

# Drone Project



Studio - 6 Seymour Reeves-Boddy

1

Drones Cost a lot of Money

2

Operating Costs are increadibly high

3

Difculty to use and training is required

# Problem

1

Cheap and easily replaceable platform

2

DIY and fixable by user

3

Minimal knowledge required

# Solution

# Plan

My main goal for this Studio 6 project is to create a drone that is both cheap and easy to use, for the end user.

Drones play a big part in surveying and other tasks and i want them to be easily accessible to farmers and doc for suevryng operations.

Currently,most drone projects are done by large scale operations that use very large and expensive drones to complete the task. They also require a trained operator that adds to this cost.

Once i have a 3d printed Drone that is cabapale of completing tasks. I wil begin to work on devloping a Aplication that will interface with the drone and allow the users to create waypoint missions for the drone to follow then begin to genrate a map of the surveyd area

# Research

COMMERCIAL SOLUTIONS > INDUSTRY > SURVEYING > DJI MATRICE 300 RTK PHOTOGRAHMETRY COMBO [GO TO CART](#)



**DJI MATRICE 300 RTK  
PHOTOGRAMMETRY COMBO**

Contact for Pricing  
SKU: M300RTK\_P1

The DJI Matrice 300 RTK with Zenmuse P1 (45MP full-frame sensor) can scan up to 3 km in a single flight at 3cm GSD. This coverage area makes it a highly efficient surveying tool without the requirements for GCPs.

QUANTITY

[CONTACT FOR PRICING](#)

