


PERIPHERAL OVERLAY DISPLAY: OPERATION TRAINING MANUAL

POD SOLDIER SYSTEMS MANUAL

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1 Overview

The Peripheral Overlay Display (POD) is an integrated upgrade for the AN/PVS-14 and BNVD-1531 that brings mission-critical information to the operator in the form of a simple Heads-Up-Display (HUD) without obscuring the central vision span [FCC ID Pending: XXXPOD-PVS14]. The overlay fuses an ultra-low-power monochrome display and associated driving electronics with an L3Harris Image Intensifier without changing the baseline system's dimensions. When paired with the user's personal electronic device, this internal module adds heading and GPS information, waypoint tracking, route navigation, and text delivery to the upper portion of the Field-of-View (FOV).



(1a) The green display demo



(1b) The amber display demo

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2 Display Layout

The Peripheral Overlay utilizes a 320 x 240 resolution micro-display in either monochrome amber or green. When displayed in an I2 device, this results in an 8° x 3.6° coverage at approximately 12° above the center of the image. The display will default on when the system is first powered on but can be turned on or off when connected to the Android Application on the End-User-Device (EUD). The layout of the display is broken down into five key segments:

1. Heading
2. GPS Position
3. Compass Tape
4. Waypoint & Route Data
5. Text Notifications or Commands

These segments are shown in Figure 2 below. The heading, represented as degrees away from North, is shown in the upper left and is tied to the heading indicator in the center of the compass tape. The GPS position is shown on the same line in the upper right corner; this data can be turned on or off via the connected Android App. The compass tape is always on (when display is active) and immediately below the top line. Further details are found in the detailed section below. The Waypoint and Route data consists of three lines of text below the compass tape. When more than three waypoints are active, the data will cycle through all data at a set time interval. Finally, the bottom line of the display is reserved for text notifications or commands sent from the Android App on the EUD.

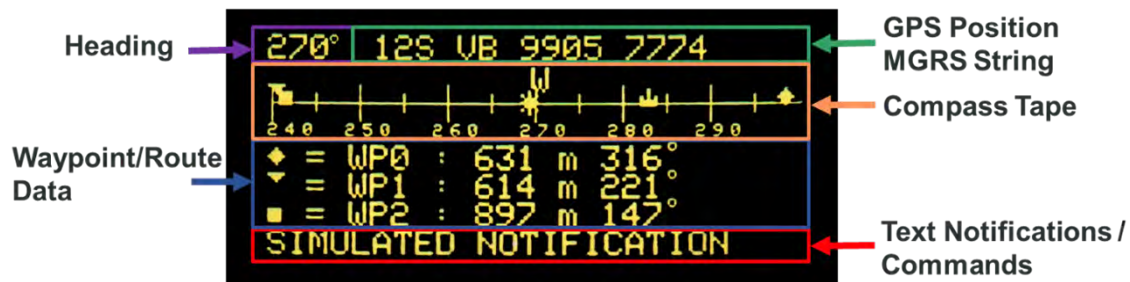


Figure 2: Fully populated Display with labels

2.1 Compass Tape Layout

The compass tape shows a full 60° from edge to edge. This is of course more than the FOV of the display and even the full FOV of the night vision image itself. This is therefore a compressed angular representation of a 60° wedge in front of the operator. All waypoints outside of this 60° wedge will be shown at the edge of the tape indicating its relative position as greater than a 30° delta to the operator's left or right. As all active Waypoints will be shown on the tape, the edges can become cluttered when a significant amount of Waypoints are added. Waypoints can be saved but disabled in the Application to prevent them from appearing on the display when not desired.

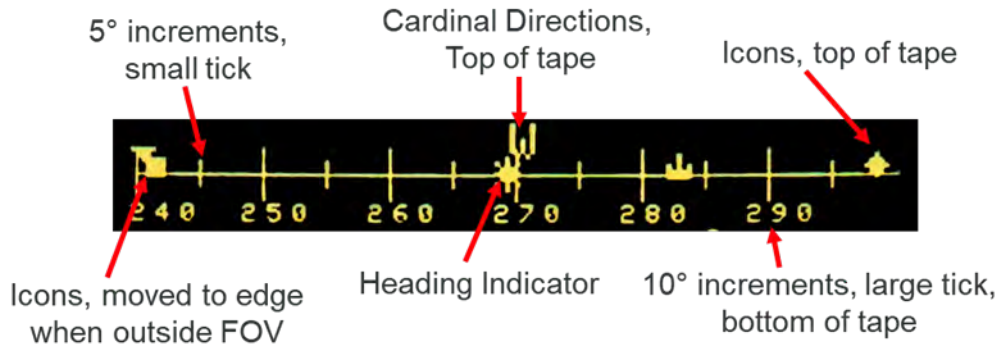


Figure 3: The compass tape: 60° shown from edge to edge; compressed compared to actual FOV

2.2 Waypoint / Route Layout

The layout of the Waypoint and Route data is divided into four main sections. The represented icon from ATAK will be displayed on the far left. Next, the waypoint name; which can be truncated depending on name length. And finally the distance and heading sections. When the distance to the waypoint is less than 1 km, it will be shown in meters.

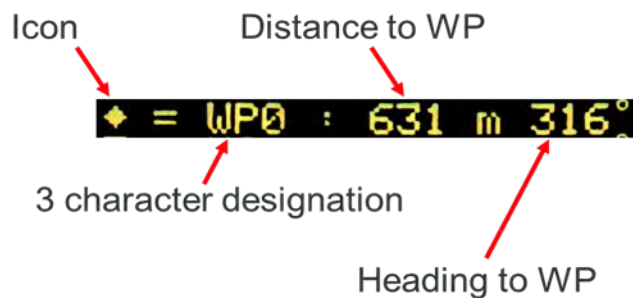


Figure 4: Waypoint Display labeled

3 EUD Application Installation

Along with the POD, the operator will have received files that will allow installation of Soldier Systems. This is an L3Harris Android app that will serve as the interface to connect and communicate with the POD while supporting ATAK integration.

3.1 Package Installation

Once the files are on the device, the .APK (Android Application Package) files will need to be located to begin your installation. There are two APK files along with ATAK that are needed for the POD system to work with the EUD:

1. ATAK (Android Team Awareness Kit) (if not already installed)

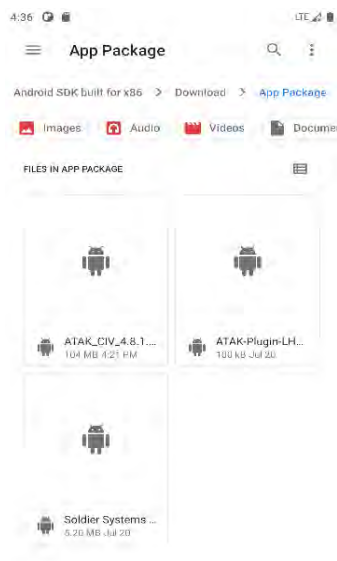
Android Team Awareness Kit is an Android smartphone geospatial infrastructure and military situation awareness app, that can be downloaded from the Google Play Store. It allows for precision targeting, surrounding land formation intelligence, situational awareness, navigation, and data sharing.

2. ATAK-LHX-HUD Plugin

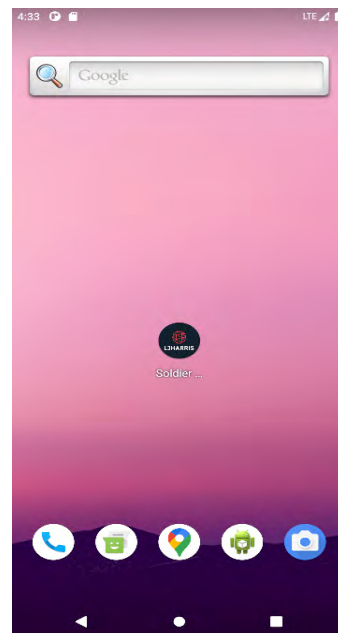
This plugin will allow for the ATAK to communicate with POD, via the Soldier Systems app.

3. Soldier Systems Manager

This app functions as the user's interface to the POD, and is used for the initial connection and POD settings.



(5a) The files can be located through the EUD file browser, often within internal storage



(5b) Soldier Systems App on Device

The file locations are user selected, however as shown in 55a, they can often be found using the EUD file browser within internal storage. Once the files are located, click on each file to begin the installation; then, open the ATAK app to activate the plugin.

3.2 LHX Plugin Activation

After installation, the first time ATAK is opened there may be prompts to give it the correct permissions and accept the ATAK End User License Agreement (EULA). **Note that some app functions rely on certain permissions to function properly. Please refer to the ATAK documentation for more details.**

In order for the POD to interface with TAK the LHX Plugin must be activated, and enabled. The plugin menu can be accessed through the drop down if it is not present on the hotbar at the top, as shown in Figure 6.



Figure 6: The plugins menu can be reached by clicking the menu drop down and locating the "Plugins" icon.

Within the plugin menu, locate the LHX HUD Plugin, and activate the check box under the status column to load it in, and accept the prompt shown in Figure 8. If you do not see the LHX HUD Plugin depicted in Figure 7, please ensure that it was installed along with the other files in Section 3. Otherwise if the availability is incompatible, please check the installed version of ATAK.

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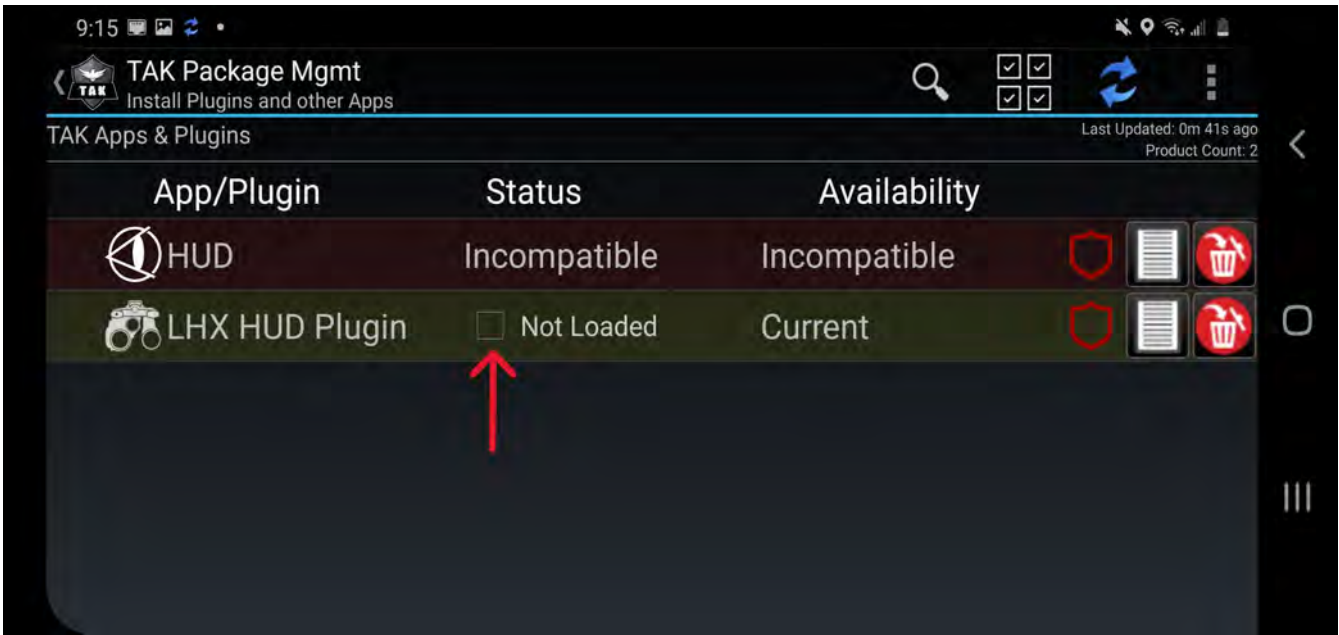


Figure 7: Activating the checkbox on the LHX HUD Plugin will activate the prompt to load the plugin into ATAK.

