ROYAL CANADIAN ARMY CADETS

SILVER STAR

INSTRUCTIONAL GUIDE

SECTION 6

EO M322.06 – IDENTIFY LOCATION USING A GLOBAL POSITIONING SYSTEM (GPS) RECEIVER

Total Time: 120 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-703/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Ensure GPS receivers have fully-charged batteries.

Prepare a navigational route of six legs.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

A practical activity was chosen for this lesson as it is an interactive way to allow the cadets to identify location using a GPS receiver.

INTRODUCTION

REVIEW

The review for this lesson is from EO M322.05 (Set a Map Datum on a Global Positioning System [GPS] Receiver, Section 5). Review how to use the GPS receiver to identify position by:

1. confirming the correct map datum is set on the GPS receiver;
2. locating the geographical position page on the GPS receiver;
3. reading the current 10-figure grid reference (GR), extract the six-figure GR from the 10-figure GR shown; and
4. plotting the six-figure GR on the topographical map of the area.

OBJECTIVES

By the end of this lesson the cadet shall have identified their location using a GPS receiver.

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IMPORTANCE

It is important for cadets to be able to identify location using a GPS receiver because it provides a more accurate position. Being able to identify the position on a GPS receiver and translate and plot that position onto a topographical map will support one's location and provide a backup in the case of a GPS receiver failure.

Teaching point 1 **Have the Cadets Navigate Along a Predetermined Route Using a Topographical Map**

Time: 110 min Method: Practical Activity

BACKGROUND INFORMATION



Cadets have covered the following material in EOs M322.03 (Identify Components Of The Global Positioning System [GPS], Section 3), M322.04 (Identify Features Of A Global Positioning System [GPS] Receiver, Section 4) and M322.05 (Set A Map Datum On A Global Positioning System [GPS] Receiver, Section 5).

If required, complete a quick review on:

- the components of a GPS receiver,
- GPS screen pages,
- identifying the map datum from a topographical map, and
- setting a map datum on a GPS receiver.

COMPONENTS OF A GPS RECEIVER

Antenna. Allows the GPS receiver to receive satellite signals.

Screen. Location where all information is displayed.



Some GPS receivers use an arrow joystick that acts as a mouse, providing a simple to use interface with the GPS receiver.

Battery Compartment. Stores the receiver power supply.



The buttons in the following list are found on the Magellan eXplorist 200 GPS receiver. Other makes and models of GPS receivers may have different function buttons. Consult the owner's manual for GPS receiver button functions.

On/Off. Turns the receiver on and off.

Backlight. Turns the display backlight on and off and changes intensity.

Enter. Used to access highlighted menu items or highlighted page menu options.

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Escape. Cancels data inputs. Closes the accessed function and goes back to the previous screen and moves backward through the navigation screens.

Zoom In. Used on the map screen to zoom in on the map displayed. The map display can be zoomed in to 35 m (100 feet). Also used to move through the list of waypoints when using an alphabetical search.

Zoom Out. Used on the map screen to zoom out on the map displayed. The map display can be zoomed out to 2736 km (1700 miles). It is also used to move through the list of waypoints when using an alphabetical search.

Menu. Displays a menu with available options. Options may be selected by using the arrow joystick to highlight the option and pressing “enter” to access it.

NAV. Moves through the navigation screens (Map screen, Compass screen, Position screen, Satellite screen).

Mark. Used to save present position as a waypoint. Waypoints are saved and stored in “My Points of Interest” (POI).

GOTO. Creates a one-leg route from the present position to a destination selected from the POI database or by using the cursor on the background map and pressing GOTO on a point.

Arrow Joystick. Moves the cursor on the map screen. It also moves the highlighted bar to select menu options and data-entry fields.

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Thales Navigation, Inc., Magellan eXplorist 200 Reference Manual, Thales Nav, Inc. (p. 1)

Figure 1 eXplorist 200 GPS Receiver

GPS SCREEN PAGES



GPS receivers may differ in the way they present information, from unit to unit. Identify the screens that are similar to those contained in this TP.