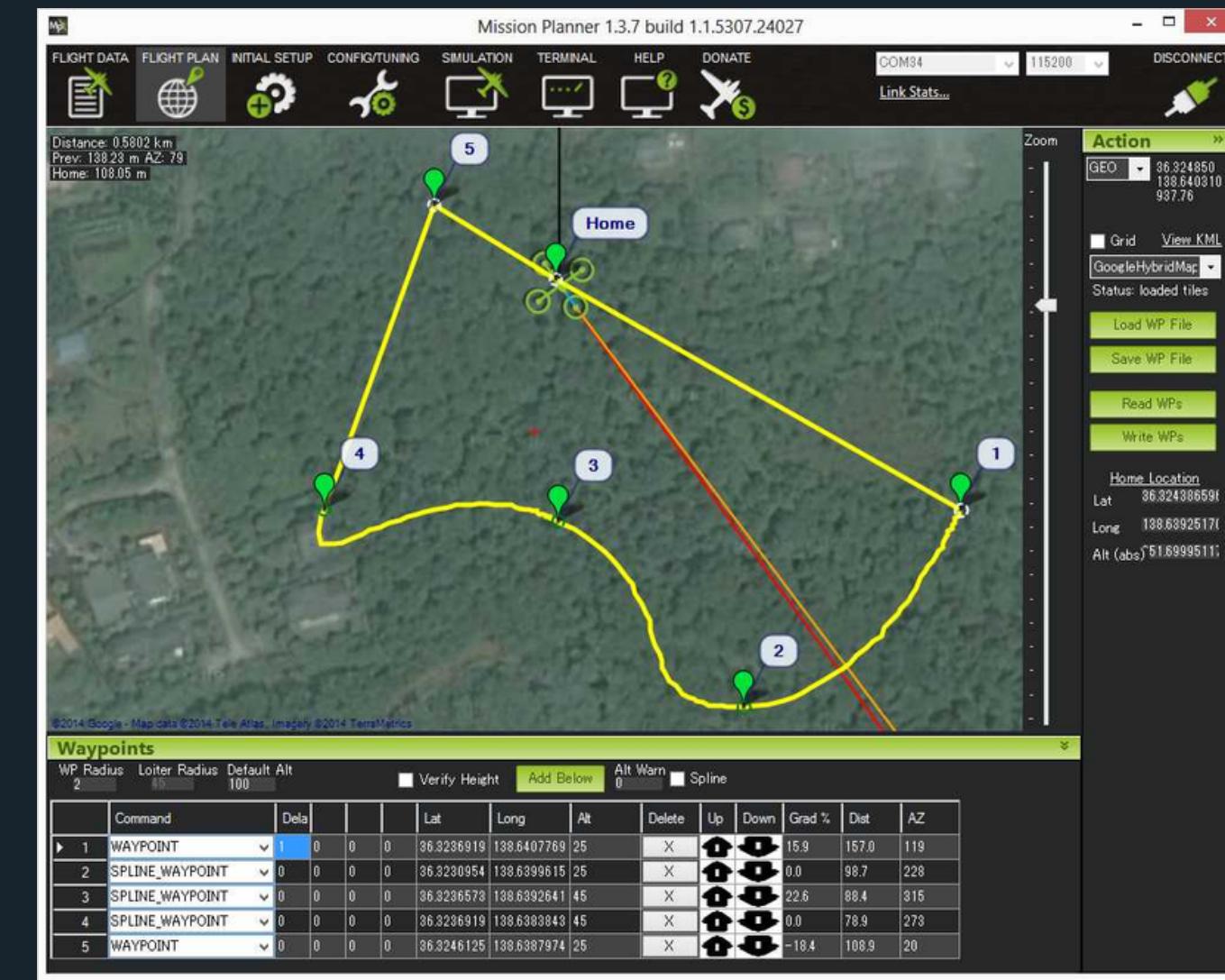
In Stock

HAVE A QUESTION? [CALL US 0800 787 623](#)

**FREE SHIPPING ON ALL ORDERS OVER \$300**  
All orders placed before 2pm will be delivered the next day on overnight track and trace courier. Larger items will be sent on a two day service to the South Island. Please note rural addresses (RD) can take 1-3 days longer.

Drones Such as this one are increadibly usefull for surveying but cost upwards of \$40,000 NZD and this inherit cost can be a big hurdle for users and i seek to create something that might not be as advanced as a \$40,000 drone but still give the user what they need, that be surveying or other required operations.