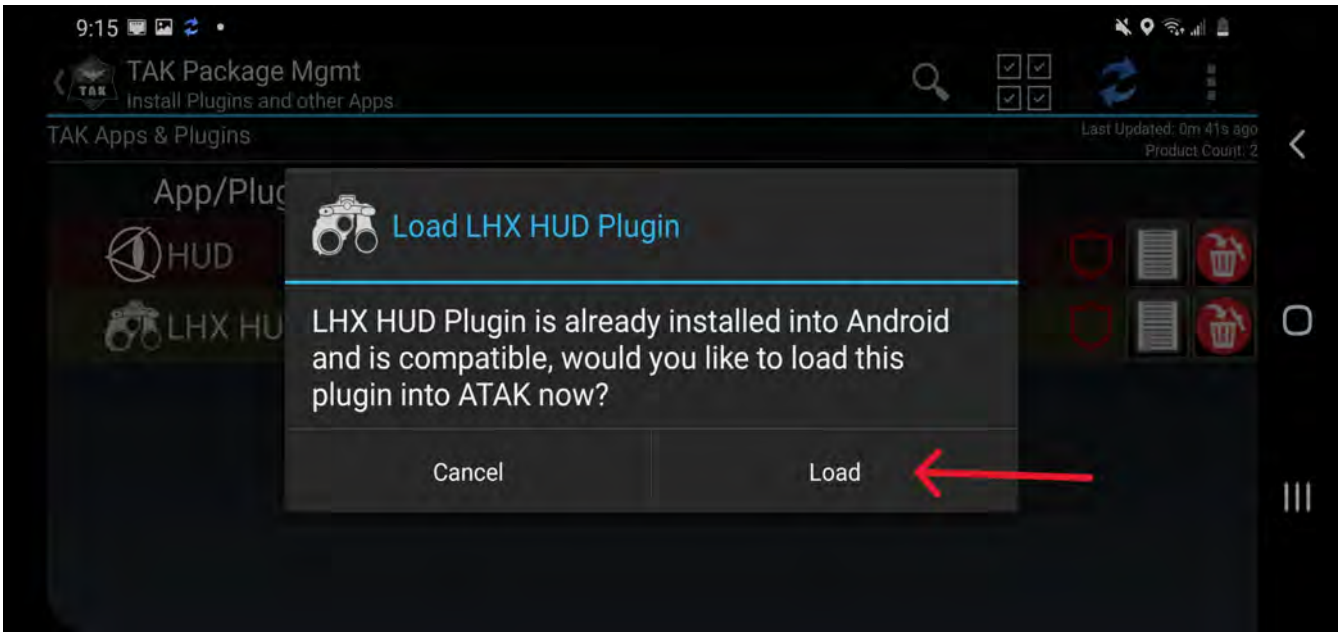


Figure 8: By clicking Load, the POD will be able to communicate with ATAK

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4 Soldier Systems Manager

4.1 Connecting to the Device

When the Soldier Systems App is opened for the first time, the home page in Figure 9a will be shown. Ensure that location services are enabled on the EUD, as they are needed for Bluetooth scanning. The primary use of the home page is to display the connected devices and allow the user to connect new ones. Here there are several features:

1. Navigational Tabs

These two tabs allow for the operator to move between the Device and Network overlay, both of which are able to connect new devices.

2. Settings

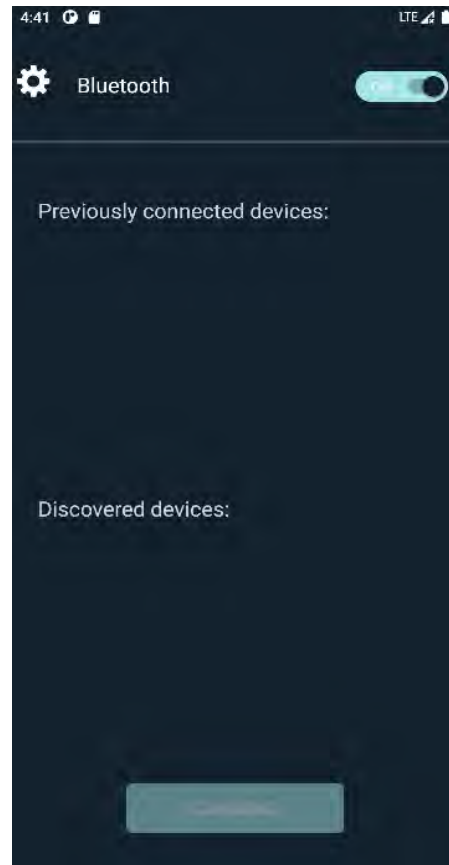
This button will display relevant app information like software version.

3. Device Window

Connected devices will be displayed here.

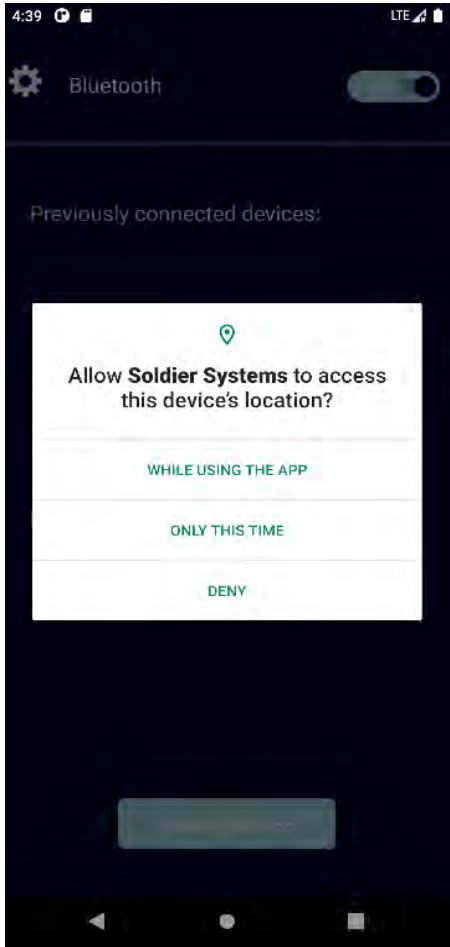


(9a) Soldier Systems Home Page

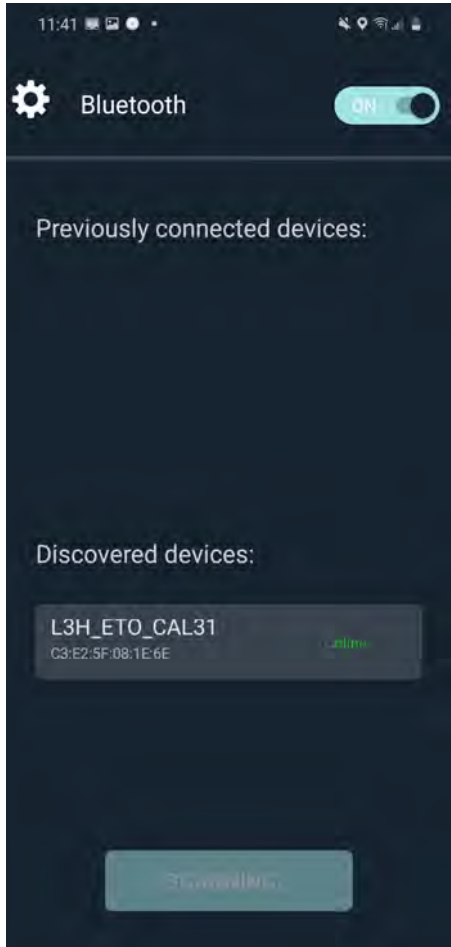


(9b) Scanning for Devices

To connect a POD system click the "ADD DEVICES" button, then the Bluetooth option, which will display the Bluetooth connection page. This page can also be accessed by clicking on Bluetooth from the Network Overlay. Once on this page, location access will be needed "while using the app" and using the "SCAN DEVICES" button will begin searching for a POD to connect. Once successfully found the POD will appear on the page and can be connected by clicking on the name in the "Discovered devices" section as shown in Figure 10b. This will only need to be done for the first time that the POD is connected to the EUD. Soldier Systems will attempt to auto connect when it recognizes a previously connected device.



(10a) Give the app permissions

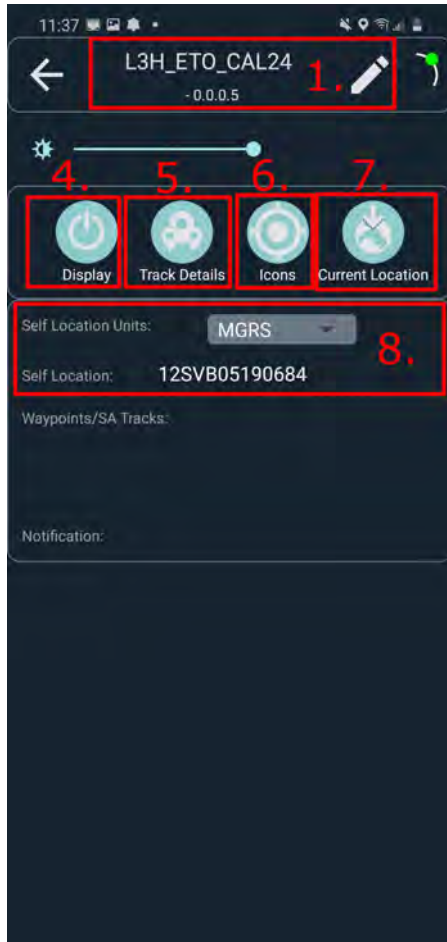


(10b) Device Found

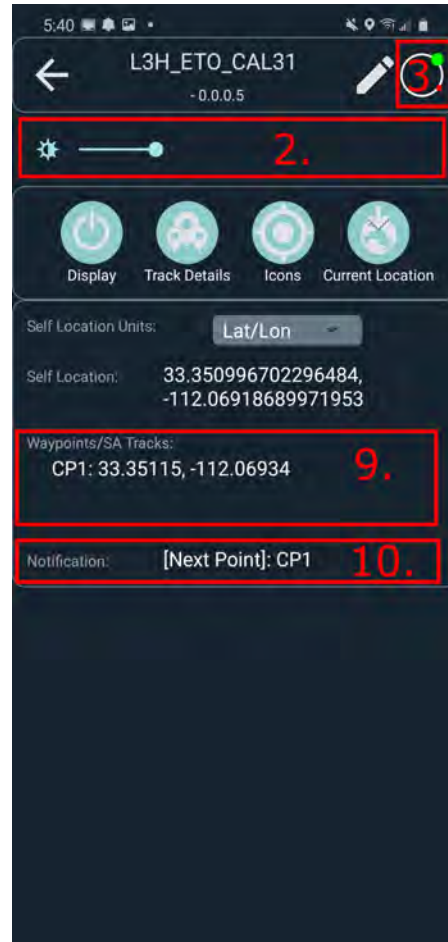
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4.2 POD Interface

Once a POD System is connected through the application, the POD control page, as shown in Figures 11a and 11b, will appear with functionality for displaying and controlling information relevant to the POD.



