ATAK

UAS Tool

Plug-in Version: 12.12.2
ATAK 5.4
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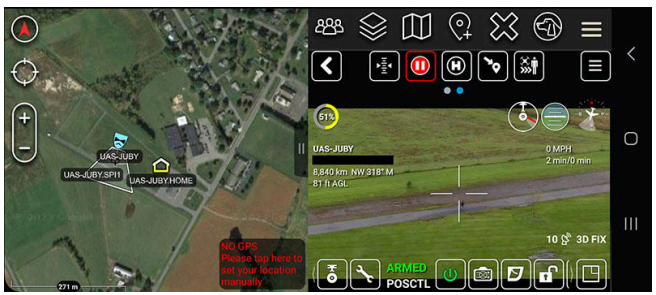
Overview

The UAS Tool Plug-in provides integration of Unmanned Aircraft Systems (UAS) for enhanced Situational Awareness (SA) and telemetry data, Full Motion Video (FMV), and command and control (C2).

The UAS Tool transmits basic point position location information, Sensor Point of Interest (SPoI), field of view (FOV), four corners (Camera view on Map), telemetry data, and FMV to other ATAK and WinTAK devices on the TAK network (local or beyond line of sight).



Supported sUAS Platforms

Each platform has varying levels of interoperability (LOI) from LOI 1: receipt and retransmission of basic position location information (PLI) and FMV; LOI 2: LOI 1 plus gimbal control, and LOI 3 full C2.

AeroVironment (AV)

- Puma/Puma II (LOI #1)
- Raven (LOI #1)
- Wasp (LOI #1)

Supported sUAS Platforms (continued)

DJI – (Not supported in DIU version of UAS Tool)

Support DJI Android Mobile software development kit (SDK) v4.16.X applicable DJI model platforms and ATAKGO v5 support for DJI Android Mobile SDK v5.X.X Enterprise Platforms (see https://developer.dji.com/) Select DJI for v4.16.X and DJIV5 for v5.X.X (LOI 3).

T-FLIR

- Black Hornet III (4.1.2+ firmware LOI 3)
- R80D (14.0.1 ADK/firmware LOI 3)

Lockheed Martin

- Indago 4 (MAVLink ArduPilot LOI 3)

MAVLink

- Platforms using PX4 and ArduPilot; over serial, User Datagram Protocol (UDP), UDP Client, and Transmission Control Protocol (TCP) (LOI 3) Includes Skydio X2D/X10D, Vantage Robotics Vesper, Teal Golden Eagle (Version 1, 2, and 3).
- DoD Defense Innovation Unit (DIU) Robotics and Autonomous Systems – Air (RAS-A) MAVLink Control Link Interoperability Profile (IOP) compliant.
- The MAVLink platform selector supports multiple video URL/URIs and the MAVLink Camera Microservice to include Ping quality of service and the camera parameters XML.
- The MAVLink platform selector also supports the concept of a Camera Component. A user can connect to a MAVLink autopilot but also to the following Camera Components for Gimbal control: MAVLink Gimbal Protocol V2, HoodTech, Octopus, Trillium, KLV Video, USB Video device Class, or any Video URL.

Parrot Anafi Ground SDK (Not supported in DIU version of UAS Tool)

- Parrot Anafi and Anafi USA (All Variants) (LOI 3).

Supported sUAS Platforms (continued)

Generic FMV

- Supports Motion Imagery Standards Board (MISB)-compliant video with embedded key length value (KLV) data / AeroComputer (LOI 1)
- Generic now supports Gimbal Control via the Camera Component for the following: HoodTech, NextVision, Octopus, Trillium, KLV Video, USB Video device Class, or any Video URL.

Autel Robotics – (Not supported in DIU version of UAS Tool)

- Autel EVO MAX Series of UAS (all other Autel platforms are not supported)

CRSF / ArduPilot

- FPV Platforms using BetaFlight, iNav, and ArduPilot can be connected to using connections to Crossfire and ELRS radios.

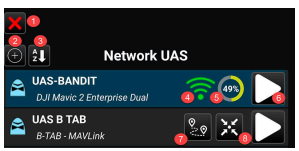
Other Platform Compatibility

Some payloads (cameras and attachments) may not be currently supported in the UAS Tool, depending on the platform. The MAVLink platform selector supports multiple video URL/URIs. Some MAVLink and T-FLIR platforms support setup via Avahi/ZeroConf/mDNS. Support for the DJI Mavic 2 Enterprise accessories have been integrated including the speaker, light, strobe and belly lights. The light attachment for the DJI Mavic 3 Enterprise/Thermal is integrated.

Some dual gimbal support to include a spotlight exists for the DJI M300. Some DJI MSDK supported platforms do not have the same fidelity as others, most notably the DJI Mini 3, for example, does not perform the same level of semi-autonomous tasking as the DJI M3T, M30T, or M300.

Home Screen

The Home Screen for UAS Tool displays all UAS's currently connected to the network. Select + to select a UAS platform. Depending on the platform, additional information will need to be configured to ensure proper connection. If the UAS is in "Operator Connected" mode to the ATAK end user device (EUD), it will always be displayed on the top of the list and will have a blue background.

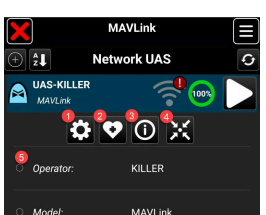


Number	Function
1	Close UAS Tool
2	Platform Configuration
3	Sort UAS list
4	Signal Strength (if available)
5	Battery Status
6	Enter UAS Display
7	Toggle Routes Viewable
8	Pan-to UAS marker

ATAK UAS Tool users that are in "UAS Observer" mode within the local tactical radio network or TAK Server, will be displayed below the Operator Connected UAS and have a black background. Each UAS on the network will have a **Play** button to access their menu, and a **Pan-To** button. When a platform is broadcasting video, the **Play** button will have a green ring around it. The following buttons are selectable.

Selecting the ribbon of an sUAS opens a drop-down display of telemetry data. Selecting the dot to the left of an entry will set that entry to be shown in the UAS ribbon. Only one item can be selected at a time. Telemetry data displayed is dependent on platform and may include:

- Location
- Altitude
- Heading
- Speed
- Battery
- Signal Strength
- Range and Bearing information
- Temperature
- Windspeed
- Notifications of hardware irregularities/errors - These include hardware issues, such as a need for calibration and UAS locked warnings.



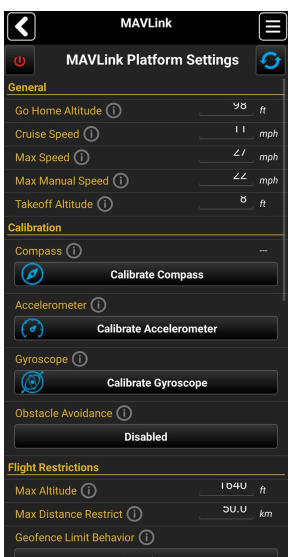
Number	Function
1	Platform Settings
2	Platform Health
3	Platform Information
4	Pan To
5	Metadata Selector

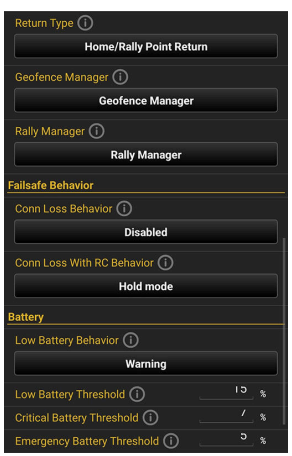
Platform Settings

Select the **Settings** button on the UAS Tool Home Screen to access the platforms specific settings. Select the **Refresh** button (upper right of the interface) to refresh settings. The settings menu will vary based on platform connected to the EUD. Platform settings discussed in this section is based on a MAVLink Platforms.

The Platform Settings include many options that pertain to aircraft preflight, flight operations and general settings. Upon startup, set the platform settings as part of the preflight operations. Settings of concern include:

- Sensor Calibrations: Compass, Gyro, Gimbal (varies based on aircraft configuration)
  - Flight Restrictions
  - Max Altitude
  - Max Range
- Failsafe Behaviors
  - Go Home Battery Percentage
  - RTL Altitude
  - Land Now Battery Percentage
  - Lost Communications Behavior
  - Platform Geofences (For Supported Platforms) This Item is covered in the Mission Manager section
  - Rally Points (For Supported Platforms) This Item is Covered in the Mission Manager Section

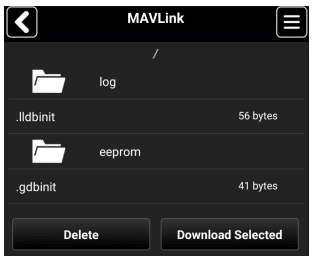




File Manager

Selecting File Manager will give access to the aircraft's onboard file system. Images, Videos, Firmware files etc., can be accessed from the aircraft.

Note: This connection uses the Telemetry link and Upload/Download speeds can be slow depending on the bitrate of the connection.

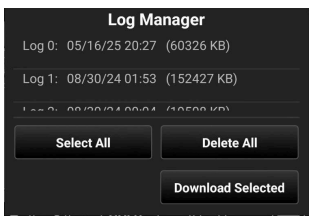


Flight Logs

Selecting **Flight logs** opens up the Log Manager. The Log Manager allows download of both individual or multiple files from the connected UAS.

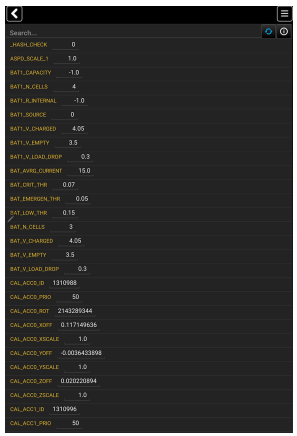
Note: Large files will take some time and use the C2 (Command and Control) Link of the aircraft.

While a download is in progress, the aircraft should not be armed and in operation while using this function. Backing out of this process while still downloading may cause a system issue which could require a full UAS reboot to clear.



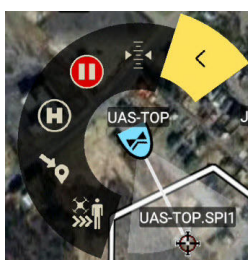
Advanced Options

Selecting advanced options gives access to the MAVLink parameters of a platform. Modifying parameters incorrectly in Advanced Options can cause the drone to behave erratically if the settings are out of the drone's performance tolerance.



Radial Menu

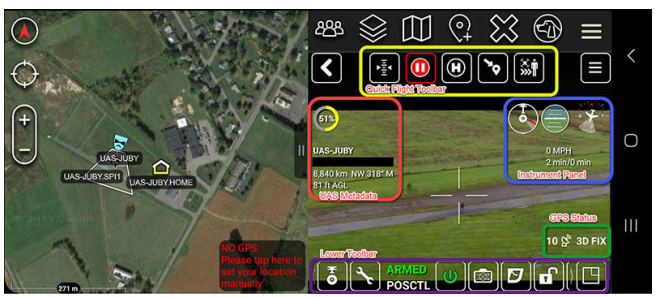
From the top and following clockwise: Lock-on, Open UAS Tool, Open Video Stream, Breadcrumbs, CoT Details, Delete, Compass Overlay, Route Map Overlay, UAS Labels and Range and Bearing. Long Pressing the UAS Tool Radial will further open the Quick Flight Radial Menu. (Quick Flight feature is covered in the Operator Features section of this document.)