Note: The term “Page” refers to the different screens an operator can scroll through to locate different information in a GPS receiver.

Satellite Status. The satellite status screen displays the acquisition of satellites (satellite signal strength and satellite geometry) and the progress of the collection of satellite data. The receiver is constantly monitoring satellites. The display on the satellite status page graphically depicts the activity.

As new satellites come into view, a new bar appears in the graph. Bars that were solid minutes ago disappear as satellites pass over the horizon. If a satellite is being monitored but not used, the bar will appear hollow. On Wide Area Augmentation System (WAAS) enabled GPS receivers, the WAAS satellite signal strength is indicated on its own bar on the graph. On this page it is common for GPS receivers to display the following information:

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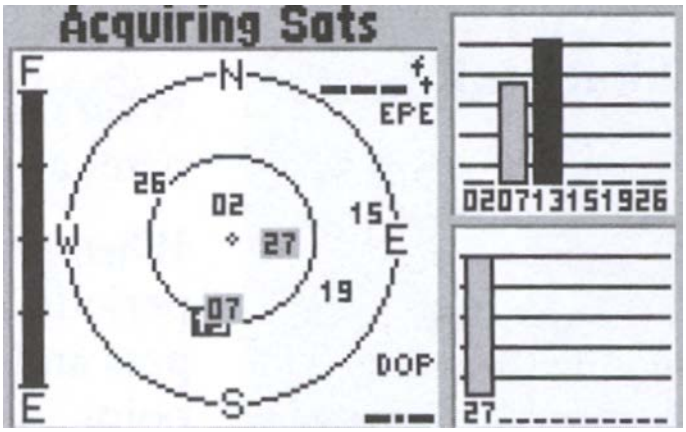
- satellite signal strengths,
- battery strength, and
- estimated position error (EPE).

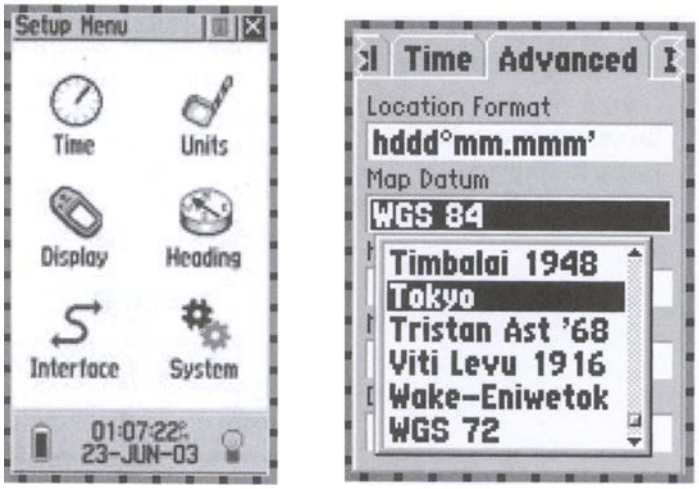


S. Featherstone, Outdoor Guide to Using Your GPS, Creative Publishing International, Inc. (p. 45)

Figure 2 Satellite Status Page

Menu. This page is used for customizing the GPS receiver. All data fields can be changed to give a person the information they require including waypoints, routes, time and speed, etc. On this page it is common for GPS receivers to display the following information:

- customization options for the GPS receiver,
- waypoints and routes, and
- map datum.



S. Featherstone, Outdoor Guide to Using Your GPS, Creative Publishing International, Inc. (p. 54)

Figure 3 Menu Page

Position. The position page is used for confirming coordinates, datum, time, date, and the EPE. This page is used infrequently, for brief periods, mostly in planning and after marking a waypoint. No easy-to-understand graphics, like a compass rose, are displayed.