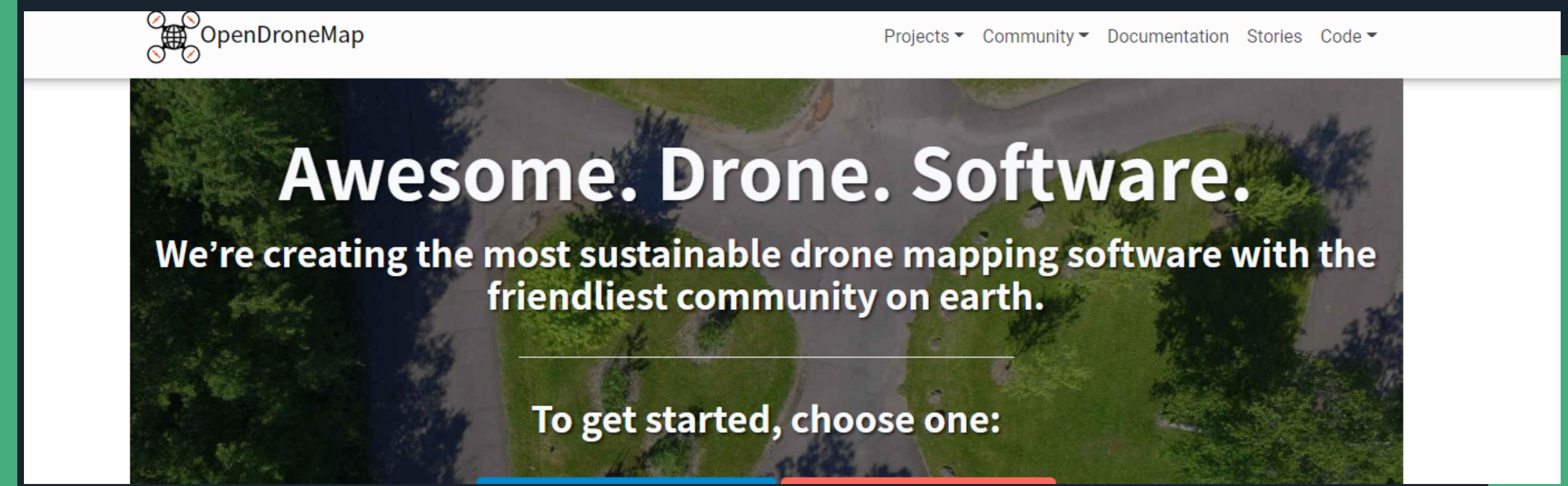
# Applications



	Command	Dela			Lat	Long	Alt	Delete	Up	Down	Grad %	Dist	AZ
► 1	WAYPOINT	v	1	0	0	36.3236919	138.6407769	25	X	15.9	157.0	119	
2	SPLINE WAYPOINT	v	0	0	0	36.3230954	138.6399615	25	X	0.0	98.7	228	
3	SPLINE WAYPOINT	v	0	0	0	36.3236573	138.6392641	45	X	22.6	88.4	315	
4	SPLINE WAYPOINT	v	0	0	0	36.3236919	138.6383843	45	X	0.0	78.9	273	
5	WAYPOINT	v	0	0	0	36.3246125	138.6387974	25	X	-18.4	108.9	20	

Ardu Pilot is the main application that i will be using for testing and creating missions for the drone it is an open source project with extensive documentation on utilizing it to its full potential. and it easily interfaces with GCS (Ground Control Software) that i hope to create

# Applications



Open Drone Map is another key software that i am using to facilitate my project.

It is also a very trusted open source codabaser that allows for image stiching and creating maps with captured images it will also interface with my application allowing the users to easily see the mapped area the drone has been,

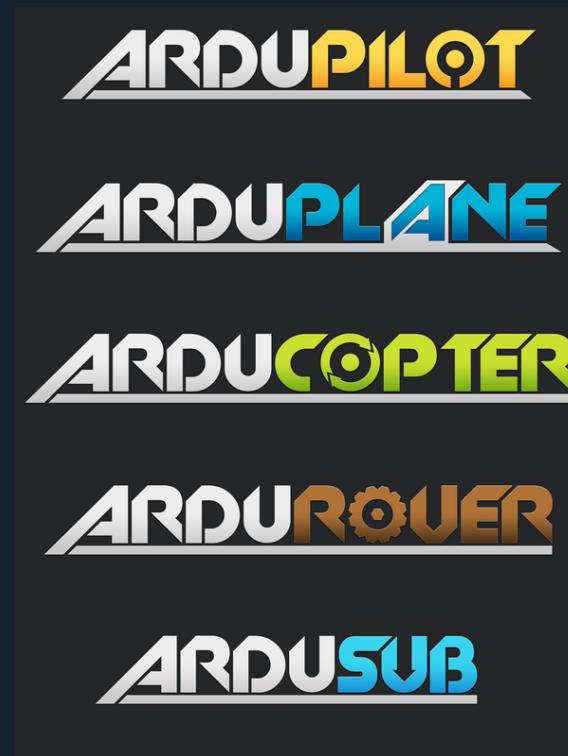
I chose this software as it its open source and i can build on an already devloped and tested platform, it is also the most full featured drone mapping solution

# Applications

The screenshot shows the 'WebODM Demo' application window. On the left is a dark sidebar with a navigation menu containing 'Dashboard', 'GCP Interface', 'Processing Nodes', and 'About'. The main content area has a light background. At the top, it says 'Welcome! ⓘ' and includes a note: 'You are currently in a demo. You cannot create new tasks and some features such as volume calculation and contours have been disabled, but you can look around to explore the software.' To the right of this note is a 'Add Project' button. Below the note, there are three project cards: 'Multispectral' (with 1 Task), 'State University Zanzibar' (with 1 Task), and 'Brighton Beach' (with 1 Task). Each card has a 'View Map' button to its right.

Open Drone Map Also has the WEBODM that can be used to create a web application to my needs for orgazning jobs for the images to be proccesd and get multiple types of data from the images.

# Drone Software



For the matek F765-Wing it can run on two systems Arduplane And i Nav, i decided on using i nav due to the fact that ardulane is more advanced and has the ability to use the full potential of the controller.  
But its not as simple and user friendly as i nav and since this is a solo project i wanted to be able to work on something quickly and effiecently.