UAS Operator Features

Select the **Play** button on the Home Screen to open the UAS Full Motion Video (FMV) display and map. On the map display, the user marker appears for the UAS (signifying Fixed or Rotary UAS) at its location. From the marker a SPoI (Sensor Point of Interest), FOV (Field of Vision), and Four-corners projection (if the UAS is not looking at the horizon) can be seen.

Additionally, if enabled in Settings, Augmented Reality (AR) markers will appear within the video display, corresponding to their map locations. See the Augmented Reality section for more details.



Most of the features available for the UAS are located in the video display. They appear in both the half screen and full screen FMV displays. The buttons and metadata are grouped within the display by function:

Quick Flight Toolbar: Toolbar for UAS Tasking Options (Covered in another section).

Additional Options: Accessing additional options exposes a dropdown menu that gives the user the options to change video overlays, Add/Remove Widgets, adjust the UI access local flight logs, and pair a controller.

Flight Indicators: This overlay shows Gimbal angle, Virtual Horizon and aircraft heading.

GPS Status: This option can be turned on/off in additional Options> Widgets. This Widget gives the operator the GPS count and if the aircraft has a 3D fix.

Bottom Toolbar: Toolbar for UAS Utilities (Covered in another section).

Note: some buttons now feature a tabbed arrow in the bottom right, indicating additional functionality via a long press button action.

sUAS Metadata

The information in the upper left of the screen gives the user data specific to the UAS. These include:

- Remaining battery life
- Connection strength
- UAS location
- Distance between UAS and the Operator (Self Marker)
- Azimuth from Operator to the UAS
- Altitude of the UAS

Quick Flight Toolbar

The Quick Flight Toolbar is located at the top of the UAS menu. The table shown defines functions after takeoff. Only Platforms with LOI 3 will have access to these functions.

Number	Function
1	Set Altitude
2	Emergency Stop (Pause)
3	Return to Home
4	Quick Task
5	Follow End-User Device (EUD) or Marker

Set Altitude

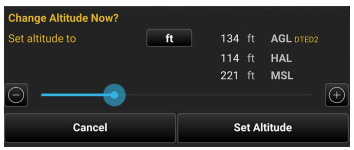
Allows the user to change the altitude of the UAS. Select **Set Altitude** and then move the slider to adjust the altitude. Below the slider are buttons to Cancel and Set Altitude / Land Now. If the altitude is not changed, Land Now will show. Once the slider is moved, Land Now is replaced by Set Altitude.

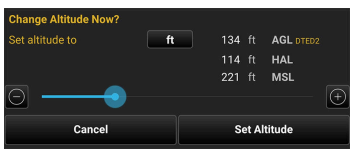
Before the sUAS has launched, the **Set Altitude** button appears differently, indicating it is not in flight and on the ground. The image will have GO inside a green circle and is known as the **Takeoff Now** button.

Quick Flight Toolbar (continued)

Select **Takeoff Now** and the UAS will immediately launch and then fly to the altitude set.

During flight, the Set Altitude dialog box also provides a **Land-Now** feature for quick landing in place.

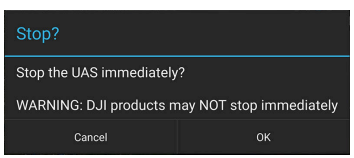




Note: Land-Now behavior may vary based on platform. Some platforms require additional user input to land and disarm. (***Example:*** DJI units will hover slightly above the ground and require the operator to use the Ground Control Station (GCS) to land and disarm.)

Emergency Stop

Emergency Stop terminates any task that the UAS is currently executing. Selecting this function will open a prompt to prevent accidental termination. Functions affected by Emergency Stop include Quick Tasks, Routes, and Quick Altitude. For DJI, this button is NOT synonymous with the pause button on the physical DJI GCS.



Notes:

- Emergency Stop does not stop manual controls. The time it takes for the UAS to execute an emergency stop varies, based on the platform.
- Some MAVLink based aircraft will backtrack.

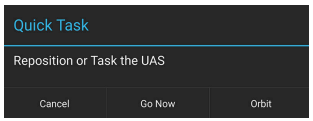
Return to Home

Select the **Return to Home** function to activate the UAS' native Return to Home function.

Quick Flight Toolbar (continued)

Quick Task

Quick Task is a simple routing function that commands the UAS to a new location without requiring a route to be established. Quick Task has two options, **Go Now** and **Orbit**. After selecting the Quick Task function, tap a location on the map where the UAS should travel to or orbit. This will open a window with options to **Cancel**, **Go Now**, or **Orbit**.



Selecting **Go Now** commands the UAS to immediately takeoff, if not already, and go to the specified location. Selecting **Orbit** gives an additional window to specify the orbit radius around the specified location. Both functions make the UAS maintain its current altitude (Height Above Launch **HAL**) and default or last used speed for executing the given Quick Task. Active Orbits are dynamic once the platform begins the Orbit. Stick inputs via the controller or virtual sticks will allow the user to: Increase/Decrease orbit Radius, Increase/Decrease Orbit speed, and reverse orbit direction. ***Note:*** Gimbal orientation, by default, is set to look toward the Action Point. To look at other locations, use the Gimbal controls within the UAS Tool or on the physical GCS.

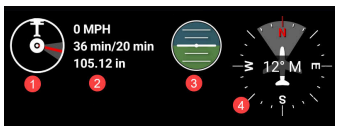
Follow Me

When the user selects the **Follow Me** button within UAS Tool, the aircraft will maintain its stand-off from its current range and bearing to the user's self-marker (ATAK EUD's GPS location).

For example, if the drone is 100 meters from the ATAK EUD, it will continue to maintain a 100-meter stand-off from the ATAK EUD. If the user moves outside a +/- 25-meter bubble (to account for GPS drift) around the ATAK EUD's current location (as dictated by the location of the ATAK EUD self-marker), the drone will move to close the gap. If the user's location (as dictated by the GPS on the ATAK EUD and as shown as the self-marker on the ATAK moving map) is 100 meters from the drone and the user selects **Follow Me** and then subsequently breaks beyond a 25-meter radius away from the drone then the drone will move to close the distance so it maintains 100 meters away from the self-marker of the ATAK EUD. As the user keeps moving away from the drone, the drone continually keeps closing the distance. If the user long presses on the **Follow Me** button, a dialog box pops up to choose a marker on the map to follow and an ability to custom set the stand-off distance.

Instrument Panel

The Instrument Panel serves as a indicators of the platform's current active status. Included in this section is the Gimbal tilt indicator, Flight speed and time, Attitude indicator and Compass Heading.



Number	Function
1	Visual Gimbal Tilt indicator
2	Current speed and time in flight
3	Attitude Indicator
4	Compass degrees/cardinal direction of aircraft nose

Gimbal Tilt Indicator

Shows the current Gimbal Tilt of the UAS's Sensor. Long Pressing the indicator opens the Camera Status Drawer that gives additional Sensor information, and a button to Stap (reset) the camera to the UAS's Heading.

Speed and Flight Time

Indicates Speed and Flight of Platform. Settings for units of measurement are based on ATAK core's preferences.

Attitude Indicator

Indicates the platform's pitch and roll. As the aircraft maneuvers through the air the attitude indicator serves as a virtual horizon.

Instrument Panel (continued)

Compass/Cardinal Direction of Aircraft Nose

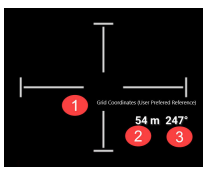
The directional indicator displays the compass degrees (either magnetic or true depending on ATAK's core setting) of the gimbal's azimuth.

When tapped once, the compass switches between North Up and Direction of Travel.

Long Pressing the compass will activate Map heading mode. When activated the map will change orientation based on the gimbal heading.

Sensor Point of Interest (SPoI) Metadata

The crosshairs in the center of the video display indicate the SPI's location visually. Crosshairs for the SPoI and other elements of the User Interface can be customized in the UAS Tool Settings> User Interface Preferences. The metadata for the SPoI is grouped with it.



Number	Function
1	Location of the SPI on the map (Default coordinate system is MGRS which can be changed in ATAK core Settings).
2	Slant length (Range) – distance from UAS to SPI.
3	Slant degrees (Bearing) – Angle/Azimuth from UAS to SPI, relative to the ground.

Lower Toolbar

The toolbar at the bottom of the display gives the user access to a myriad of features. The center section of the toolbar will vary based on the platform and payload of the connected sUAS. The bottom toolbar is for a generic MAVLink Platform.

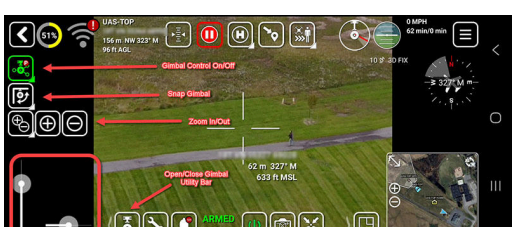
Number	Function
1	Gimbal Camera Controls
2	Drone Utilities
3	MAVLink Status/Flight Mode
4	MAVLink Arm/Disarm
5	Camera/Sensor Options
6	Trigger
7	Gimbal Lock
8	Pan-To
9	Change Screen Size (Full screen/Half screen)

Specialized lower toolbars for other platforms will be covered in more detail within the appendices at the end of the manual. Arrows on the left and right of the main toolbar can be used to scroll left or right to reveal any additional buttons.

Gimbal Camera Controls

Gimbal Camera Controls give the user a quick way to enable the Gimbal Control functions using the UAS Tool display versus the manual controller. Select the **Gimbal Control** button to open the Gimbal Control Toolbar, Zoom Functions, and Pan/Tilt sliders.

Note: The user now has the option to utilize a gimbal joystick in-lieu of the gimbal Pan/Tilt sliders.



Lower Toolbar - Gimbal Controls (continued)

Select the **Gimbal Control** button to allow the FMV screen to focus and pan the gimbal to a location/object in view. When gimbal controls are active the button turns green. The gimbal can be manipulated by executing the following gestures on the screen:

The gimbal can be manipulated by executing the following gestures on the screen:

Long Press on SPoI: The user will notice that the SPoI connected to the UAS marker now has a blue ring around it. This means that the user can long press on the SPoI and drag or click it to a new location (much like moving a marker in core ATAK). If the UAS' gimbal can only tilt up and down, then the command will yaw the whole UAS and the nose of the UAS will point in the direction of where the user moved the SPoI.

Short Press on FMV: The user can also control the gimbal by short pressing on the FMV while Gimbal Control is enabled. The FMV frame correlates to the four corners data on the moving map. Four corners is a map overlay extrapolation of the camera's field of vision. It's called four corners because of the four-point polygon drawn on the map when viewing below the horizon. It also takes into account DTED data. If the drone does not have four corners data (e.g., it may be looking at the horizon) this feature will not work.

Double Tap: Double tapping on the FMV frame resets the gimbal position to center.

Long Press on FMV: Long pressing on the FMV drops a point of interest on the moving map where the SPoI is. ***Note:*** the POI is now customizable for the marker type.