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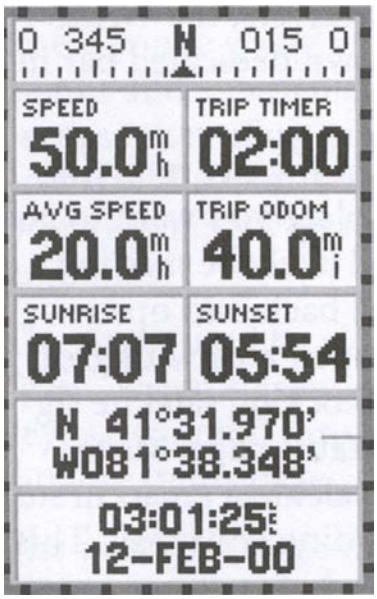
After acquiring enough satellites to begin navigating, many GPS receivers automatically go to the position page or the map page. In addition to the information mentioned above, an operator may find current speed, heading and a trip odometer. On some GPS receivers the information displayed can be changed.



S. Featherstone, Outdoor Guide to Using Your GPS, Creative Publishing International, Inc. (p. 46)

Figure 4 Position Page

Compass Navigation. This page shows the direction of travel (track) as it relates to the direction of the destination (bearing). It will show the distance from the destination and time to the destination. This page is used frequently when navigating from point-to-point and for navigating around obstacles.



The digital compass graphic should not be confused with a real compass. Although they look the same it can give a very different reading because without movement GPS receivers cannot display direction. Read the owner's manual and determine if the compass is an electronic compass capable of identifying compass heading while standing still.

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S. Featherstone, Outdoor Guide to Using Your GPS, Creative Publishing International, Inc. (p. 47)

Figure 5 Compass Navigation Page

Map. This page identifies position. A GPS without a built-in map will identify where a person is in relation to another waypoint. A GPS receiver with a built-in map will identify where a person is in relation to landmarks, such as roads, cities and bodies of water. A GPS receiver with downloadable maps will identify where a person is in relation to city streets and topographical features.

The advantage of this screen is its ability to identify the current position by looking at the features on a map rather than just the coordinates. Depending on the zoom level – which is shown at the bottom of the page – these features might be roads or cities or entire continents.

The map page allows an operator to pinpoint where one is and create a waypoint over a feature by pressing “enter” or “mark”, making route building easier. The map page can also serve as an address book. By moving the cursor over a certain waypoint and pressing “enter”, information is displayed such as phone numbers, addresses, and navigation information.

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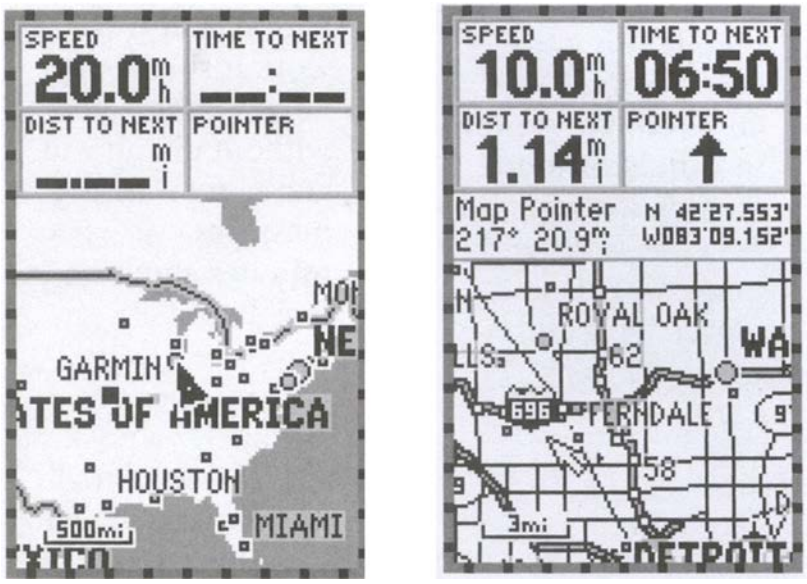

S. Featherstone, Outdoor Guide to Using Your GPS, Creative Publishing International, Inc. (p. 50)

Figure 6 Map Page

IDENTIFY THE MAP DATUM FROM A TOPOGRAPHICAL MAP

The map datum of a topographical map is located in the lower right side of the marginal information, under the conversion scale for elevations.