(11a) Location Displayed



(11b) Extended Display Notifications

1. Device Naming


Renaming the POD system will change the name that appears in the Bluetooth connection window once the POD is forgotten and reconnected to the system.

2. Brightness control

Adjusts brightness level of display directly; default level is 50% allowing for room to increase or decrease brightness. Significantly more range exists than what is currently implemented. Total range will be increased in future revisions to ensure there is enough range to prevent washing out in brightly lit environments.

3. Device Connection Indicator

This indicator in the upper right hand corner of the screen provides a visual indication

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of the connection status with the display. When connected, a green circle will appear and the white ring will spin indicating commands being sent.

4. Display

This toggle button allows the operator to turn the display on or off. All data is saved within the phone and connection is maintained.

5. Track Details

This toggle button allows the operator to display or not display the Waypoint data entered within the application.

6. Icons

This toggle button allows the operator to display or not display the current Icons on the compass tape.

7. Current Location

This toggle button allows the operator to display or not display the current GPS location above the compass tape.

8. Self Location Notation

The drop down text menu in this section will allow the operator to display their self location using Latitude/Longitude format or MGRS format.

9. Waypoints/SA Tracks

This area will display your relevant waypoint and situational awareness track information that are activated by ATAK, such as: routes, waypoint names, and location information.

10. Notification

This section will echo text notifications, such as messages and route information, that are sent to the POD system from ATAK or commanded from other future networked devices.

4.3 GPS Notation and Accuracy

The GPS location of the operator is taken from the EUD. Therefore the resolution of this data is driven by the accuracy of the device in question. For a standard phone, this is typically accomplished with Assisted Global Positioning System (AGPS) which also relies on assistance from cell tower locations to provide a more accurate position. The GPS information comes from ATAK, therefore the operator is able to supply that information to source from through alternative means, however default is the standard phone method.

GPS information can be presented in either Lat/Long or MGRS format through selection in the Soldier Systems app. There is a truncated self position that can be displayed on the POD using the current location function, however the extended coordinates can be found the Soldier Systems App.

4.4 Renaming the Device

The POD can be renamed after connecting by using the pencil icon on the top right of the app. This will open a prompt as seen in Figure 12, and a new name can be entered. After renaming the device, upon the next power cycle, the renamed device can be connected to again by removing

the device (Section 4.5), and then following the steps in 4.1.

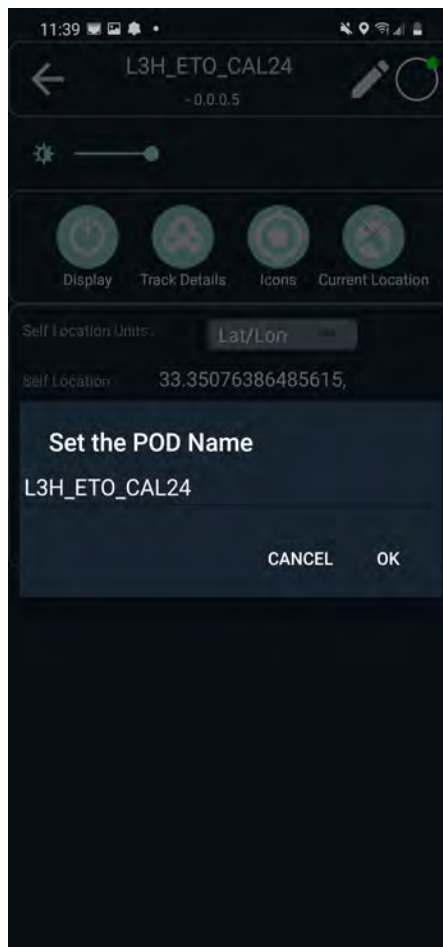


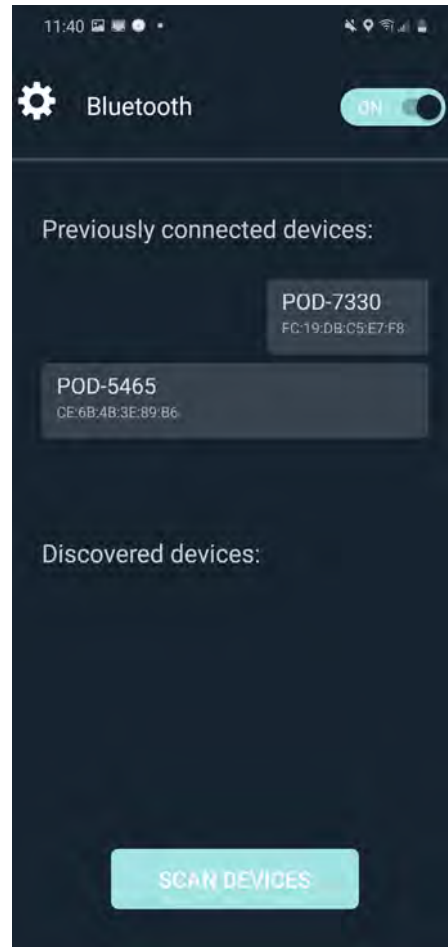
Figure 12: Renaming Device

4.5 Removing a Device

A previously connected POD system can be removed by first navigating to the network tab on the Soldier Systems home screen then clicking the Bluetooth button. This will take you to the screen shown in Figure 13a, which will display a list of the names and MAC addresses of devices previously connected. To forget one of these devices, slide the device to the right side of the screen, and you will be prompted to delete the device.



(13a) Previously connected devices will appear here



(13b) Devices can be removed by swiping right

5 ATAK Usage

For detailed information on how to operate and navigate the Android TAK software, see [CivTAK documentation](#).

5.1 Maps

Maps in ATAK are able to be loaded and cached in advance while there is a data connection (WiFi/cellular). This can be done by clicking on the map icon, selecting a map type, and then zooming in on the areas that you wish to pre-load. Those areas will be stored into cache, and will be available with whatever fidelity the map had when it zoomed. The more an area is enlarged for loading, the better it will be loaded for when the device is offline.

5.2 Waypoints

Waypoints are a way to mark special points of interests, and track them via the POD. Using a variety of shapes and adding a custom name will allow the operator to categorize and distinguish one waypoint from another when visualizing through the POD. Section 2.2 has details on how this information is presented to the operator.

5.2.1 Waypoint Creation

To create a new waypoint on the map select the add waypoint icon as indicated by the red arrow in Figure 14, which will bring up a menu in which you can assign a custom waypoint name or prefix as in Figure 15.