Drone Utilities

Select the **Drone Utilities** icon to access Broadcast Video, Map Shot, Record Video and Platform Settings.

Lower Toolbar - Broadcast Video Stream

Select **Broadcast ON** to broadcast video data across Wi-Fi/Tactical Radio Network to other TAK users, and Beyond Line of Sight (BLOS) communications via a correctly configured Video Management Service (VMS) via UDP Unicast, RTSP Push or SRT (provides encryption and passphrase). Long Press Functionality to quickly edit settings or swap between the video destination.

TAK users with the UAS Tool plug-in will be able to access video through the Observer menu (see Observer section). ATAK and WinTAK core users without the plug-in will be able to view the video by selecting **Video** from the UAS map marker radial menu or by using a corresponding video alias. The Broadcast button turns green when video broadcasting is enabled.

There is now a DoD GOTS-licensed VMS that supports RTSP, UDP Unicast and SRT capabilities within the ATAK UAS Tool, and can be provided by request (GovStreamer).

Mapshot creates an image of what is displayed on the UAS Tool's FMV screen. This feature has been optimized for SA within the TAK Environment. When selected, a picture marker will drop on the map location with the image as an attachment.

The image is also placed within ATAK's image gallery. A prompt automatically appears to send the captured image to other TAK users within the network. When in full screen on-screen display (OSD), the sUAS metadata is included on the display, in the image. The mapshot utilizes EXIF data and is taken from the perspective of the UAS (i.e., the image is dropped on the map with the altitude and FOV of where the UAS was looking).

Record Video

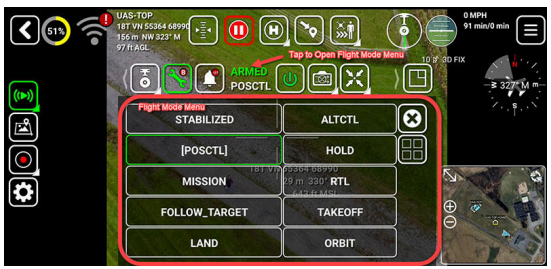
Selecting the **Record Video** Icon will Start/Stop recording video being received from the Platform. Videos recorded in this method are stored on the ATAK EUD and are automatically populated in ATAK's Video Player.

Recorded videos include KLV data and will show the platform and SPI location when replaying in ATAK. If the Record Video Widget is long pressed, the user can configure how the video is recorded. Options to record to the EUD, record to the SD Card onboard the fuselage, or both. This same option can be found in the settings for UAS Tool to set by default.

Lower Toolbar - Platform Settings

Selecting Drone Platform Settings from the Utilities menu will open the Platform Settings menu. (This item was covered previously in the "Platform Settings" section of this guide.) Zoom In/Out: Digitally or optically (depending on platform) zooms the video/gimbal in and out.

MAVLink Flight Modes



Selecting the **MAVLink** button on the bottom toolbar will open the Flight Modes Menu. Flight modes will change how the platform flies or executes specific flight commands.

ALTCTL (Altitude Control): This allows manual control of the platform. This mode does not use GPS to hold its position and can drift in a hover state.

POSCTL (Position Control): This is the preferred flight mode with GPS assisted flight. The platform will auto correct to hold positions when in a hover state.

HOLD: Commands platform to hold its position and loiter at a position using GPS. Any stick commands will change HOLD to POSCTL.

MISSION: Commands the platform to execute the mission uploaded to the flight controller. Note: This will execute the last mission uploaded.

RTL: Commands the platform to return to land.

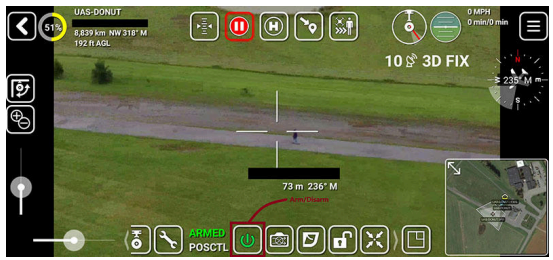
FOLLOW_TARGET: Commands the platform to follow specified target.

TAKEOFF: Commands the platform to arm and rise to designated altitude.

LAND: Commands the platform to land at its current position.

ORBIT: Commands the platform to begin an orbit.

Lower Toolbar - Arm/Disarm Platform

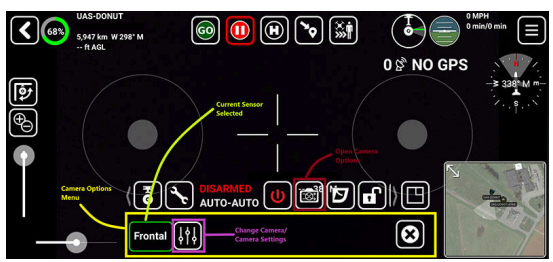


Arm/Disarm sends a command of the platform to Arm/Disarm the motors of the platform. Force Arm/Force Disarm will Arm/Disarm the platform and bypass Arming/Disarming checks.

Notes:

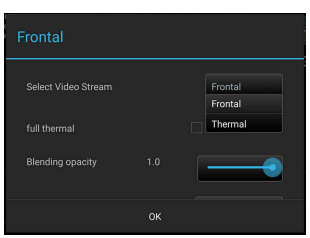
- Force Arming may result in issues in flight if any errors are present in the flight controller.
- Force Disarm while in-flight will result in shutdown of motors (if in-flight, the sUAS drop will be uncontrollable.)

Camera Options



Selecting the **Camera** icon from the toolbar will open a ribbon with camera options for the platform. Items displayed will depend on sensors installed on the platform.

Platforms with multiple sensors/cameras will be able to switch between them. Camera/Sensor settings are also accessible in this ribbon.



Gimbals with multiple sensors, such as Electro Optical (EO) and Infrared (IR) can be switched via the settings menu.

Lower Toolbar - Trigger

Selecting the **Trigger** icon on platforms configured with drop release mechanisms will activate the Pulse Width Modulation (PWM) signal to drop a payload from the aircraft. This needs to be enabled within UAS Tool MAVLink Settings (Show Trigger Menu).

Gimbal Lock

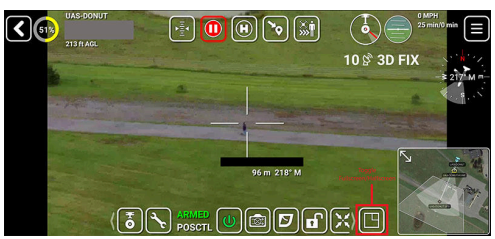
Selecting the **Gimbal Lock** icon will lock the gimbal's yaw, remain fixed and not rotate the platform.

Pan-to UAS

Selecting the **Pan-To** button moves the focus of the current map view to the location of the UAS. Long Pressing Pan-To allows the user to lock the map location to the UAS marker. By default, if GPS is not acquired the UAS location will be placed at the EUD's location.

Change screen size (Full screen vs. Half screen)

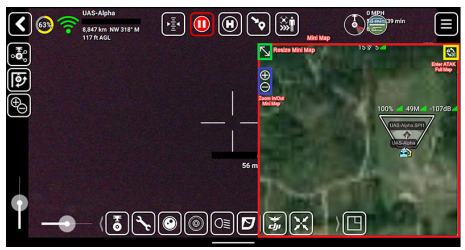
The screen sizing button toggles the display from the half screen showing the larger map with a smaller video display to the full screen video display with the embedded mini-map. Selecting it again switches it back to half screen.



Mini Map

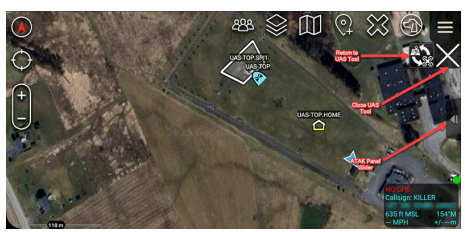
Mini Map can be disabled/enabled by selecting More Options > Widgets > Mini Map. When the Mini Map box is checked, the picture-in-picture mini-map shows within the full screen display.

This is turned on by default. Mini Map can be enlarged or reduced to user preference by long pressing and dragging the double arrow in the upper left corner of the mini map.



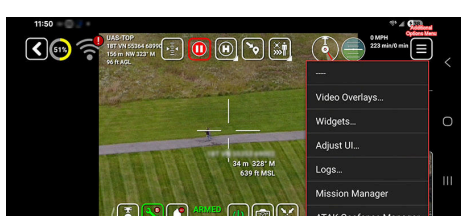
The (+)/(-) buttons will zoom in/out the Map. Using the icon in the upper right corner of the Mini Map changes the view to the ATAK Map View. In ATAK Map view, a widget is layered on the map allowing to return to UAS Tool Full Screen or close the widget.

Using the ATAK Panel Slider will return the UAS Tool into half screen view.



Additional Options Menu

When the user selects the **UAS Additional Options** button, a drop-down menu opens displaying additional options for Video Overlays, Widgets, Adjust UI, Logs and UAS Map Labels.



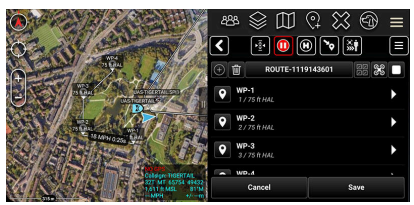
Additional Options (continued)

Mission Manager

Selecting **Mission Manager** allows for the creation of a single point or multipoint mission for the sUAS to execute. From the Home Screen, swipe to the left to access Stored Tasks. This panel allows for mission planning prior to UAS launch and does not require a UAS to be connected.

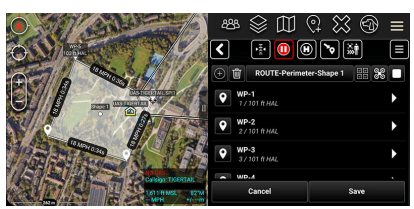
Route Types

Route: Create a muti point route for a platform to follow.

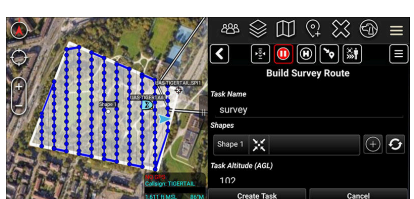


Existing Route: Convert an ATAK route to a route that a platform can follow (functionally the same as Route).

Perimeter: Create a multi-point route that follows a shape and returns to the initial waypoint of the shape.

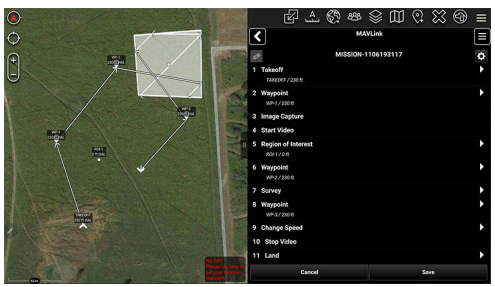


Survey: Creates a survey route that covers a designated area.



Additional Options (continued)

Mission: MAVLink Specific



MAVLink Mission offers a robust array of actions that can be executed by the platform for tasking. Select Mission from the Add Task Menu (+), and select Add. A blank Mission pane will populate with the Pencil Icon to add mission items and a Gear Icon for Mission settings.

Within Mission Settings Name, Route Color, Initial Speed, the ability to show breadcrumbs when executed, and Platform Info are available to be modified. Select the Pencil Icon to add Mission Items to the map and mission que.