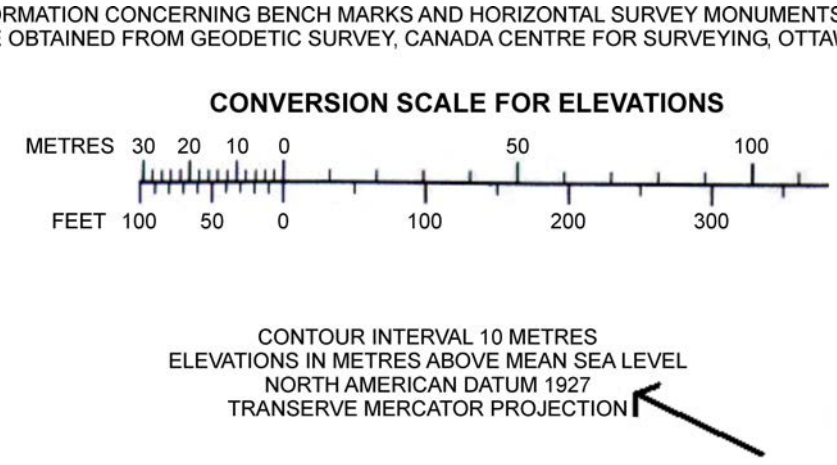

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Figure 7 Map Datum



Have the cadets locate the map datum on the topographical map.

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SETTING A DATUM ON A GPS

To set a datum on a GPS:

1. Identify the map datum of the topographical map being used as the reference.
2. With the GPS, go to the set-up menu then “navigation” then “system” or “units”.
3. Highlight the map datum’s box.
4. Scroll through the list of datums and find the map datum being used.
5. Set the correct datum.



To set the datum of the eXplorist 200 GPS receiver:

(1) Power up the receiver.

(2) Press the ENTER button.

(3) Press MENU button.

(4) Highlight preferences and press ENTER.

(5) Highlight map units and press ENTER.

(6) Highlight map datum and press ENTER.

(7) Highlight correct datum and press ENTER.

EXTRACTING A 6-FIGURE GR FROM A 10-FIGURE GR

A 10-figure grid reference given from a GPS receiver has 10 digits and is accurate to 1 m. To extract the 6-figure GR from the 10-figure GR one must understand how the figures work.

GRID REFERENCE WRITTEN FIGURES		
Definition	**Easting**	**Northing**
A 10-figure GR accurate to 1 m is written as	96779	86744
A 8-figure GR accurate to 10 m is written as	9677	8674
A 6-figure GR accurate to 100 m of the same coordinates is written as	967	867
A 4-figure GR accurate to 1 000 m of the same coordinates is written as	96	86

As illustrated in the above chart the 10-figure GR has two sets of numbers. The first five digits are eastings and the last five digits are the northing coordinates. When taking a GR from a GPS receiver is important to identify the 10 digits and extract the first three numbers from the easting portion and the first three numbers from the northing portion (eg, **967**79 **867**44). The 6-figure grid reference can then be plotted on a map as GR 967 867.

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IDENTIFYING MGRS GRID SYSTEM ON A GPS RECEIVER

The provided examples correspond to the Trenton, Ont., 1 : 50 000 map, # 31 C/4. The map datum for this map is NAD-27.

These examples should be reproduced using a GPS receiver and a local topographical map of the area. This will provide cadets with realistic examples and hands on experience.

Ensure that the GPS receiver coordinate system is set to Military Grid Reference System (MGRS).

GPS receivers will identify the MGRS coordinates when reading location, to include:

- grid zone designator,
- 100 000 m square identifier, and
- GR.

GPS receivers, depending on the make and model, are capable of selecting a MGRS accuracy of four-, six-, eight-, and ten-figure GRs. If the GPS receiver being used for this TP is enabled with this capability, it is suggested that it be set to a six-figure GR.



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Figure 8 GPS Receiver Coordinates

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The coordinates displayed on the GPS receivers in Figure 8, are set to MRGS. Each GPS receiver is set with a different datum for the same location.