# Planning and Timeline

1-5

Finish Assembling Wing  
See what Parts are required  
search how to use web DO

5-10

Drone Working and  
bench test parts  
New parts arrived and  
tested

10

Drone software  
running  
GPS syetm working  
Radio and Video Link

15+

Drone Flying  
Demo Software

This image shows a dark-themed Kanban board with three columns: "To do", "In progress", and "Done".

- To do:** Contains one item: "Drone Can Loiter" (Added by REEV3).
- In progress:** Contains two items: "First Waypoint Mission" (Added by REEV3) and "Drone Can land And take off" (Added by REEV3).
- Done:** Contains five items: "Order Final Parts" (Added by REEV3), "Build And Assemble final drone parts" (Added by REEV3), "Plan test flight" (Added by REEV3), "Software and firmware loaded and ready for drone" (Added by REEV3), and "Organize Software for drone and choose what software" (Added by REEV3).

# I NAV and how it works

I nav is the software for the drone to run on and it is how everything is managed i will go through how to use the software and what every tab and part does for future students working on this project.

## INAV Target: MATEKF765

\*\*\* CLI defaults after refreshing

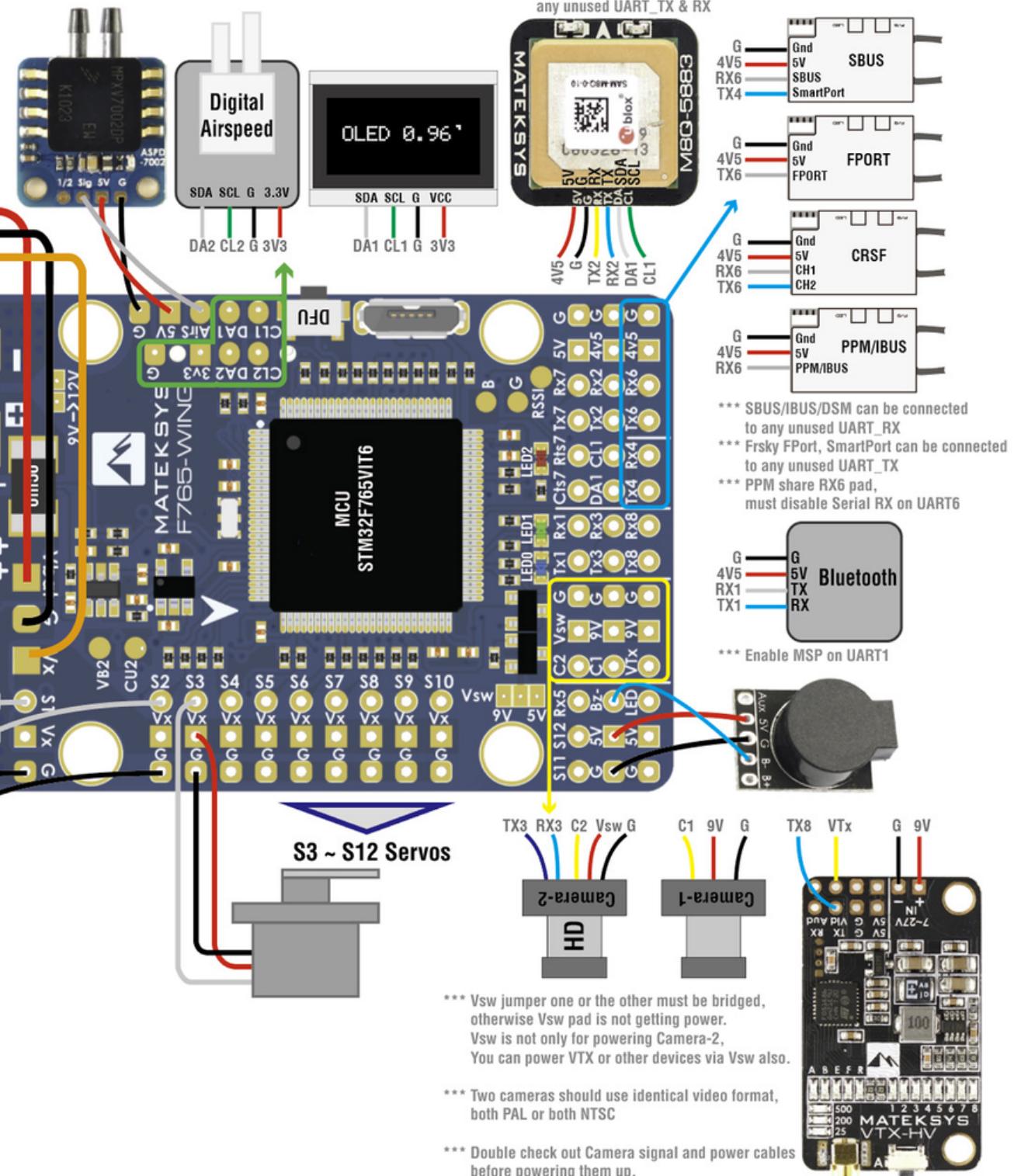
### Wiring (INAV Airplane)

