

# CHANGES FROM RELEASE 2023-02 TO 2023-03 FOR EOS C VTOL UAV


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357-204-101436-01-10

2023-12-20

## APPROVAL

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## DOCUMENT CHANGE HISTORY

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DATE	REVISION	DESCRIPTION	MODIFIED BY
18.03.2023	10	First Issue	HR

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# 1. SCOPE

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## 1.1 PURPOSE

This document gives an overview of the changes in update package Release 2023-3 when updated from Release 2023-2. Release 2023-3 incorporates both software and firmware changes of multiple components which are further described in this document.

This document is intended mainly for UAV end-users and technical personnel, as well as other internal and external parties involved with EOS C UAV.

In case of further questions regarding the update, contact Threod Systems customer support:

Email – [support@threod.com](mailto:support@threod.com)

## 1.2 OVERVIEW

The document consists of the following sections:

Section 1: Overview Section

Section 2: Applicable and Reference Document List

Section 3: Compatibility With Earlier Releases

Section 4: Pilot Software changelog

Section 5: Mission Software changelog

Section 6: Autopilot changelog

Section 7: RVT Software changelog

Section 8: Gimbal changelog

Section 9: Silvus Streamscape changelog

## 2. APPLICABLE DOCUMENTS

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### 2.1 REFERENCED DOCUMENTS

- 503-204-101436-01-01 EOS C VTOL FIRMWARE UPDATE MANUAL
- 502-526-115850-01-13 Remote Video Terminal User Manual
- 502-204-102798-01-2023-02 EOS C VTOL UAV Operator GCS Software Manual

## 3. COMPATIBILITY WITH EARLIER RELEASES

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### 3.1 REQUIREMENTS

Release 2023-3 update package is compatible with Threod Systems EOS C VTOL UAV system components which are operating on Software Release 2023-2. In case of earlier versions, please contact Threod Systems for support.

When proceeding with Release 2023-3 updates, it is necessary that all components of the system (aircrafts, GDTs, RVTs and GCSs) are simultaneously updated to Release 2023-3. Also, if your equipment fleet consists of more than one aircraft, GDT, RVT or GCS, that are all used as a part of the same system, then all of them must be updated. **Components with different release versions must not be used in the same system simultaneously!**

All updates must be performed by Threod Systems technician or according to instructions provided by Threod.

### 3.2 NEW VERSION NUMBERS

Release 2023-3 update package consists of following changes

- **Firmware updates:**
  - Autopilot firmware vers 1.12.6 (including Autopilot parameters R2023-3)
  - Battery heater firmware vers 0.51
  - Communication board firmware vers 2.47
  - INS firmware vers 2.5.208
  - Pitot firmware vers 1.20
  - Silvus Streamscape firmware vers 5.0.0.1
- **Software updates:**
  - Pilot software vers R2023-3
  - Mission software vers R2023-3
  - RVT software vers 1.3.1

Please note that version numbers can change if bugs are discovered and fixed within release i.e before the launch of the new release.



## 4. PILOT SOFTWARE UPDATE

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Version R2023-3

### 4.1 PILOT SOFTWARE UPDATE

Following subchapters give an overview of the changes in Pilot Software. Further information about the changes in the operation procedure can be found in EOS C VTOL UAV OPERATOR GCS SOFTWARE MANUAL 502-204-102798-01-2023-02.

### 4.2 CHANGES IN SYSTEM OPERATION

New error messages:

1. Movement detected during IMU temperature calibration. Calibration aborted.
2. IMU temperature calibration complete.
3. Vibration in fixed wing mode over \$g.
4. Vibration in rotary wing mode over \$g.
5. Temperature and humidity sensor disabled due to errors.\*
6. Temperature \$ is out of aircraft operational limits.
7. Icing May Occur Fly Safe.\*
8. High Moisture In The Air.\*
9. Decreasing airspeed for climb

*\* Feature available only on aircrafts equipped with temperature and humidity sensors.*

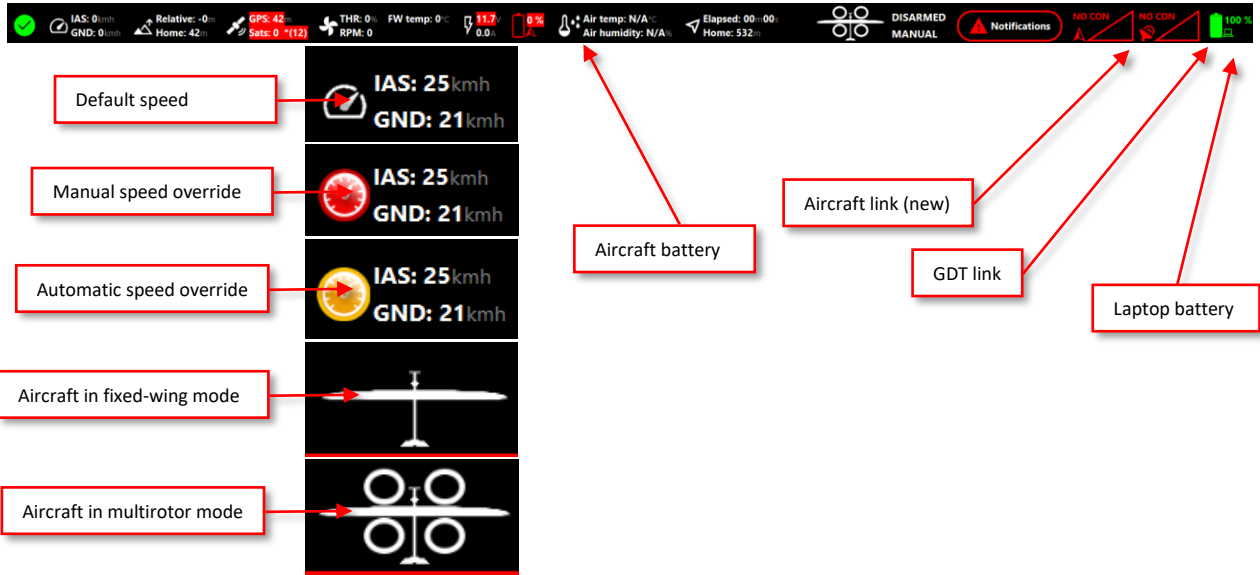
### 4.3 BUG FIXES

- During guided flight landing, an error message stating "Can't switch to guided mode when not flying" erroneously appeared when the UAV was already on the ground. This error should not have occurred in this scenario. Furthermore, if the error dialog was closed before the aircraft disarmed itself automatically, the aircraft would unexpectedly resume flying towards the first waypoint.
- Failed to add images to report if daylight saving was turned off in Windows.
- When opening Pilot Software then it consistently displayed 'Tracker GPS lost', even though it should show only if connection to tracker has been established at least once.
- In waypoint editor if coordinate dropdown menu was set as 'map center' then you had to click two times 'position from current home' until current home position was put to the coordinate field.