GPS Receiver Datum Set to NAD-27	GPS Receiver Datum Set to NAD-83
The coordinates are identified as: • grid zone designator – 18 T, • 100 000 m square identifier – TD, and • 10-figure GR as – 96785 86748	The coordinates are identified as: • grid zone designator – 18 T, • 100 000 m square identifier – TP, and • 10-figure GR as – 96830 86973

Note the difference between the coordinates of the same location using a different datum.

PROCESS FOR CONFIRMING CORRECT MGRS COORDINATES

MGRS coordinates allow a GPS receiver to work in conjunction with a topographical map. To confirm the MGRS coordinates correspond with the topographical map the user will have to:

1. Identify the MGRS grid system on the topographical map.
2. Locate the grid zone designator.
3. Confirm the 100 000 m square identifier.

Identifying MGRS Grid System on a Topographical Map

Locating the MGRS grid system on topographical maps provides the navigator with another method to confirm the GPS receiver is reporting coordinates that correspond with the map being used. If the coordinates are different, the navigator will know that the GPS receiver is set to another datum and will have to be adjusted to provide the correct coordinates.

Locating the Grid Zone Designator

The location of the grid zone designator is found in the marginal information. The zone for the example in Figure 10, is 18 T.

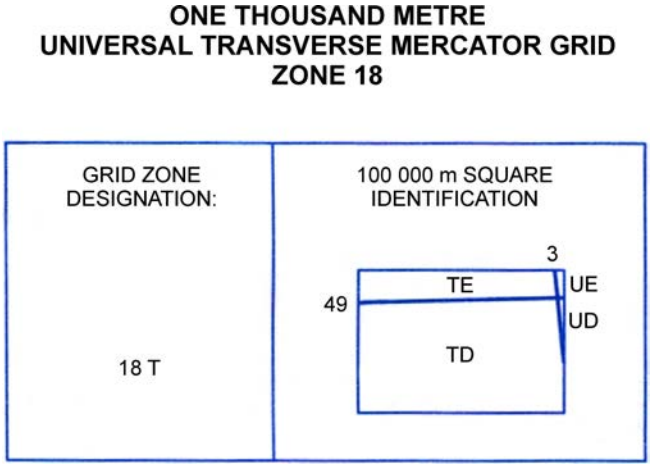

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Figure 9 Grid Zone Designator

13-M322.06-11

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Confirming the 100 000 m Square Identifier

The 100 000 m square identifier is located in the same marginal information area as the grid zone designator. The example in Figure 9 states that the map is adjacent to the 100 000 m square identifications UE and UD. Additionally, the 100 000 m square identifier on a topographical map joins an adjacent grid zone, the identifier will be noted on the map in the 00 00 grid square. This is illustrated in Figure 10.