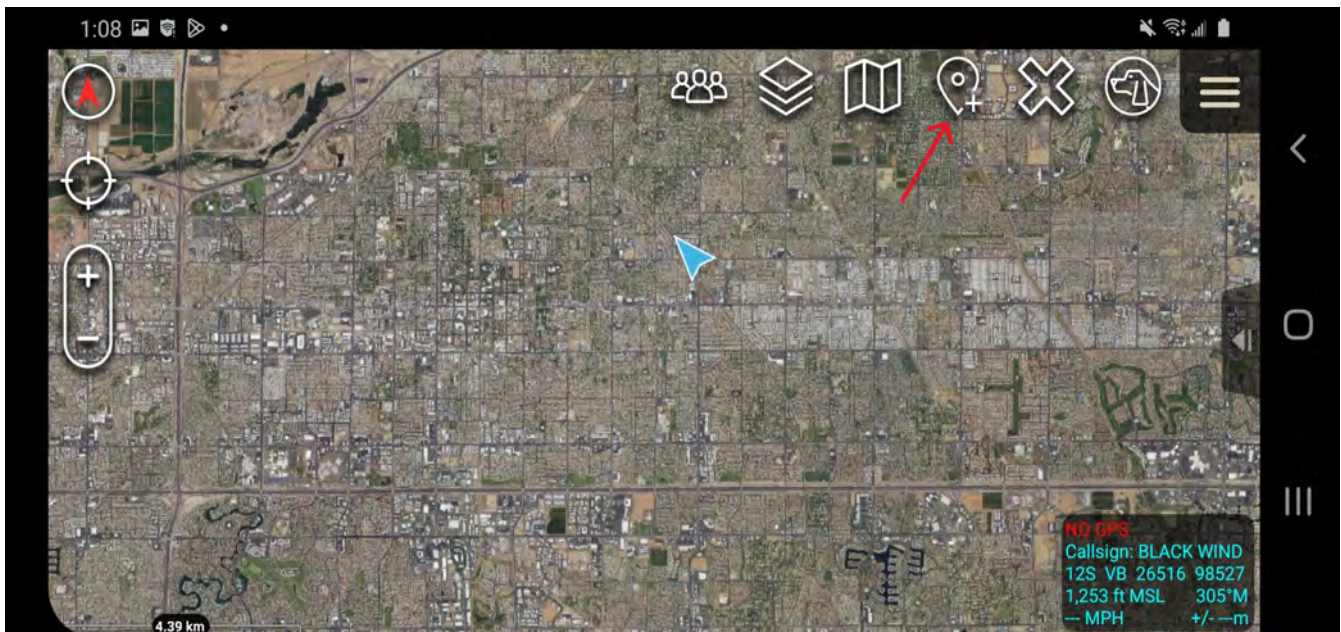


Figure 14: Add waypoint icon

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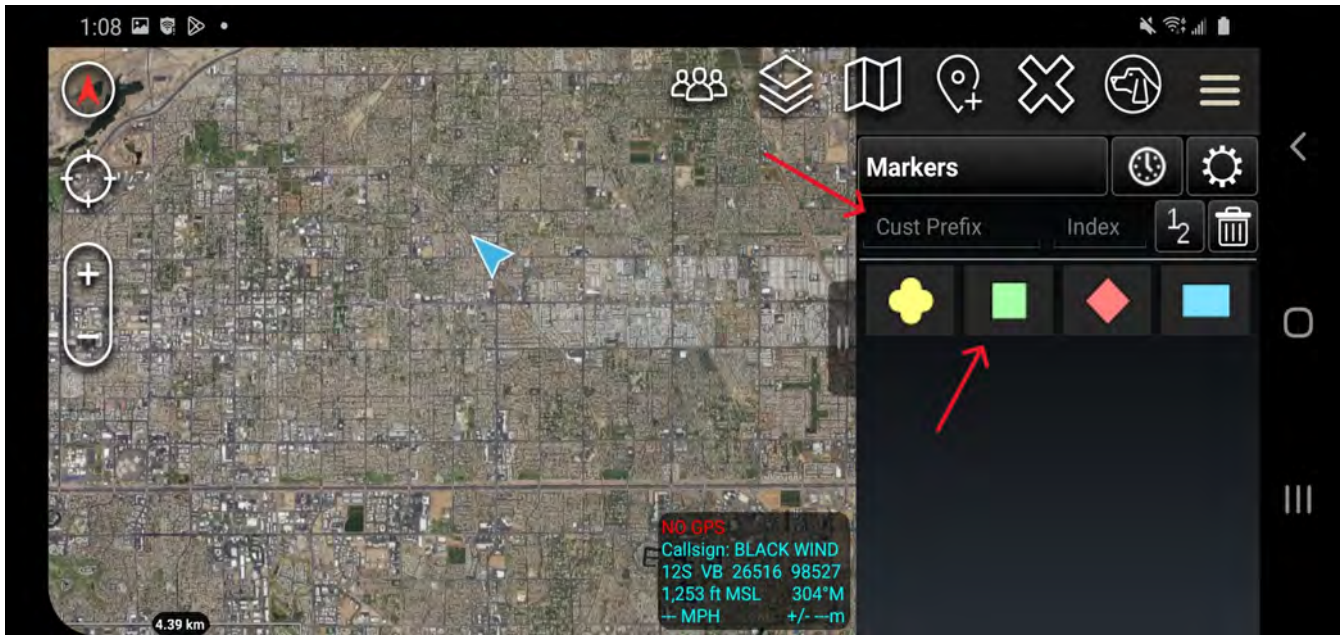


Figure 15: Edit waypoint menu

After selection of a waypoint icon and name, tapping on the map will place the waypoint at that location, or alternatively long pressing will allow for specific coordinates to be entered for the waypoint. Once the waypoint has been created it will appear on the map at the location it was placed. On the display, once the waypoint is in view the POD will show the selected waypoint icon, name and heading as described in section 2.2.

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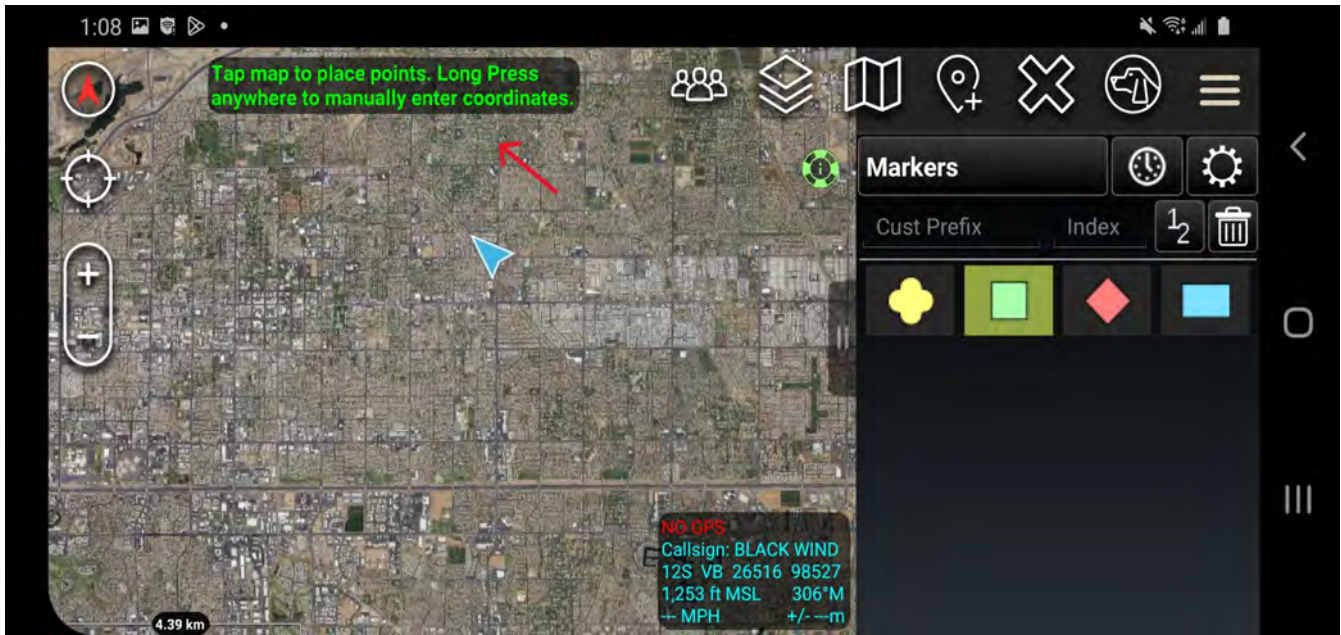


Figure 16: Placing a waypoint

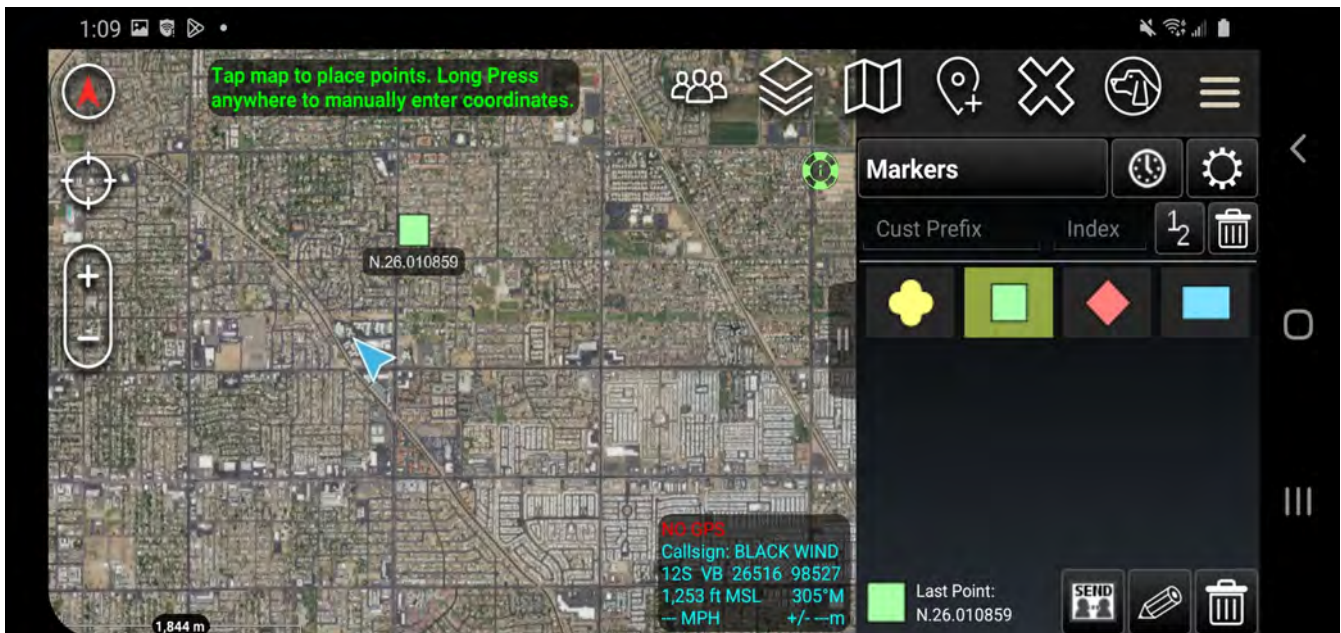


Figure 17: The waypoint will appear on the map with the icon that was selected

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5.2.2 Removing a Waypoint

To remove a singular point on the map, press and hold on the point to bring up the radial menu as shown in Figure 18. Selecting the "trashcan" icon at the bottom most point, will prompt the operator to confirm deletion of the point before removing it from the map.

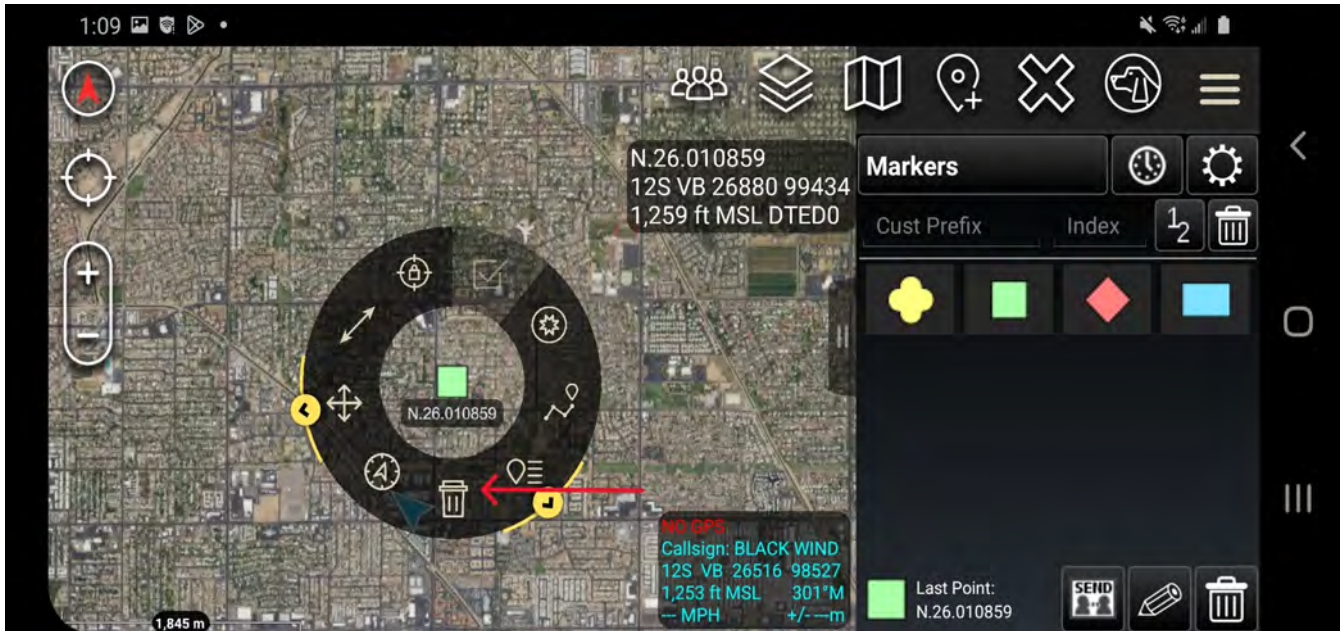


Figure 18: Removing a singular waypoint

5.2.3 Removing All Waypoints

To remove multiple points on the map, start by accessing the overlay manager. Next, press the multi-select icon and choose the delete action, before selecting the markers category and clicking the delete icon as demonstrated in Figures 19-22.