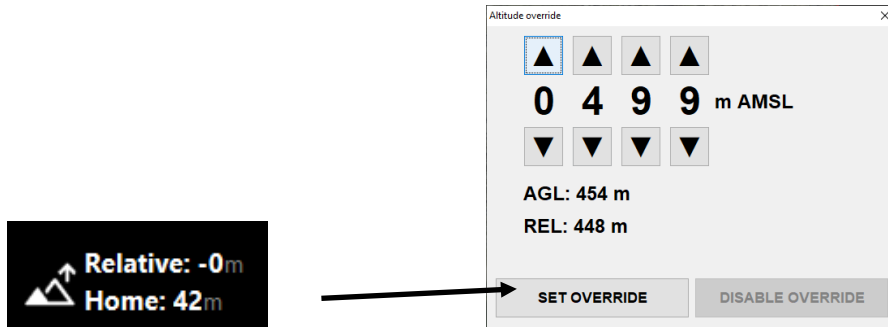
- When the manual loiter altitude was set high (2000m AMSL or higher), dragging the manual loiter icon in 2D map mode resulted in slower movement of the loiter icon compared to the mouse cursor.

### 4.4 CHANGES

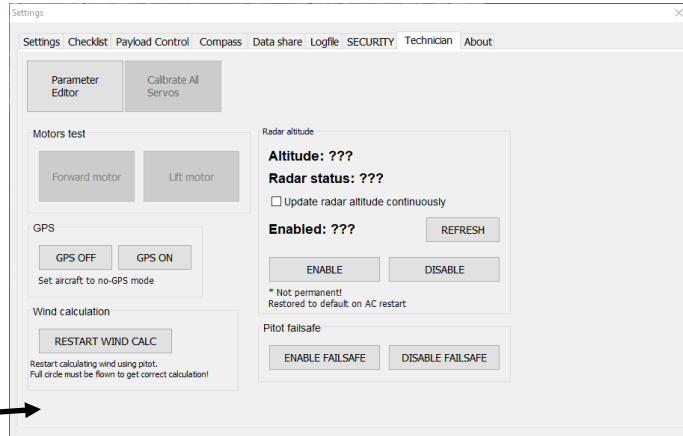
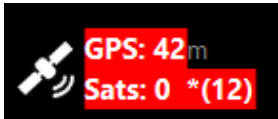
- Status bar user interface changed completely. Status bar is showing GDT and AC radio link now instead of only GDT. Icon is showing if aircraft is in multirotor mode (lift motor circles added as in picture) or fixed-wing mode. Aircraft speed icon changes if manual speed override is active or automatic speed override is active. Speed override icons themselves are same as previously. Notifications buttons icon and border color depend on which is most severe error in notifications window.



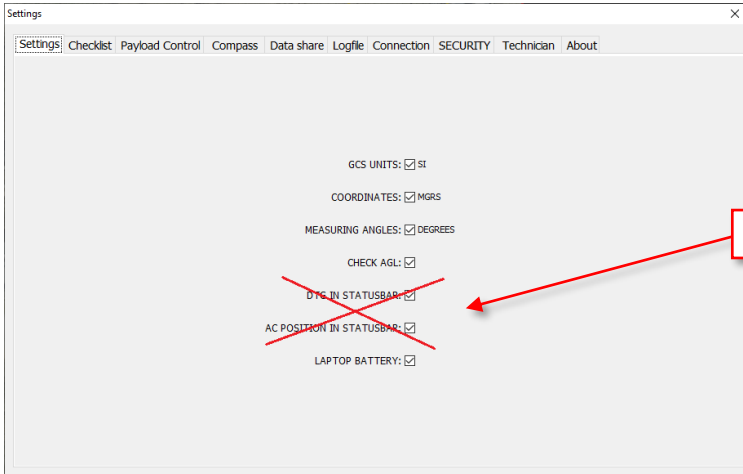
- Altitude override can be additionally opened from status bar (altitude bar still works as it did before).



- GPS icon on the status bar acts as a shortcut. Clicking on GPS icon opens Settings window tab where you can turn GPS ON/OFF.

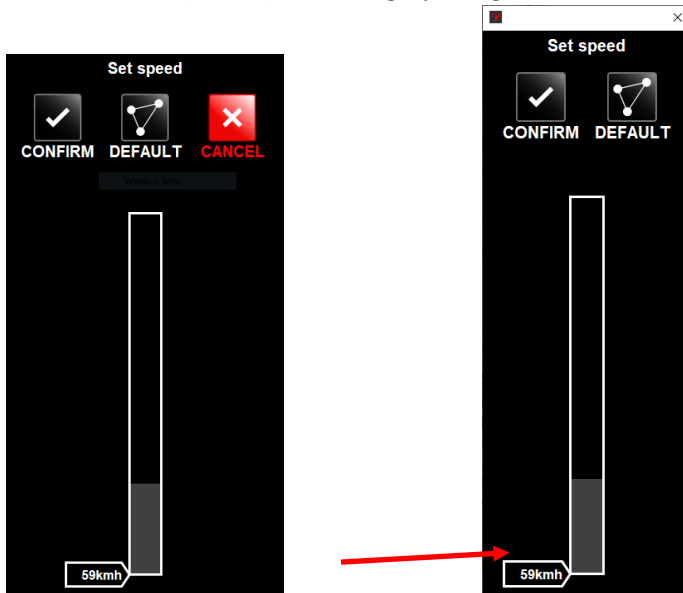


- Coordinate and DTG options have been removed from settings as it's not needed to show them in status bar (already visible in video overlay).

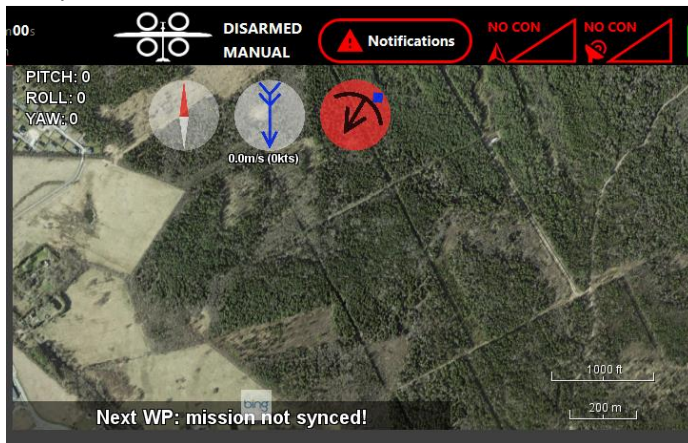


Deleted these two checkboxes

- Now, the speed override dialog can be dragged, and the red "cancel" button has been removed. You can now close (cancel) the dialog by using the default Windows close button.