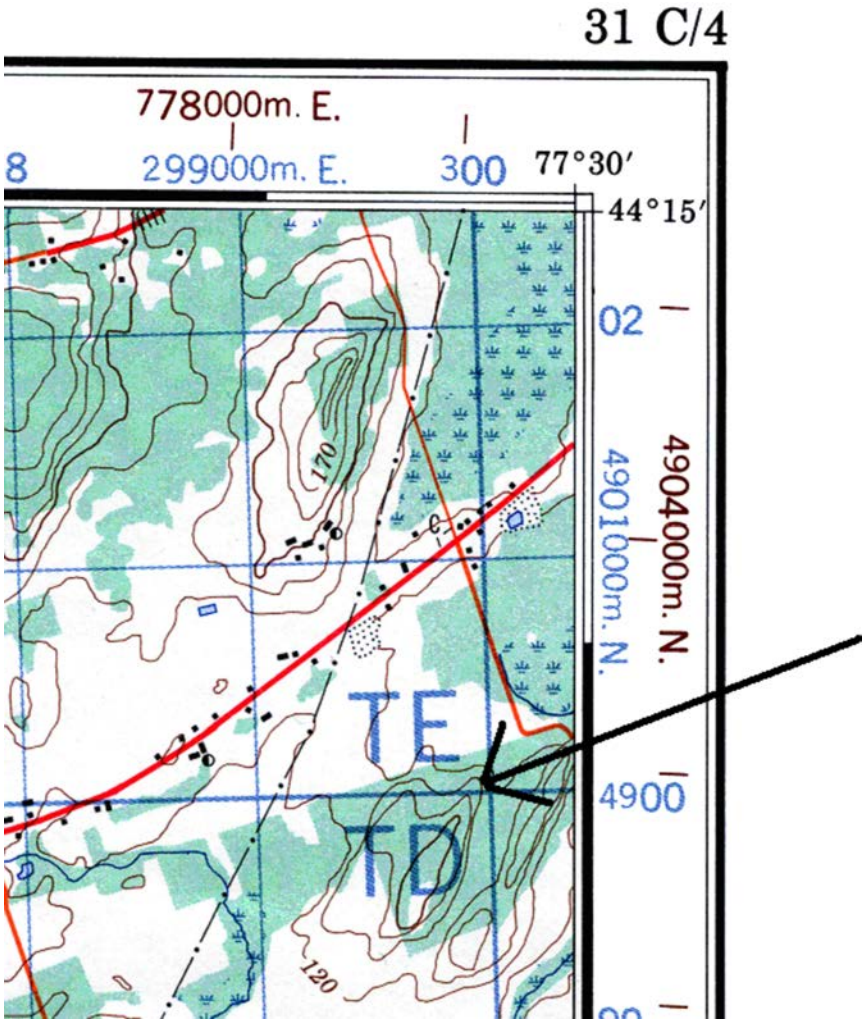

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Figure 10 Topographical Map 100 000 m Square Identifier

ACTIVITY

OBJECTIVE

The objective of this activity is to have the cadets identify location using a GPS receiver and plot that position on a topographical map.

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RESOURCES

- GPS receiver,
- Topographical map of the area,
- Compass,
- Pen/pencil,
- First aid kit, and
- Communication equipment.

ACTIVITY LAYOUT

1. Prepare a route along Class 1 or 2 terrain that does not exceed 6 km (3.7 miles).

2. Along the route mark off six specific checkpoints. Record the six-figure GR off of the topographical map and the 10-figure GR from the GPS for every point.

ACTIVITY INSTRUCTIONS

1. Divide the cadets into groups of no more than six.

2. Assign each cadet in the group one of the six checkpoints.

3. Have each cadet lead the group to their designated checkpoint navigating with a topographical map.

4. Before moving to the next sequential checkpoint, have the designated cadet identify their current location using a topographical map through a six-figure GR.

5. At the checkpoint have the cadet identify position using a GPS receiver, to include:

    a. confirming the correct map datum is set on the GPS receiver,

    b. locating the geographical position page on the GPS receiver and confirm:

        (1) grid zone is the same as printed on the topographical map,

        (2) the 100 000 m square identifiers are the same; and

    c. reading the current 10-figure GR and extracting the 6-figure GR; and

    d. plotting the 6-figure GR on the topographical map of the area.

6. Confirm the plotted six-figure GR corresponds with the assigned checkpoint.



Remember that a 6-figure GR is accurate to 100 m. The plotted GR should be within 100 m of the actual group location.

SAFETY

Communications and emergency first aid equipment shall be carried with each group in case of emergency.

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CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

This EO is assessed IAW A-CR-CCP-703/PG-001, Chapter 3, Annex B, Appendix 5 (322 PC).

CLOSING STATEMENT

Being able to use a GPS receiver to identify position and plot that position on a map provides the the cadet a secondary means to confirm position and backs up the location of the cadet in the case of a GPS receiver failure.

INSTRUCTOR NOTES/REMARKS

322 PC shall be scheduled on the weekend bivouac/survival FTX.

The route will consist of Class 1 or 2 terrain and will not exceed 4 km (2.5 miles).

REFERENCES

A2-036 A-CR-CCP-121/PT-001 Director Cadets 3. (2003). *Royal Canadian Army Cadet Reference Book*. Ottawa, ON: Department of National Defence.

C2-143 (ISBN 1-58923-145-7) Featherstone, S. (2004). *Outdoor Guide to Using your GPS*. Chanhassen, MN: Creative Publishing International, Inc.

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