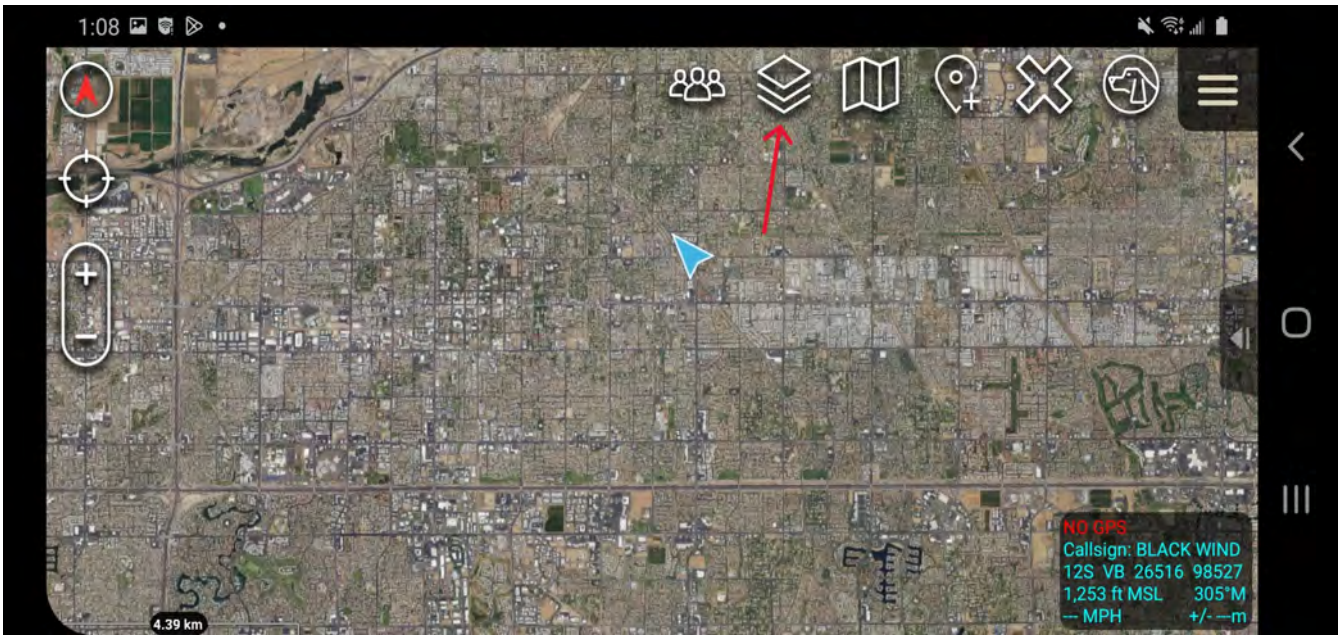


Figure 19: Select the Overlay Manager Icon.

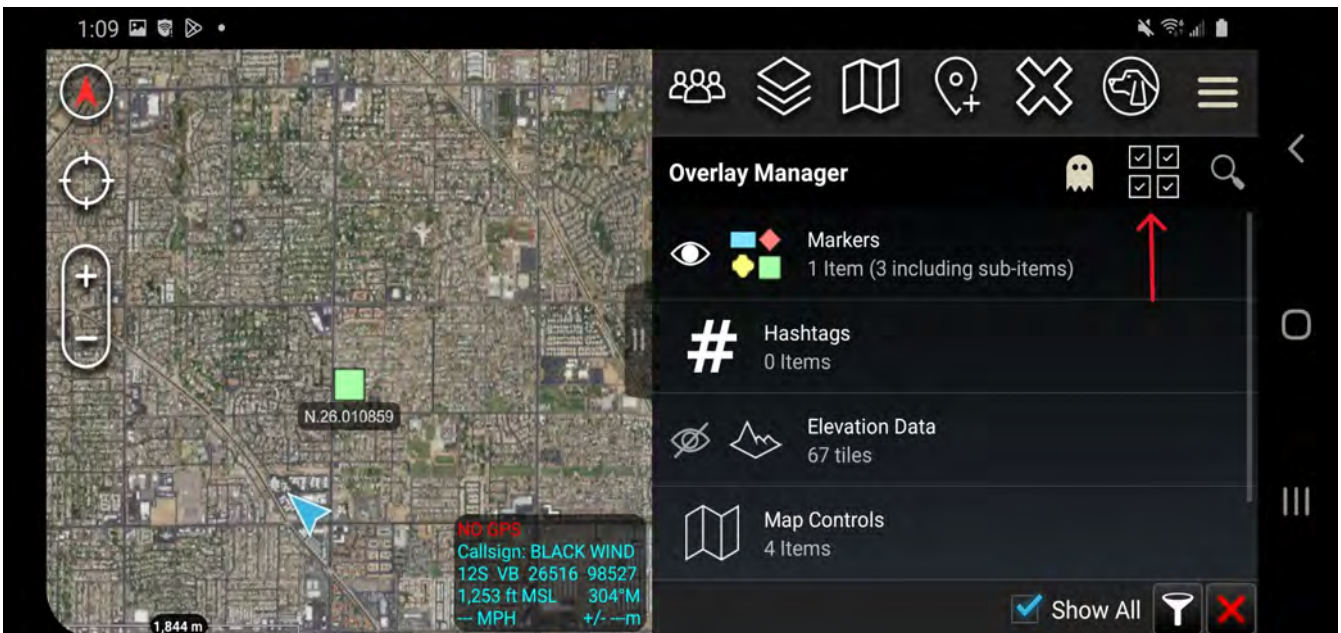


Figure 20: The four boxes with the check marks represent the multi-select action icon.

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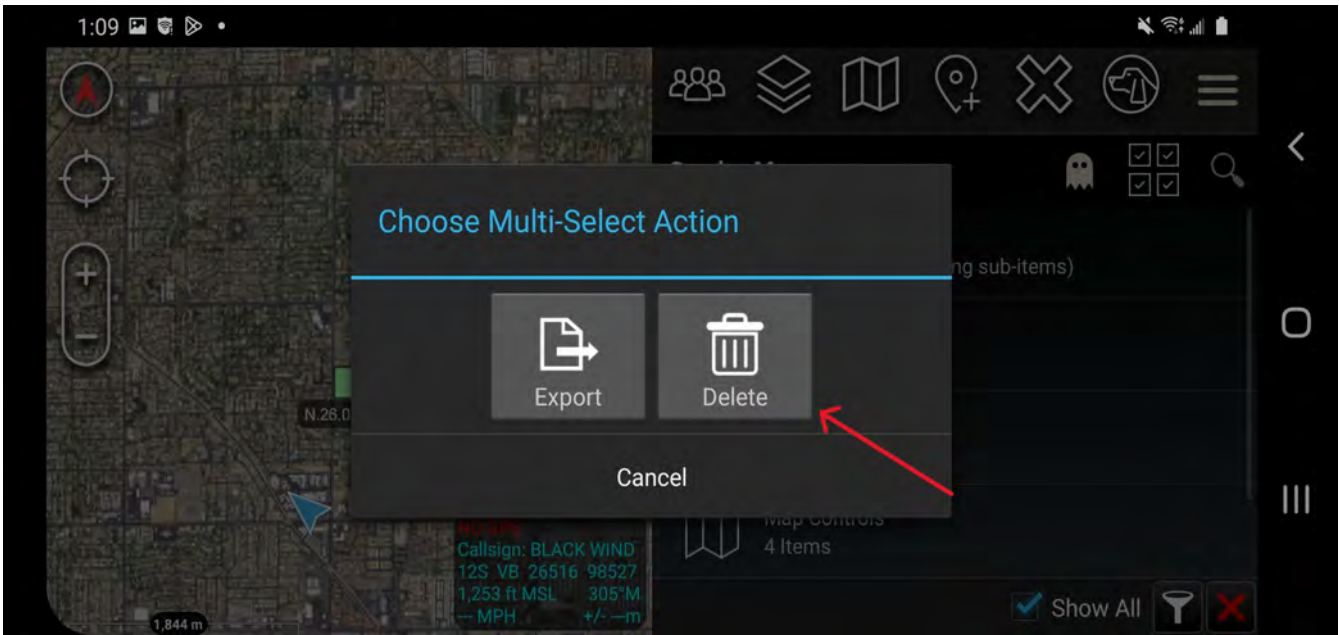


Figure 21: There are multiple actions that the multi-select icon can perform. The action that is selected will apply to all categories afterwards.

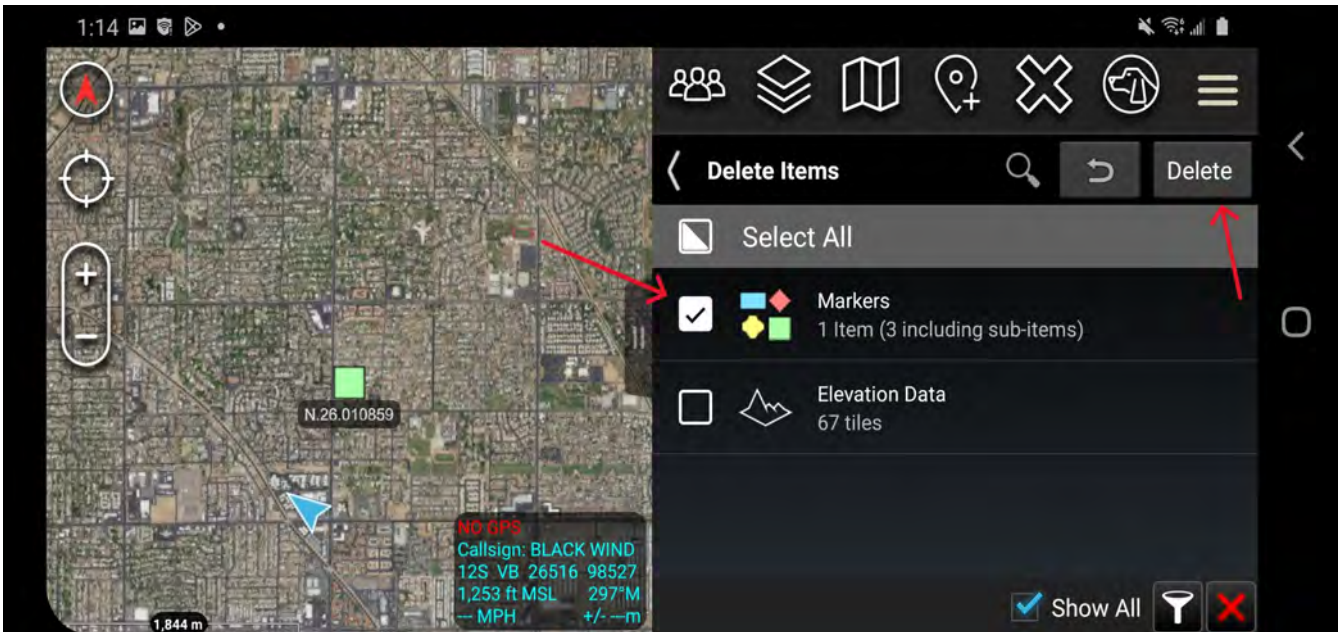


Figure 22: The category that is selected will delete all items in that category, for example selecting navigation would delete all routes.