Airplane S1 & S2 for motors  
S3 ~ S12 for servos

Top BEC plate

Silicon wires 22-24AWG

If you don't connect Vbat/G/Vx to top BEC plate,  
you can use other BEC module to power up the servos,  
connect other BEC output to Vx and G of FC board.



### Check and swap the Gyros (INAV)

CLI status

```
# status
System Uptime: 52 seconds
Current Time: 2041-06-28T01:04:00.000+00:00
Voltage: 0.39V (1S battery - NOT PRESENT)
CPU Clock=216MHz, GYRO=MPU6000, ACC=MPU6000, BARO=BMP280, PITOT=ADC
```

CLI get gyro\_to\_use
0 = MPU6000 by default
1 = ICM20602

```
# get gyro_to_use
gyro_to_use = 0
Allowed range: 0 - 1
```

CLI get acc\_hardware

acc\_hardware = MPU6000

All hardware: MATEKF765, MATEKF765, MATEKF765, MATEKF765, MATEKF765, MATEKF765, MATEKF765, MATEKF765

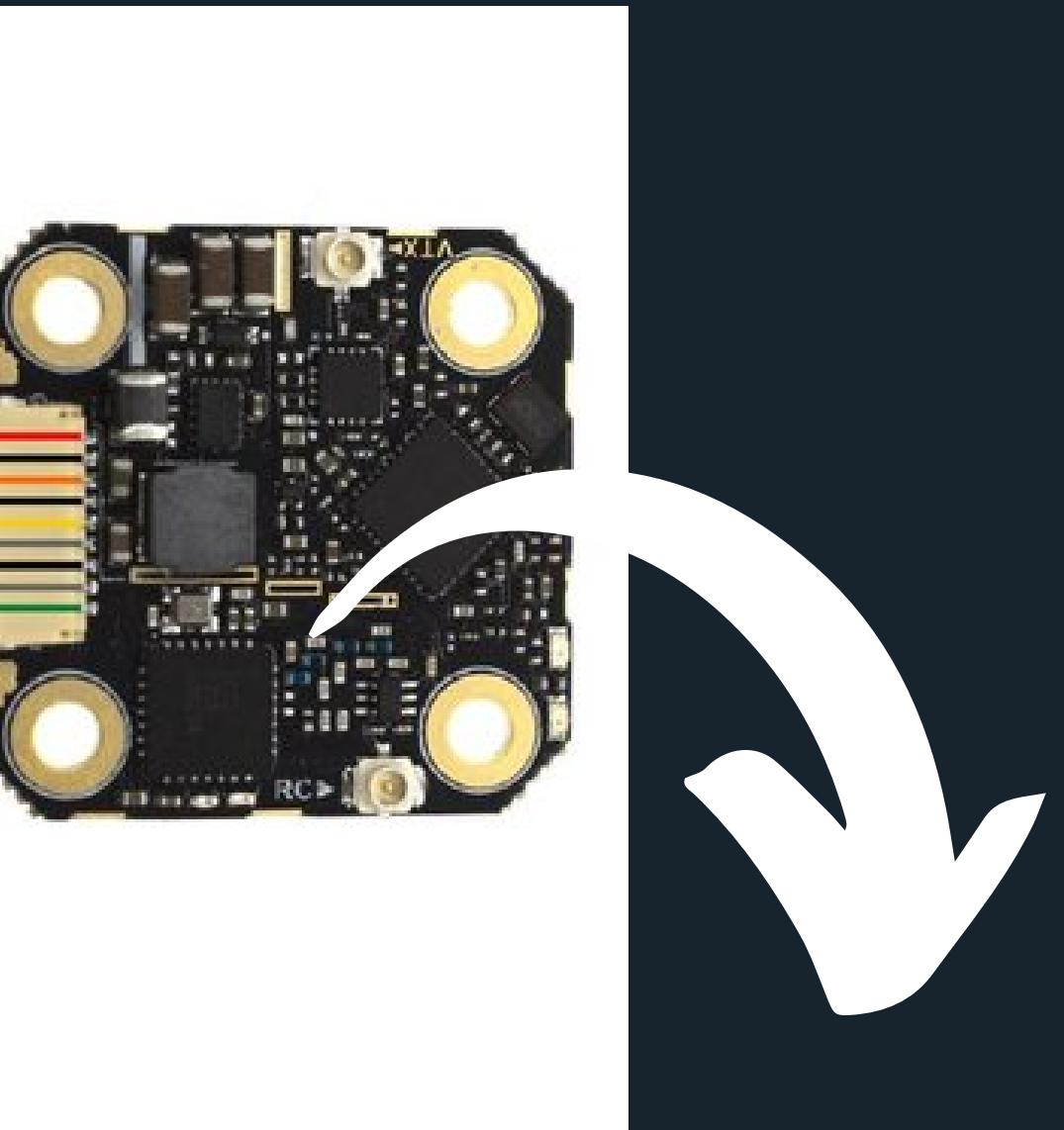
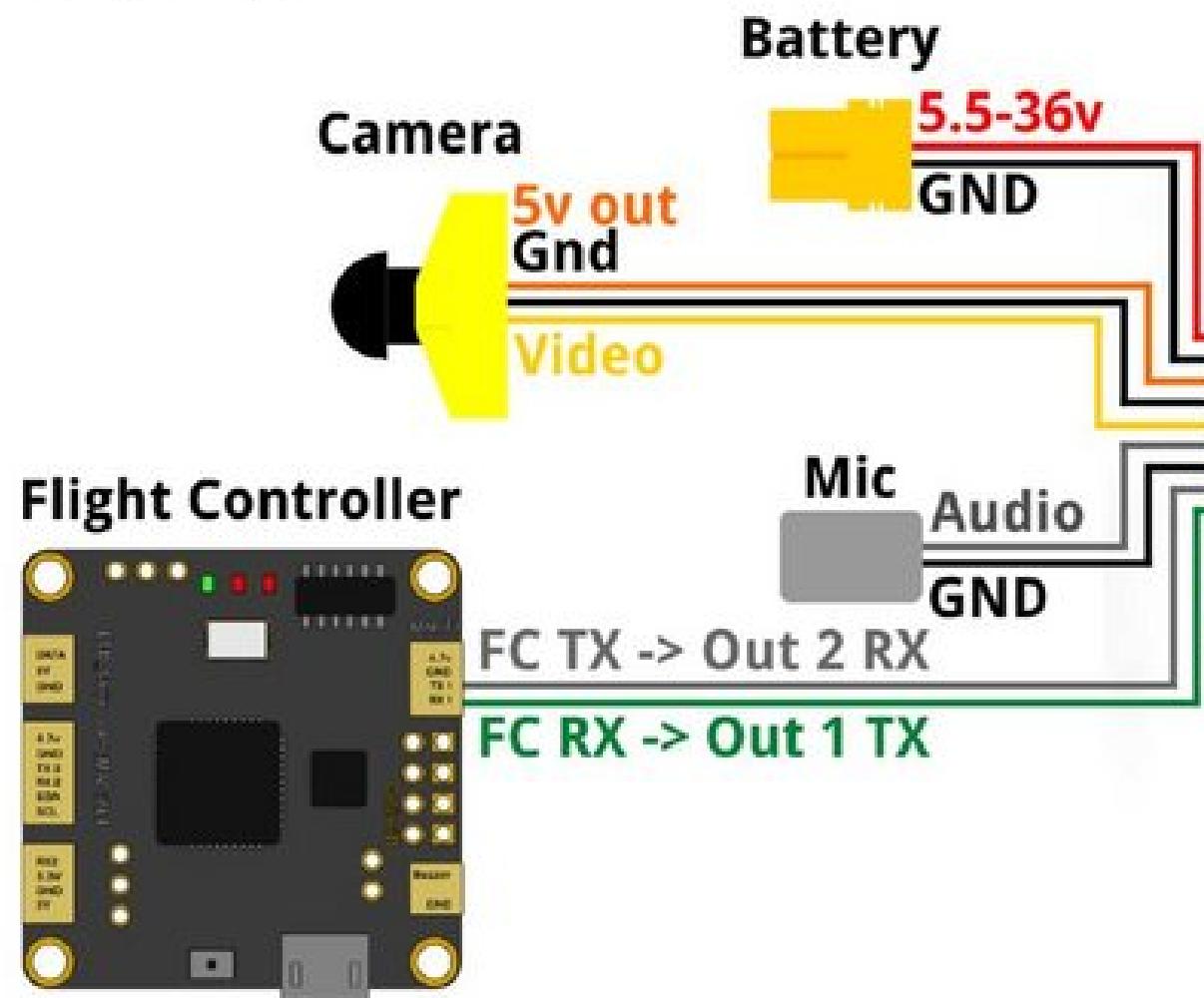
Wiring diagram for the flight controller  
all the port marked rx and tx correspond to