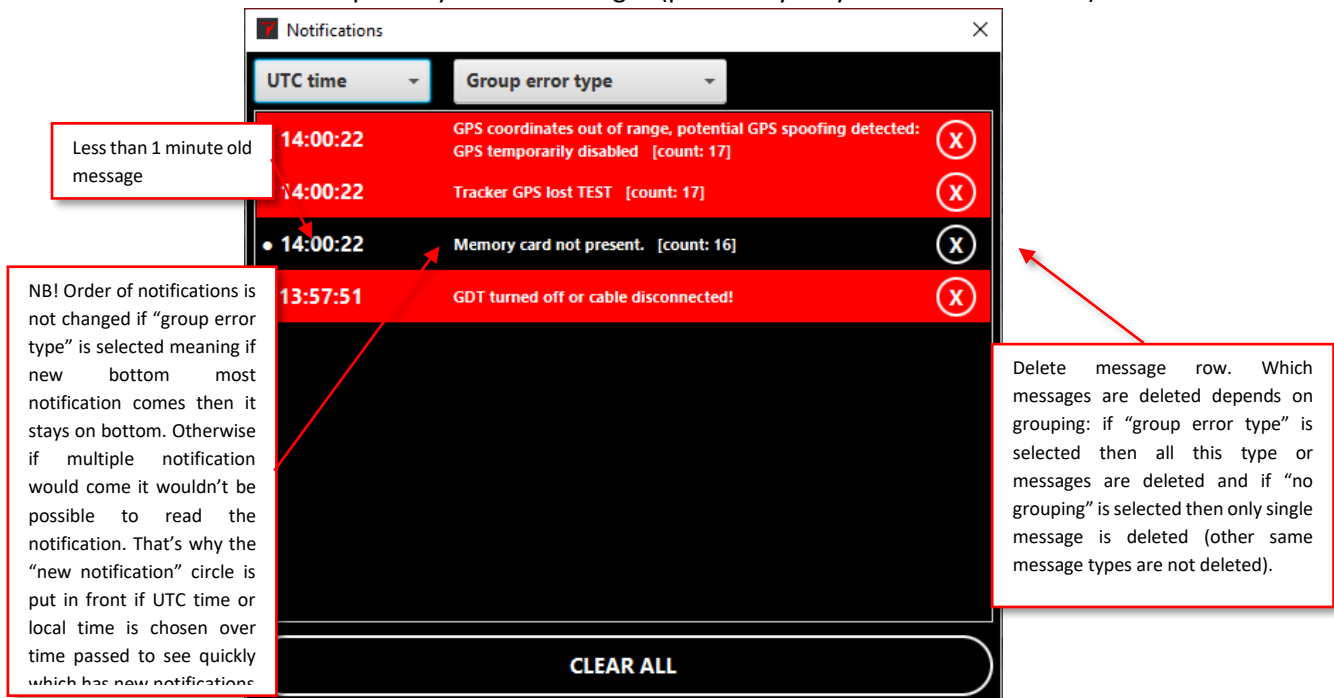
- If map and video are on the same single window and it's currently in video mode (big video and small map) then map scalebars and playtime part are moved in a way that scalebar is not under the playtime text part



- Wind indicator icon is blinking if UAV is in pitot failsafe mode.
- If GPS part is blinking as error in status bar (no 3D fix, not enough satellites or using GPS in autopilot is turned off) then it's showing best satellite count in brackets. Best satellite count means it shows highest satellite count of the different existing GPS devices (if multiple) which match criteria: have 3D fix, barometric altitude and GPS altitude difference is less than 1000m and last telemetry received for given GPS is less than 4 seconds ago. Useful if you fly in GPS denied area and fly back and want to know if/when to turn back on GPS usage in autopilot instead of flying with INS.



- When clicking tracker start track button then confirmation will be asked if calibration is not done in this GCS session.
- If an error related to a CAN component is reported by the autopilot, the name of the component (e.g., 'communication module') is now displayed instead of the component number, as the name provides more descriptive information.
- When a servo-related error is reported by the autopilot, the location of the servo (e.g., 'right aileron') is now displayed instead of the servo number, which provides more relevant information.
- When an ESC-related error is reported by the autopilot, the location of the ESC (e.g., 'right front') is displayed instead of the ESC number, as the location provides more relevant information.
- Errors window UI changed completely. Now it's possible to set which time is shown for errors (UTC, local time, time passed) and how errors are grouped (error type, consecutive type, no grouping). If UTC or local time is selected then circle is shown next to time that tells this message is less than 1 minute old.



Notifications

UTC time    Group error type

Less than 1 minute old message

14:00:22    GPS coordinates out of range, potential GPS spoofing detected:    X  
GPS temporarily disabled [count: 17]

14:00:22    Tracker GPS lost TEST [count: 17]    X

14:00:22    Memory card not present. [count: 16]    X

13:57:51    GDT turned off or cable disconnected!    X

CLEAR ALL

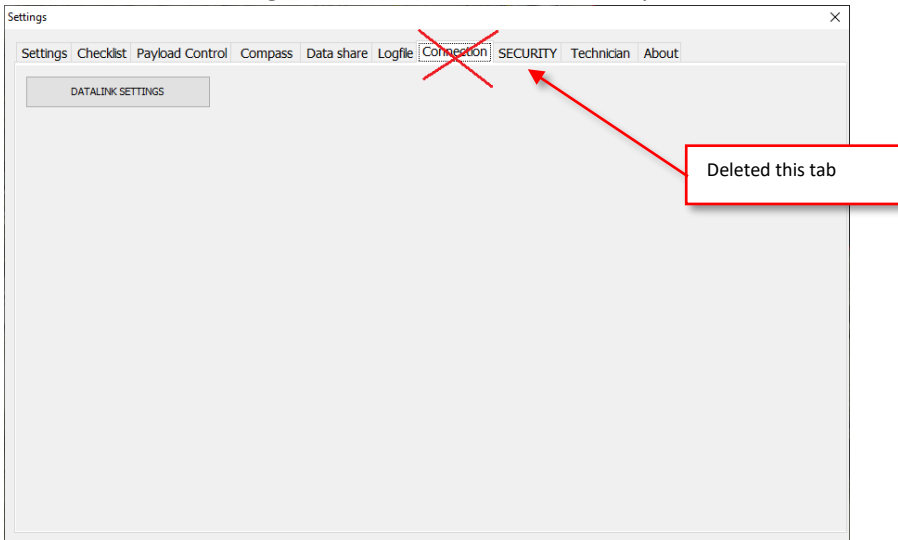
NB! Order of notifications is not changed if "group error type" is selected meaning if new bottom most notification comes then it stays on bottom. Otherwise if multiple notification would come it wouldn't be possible to read the notification. That's why the "new notification" circle is put in front if UTC time or local time is chosen over time passed to see quickly which has new notifications

Delete message row. Which messages are deleted depends on grouping: if "group error type" is selected then all this type or messages are deleted and if "no grouping" is selected then only single message is deleted (other same message types are not deleted).

- 'Waypoints not synced' warning is removed if last connection with aircraft was more than 60 seconds ago. Will start showing again (if it was showing before) when connection comes back or aircraft restart is detected.
- On GCS startup and when aircraft restart is detected then black screen is shown as gimbal video until video starts coming. Also button to request video (high quality) feed is shown on video (when it hasn't started yet) so you don't need to open the video settings window anymore. NB: currently there is an unresolved bug from previous releases - when this black screen with button is shown and you toggle between video mode (big video, small map) and map mode (big map, small video) then the black screen and button are lost and default grey video screen is shown. This will be resolved in future release.