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5.3 Routes

Routes are a way to set up ordered navigational checkpoints that can be used to allow the operator to be guided visually through the POD.

5.3.1 Route Creation

To create a route, first locate and press the route icon as indicated in Figure 23, followed by the add new route button as depicted in Figure 24.

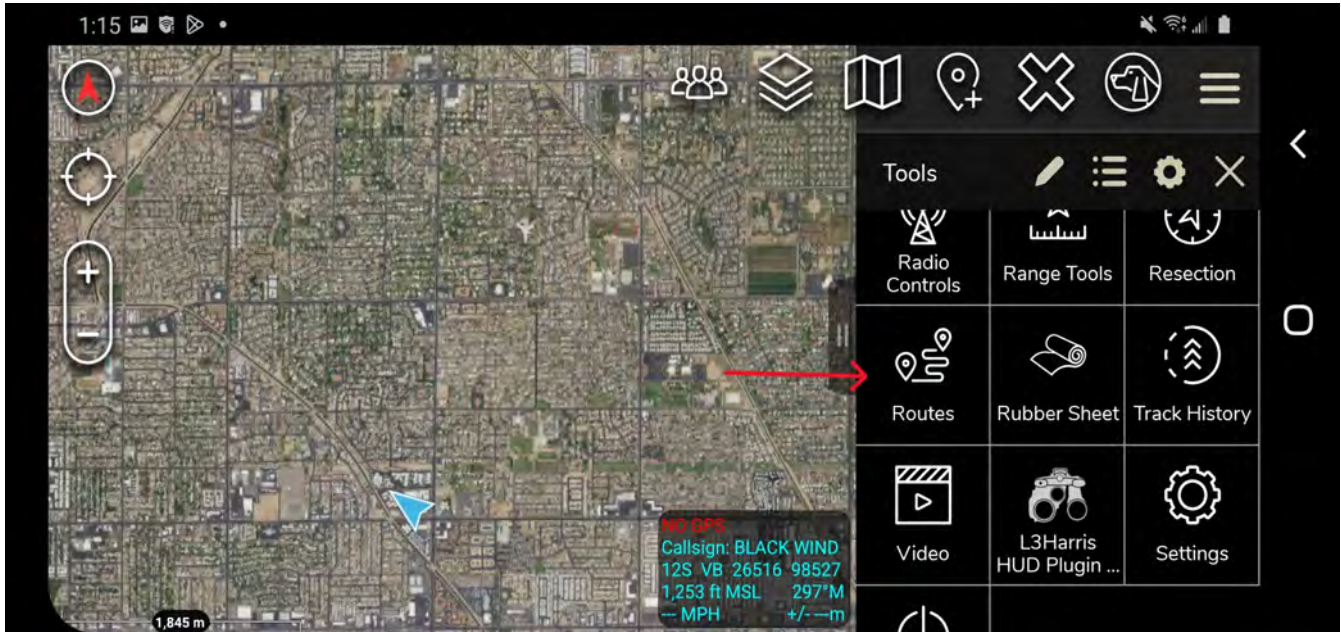


Figure 23: The create route button, indicated by the red arrow, can be found within the icon bar

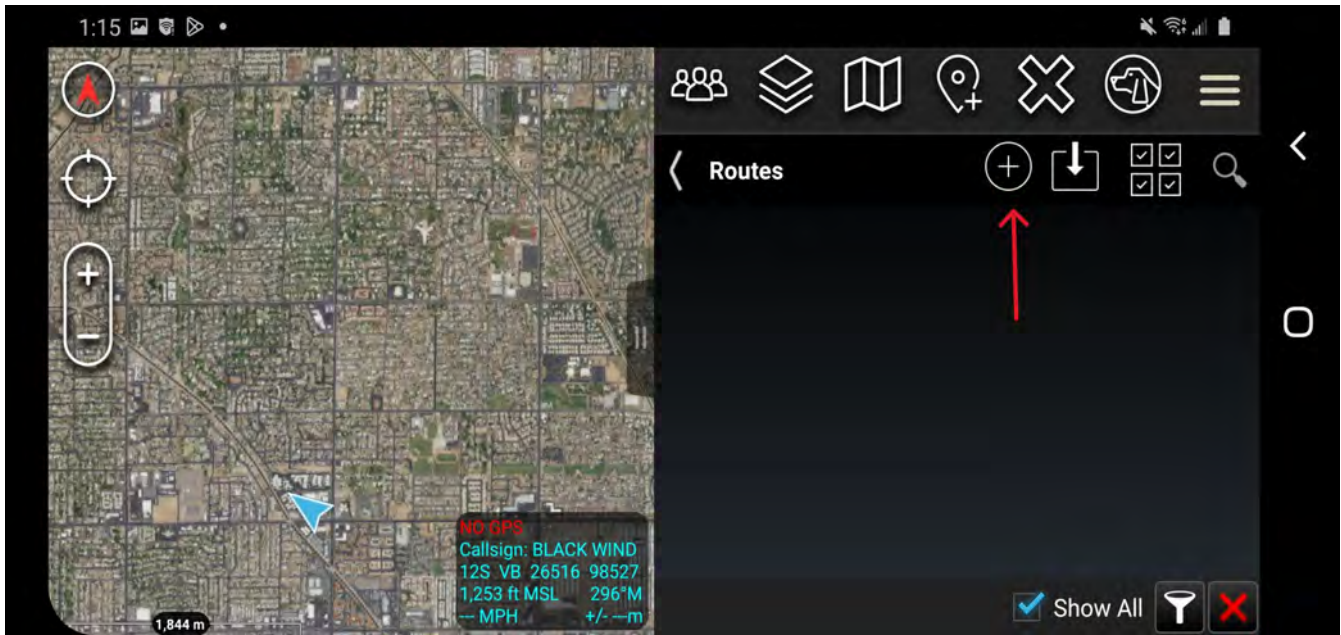


Figure 24: The add route button in the top right hand corner will begin the prompts to create a new route.

The next selection will prompt the operator to select the route type, or navigation method. Selecting the route type will help configure route accuracy settings with how close the operator will need to be to the waypoint for it to register. For more information, refer to the TAK documentation.

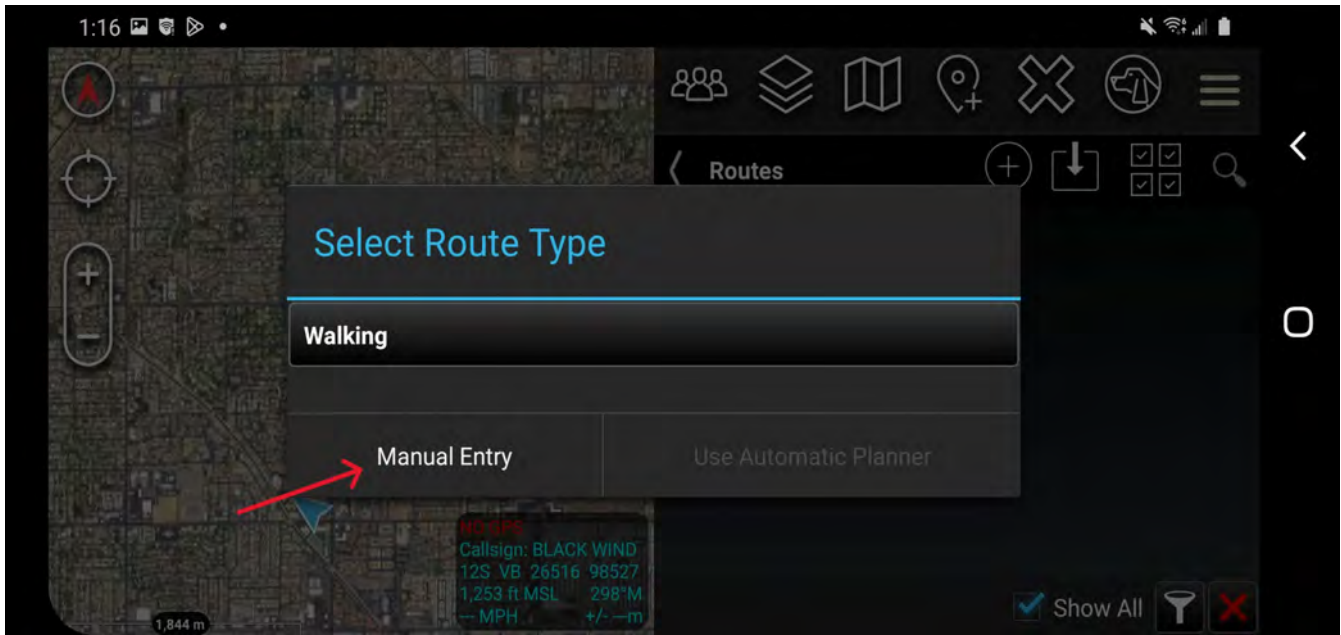


Figure 25: The route type selection menu allow for accuracy configuration, the specifics for the type can be adjusted through the settings.

After selecting the type the operator can begin to map the route on the EUD, by tapping the location of the start point on the screen for manual entry of route points. The first marker placed will be the start point, and any subsequent taps will allow for a path to be created. To add checkpoints along the route, long press (instead of tap) a location. The last point on the route will be marked "VDO" by default, and any checkpoints in between will be labeled "CP#" where # is their order along the route. Pressing "end" will finalize the route.



Figure 26: Checkpoints on along the route can be created with a long press. Otherwise normal presses will allow for controlled path points.

5.3.2 Navigating a Route

Starting route navigation will allow for the route to become active on the POD, while also giving control to toggle through checkpoints and have audio guidance to accompany the visual displayed on the POD. To begin navigation access the route icon, and find the route to be activated. Once located, click on the drop down on the route and press on the green flag to start navigation as shown in Figures 27 and 28.