Long pressing a Mission Item will highlight it, once highlighted the mission item can be dragged to a desired location within the mission queue. Select save to complete mission creation. The following is a list of mission items currently available to queue in UAS Tool.

Takeoff: Arms and launches the aircraft to a designated altitude.

Waypoint: Sets a point for the platform to fly to. This option includes customization of how the platform flies to the point including, but not limited to: Speed, altitude, Yaw, and Gimbal orientation.

ROI (Region of Interest): Sets a point for the gimbal to focus on. This function will continue until it is Canceled by the mission.

Cancel ROI: Cancels the ROI set previously in the mission. Note: If Cancel ROI is not set before the mission ends, the platform will continue running ROI in manual flight until the mode is changed.

Survey: Creates a Survey route within the mission. This survey entry can be used as the only mission Item or part of an entire mission. Survey can be customized to take video or images, designate altitude, set gimbal controls, and multiple other options to capture the desired coverage.

Additional Options - Mission (continued)

Return to Launch: Issues the command to return to launch location and land.

Land: Sets a waypoint for the platform to fly to and land.

Change Speed: Changes Speed of the platform.

Delay: Give the option to have the platform hold a given point. This can be set in seconds, Minutes, and hours. An entry of -1 in each section will ignore an increment.

Mount Control: Changes/Sets new gimbal orientations.

Image Capture: Capture an image from the sensor. Note: This capture method stores on the platform only and will not be displayed or stored on the EUD.

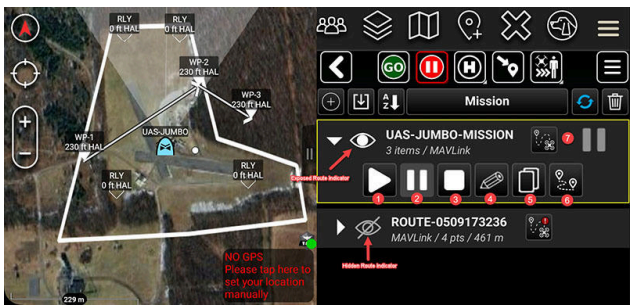
Start Video: Records video from the sensor. Note: This capture method stores on the platform only and will not be displayed or stored on the EUD.

Stop Video: Stops video recording to the platform.

UAS Stored Tasks (Routes)

Routes are created by selecting the + button and dropping waypoints on the map. Waypoints are created by selecting locations on the map. The ATAK UAS Tool treats all vertices as a waypoint due to the way that UAS platforms fly in straight lines.

Number	Function
1	Start/Resume Route/Mission
2	Pause Route/Mission
3	Stop Route/Mission
4	Edit Route/Mission
5	Delete Route
6	Set Mission Current
7	Validate Route



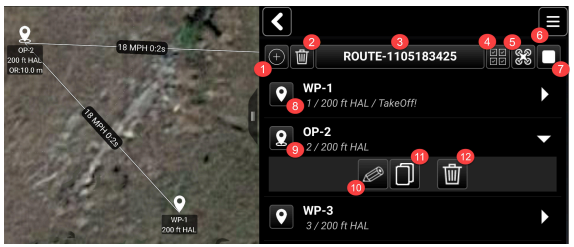
Select **End** when finished placing all routing points. Tap the triangle for any route to expand the ribbon. Tasks highlighted in Green signify tasks that are currently being executed. Tasks highlighted in yellow signify tasks that are currently on the flight controller (MAVLink). The following options appear on the expanded ribbon:

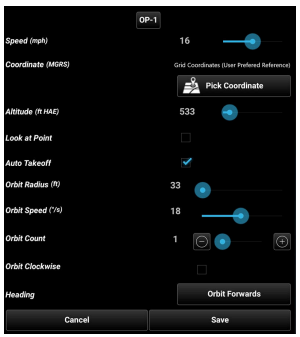
- **Start/Resume Mission:** Opens a dialogue window to **Add only** or **Add & Run Now**. Both actions will create an entry in the Active Task panel, with the latter executing the task.
- **Pause/Resume Mission:** Pauses or resumes a mission.
- **Stop Mission/Route:** Stops a mission.
- **Edit Route:** Opens the Edit Route panel.
- **Clone Route:** Clones the selected route.
- **Set Mission Current:** Sets Route in progress to a specific waypoint in the route.
- **Validate Route:** Validates route based on DTED data in ATAK to ensure that the platform's route does run into terrain based on those values.

Editing a Route

When editing a selected route, selecting the **Waypoint** icon will toggle between a waypoint and an orbit point. Select **Edit** from a waypoint's ribbon to customize the behavior for advancing to, and actions at the waypoint. Start and End waypoints in a route have additional options that include auto-takeoff and commands for actions after the route has been completed (e.g., Return to Home).

Number	Function
1	Add waypoint to route
2	Delete all waypoints in the route
3	Edit route name
4	Edit multiple points at once
5	Change sUAS platform
6	UAS Additional Options
7	Change route color
8	Waypoint
9	Orbit point
10	Edit way/orbit point
11	Clone way/orbit point
12	Delete way/orbit point

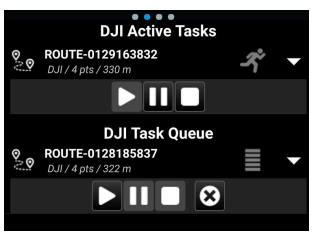




Route Execution

Routes can be executed directly from the Stored Tasks panel or from the Active Tasks Queue. Select a queued task's ribbon to expose the commands for the task: **Run Task**, **Pause Task**, **Stop Task**, and **Remove Task**.

A Task that is currently being executed will have a running-man icon on its ribbon. Once a route has been executed it cannot be altered. The route will need to be deleted and re-created with the alterations.



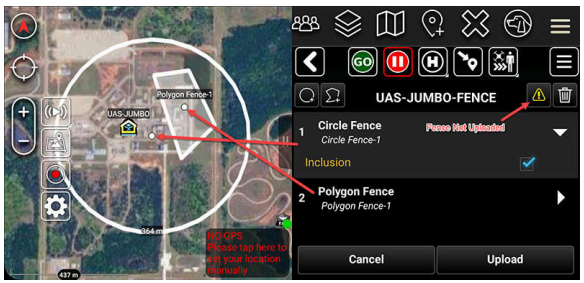
DJI Platform Additional Note: Selecting the **Pause** button on the DJI Controller will stop execution of the waypoint/orbit point in progress and will reroute and proceed to the next waypoint in the route.

Geofence Manager

Selecting Geofence from the Mission Manager panel will Give the options of Mission, Geofence and Rally. Geofence Manager will give access to create and upload geofences into the platform's onboard flight computer.

After selecting the Geofence Manager a User can select either a polyshape or Circle shape by selecting the appropriate Icon in the Upper Left hand side of the pane. After creation, the shape will populate into the Geofence list. Select Upload to Upload to the Platform.

By selecting the ribbon of the created shape in the panel, the user can toggle a Geofence from Exclusion Zone to Inclusion Zone. Once selected a fence can be deleted by selecting the Trashcan Icon. A triangle with an <!> is shown in the top of the panel this indicates that the Geofence(s) have not been uploaded.



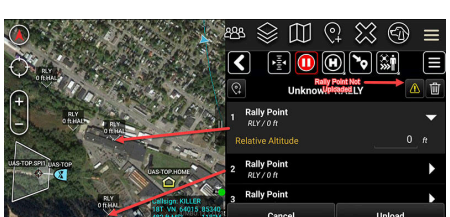
Geofence Manager (continued)

Geofence Manager allows the user to enable built in Flight Restrictions of a MAVLink Platform. These Flight Restrictions limit the Platform's movement either within a designated region, or stop it from entering a designated region. These include:

- **Inclusion Zone** - Geofence which draws out an area that a drone can operate in. Crossing outside of it will cause a Geofence Action Trigger.
  - **Exclusion Zone** - Geofence which draws out an area in which the drone cannot operate in, Crossing inside of this zone will case a Geofence Action Trigger.
- **Geofence Breach Behaviors:** Displays/Modifies the Behavior of the Platform if the Geofence has been breached. For some platforms, breaching the Geofence also includes if a Platform exceeds the Max Altitude designated in settings. Behaviors for this setting include:
  - Nothing
  - Warning
  - Hold
  - RTL
  - Terminate (kill motors)
  - Land now

Rally Manager

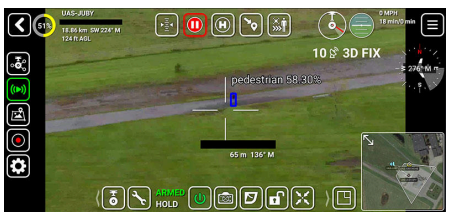
Select the Mission Manager Pannel Button gives the option of Rally to set Rally Points. One or more Rally points can be Rally Points Can be set to give an alternative to Home Point. Triggering a Return to Home action, the platform will Return to Home at the closest Rally Point.



Video Overlays

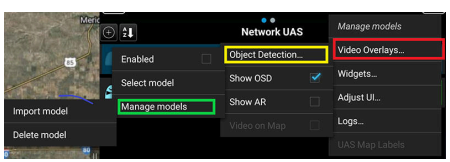
Within Video Overlays, Object Detection, Toggling OSD, Augmented Reality, Video on Map and Dual Sticks (Virtual Joystick) options can be manipulated.

Object Detection



Selecting **Object Detection** from the menu will display the options to **Enable**, **Select Mode**, and **Import Model**. When Object Detection is enabled, objects will be framed within the video screen with the corresponding confidence level of identification. Objects that can be identified include, but are not limited to, cars, trucks, and people.

UAS Tool includes three model sets by default, additional sets can be imported though ATAK by selecting the **Import Model**. This Plug-in is only compatible with TensorFlow Lite (.tflite) models, including YOLO V4-V8. Object detection is disabled by default.



Show OSD

The center crosshair and all sUAS metadata in the video OSD are visible by default. The visibility of these can be turned off by unchecking the **Show OSD** box. The toolbars will always remain on the screen.

Show AR – Augmented Reality

If the **Show AR** box is checked, the user markers will appear within the video display, corresponding to their map locations. The markers shown are those that are within the sUAS sensor feed, indicated by the UAS having four corners data. The UAS must not be looking at the horizon and have valid four corners data for AR to work. There is no range gating on the AR, so jumbled markers on the map will result in jumbled AR markers in the video frame.

Video Overlays (continued)

Video on Map

Enabling Video on Map projects the video stream within the 4 corners projection for added SA. The gimbal must be tilted down at least 15 degrees to project the 4 corners.

Virtual Joystick

If supported by the selected platform, this will toggle the on-screen virtual joysticks for flight control of the connected UAS when in full screen mode only. . Selecting More> Adjust UI > Edit Joysticks enables custom positioning of the left and right sticks on the screen.

Widgets

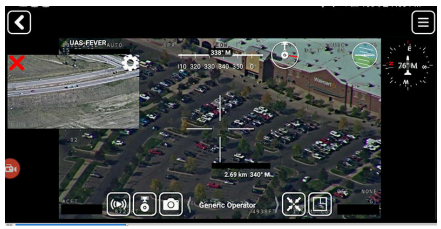
The widgets submenu provides the ability to toggle on/off overlays within the video screen to the user's preference. Items included within this menu are:

- Mini Map
- PIP Video (Picture in Picture)
- UAS Heading
- Gimbal Heading
- Health
- GPS Status
- POI Marker
- Video Record: Adds Video recording button in the interface.
- Use Gimbal Stick: Changes the gimbal sliders to gimbal stick.