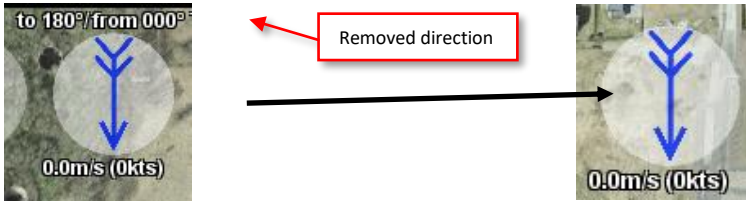
- Removed 'Connection' tab from settings window as it's not needed because it contained only one button 'datalink settings' which window can now be opened from status bar



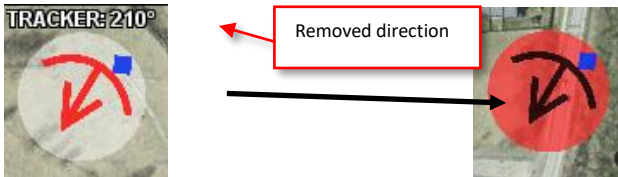
- The text on the pitot failsafe buttons has been updated for better clarity: 'FAILSAFE ON' is now 'ENABLE FAILSAFE', and 'FAILSAFE OFF' has been changed to 'DISABLE FAILSAFE'.
- Changed error view that is showing more serious errors on top-center of window. Now you can mute the error sound for all currently visible errors. If new type of error appears the error sound will play again. If you clear the notifications list in notifications window and same error appears again the error sound will also play again. You can remove some errors separately from the error view. If you clear the notifications list in notifications window and the same error (removed from errors view) appears again then it'll appear in errors view again also. Now it's showing error description if it comes from autopilot (previously it showed just 'error in component X').



- The wind direction value has been removed from the top of the wind icon, as displaying the exact value was deemed unnecessary.

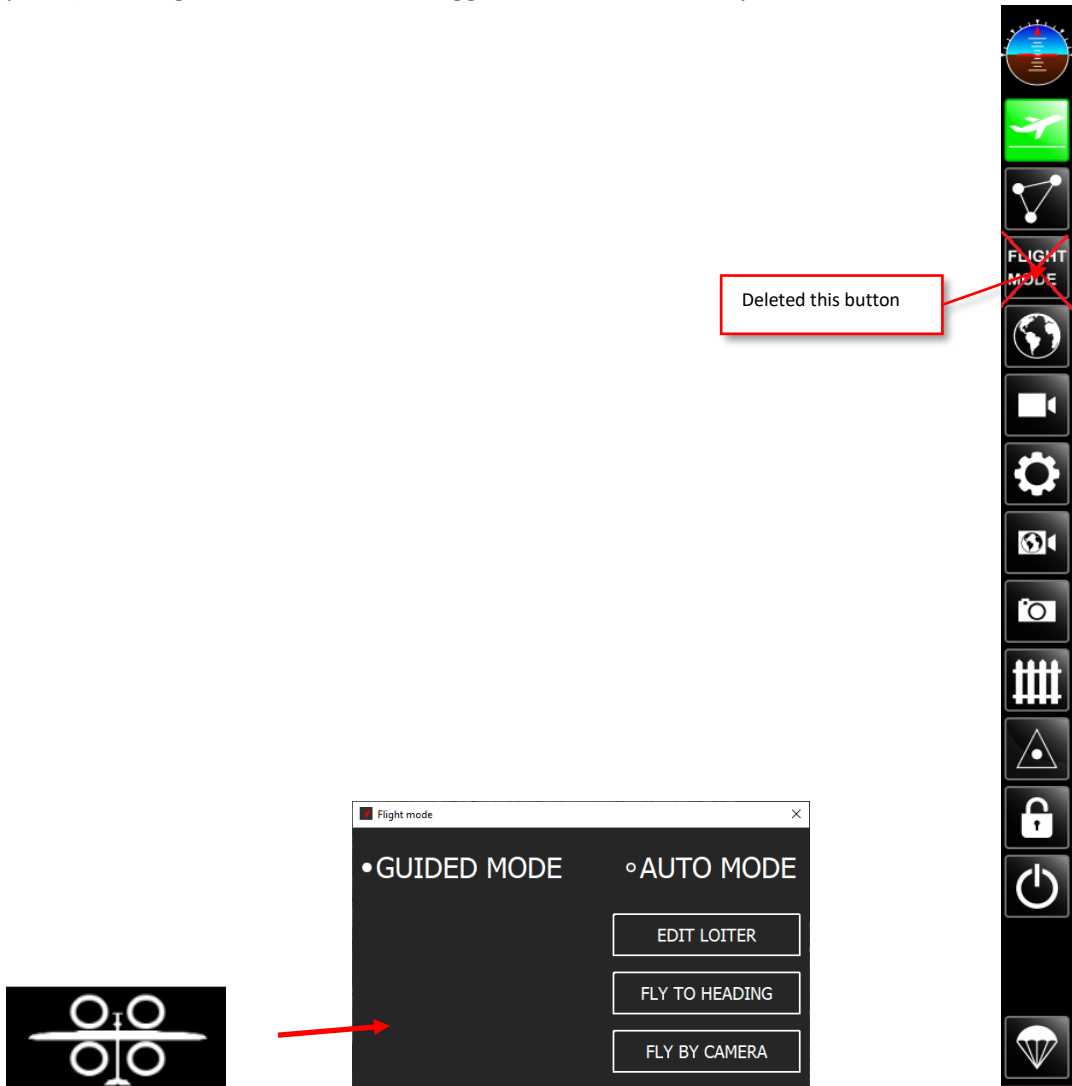


- The tracker direction value has been removed from top of the tracker icon, as displaying the exact value was deemed unnecessary. Also now it toggles between tracker and gimbal video (previously always only opened tracker video)



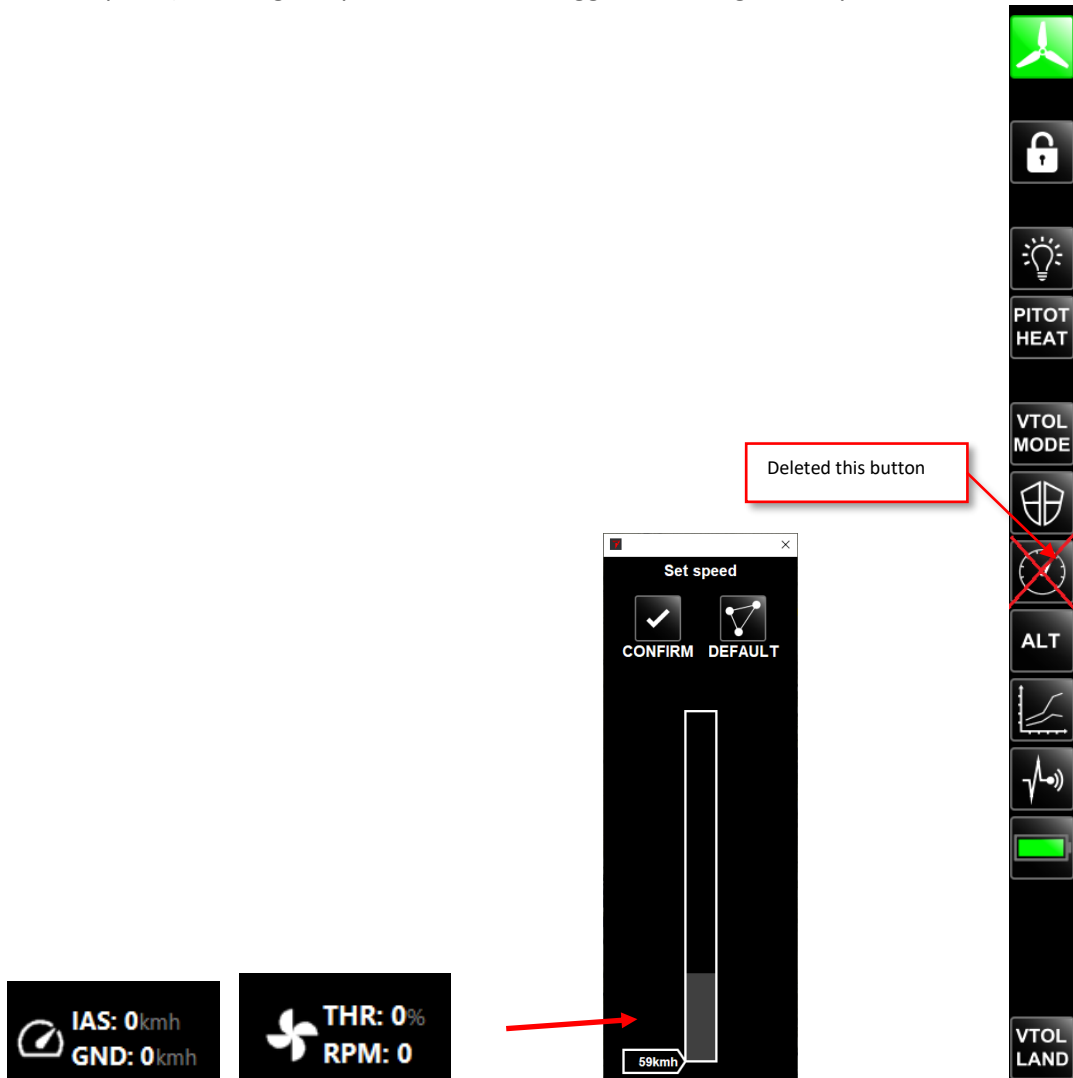
- When switching back to auto mode then next time you switch to guided mode the speed is reset to default speed (if it was increased in guided flight).