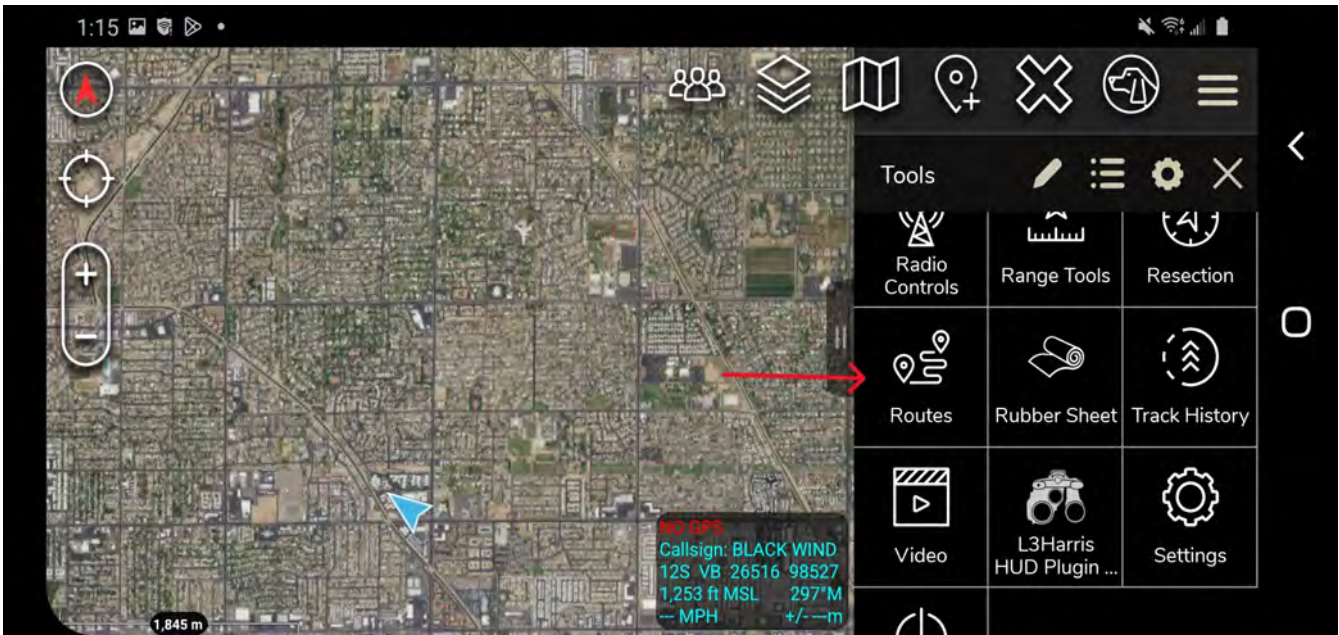


Figure 27: Open the route menu to see all available routes

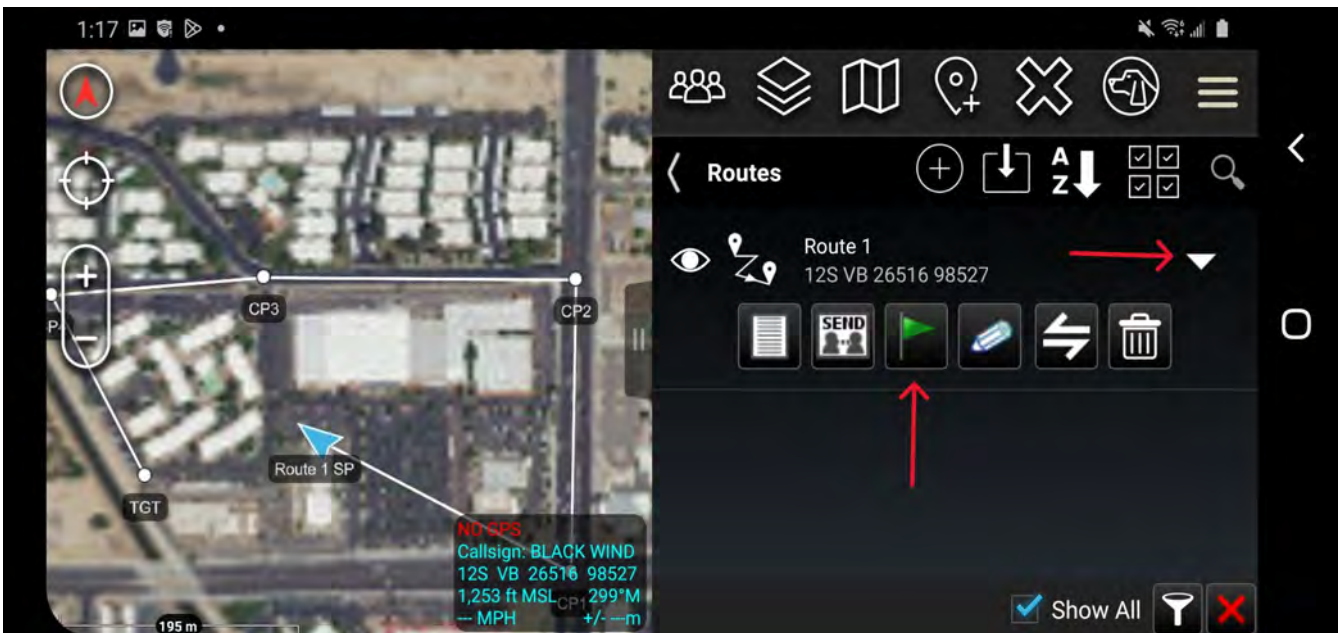


Figure 28: Clicking the drop down menu on a route, will display extended options. The green flag will start navigation.

Entering navigation mode will start guiding the operator to the first checkpoint in the route, while also granting control over which checkpoint is active. Changing the active checkpoint on

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the EUD will also change it on the POD when synced. The navigation can be ended by selecting "X" on the EUD.

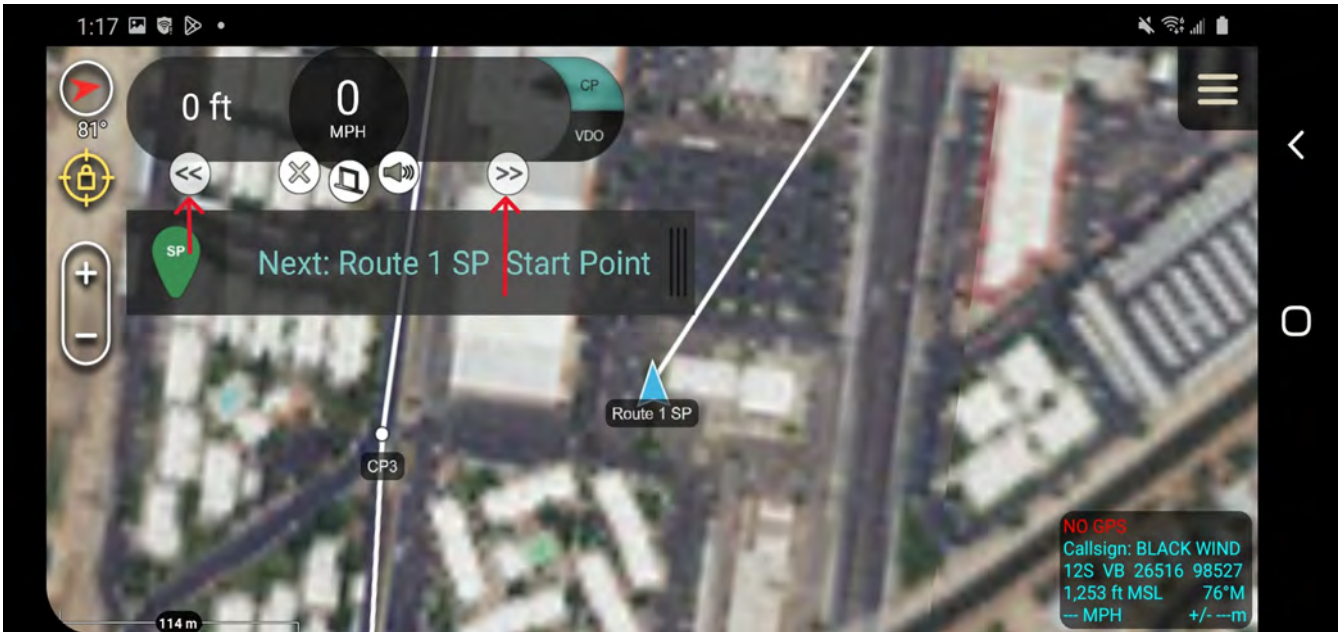


Figure 29: The active checkpoint can be swapped by pressing the arrows

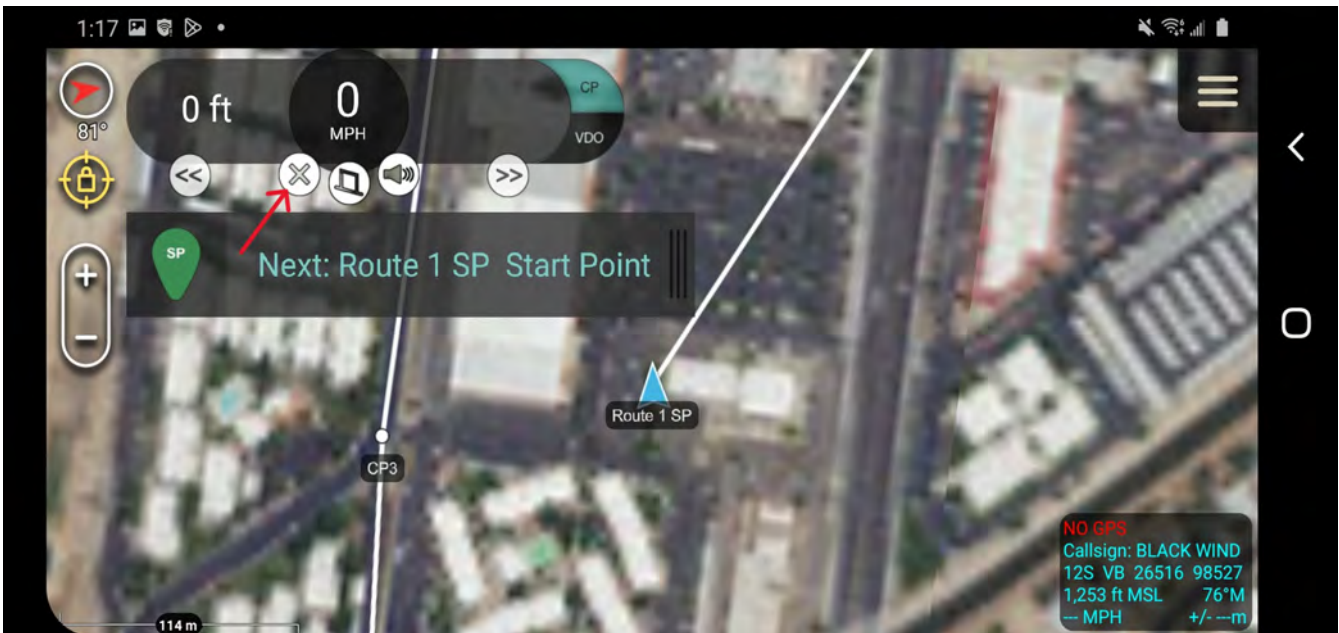


Figure 30: The navigation can be ended by pressing the X, indicated by the red arrow.

