
   (c) Set the wind speed at 0.25 km/min out of 90 (degrees).
   (d) Set the wind speed at 0.25 km/min out of 270 (degrees).

3. Fly from AA to NAI1 with the following wind settings. Completing these tasks and everything above will prepare you to earn an A+ on the DLA.
   (a) Set the wind speed at 0.25 km/min out of 0 (degrees).
   (b) Set the wind speed at 0.25 km/min out of 180 (degrees).
   (c) Set the wind speed at 0.25 km/min out of 90 (degrees).
   (d) Set the wind speed at 0.25 km/min out of 270 (degrees).


Land Nav
CFT Special
10 m Contours
Roads are OFF LIMITS while executing Land Navigation Courses except for GREEN highlighted sections
Allowable Road
Contour Line (10m)
Index Contour
Major Road
Minor Road
Large Stream
Stream
Minor Stream
Wetland
Lake, River
Open Land
Forest
Trails are removed from this map to decrease overreliance on trails
Black Grid 1,000 meters
Datum: WGS84 (~NAD1983)
Projection: UTM Zone 18
Grid Zone Designation: 18T
100,000 meter square identifier: WL
Map produced by:
Geospatial Information Science Program
Dept of Geography & Env. Eng.
United States Military Academy
POC: COL Michael Hendricks
1:25,000
78
79
80
81
82
77
76
75
74
NAI1
NAI2
NAI3
AA
Mine Lake
Lake Stilwell
Lake Masureyga
Wyant's Pond
Turkey Hill Pond
Queensboro Lake
OFF LIMITS
Meters
10 Jun 2013

INDIVIDUAL COMPONENT

Cadet: _____ 21 February 2019

Section: _____

DLA 2A MA103 Page 1 25 Points

1. Using the following vectors, compute each of the following, if possible. If the indicated computation is not possible state why.

$$\vec{a} = \langle 0, 7, -3, 4 \rangle \qquad \vec{b} = \langle -5, 2, 4 \rangle \qquad \vec{x} = \langle 2, 3 \rangle \qquad \vec{y} = \langle 1, 6 \rangle$$

(a) $\vec{a} + \vec{b}$

(b) $\vec{x} \cdot \vec{y}$

(c) Find the angle between $\vec{x}$ and $\vec{y}$.

2. Using the following matrices, compute each of the following, if possible. If the indicated computation is not possible state why.

$$B = \begin{bmatrix} 3 & -1 \\ 0 & 2 \end{bmatrix} \qquad C = \begin{bmatrix} -2 & 0 \\ 1 & 3 \\ -1 & 0 \end{bmatrix} \qquad D = \begin{bmatrix} -3 \\ 4 \end{bmatrix}$$

(a) $2(CB)$

(b) $D^T B$

3. Find the inverse of the following matrix. If there is no inverse, state why.

$$A = \begin{bmatrix} 2 & 3 \\ 2 & -1 \end{bmatrix}$$

Cadet: _____ Cadet: _____

Cadet: _____ Cadet: _____ 21 February 2019

Section: _____ Team: _____

You are stationed at Fort Knox and due to training area conflicts, your battalion is making use of the Illinois National Guard's Marseilles Training Area. Although there are restricted land areas in the Marseilles Training Area, there is no restricted air space.

You may use the applet located at `http://kaylablyman.com/droneteam.html` to check your answers.

4. With 0 km/min wind out of 0 degrees, what is the heading and duration necessary to fly from AA to NAI1? **In order to receive credit you must SHOW ALL YOUR WORK.**

5. The wind has picked up and is now blowing 0.2 km/min out of the east (90 degrees). What is the heading and duration necessary to fly from AA to NAI2? **In order to receive credit you must SHOW ALL YOUR WORK.**