- Flight mode dialog is opened from status bar now (removed flight mode button from left buttons panel). Clicking on aircraft icon will toggle the window visibility.

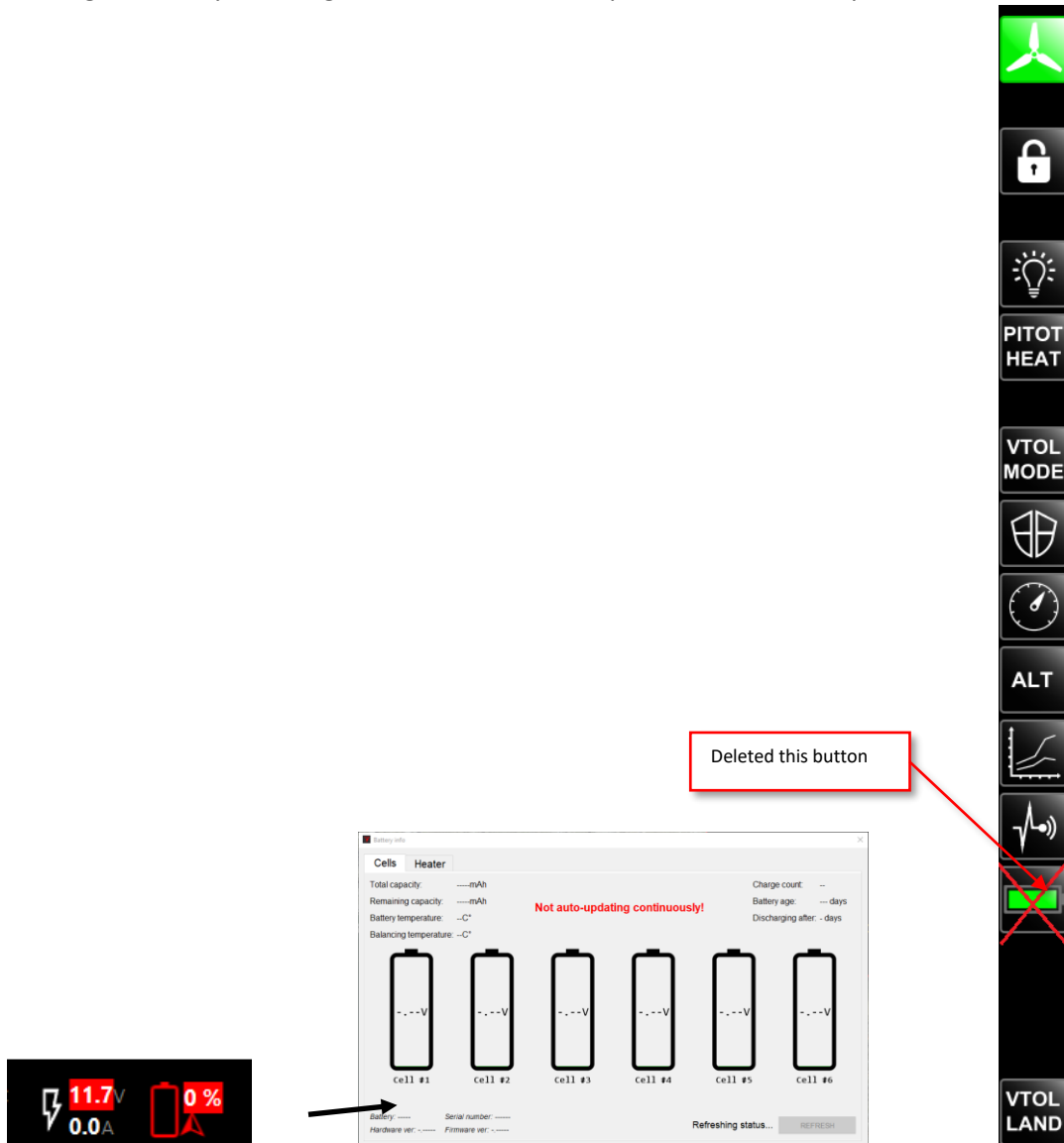




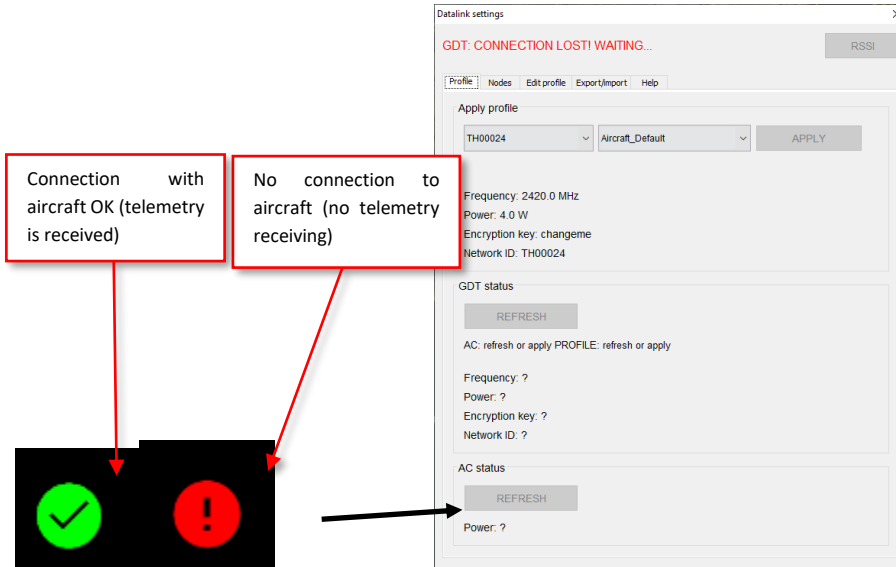
- Speed override dialog is opened from status bar now (removed speed override button from flight buttons panel). Clicking on speed section will toggle the dialog visibility



- Battery window is opened from status bar now (removed the battery button from flight buttons panel). Clicking on battery or voltage/current section will open/close the battery information window.