Widgets (continued)

Picture In Picture (PIP) Video

When in full screen mode, if **PIP Video** is checked, a secondary video screen will be added to configure an additional video source. Select the **Cog** icon in the secondary display to enter a video URI to subscribe. This option is turned off by default.



Adjust UI

The entire group of metadata and toolbars can be scaled down using the sliding percentage bar accessed through the **Scale UI** option. This affects full screen mode only.

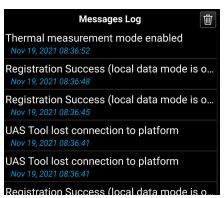
Selecting **Lock UI** will make the current configuration unchangeable. Select **Lock UI** again to unlock the ability to make other changes.

Any changes can be immediately reset to their defaults using the **Reset UI** option.

Logs

Message Log

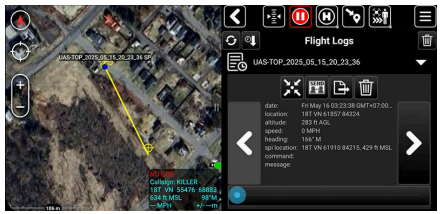
This feature logs communications and updates between the UAS Tool and the UAS Platform. Logged items include connection, disconnection, task execution and snapshots. Each item has a time stamp. Select a message ribbon to display the details of that message. Message logs are cleared when ATAK is closed.



Logs (continued)

Flight Logs

The Flight Log interface provides the ability to toggle the Flight Logs panel of the UAS Tool. The flight log is an enhanced version of the Track History function within core ATAK. The flight logs show the UAS and SPI locations, commands issued, and any messages shown by the UAS Tool.



ATAK Geofence Manager

UAS Tool can take advantage of geofences that are set in ATAK. When the ATAK geofence is triggered the one of the following behaviors can be set to be triggered:

- ALT Control
- Auto/Mission
- Capture Image
- Capture Video
- Circle (APM)
- Drop POI
- Emergency Pause
- Land
- Loiter
- Mapshot
- Mobile
- Position
- Reset Gimbal
- RTL
- Stabilized
- Toggle Broadcast
- Notify
- Alert

Note: Behaviors (varies Per platform)

UAS Map Labels

Select the **Map Labels** box to toggle on and off telemetry data labels. The data available that is displayed depends on platform, and can include:

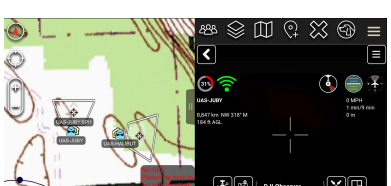
- Altitude
- Battery
- Ground Speed
- Heading
- Height Above Launch
- Pitch – (aircraft only)
- Temperature
- Windspeed

Telemetry data displays below the sUAS map marker.

Observer Devices

Observer View is a truncated view of the UAS Tool for interacting with a UAS.

Select **Play** from a broadcasting UAS' ribbon to open the observer UAS menu. The observer UAS menu presents only functions accessible to observers. Selectable options included in the Bottom Toolbar function identical to operator mode are:



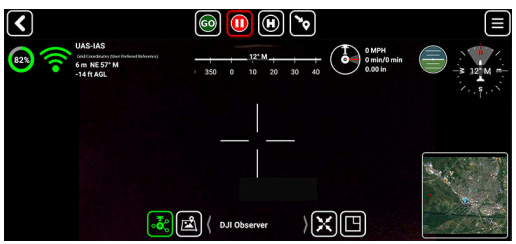
- Mapshot
- Gimbal Control/Observer Control
- Pan-To
- Full screen

Observer Devices (continued)

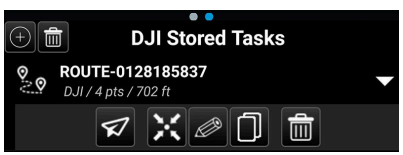
Selecting **Gimbal Control/Observer Control** sends a tasking request to the operator of the drone that the user is observing. Once the request has been sent, the button will display yellow. When the UAS operator accepts the request, (see section on Received Tasks) the button will display green, and the observer will have control of the drone. Selecting **Observer Control** again will release gimbal control.

Once control is active for the observer, the observer will see the Quick Flight toolbar appear on the UI to control the drone. The observer can conduct gimbal control via clicking on the FMV frame or by long press dragging the SPI that will now be highlighted with a blue marker highlight.

The observer can also task quick flight waypoints or orbit points on demand to the drone. The Observer Control is a "mode" of control given to the observer whereby gimbal movements and quick flight waypoints and orbit points do not require individual approvals from the UAS operator. The observer can also utilize the Altitude, Return to Home, and Emergency Stop buttons found on the quick flight toolbar in this mode.



The Observer-Viewed UAS Queue Task function has been substituted with the Dispatch Task function (paper airplane icon) which queues the route into an operator's Received Tasks (see Route Tasking). This is how an observer can send a specific UAS a route task to fly. The UAS operator is the arbitrator and chooses when the UAS will fly the sent route task.



UAS Tool Preferences

Settings can be accessed in Additional Tools > Specific Tool Preferences > UAS Tool Preferences. If the UAS Tool pane is already open in ATAK and the user hits the ATAK settings, they will be brought directly to the UAS Tool Plug-in specific settings. The UAS Tool Plug-in settings are grouped as follows:

Manual Configuration

- **Default Platform Detection:** Set Default Platform Detection to a platform type
- **Callsign Override:** The UAS Tool will assign the sUAS with the callsign as UAS-<ATAK EUD Callsign> by default. Use this setting to override the displayed default callsign.
- **Broadcast CoT:** By default, the ATAK UAS Tool will broadcast UAS Tool specific schema CoT message for a connected UAS in Operator mode. A user could have a drone that already puts out its own CoT message on the network, such as the Indago. It is recommended to avoid "ghosting" or duplication of the CoT markers on the tactical radio or TAK Server network.

Video Broadcast Preferences

- **Broadcast size:** Specifies what size (resolution) of video to be broadcast. Options range from 320x240 (low) to 1920x1080 (high).
- **Video Broadcast Bitrate:** Specifies what bitrate to broadcast. Options range from 400kbps (low) to 3000kbps (high).
- **Video Broadcast Destination:** Selects broadcast between RTSP-Push (Video Management Server), UDP (Multicast/Unicast) or SRT (VMS Systems). A Video Management Server must be setup and configured prior to use. Video Management System (VMS) is used for broadcasting video in conjunction with a TAK Server for a Beyond Line of Sight (BLOS) network configuration.

Notes: VMS Servers are separate from TAK Server and not integrated with TAK Server. UAS Tool broadcast settings has an option to check Reliable P2P. For certain network types this is useful and adds the ?tcp extension added to the end of the UASs' video alias.

UAS Tool Preferences

RTSP-Push Configuration

RTSP-Push Configuration will only be available if a Video Management Server is selected for Video Broadcast Destination.

- **Video Destination IP Address:** Location to enter the address of a configured Video Management Server.
- **Add New Endpoint:** creates the list of destination IP addresses. After creation, the user still needs to select the intended Endpoint from the list.
- **Video Destination Port:** Location to enter the port configuration for the Video Management Server.
- **Use SSL:** Toggles SSL encryption on/off.
- **Video Broadcast Identifier: Location** to enter the identifier of the video stream. ***Note:*** The application will auto-generate live/UAS-<ATAK-Callsign>. Example: live/UAS-Hunter
- **Video Destination Username:** Location to enter a username if the Video Management Server requires login credentials.
- **Video Destination Password:** Location to enter a password if the Video Management Server requires login credentials.

UDP Configuration

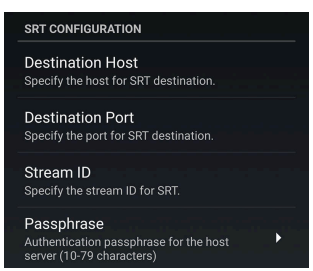
UDP Configuration will only be available if UDP Configuration is selected for Video Broadcast Destination. This configuration is used to Broadcast video through a Local Area Network (LAN).

- **Video Destination Network Adapter:** Uses the Network Monitor Tool to show what Network Interface Controllers (NICs) are available.
  - **Example:** The user could have Tactical Radio and Wi-Fi network access.

Preferences - UDP Config (continued)

- **Use Last Octet:** Check to use the last octet of the device's IP as the last octet in the broadcast IP and Port. If enabled, some video settings will be greyed out and autogenerated.
- **Video Destination IP:** Set the IP address for the video destination.
- **Video Destination Port:** Set the port for the video broadcast.
- **Video Observer URL:** The URL for an observer to view video data is autogenerated. Use this setting to change the default value.

SRT Configuration



- **Destination Host:** Location to enter the address of a configured Video Management Server.
- **Destination Port:** Location to enter the port configuration for the Video Management Server.
- **Stream ID:** Stream Identifier for video broadcast.
- **Passphrase:** Authentication to connect/view SRT Server Stream.

Camera Preferences

- **Auto Record:** Enable/Disable automatic recording to (EUD/platform/both) once operator connects to the platform's video feed in UAS Tool.
- **Video Save Location:** Allows recording to EUD/Platform or both, Note: recording to platform will require storage media installed or available onboard the airframe and will vary by manufacturer.
- **Video Record Bitrate:** Set the bitrate of the recorded video. Ranges from 400kbps to 3000 kbps.
- **Use DTED for 4 corners:** Setting to turn on/off calculations to conform 4 Corners projection to use DTED Data (Note: Full explanation located in Appendix J).