– Continued on Back –

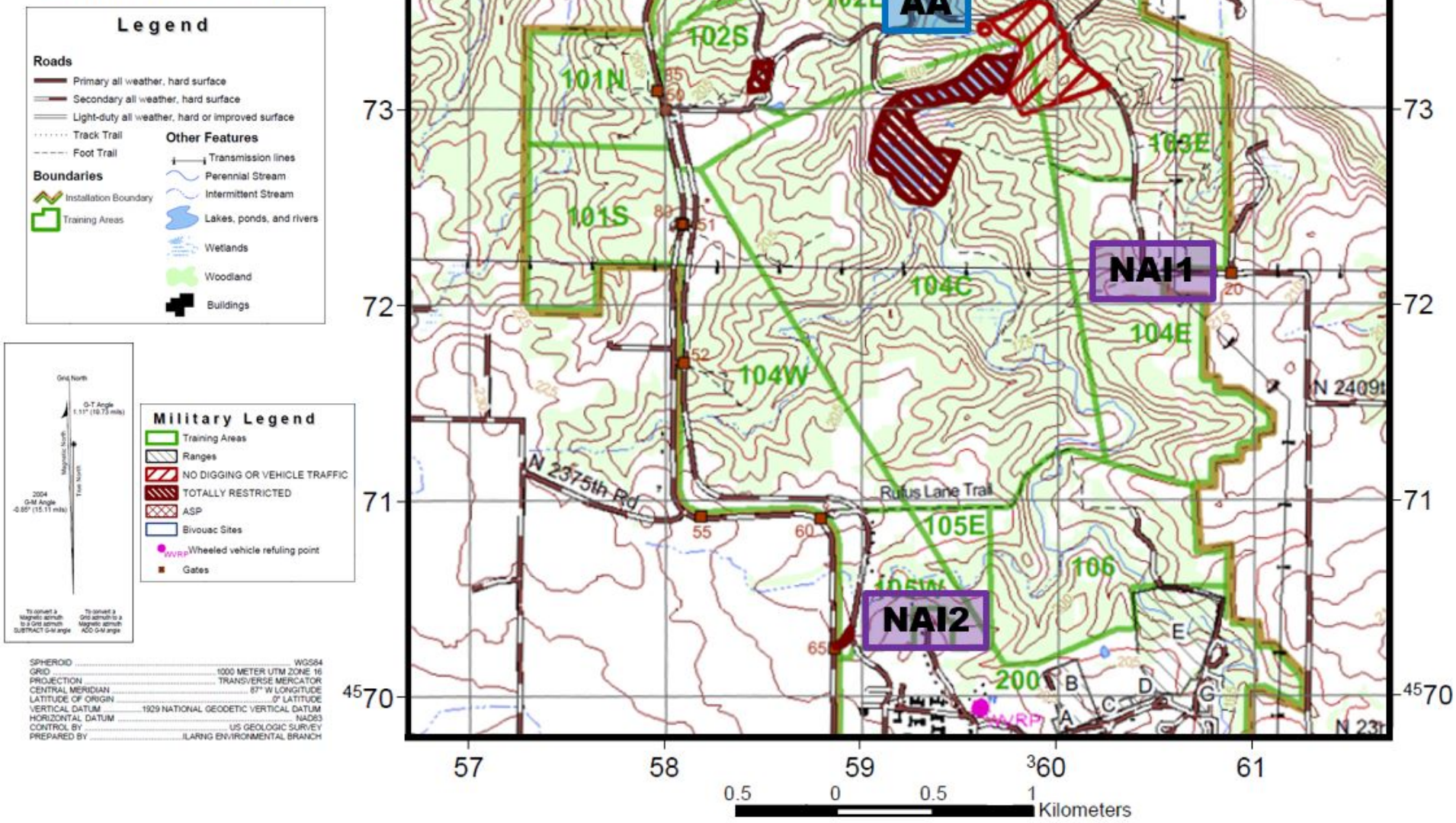
6. If you planned the flight for your Raven from the ground at AA (Elevation 160 meters = 0.160 kilometers) to 100 meters = 0.100 kilometers above NAI1 (Elevation 205 meters = 0.205 kilometers), what is the vector equation of the line that represents your flight path?

7. Intelligence has alerted you that there is an unknown enemy anti-aircraft located at (WL 597 731) where the elevation is 165 meters = 0.165 kilometers, so the 3-dimensional location can be represented by the point $(59.7, 73.1, 0.165)$. Given the vector equation of the flight path from AA to NAI2, $\overrightarrow{r}(t) = \langle 59.3, 76.6, 0.16\rangle + \langle 0, -6.2, 0.15\rangle t$ how close will your Raven fly to the anti-aircraft?

Marseilles Training Area

Edition # MTA 04-002

ELEVATION IN METERS
CONTOUR INTERVAL 5 METERS



8. If the wind changes speed and/or direction, how must you alter your flight heading and duration?