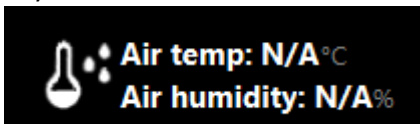
- Charge count value of heated batteries was not working properly – system was showing random numbers. This issue is not fully resolved, so instead battery cycle count for heated batteries is now shown as 'N/A'.
- Radio aircraft profiles window can be opened directly from status bar (telemetry status icon - most left icon on status bar). It can still be opened also from radio connections window as previously.



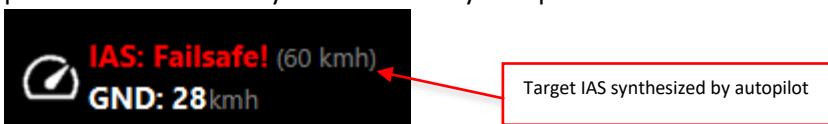
- For live video feed calculations (footprint on map, aircraft location on map etc.) aircraft location is based on aircraft telemetry instead of KLV in video. Therefore in GPS denied environments, whereby aircraft location is overwritten in autopilot, the locations are more correct on map. For playback KLV is still used.
- GCS will delete automatically logs older than 90 days on startup to free up hard drive space and also older logs are not relevant anymore.
- Importing layers and elevations percent is shown with 2 decimal places instead of 1.

### 4.5 ADDED FUNCTIONALITY

- A yellow notification will appear in the notifications window if the wind speed exceeds 16 m/s. Additional notifications will be added for each 1 m/s increase in wind speed, up to a maximum of 19 m/s. If the wind speed exceeds 19 m/s, a constant red warning will be displayed at the top-center of the screen. Notifications will start again from 16 m/s if the wind speed falls below 14 m/s.
- Air temperature and humidity have been incorporated into the status bar. Values will be displayed if the aircraft is equipped with the necessary sensors. Air temperature will appear in red if it falls below -19 degrees Celsius or exceeds 49 degrees Celsius, and it will be displayed in yellow if it is below 1 degree Celsius or above 39 degrees Celsius. Humidity will be highlighted in red if it surpasses 94% and in yellow if it exceeds 84%

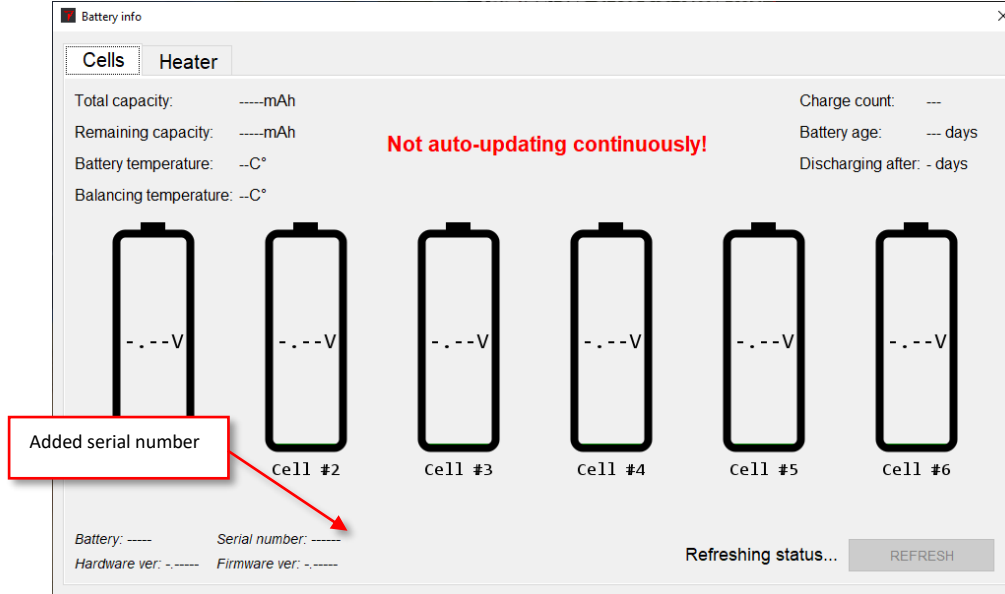


- If pitot failsafe is active then in addition to text 'FAILSAFE!' also target IAS will be shown. Target IAS in pitot failsafe mode is synthesized IAS by autopilot

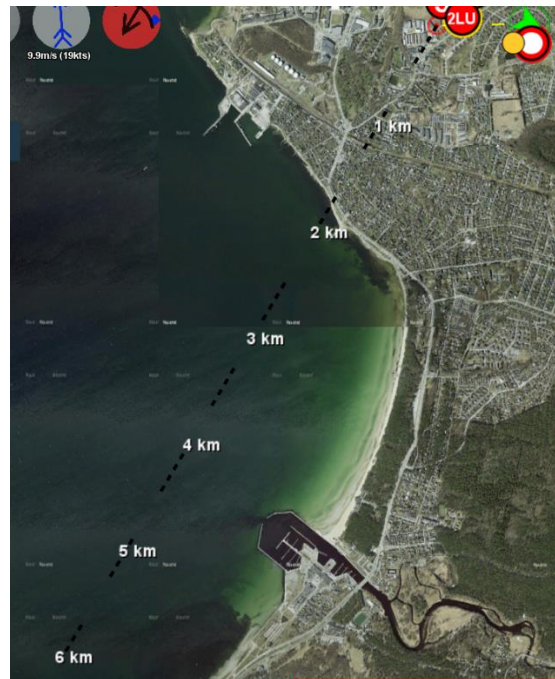


- Will show text '(FAILSAFE, INACCURATE!)' next to playtime if UAV is in pitot failsafe mode currently

- Battery serial number shown in battery window.