Preferences - Camera (continued)

- **Camera Field of View customization:** Used with platforms where the camera parameters/properties are not being read into UAS Tool Configuration to enable 4-corners calculation.
- **Horizontal Field of View** (Not available on all platforms).
- **Vertical Field of View** (Not available on all platforms).
- **Camera Pitch Override:** Set a specific fixed camera angle. Used for platforms with a fixed camera. IE FPV platforms.
- **Mapshot Save Mode:** Toggle the ability to display HUD and AR Overlays in Mapshot images.
- **Always Drop Mapshots on UAS Location:** By default, Mapshots will be dropped on the SPI location - Drops on the platform's location.
- **POI Marker Callsign:** Override POI marker's prefix to user preference.
- **Video Zoom:** Allows pan and pitch zoom capability in video AR Overlay
- **AR Item Scale Multiplier:** Enlarge/Reduce marker size in Video AR overlay
- **AR Item Opacity Override:** Increase/Decrease AR Marker Opacity.
- **Object Detection:**
  - **Object Detection Model:** Selector for use in Object Detection
  - **Import Object Detection Model:** Import .tflite model to be used in Object Detection
  - **Delete an Imported Model:** Deletes models
  - **Object Detection Interval (ms):** Change detection rate
  - **Maximum Error Stake:** Increase/Decrease the number of errors before detection is turned off
  - **Mapshot on Object Detection: On/Off:** Drops Mapshot CoT markers on map at the location of detection. Note: this will drop new markers every time a detection occurs, and does not change the location of previous objects detected.
  - **Broadcast Object Detection:** Broadcasts markers to TAK Network/TAK Server
  - **Vibrate on Object Detection:** Vibrates EUD (is applicable) on detection
  - **Max Open Mapshots:** Limits number of mapshots on map to prevent slowdown of older devices

Preferences - User Interface

User Interface Preferences

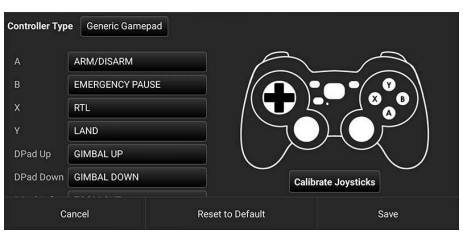
- **Use Gimbal Stick:** Changes Default for gimbal controls to gimbal Stick. Default is pitch/yaw sliders (not applicable to all platforms)
- **Show Gimbal Roll Slider:** Adds slider to adjust roll of gimbal (not applicable to all platforms)
- **Camera Reticle Image:** Turn off or select one of the 15 reticles
- **Camera Reticle Size:** Enlarge/Reduce Reticle size
- **Camera Reticle Color:** Set the crosshair reticle color using RGB sliders and an opacity slider.
- **OSD Background Color:** Allows for customizing overlay's color to the user's preference.
- **OSD Text Color:** Allows for customizing overlay's text color to the user's preference.
- **Display AGL for UAS:** Selecting this option will override global ATAK preferences to AGL.
- **Battery Level Units:** Toggle battery unit display between voltage and percentage.
- **Rotate UAS Marker:** Rotates UAS Marker with heading.
- **Show Message Log Button on Bottom Bar:** Add/Remove Message/Alert logs button on the lower toolbar
- **Don't Show the Startup Warning:** Show Startup warning at startup of UAS Tool
- **Floating Virtual Joystick:** Enable Virtual sticks floating to user based touch location or fixed location

Preferences - Utilities

- **Capture-to-Storage:** Check to toggle on/off for developer level captures of a sUAS Sensor Imagery. (DEPRECATED, DO NOT USE)
- **Log Flight Data:** Check to toggle On/Off for inclusion in the flight logs.
- **Danger Low Altitude in feet AGL:** Alert when sending a task in UAS will go below 75ft AGL.
- **Radio Discovery Service:** Enables/Disables discovery of WaveRelay, TrellisWare, Sylvus and MAVLink Radios to show RSSI in UAS Tool UI.
- **Text to Speech Enabled:** For MAVLink based aircraft gives audible alerts similar to Q Ground Control.
- **Keep initial Home Altitude:** Configuration for home point ground level placement.
- **Show Resection Toolbar Button:** Enables resection toolbar to update UAS location in GPS limited/denied locations.

Controller Preferences

Controller Mapping: Setup controller with custom input - Buttons are user configurable to desired mapping. Mapping the same function to two buttons will create a failsafe requiring both buttons to be depressed to trigger the function. Example: Mapping A and B buttons to Arm/Disarm. Controllers Supported: Generic (Bluetooth/USB Gamepad), Airboss, Parrot MPP3, Tomahawk Grip20, Herelink Blue, KTAC, Skydio Controller, SRoC, TAC, Vison 2 and WEB Controllers. Each of the listed controllers have corresponding image and button layout in the User Interface.



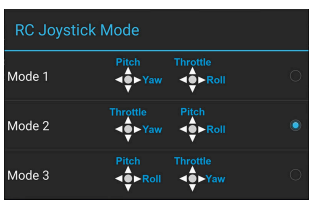
Joystick Sensitivity: Adjustments can be made to the sticks to be less sensitive in the center, for finer control in this zone.

- Twitchy (Default)
- Average
- Sluggish
- Lethargic

Preferences - Management

- **Save Preferences:** Saves current UAS Tool Preferences. Saved Preferences are located in atak/tools/uastool/prefs.
- **Load Preferences:** Load preferences from a .pref.
- **Reset UAS Tool Preferences:** Reset preferences to default.

Platform-Specific Options



- **DJI Preferences:** Setting for use with DJI platforms.
  - **RC Joystick Mode:** Sets the joystick configuration for the remote controller.
  - **Ignore Missing Asset APKS:** Disables dialog box warning that ATAK Go/ATAK Go V5 needs to be updated or not installed.
- **DJI v5 Platform:**
  - **RC Joystick Mode:** Sets the joystick configuration for remote controller (Same as DJI settings listed above.)
  - **ATAKGo Startup Behavior:** Chooses behavior of ATAK Go when a DJI platform is connected when in ATAK.
  - **Ignore Missing Asset APKs:** Disables dialog box warning that ATAK Go/ATAK Go V5 needs to be updated or not installed.
  - **Check Firmware:** Verify that Firmware is up to date. UAS Tool does not download/update firmware.
  - **(M3R/RC Pro) - Zoom Dial switches to Zoom Lens:** When using the zoom dial UAS Tool will automatically change from Wide angle to Zoom.
  - **(M3R/RC Pro) - Enable Zoom Dial on IR Lens:** Allows the ability to zoom using IR Camera.

Preferences - Platform Specific

- **BH3 Preferences:** Set when using the PD100 Black Hornet III platform.
  - Video Source Network Adapter
  - Video Source IP Address
  - Video Source Port
  - BH3 Incoming CoT UDP Port
  - BH3 Incoming CoT TCP Port
- **MAVLink Preferences:** Settings for using MAVLink platforms.
  - Default Sensor Type: Select a sensor Type for use with UAS Tool
  - Video Source Network Adapter
  - MAVLink Network Protocol and Platform IP
  - MAVLink Platform Port
  - Local Port
  - Video Source URI 1-4
  - MAVLink Dialect
  - Auto
  - PX4
  - ArduPilot
  - INDAGO4
  - Joystick Input Delay and Joystick Input Enabled
  - Gimbal Bar Pan/Tilt Mode
  - Zoom Mode
  - Message Severity Level

Preferences - Platform Specific

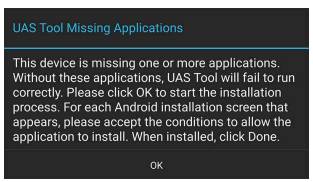
- **AV Platform Preferences:** Set when using AeroVironment platforms, such as the Puma, Puma II, Raven and Wasp.
    - Video Source Network Adapter
- **Indago Preferences:** Settings for using Indago Platforms
    - Platform IP
    - Platform Port
    - Video Source Adapter
    - Video IP
    - Video Port
- **Generic UAV Preferences:** Set to use a generic video source within the UAS Tool. The UAS Tool can rebroadcast generic video that has KLV/MISB-compliant data.
    - Video Source Network Adapter
    - Video Source IP Address
    - Aero Computers IP
    - Aero Computers Port
- **Trillium/Orion Platform Preferences:** Settings for using Trillium/Orion Platforms
    - Video Source Adapter
    - Trillium/Orion Platform IP
    - Trillium/Orion Platform Port
    - Buffering (in milliseconds)

APPENDIX A: Connecting to a DJI Platform

UAS Tool is compatible with both USB A / Micro ports located on the bottom and side of the Mavic, Mavic 2, and Mavic 2 Enterprise. UAS Tool can be side loaded into DJI Smart controller RM500 (used with the Mavic 2 series), and the M300 smart controller. Crystal Sky devices are currently not compatible.

Note: Performance can be hindered when using Augmented Reality and Object Detection on a DJI Smart controller.

Once the UAS Tool has been loaded into ATAK, a prompt will appear to install supplemental applications. ATAK Go is needed only for the operation of DJI Platforms and not required for the other sUAS platforms. Select **OK** to begin installation of ATAK Go.



Power on the sUAS and GCS controller outside prior to connecting to the ATAK End-User Device (EUD). This ensures that the DJI platform has a GPS signal, which is required to effectively operate using the platform and ATAK UAS Tool. Ensure the DJI's compass and gimbal are also calibrated.

It is imperative that the user has Digital Terrain Elevation Data (DTED), or some form of elevation data installed on the ATAK EUD prior to flying. The ATAK UAS Tool will prompt the user if they do not have DTED installed.

Set the ATAK Settings > Display Preferences > Reverse Landscape orientation on the Mavic Controllers, when connecting a device into the arms of the remote using the side connection. This ensures that ATAK is displayed properly while the ATAK EUD is mounted into the handles of the DJI controller.

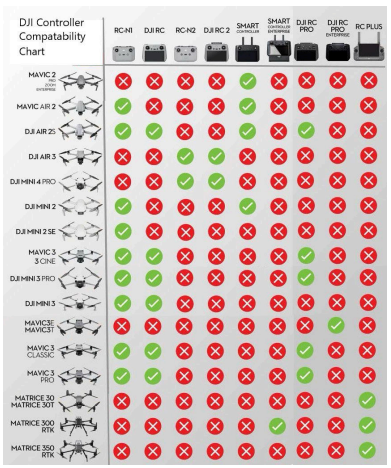
After ATAK is started and the UAS Tool Plug-in is loaded, select the **Additional Tools** button and locate the plug-in to open its pane. In the ATAK UAS Tool's pane, select + to choose the desired platform.

Appendix A - DJI (continued)

Connect the ATAK EUD to the GCS controller. Upon the first DJI connection, pop up messages will appear for ATAK Go. Select **OK** to allow ATAK Go the necessary Android permissions to function. Select **Use as Default** for ATAK Go to no longer be prompted every time a DJI connection happens. Should requests for permission not appear, exit ATAK and open ATAK Go.

Accept the Android permissions, then close ATAK Go. ATAK Go does not need to be opened again and will run in the background during UAS Tool operations using a DJI platform. ATAK Go will need to be reopened to turn on/off Local Data Mode, or to enter credentials that unlock No fly Zones after they are approved by DJI.

DJI Platforms can work with multiple different controllers. The Compatibility Chart shown here does not reflect UAS Tool capabilities or performance of ATAK on those devices, but rather Aircraft/RC pairings.

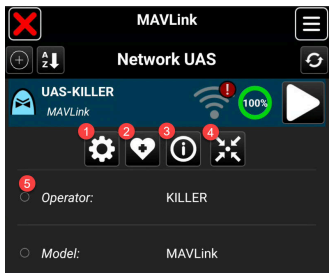


Note: Due to the design of the DJI SDK, V5 Platforms cannot be armed unless ATAK Go V5 is in the foreground. To launch an aircraft, Start in ATAK Go V5 and take the platform off the ground. Select **Back to UAS Tool** to return to ATAK and continue operations.

Appendix A - DJI (continued)

Once a DJI platform has been connected, consecutive toasts messages will appear to alert the user on the connection status. The user may have to login with their DJI account credentials within the ATAK Go application.

After successful registration, the sUAS home point, user marker, SPoI and FOV Cone map items appear at the location of the UAS' GPS location on the ATAK moving map.