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5.4 Notification Delivery

The POD also contains the capability to display notifications or chat messages that are delivered through the TAK messenger. When two EUD are connected to the same TAK network, opening the Contacts menu will display the other EUD that is on the network. In this case it is "ANVIL". Note that the callsign of EUD1 is "BLACK WIND". Clicking on the chat button will open up a chat window with ANVIL as shown in Figures 31 and 32. The quick chat buttons at the bottom allow for pre-populated messages to send without needing to type through the keyboard on the EUD. Once the message is ready to go pressing send will send it over to the other user, as shown in Figure 33.

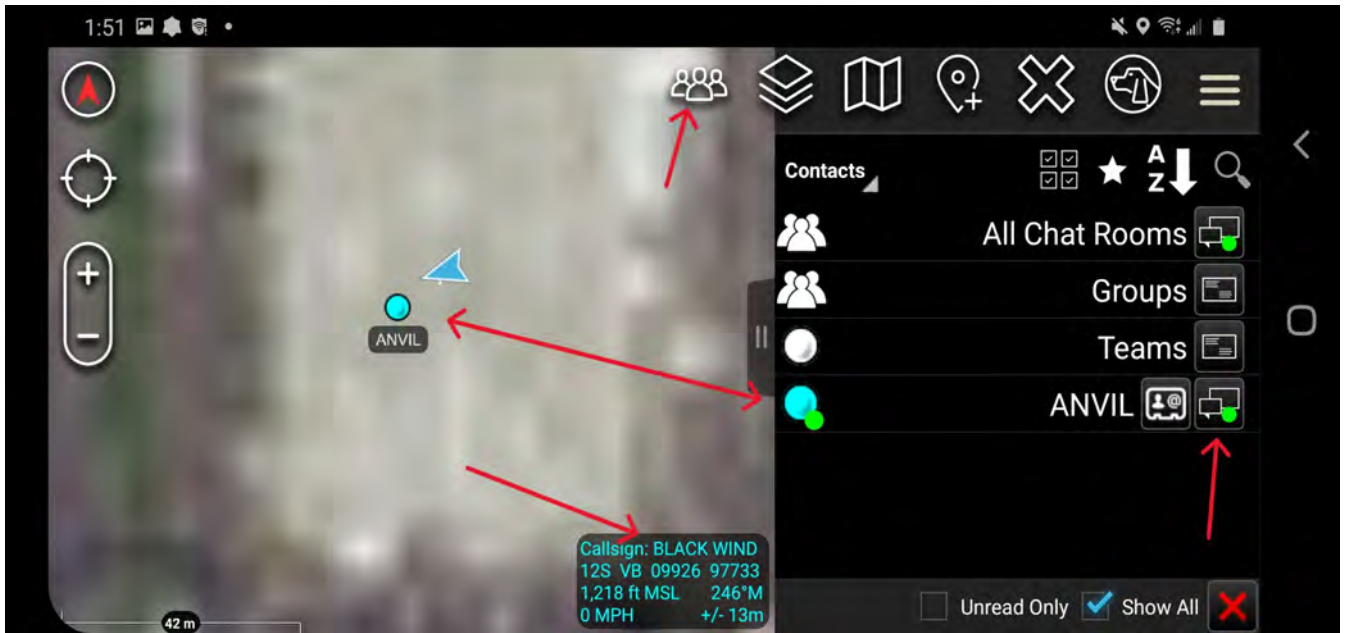


Figure 31: On EUD 1, callsign "BLACK WIND", the green chat button to ANVIL will allow a chat window to be opened

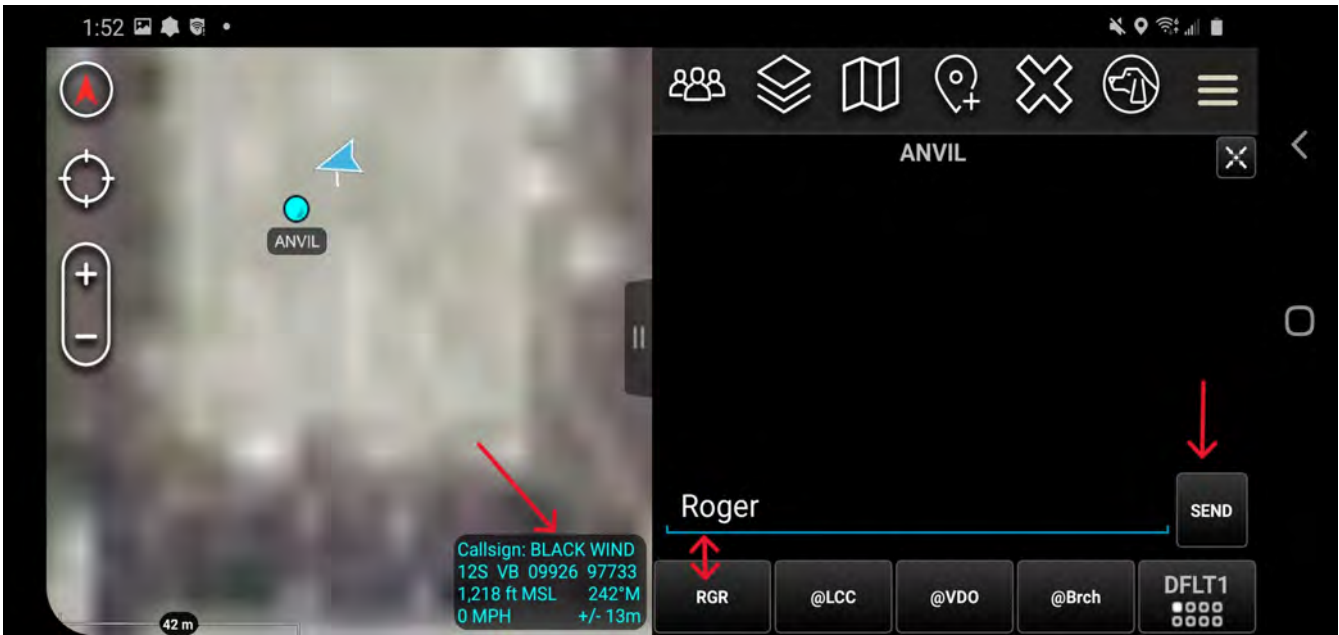


Figure 32: Once the chat window is open, quick chat commands are available at the bottom. Here "BLACK WIND" sends "Roger" to "ANVIL".

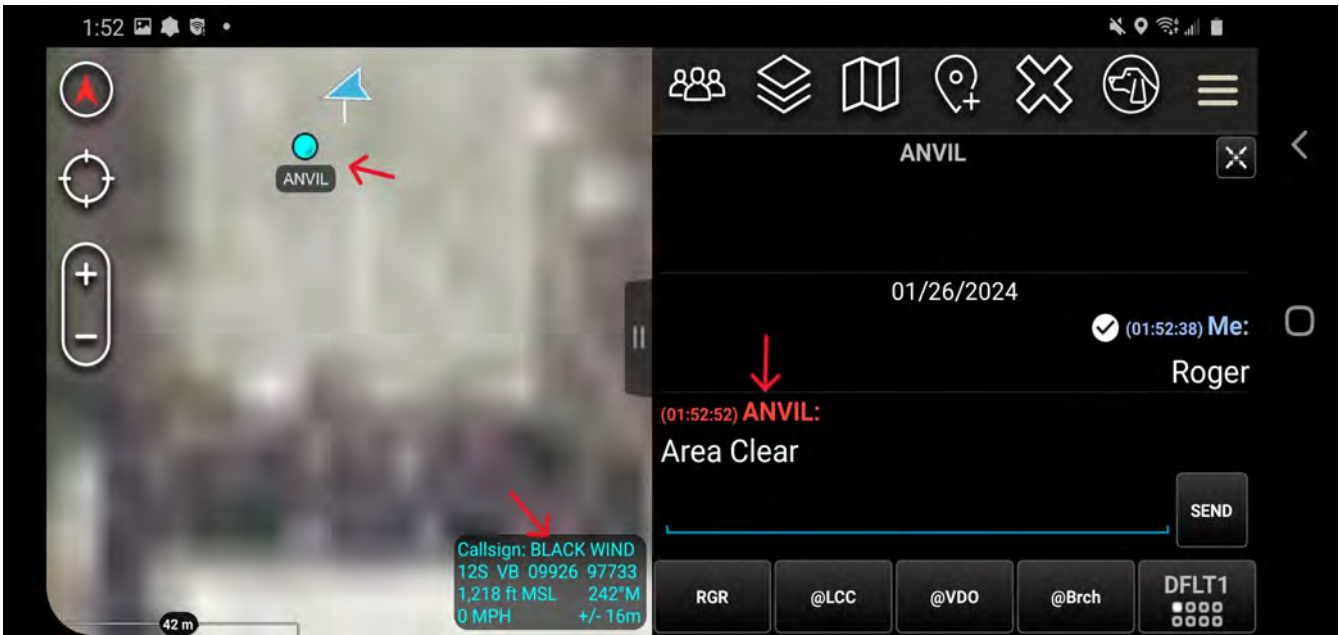



Figure 33: EUD 2, callsign "ASPEN", sends the "Area Clear" text back to "BLACK WIND"

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6 Calibration

Upon initial use, the POD system may need to be re-calibrated based on the operators geomagnetic location. To perform a quick calibration follow the steps below; for best results calibrate the device in a relatively clean magnetic environment:

1. Hold the POD system so that it is oriented in a wearable mode.
2. Slowly sweep the POD 180° from left to right to left, taking about 6 seconds to complete the left to right to left motion.
3. Repeat step 2, twice.
4. Similarly to step 2 rotate the POD vertically so that if you were looking through it you would be looking straight into the sky. The rotation pattern for this step will be up at the sky, down at the ground, back up to the sky again, taking about 6 seconds to complete the up-down-up motion.
5. Repeat step 4, twice.
6. Next will be rolling the POD 360° from right to left to right. Start with the POD oriented such that if you looked through it you would see the horizon, then rotate the POD as if it were a doorknob from right to left to right, taking 6 seconds to complete the motion.
7. Repeat step 6, 2 times.
8. Finally lay the POD on a stable, flat surface, let it rest still for 2 seconds.
9. Picturing the POD as a dice, orient the system two more times so that a different number would be displayed on the dice.

If after doing the calibration, you're still seeing bad headings, move and rotate the quickly in a single figure 8 pattern, and it should snap to the correct heading.

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7 Regulatory Information

FCC ID: 2BG9KPOD-PVS14

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation. Changes or modifications not expressly approved by L3 Technologies, Inc could void the user's authority to operate the equipment.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on the user is encouraged to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

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