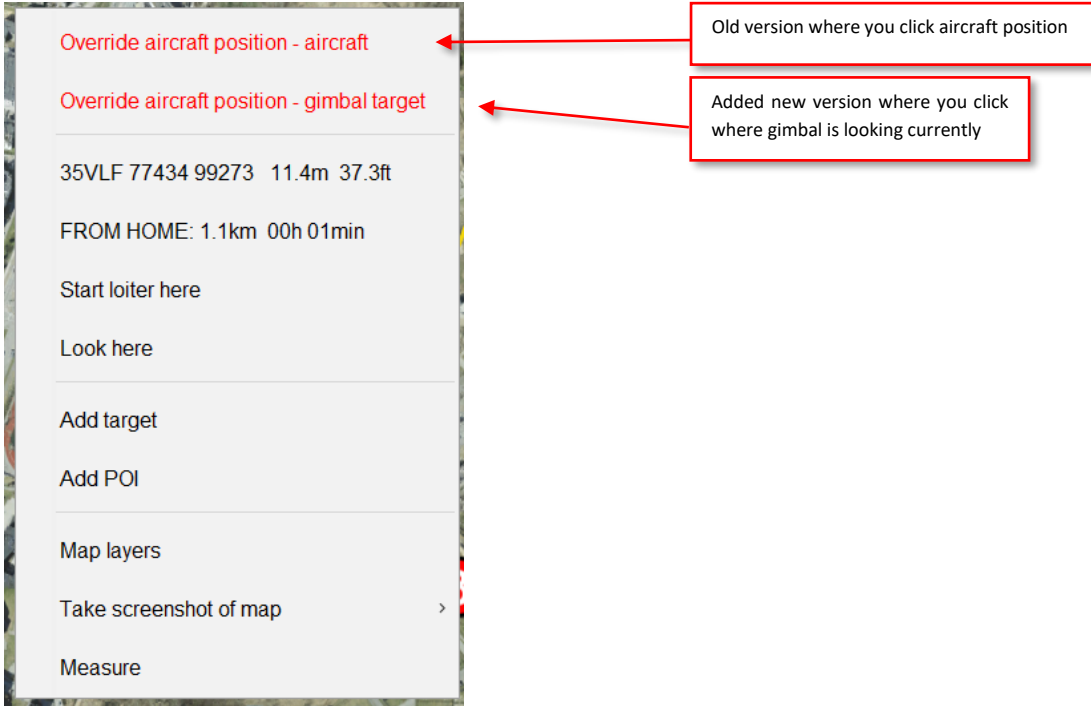


- Support for GDT radio firmware update
- Tracker line (50km) is drawn on map where tracker is pointing currently if tracker is chosen/configured to be used and distance texts are drawn along the tracker line. Higher altitude it's 5km steps and lower altitude it's 1km steps. Tracker line is red when tracking is not started and black if it's tracking.

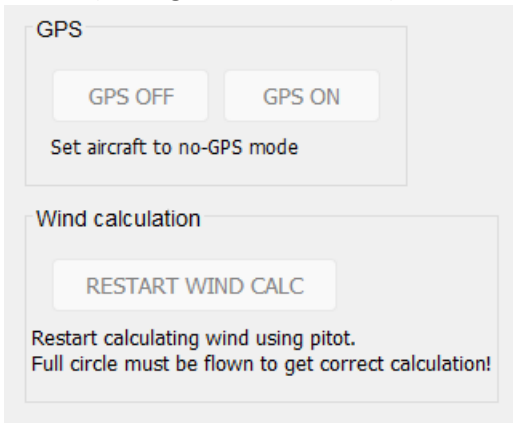


- Aircraft position can be overridden (no GPS flight) by using gimbal target now. Map context menu has option 'Override aircraft position - gimbal target' which tells where gimbal is currently pointing and

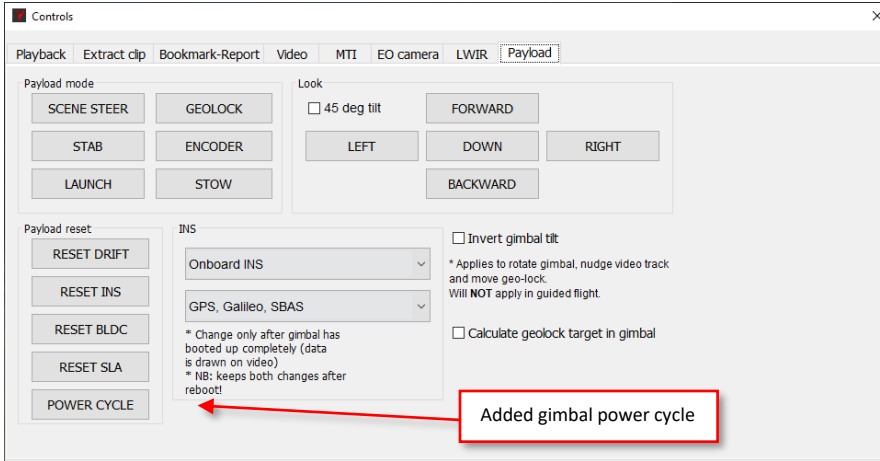
calculates aircraft position from this. Old 'Override aircraft position' option changed to 'Override aircraft position - aircraft'.



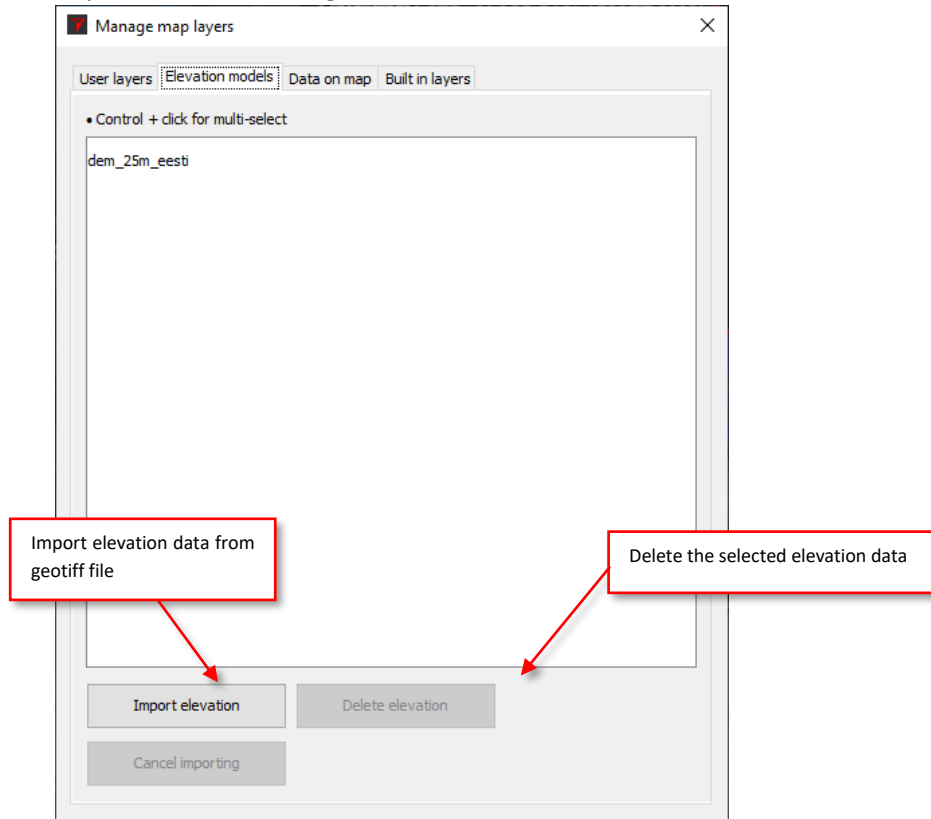
**Important note!** Autopilot no longer updates wind speed and direction after GPS has been turned OFF. When GPS signal receiving is turned back ON, then “Restart wind calculation” must be activated as well (Settings->Technician tab).



- Added gimbal Power Cycle button to payload tab in gimbal settings window. Power Cycle button restarts the whole gimbal. **NB!** Gimbal must support it (newer gimbals have the functionality and hardware to do it).