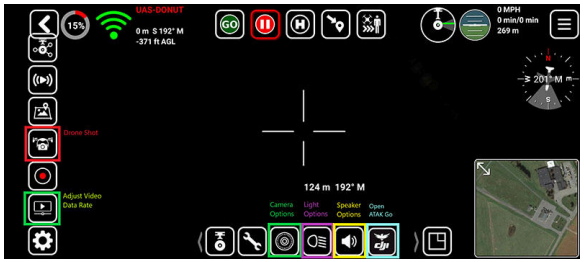


Number	Function
1	Platform Settings
2	Open ATAK Go
3	Pan-To
4	Metadata Selector

Additional Utilities for DJI Platforms

Droneshot: This feature is Mapshot but instead takes a high-resolution capture from the drone and beams it down to the phone, instead of a screenshot of the phone's view. This is predominately utilized for DJI platforms.

These images are downloaded at full resolution immediately to the ATAK EUD. The images are not stored on the sUAS and can be viewed within the ATAK Gallery.



A.1 - DJI Platform Settings

Select the **Settings** button on the UAS Tool home screen to access the DJI, platform specific settings. Select the **Refresh** button (upper right of the interface) to refresh settings. This menu can also be accessed through the **Utilities** button in full/half screen.

Calibrations

Calibrating the sUAS's Accelerometer, Gyroscope, Compass, and Gimble prior to each flight ensures optimal performance. The rear LEDs on the UAV will blink red if calibration is required or if there is an issue with the platform.

Note: Not all platforms will have the ability to calibrate all settings.

The following settings need to be synced after modifying them. To sync after modifications, select the **Sync** button (to the right of the setting that was changed) to upload the setting to the sUAS.

Flight Restrictions

- Aircraft LEDs On/Off – ***Note:*** This does not shut off the status indicator LED(s) located on the rear of the sUAS.
- Maximum Altitude
- Maximum Distance Restriction

A.1 - DJI Platform Settings

Failsafe Behavior

- Go Home Battery % Threshold
- Go Home Altitude
- Land Now Battery % Threshold
- Connection Loss Behavior
    - Return to Home
    - Hover
    - Land

Flight Assistance

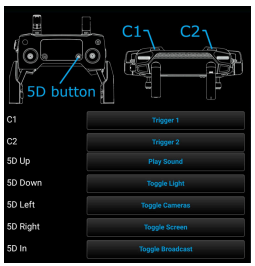
- Collision Avoid On/Off
- Active Avoid On/Off (currently not available for use)
- Vision Positioning On/Off
- Precision Landing On/Off
- Landing Protection On/Off

Miscellaneous

- Enable Obstacle Range display (currently not available for use)
- Camera Resolution/ FPS drop-down – Specifies the sUAS camera quality
- Format (sUAS) SD Card
- Format (sUAS) Internal Storage

A.1 - DJI Platform Settings

Controller



The C1, C2, and 5D Hat-Switch buttons can be customized to control the platform's Gimbal, Accessories, and Imagery. Select **Customize Buttons** to customize the programmable buttons for the sUAS's GCS.

Currently, this setting has been optimized for use with DJI Mavic Series.

Other Platform Settings

Camera Options: Switch Camera (EO/IR) and IR Color Palette

On platforms with Electro-Optical/Infrared (EO/IR) capability, the **Switch Camera** button is available.

Gimbals with Multiple sensors integrated within them has the following capabilities within UAS Tool:

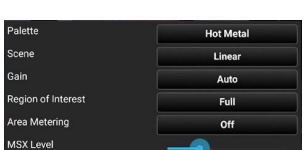
Auto Zoom: UAS Tool will automatically switch between Wide angle lens and Zoom lens while zooming in

Selecting the **Link Zoom** (located in Thermal Camera Options)- Zoom lens and Thermal Lens will stay at the same zoom level when switching between them.

Selecting **Picture in Picture Mode**- Shows EO and IR camera feeds side by side in the video pane. This video will also stream to other TAK devices if broadcasting.

Selecting the **Thermal Camera Settings** button- Opens a window with the following options: Palette, Scene, Gain, Regions of Interest, Area Metering, MSX Level.

Number	Function
1	Link Zoom
2	Picture in Picture Mode
3	Thermal Camera Settings

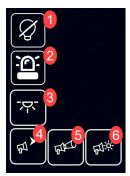


A.1 - DJI Platform Settings

Light Options

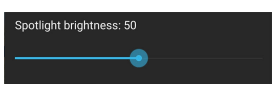
Selecting the **Light Options** button opens the Light Options Toolbar.

The **LED Lights** buttons turn off/on the aircraft front LED lights. The default is lights on. The spotlight, bottom auxiliary light, and top auxiliary lights (if available on platform) can be turned off/on through the Lights Toolbar.



Number	Function
1	LED Indicator Lights on/off
2	Beacon Strobe on/off
3	Bottom Auxiliary Light
4	Spotlight options
5	Turn on/off Spotlight
6	Spotlight Brightness

Selecting the **Spotlight Brightness** brings up a slider to change the light level.

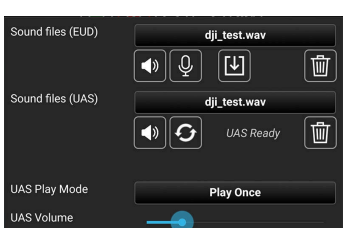


Speaker Options

Selecting the **Speaker** button brings up the Speaker Options Toolbar. Selecting the **Play Sound** button immediately plays the currently loaded file on the UAS. Selecting the **Quick Record/Play** button records and uploads sound from the EUD to UAS. The sound played is not saved after playing. Selecting the **Sound Options** opens a window with the following options:

Number	Function
1	Play sound currently loaded on UAS
2	Quick Record/Play sound
3	Sound Options

- Play sound from device file system
- Record sound on device
- Upload sound file to UAS
- Delete sound file on device
- Play sound on UAS speaker
- Refresh sound file list on UAS
- Delete sound file on UAS

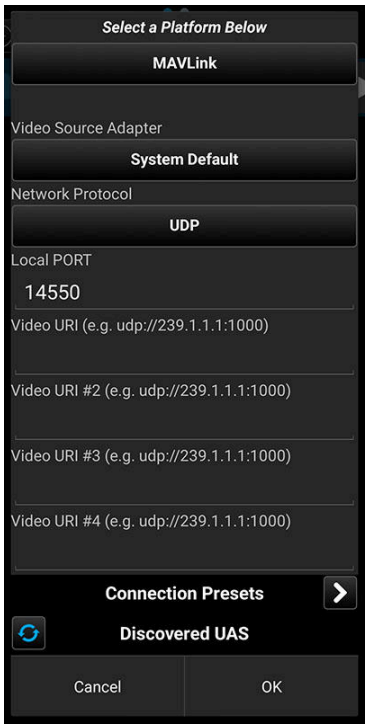


APPENDIX B: Connecting to a MAVLink Platform

UAS Tool has been configured to connect to aircraft using MAVLink Protocols. Examples of MAVLink Aircraft include the Skydio X2D, Teal Golden Eagle, and Vantage Robotics Vesper (RAS-A compliant platform). UAS Tool also has integration for the Herelink and Herelink Blue GCS/Receivers. The MAVLink configuration is also used for Parrot Anafi line of sUAS and is covered in Appendix C.

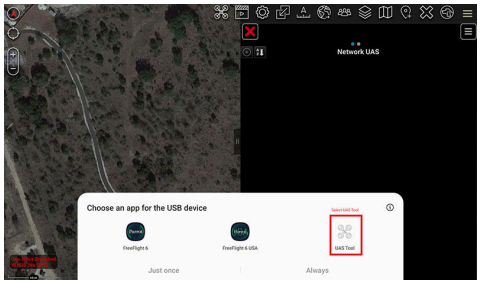
After ATAK is started and the UAS Tool Plug-in is loaded, select the additional tools button and locate the plug-in to open its pane. In the ATAK UAS Tool's pane press the plus button to Select MAVLink. Platform selection pane will update to MAVLink Configuration. Select the network protocol of the aircraft. UAS Tool supports connection through TCP, UDP, UDP_Client, and Serial. Enter the platform's IP address and video URLs and select **OK**. After successful registration, the sUAS Home point, user marker, SPoI and FOV Cone map items appear at the location of the UAS' GPS location on the ATAK moving map.

Currently UAS Tool includes configurations specific MAVLink platforms located at the bottom of the platform selection pane. Included is Generic MAVLink, Parrot Anafi (See Appendix C for full connection instructions) Herelink, and Skydio X2. Select the **Import Settings** button to the left for the desired platform to configure to the selected preconfigured settings.

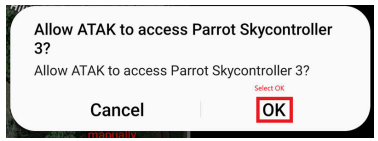


APPENDIX C: Connecting to a Parrot Platform

UAS Tool Supports connection to the Anafi Series of sUASs through the use of Parrot's Ground SDK. The commercial line platforms include Anafi, Anafi 4K, and Anafi Thermal. The Government line includes Anafi USA, Anafi UAS Gov, and the Anafi USA Mil.



After ATAK is started and the UAS Tool Plug-in is loaded, select the **Additional Tools** button, and locate the plug-in to open its pane. In the ATAK UAS Tool's pane, select the + button to choose Parrot Anafi – Ground SDK. After starting up the aircraft and Ground controller, connect the EUD to controller. Toast messages will appear as the EUD connects to the controller. If other software is installed that can control the Anafi, a toast message appears asking which software to connect to the USB device. Select **UAS Tool**.



The next toast message will allow ATAK to access the Parrot Sky controller, select **OK**. The connected Anafi will now populate into UAS Tool.

APPENDIX D: Connecting to Autel Evo Platform

Note: Incorporation with the Autel Evo series is currently under development.

UAS Tool currently only supports the Evo Max Series. After ATAK is started and the UAS Tool plug-in is loaded, hit the additional tools button and locate the plug-in to open its pane. In the ATAK UAS Tool's pane, select + to choose Evo. Connect the ATAK EUD to the GCS controller. A toast message will appear to "Connect to UAS Tool", dismiss this message. A Second toast will appear to "Connect to ATAK," select to connect to the aircraft. After successful registration, the sUAS home point, user marker, SPoI and FOV Cone map items appear at the location of the UAS' GPS location on the ATAK moving map.

Current issues and troubleshooting with the Autel Evo series:

- Aircraft will not populate in UAS Tool after EUD disconnects from the GCS. (Caused by unplugging from the controller or faulty USB cable.
  - ATAK will need to be restarted in order to reconnect to the aircraft.
- Try the following troubleshooting techniques for the "Black screen" video feed in ATAK UAS Tool due to this Autel/OEM limitation (most noticed on an EVO Smart Controller)
  - Enable ADB Debug on the Autel EVO Smart Controller.
  - Plug in both a USB-A and USB-C into the two available receptacles on the Autel EVO Smart Controller. Once connected and on the ATAK UAS Tool screen with the "Black Video" frame, remove both cables quickly.

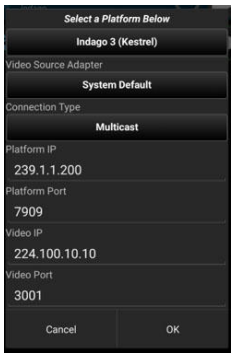
APPENDIX E: Connecting to Indago 3 Series Aircraft

After ATAK is started and the UAS Tool Plug-in is loaded, select the **Additional Tools** button and locate the plug-in to open its pane. In the ATAK UAS Tool's pane, select + to choose Indago 3 (Kestrel).