- Import elevation from geotiff file and delete elevation data



## 5. MISSION SOFTWARE UPDATE

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Version R2023-3

### 5.1 BUG FIXES

- Server restart confirmation dialog was shown on wrong screen if settings window was moved to other screen than main window (where main buttons are).
- Confirmation dialog was shown on wrong screen if map was in separate window and the window was moved to other screen than video and user wanted to delete POI, tag or fire support target from map context menu.
- Button to create new video streaming preset was always (should be enabled if logged in).
- POI details was not opened in same screen if it was opened from search window and the search window was not in same screen as main window (where main buttons are).
- Tag window was not opened in same screen if it was opened from map context menu but the map was in second window and the window, where map is, was moved to other screen than the main window (where main buttons are).
- Tag window was not opened in same screen if it was opened from search window and the search window was not in same screen as main window (where main buttons are).
- Report map wasn't showing correct place on opening the report map window if you closed it 0-4 seconds earlier and zoomed it right before closing the window.
- If mission was deleted during watching it then some map related elements were kept showing which should be hidden.
- Initial file name in file chooser for extracting video clip was incorrect for Windows (contained '+' sign) when local time was used and in Windows settings 'Adjust for daylight saving' was turned off.
- Generating report failed when local time was used and in Windows settings 'Adjust for daylight saving' was turned off because report folder name contained illegal '+' sign for Windows.
- Mission Software didn't load geotiff file (used for calculations) if file extension contained uppercase letter(s).
- Crashed sometimes when opening report window and previously report settings was showing when you closed the report window and some report was also selected.
- In some computers writing in text fields (for example in login) lost some letters when typing fast.

## 5.2 CHANGES

- Approximate time remaining will be shown in addition to percent imported when importing layer/elevation from file. In the beginning the time will change very much.
- If currently in playback mode (watching playback mission or switched to playback mode in live mission) then joystick will not send gimbal commands anymore.
- Importing layers and elevations percent is shown with 2 decimal places instead of 1.
- Missions list window height is automatically reduced on MS startup if primary screen is too small or display scaling is too big.
- Main buttons panel (audio, chat etc. buttons) buttons size is automatically reduced on MS startup if primary screen is too small or display scaling is too big.
- User who didn't create report can now move and zoom the report map to be able to understand where exactly the place is. It's still not possible to save the map settings (coordinate and zoom level).
- Mission Software computer name contains now logged in user name in Threod GCS data share.
- Snapshot in snapshots gallery will not be selected/deselected if scrolling the list by dragging the content (items).
- Will show text '(FAILSAFE, INACCURATE!)' next to playtime if Threod UAV is in pitot failsafe mode currently.
- If live video was freezed using joystick freeze video button then it'll be unfreezed automatically when joystick is disconnected.

## 5.3 ADDITIONAL FUNCTIONALITY

- Possible to start/stop recording audio with joystick using R1 + microphone buttons combo.
- You can show quick map layer visibility toggle button on map. You can show/hide the button and choose which layer visibility the button will toggle under Layers window imported tab. Primary (left) mouse click will toggle the layer visibility and secondary (right) mouse click will open layer manager. For example you can configure (if you imported these layers) to toggle quickly between topographic map and aero photo map just make sure the layers order is correct (first in layers list is drawn first).
- Added gimbal power cycle button to gimbal settings payload tab reset section. Power Cycle button restarts the whole gimbal. **NB!** Gimbal must support it (physical addition in gimbal).
- When cursor is over tag icon on seekbar then thumbnail image of the tag will be shown also in addition to description.
- When cursor is over tag icon on map then thumbnail image of the tag will be shown also in addition to description.



- Can choose if and when tag thumbnail image is shown on map when mouse is over tag map icon. Setting can be found under 'tag' tab in layers window.
- Notification will be shown on bottom-right corner of main window if some user starts watching the same mission or stops watching it. Both notifications showing can be turned on/off separately from software settings window.
- Built-in layers, imported layers and elevations lists in layers window are showing how much disk space they take.
- Cached map data can be deleted for built-in layers and imported WMS layers.
- Can copy image to clipboard in image viewer window.
- If system is used with Threod aircraft then MS will remind that gimbal is still recording and recording in gimbal should be ended before aircraft power off if aircraft is coming to land (next waypoint is landing point) or VTOL land is detected.
- If system is used with Threod aircraft then MS will remind that gimbal is not recording yet 60 seconds after takeoff.
- Possible to show/hide password field text in login dialog and old password field text when changing password.

## 6. AUTOPILOT UPDATE

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AP code 1.12.6 (Release 2023-3)

(Version can change if bugs are discovered and fixed within release)

- Engine minimum RPM error fix
- Engine feedback timeout decrease for quad motors
- Forward motor check timeout increased
- Forward motor test RPM change (was tested at full throttle, now is tested at minimum throttle)
- IMU temperature calibration improvement
- Vibration alert parameters created for fixed wing and rotary wing flight mode
- AP sends all GPS`es information to GCS for deciding, when to re-enable GPS if disabled
- Temperature & Humidity sensor Warnings added
- Decreasing airspeed for climb message added
- Bug fix (Switching gps Ground speed will no longer go to 0)
- BMS\_BAT\_SN capability added to AP log)
- Airspeed high will use airspeed medium to gain altitude
- IMU\_Gyro calibration added
- 10 sec magnetometer automatic reboot Comboardi FIX
- Tuning timeout 100 sec. change
- New logic added with temp sensor (automatic wind speed / heading calculation)

## 7. RVT SOFTWARE UPDATE

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### Version 1.3.1

- Implemented ArcGIS maps by ESRI for offline satellite support.
- POI nudging was introduced.
- New log for displaying login and connectivity information.
- HTTPS traffic improvements.
- Server certificates are packaged into the application.
- POIs listed in the dialog.
- Implemented chat channels and one-to-one messaging.
- New feature – send RVT location to the server.

## 8. GIMBAL UPDATE

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### eOpic-5 (Orca 130 A03)

- Overlay "messaging" to inform operator of version numbers, serial number and other miscellaneous pieces of information
- Improved missing/broken SD card detection
- Initial heading setting capability through P\_WORLD\_INIT\_HDG message (refer to ICD rev 15)
- Improved camera frame-rate stability
- Adjusted internal power-cycle operation

### The release will have the following software versions

- Sightline firmware version 3.6.10
- BLDC FW version 3.18.20231127
- BLDC bootloader version 3.7.20230511
- threod-slaproc version 2.38

## 9. SILVUS STREAMSCAPE UPDATE

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### Version 5.0.0.1

#### Changes/Bug fixes

- [API] Bug fix: link throughput and serial server api were broken due to API changes
- [PHY, MAN-IC, MAN-PW, Mobility] Misc performance fixes
- [MPS] Bug fix: Frequency/Bandwidth from position 1 would get copied to other positions
- [Show Connected Devices] Bug fix: Show connected devices was broken in 5.0.0.0
- [Map view] Bug fix: Zooming on map view on touch screens would cause the browser to crash.

#### New features:

- [MAN-PC, MAN-PW, FIPS, explicit beamforming] First combined release with MAN-PW, MAN-PC, Explicit Beamforming and FIPS-140-3 support.