Note: When Connecting UAS Tool end user device, do not use the Indago OEM hand controller. (This UAS can only connect to one ground station at a time)

When connecting to a 1 X Network Interface (e.g., Trellis, MPU-5, etc.) keep the Video Source Adaptor as default.

Note: Only use Network Monitor if using a TE ROM Samsung Device, otherwise just use the Native Android More Connections Preference to configure the Network Interface on the Android end user device.



Select Connection Type

Multicast will connect to the first available Indago on the same subnet. (Requires TW650) For TrellisWare the platform port must be "7909".

Note: Users can do Unicast Video from this Connection Type by changing the Video IP to the IP of the ATAK EUD.

Note: The user must use the Serial to Ethernet S2E Windows Tool from Lockheed to point the Indago's onboard computer at the IP of the ATAK EUD for this configuration.

Note: Space out IP's and account for the payload IP being +1 whatever the ATAK EUD is. (Requires TW650)

Additional Notes on Connections:

When using Legacy TrellisWare ensure that the Platform IP is the IP of the aircraft. If the IP has not been changed from the default, it will be 10.1.x.x (x.x will be on the sticker inside the aircraft's batter bay).

APPENDIX F: Connecting to Black Hornet III (BH3)

Prior to installation, the following prerequisites must be configured in order to connect the BH3 with ATAK UAS Tool:

- BH3 Base Station is running PRS 4.1.2 Firmware.
- The BH3 Base Station does NOT support DHC. The user must place a Router or Radio (with DHCP) in the middle or use a static setup. The ATAK EUD and Base Station must be on the same subnet

On the BH3 Base Station, make sure to point the CoT UDP and CoT TCP at the ATAK EUD's IP address, port does not matter.

After ATAK is started and the UAS Tool plug-in is loaded, select the **Additional Tools** button and locate the plug-in to open its pane. In the ATAK UAS Tool's pane, select + to choose BH3. If networked correctly between the ATAK EUD and the BH3 Base Station, the NATO STANAG 4586 prompt of a detected drone will appear at the bottom of the + button setup screen.

APPENDIX G: Connecting to FLIR R80D

After ATAK is started and the UAS Tool plug-in is loaded, select the **Additional Tools** button and locate the plug-in to open its pane. In the ATAK UAS Tool's pane, select + to choose R80D Skyraider.

UAS Tool requires that the R80D Basestation has RaiderOS/ADK Firmware version 14.0.1 (previous versions of UAS Tool were keyed for 12.0.1 ADK). Once connected to the R80D system, the platform will be populated into the Discovered UAS menu. Select the **Refresh** icon if it does not populate. Then Select the **Download Configuration** icon (to the right of the Platform's listing) to configure to the selected platform, then select **OK**. The R80D is now configured for use with UAS Tool.

Note: Recommendation is to use a tactical edition (TE) Samsung device or Android EUD that supports multiple network interfaces.

APPENDIX H: Connecting to Teal Golden Eagle/Teal 2/ Teal 3 Black Widow

WARNING - Dated information subject to change from Teal OEM.

Note: This is for using UAS Tool with the TAC (Teal Air Control) Ground station.

After ATAK is started and the UAS Tool Plug-in is loaded, select the additional tools button and locate the plug-in to open its pane. In the ATAK UAS Tool's pane, select the + button to choose MAVLink. The platform selection pane will update to MAVLink configuration.

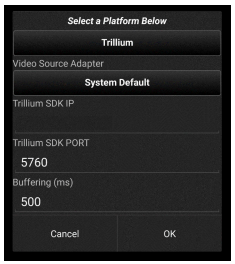
If the Platform has MAVLink router configured, ATAK will automatically connect to the platform when powered up. If MAVLink router is not configured, open Teal Q Ground Control (QGC) and connect to the platform from the ground station. Once the aircraft is connected, disconnect the aircraft from Teal QGC, and UAS Tool will connect to the aircraft. Then close Teal QGC.

Additional Notes:

- The OEM controller only supports ATAK UAS Tool in a local/offline capacity. If a user wants to extend any of the DIU Blue UAS MAVLink platforms beyond the OEM controller, the platforms to connect to a standalone Microhard Radio with a TE Android Device or an Android with Root/Super User to utilize more than one Network Interface at a time, must be configured.
- Due to the way that the Teal Series aircraft handles Altitude/Elevation data it is advised to activate the following setting to give proper altitude within the UAS Tool interface.
    - Go to Settings>Mavlink Settings>Position Source and select GPS (gps_raw_int)
- UAS Tool is now Integrated with the Tomahawk Grip ground station and has full network capability.

APPENDIX I: Connecting to Trillium Protocol (Stalker VXE30)

Configuring the ATAK EUD



Connect ATAK EUD (Tactical Edition preferred for multi-Network Connections) into a standalone Silvus Streamcaster (not the Ground station Radio). Using Network Monitor, set the EUD's network connections for the Silvus Streamcaster radio to:

- IP: 10.1.25.53
- Subnet Mask: 255.0.0.0
- Gateway: 10.0.0.1

Prior to Setting up UAS Tool, connect to the SkyLink App and navigate to Communications > Advanced Options and set the following options:

- Multicast IP: 239.225.225.1
- Port: 15004
- Bitrate 3 mbps

Next, connect the ATAK EUD to the Silvus Streamcaster radio. Using Network Monitor (ATAK Plug-in) Set the Silvus Streamcaster radio to the following configuration:

- IP: 10.1.25.53
- Mask: 255.0.0.0
- Gateway: 10.0.0.1

Once the radio is configured, startup ATAK and select UAS Tool, Select + to choose the Trillium platform. Enter the following settings and select **OK**:

- Trillium SDK IP: 10.129.238.7 (Gimbal IP)
- Trillium SKD Port: 5760
- Buffer: 500ms

APPENDIX J: Connecting to an FPV Drone

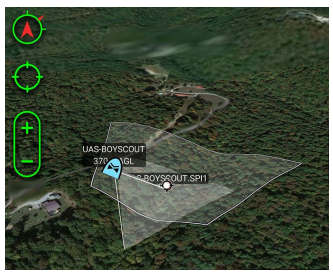
UAS Tool has some simple integration with FPV drones running Betaflight, iNav, PX4 or ArduCopter. These aircraft require an RC link that includes Telemetry, or a separate telemetry link.

After ATAK is started and the UAS Tool Plug-in is loaded, select the **Additional Tools** button and locate the plug-in to open its pane. In the ATAK UAS Tool's pane, select the + button to choose MAVLink. On the configuration pane, select **UVC Video** to enable video to be streamed from a USB connected device. These devices include Goggles with video output or Video receive dongles. Select **OK** to complete platform selection/configuration.

Configuration Examples/Connection Guide

For additional information on FPV connections, go UAS Tool settings and select **Show FPV Guide**. This guide provides information on connection to multiple configurations of Control links (including ELRS and Crossfire) as well connecting Video receivers (DJI, Analog and Walksnail) into UAS Tool.

APPENDIX K: Four Corners Projection Presentation/Calculations



In UAS Tool Version 12.9.1, an additional setting was added in Camera Preferences <Use DTED for 4 corners>. The Four Corners is a visual display of UAS Tool's best estimate for where the drone's field of view lies on the map.

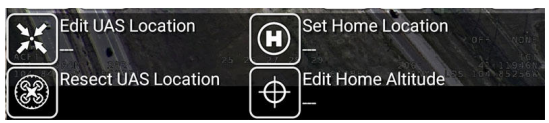
This feature uses DTED data to take into account dramatic terrain features such as large hills or valleys that noticeably alter the true location of the field of view at low drone altitudes. In order to more accurately handle these cases, it is necessary to utilize DTED data in the Four Corners calculation. The user must have DTED data imported or streamed to the EUD. The higher level of DTED data will enhance the fidelity of the projection and give a more accurate representation of the 4 Corners displayed on the map.

The first step in this calculation is to determine where the SPoI lies on the real terrain surface. This is accomplished by iteratively lengthening the camera vector until it passes below the ground. Once this happens, the point of intersection (i.e., the SPoI) is the average of the last two iterations. The Four Corners are assumed to have the same altitude as the SPoI and thus only require a simple ray-plane intersection calculation. This heuristic for finding the Four Corners appropriately balances the computationally expensive process of finding the intersection of a vector with the terrain surface (only done once here), while still displaying an accurate field of view. Previous iterations of UAS Tool (pre-12.9.1) used the drone's ground coordinate elevation in the Four Corners calculation instead of the SPoI elevation.

APPENDIX L: Aircraft Location Resectioning

Resectioning tool can be used to reposition the aircraft on the map when by using landmarks within the cameras view than calculating based on two or more of these landmarks. Cases in which this would be useful is: when an aircraft does not have a GPS installed, when an aircraft does not have solid GPS Lock, or when working within an area in where ambient radio frequencies are interfering with the aircraft's onboard GPS.

Resectioning Tool can be activated in the Settings>Utilities>Show Resection Toolbar. When enabled the button will be located in the lower toolbar. Selecting the Resection tool from the lower toolbar opens the resection tool underneath the lower toolbar. Resection Toolbar will allow form the following options:

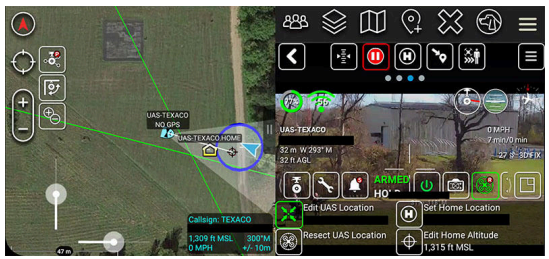


- Edit Location
- Resect UAS Location
- Set Home Location
- Edit Home Altitude

Edit Location

Selecting edit location allows for manual placement of the UAS in 3 dimensional space. By selecting <Place UAS Position> a user can tap on the map the estimated location for the platform. By selecting either <Change UAS Altitude AGL>, or <Change UAS Attitude MSL> an altitude value can be manually set from the platform's position. Once any of the items have been manually set, the Icon form Edit UAS Location will turn green to signify that the UAS Tool is using the manual entry for CoT location. By selecting Edit UAS Location again these items can be altered further or the Manual Override of can be Canceled and UAS Tool will return to using GPS location for CoT location Data. The Edit UAS Location button will be highlighted green while UAS Tool is using manual override of the UAS location (this includes resection).

L.1 - Resect UAS Location



Selecting Resect UAS Location allows the user to resect the location of the UAS by identifying landmarks with the in the crosshairs of the gimbal video stream and selecting the corresponding locations on the map. To enable select <Resect UAS Location> from the resection toolbar. Line up gimbal with a landmark and select that landmark on the map. A Resection line will drop on the map. Repeat this action to complete resection and the UAS CoT marker will reposition within the map. Selecting <Resect UAS Location> again will allow for additional resection lines to be dropped and aid in fidelity of the UAS location.

Set Home Location

This option allows the user to manually set or relocate the platform's Home Location.

Edit Home Location Altitude

This option allows the user to manually set MSL or AGL home location for platforms that use Height Above Launch (HAL)for altitude calculations. Additionally, this could be used to more accurately set altitude for platforms that use HAL and are launched from a raised position IE from the roof of a structure.