Uart ports in the software for the drone so if  
the camera is on rx2 and tx2 this means it will  
be mapped to uart 2 for all the communication  
for the drone  
same for servos and gps etc

# Vtx and how it connects

The vtx is responsible for sending a video link to the drone.  
this is sent on an analog signal to goggles followed with other information  
displayed on the OSD  
see the following diagrams

Wiring example:



This top info screen lets you know the status of all the functions on the drone for it to arm we need all blue and green ticks

INAV Configurator

INAV

CONFIGURATOR 4.1.0

FC FIRMWARE 4.1.0

2022-06-23 @ 13:05:08 -- Unique device ID received - 0x3c00245556501320343747

Setup

Calibration

Mixer

Outputs

Ports

Configuration

Failsafe

PID tuning

Advanced Tuning

Programming

Receiver

Modes

Adjustments

GPS

Mission Control

OSD

LED Strip

Sensors

Tethered Logging

Reset Settings

Restore settings to default

Heading: 0 deg

Pitch: -0.8 deg

Roll: 1.9 deg

Reset Z axis, offset: 0 deg

Gyro

Accel

Mag

Baro

GPS

Flow

Sonar

Speed

IMU2

No dataflash chip found

Profile 1

Battery profile 1

Disconnect

DOCUMENTATION

Pre-arm checks

- UAV is levelled
- Run-time calibration
- CPU load
- Navigation is safe
- Compass calibrated
- Accelerometer calibrated
- Settings validated
- Hardware health

Info

Battery detected cell count:	1
Battery voltage:	0 V
Battery left:	0 %
Battery remaining capacity:	NA
Battery full when plugged in:	false
Battery use cap thresholds:	false
Current draw:	0.01 A
Power draw:	0.00 W
Capacity drawn:	0 mAh
Capacity drawn:	0.000 Wh

Platform configuration

Airplane ▾ Platform type

Mixer preset

Flying Wing

Load and apply Load mixer

Output Mapping

Output	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12
Function	Motor 1	Motor 2	Servo 1	Servo 2	-	-	-	-	-	-	-	-

Motor Mixer

Motor	Throttle [T]	Roll [A]	Pitch [E]	Yaw [R]	
1	1	0	0	0	Delete
2	1	0	0	0	Delete

Add new mixer rule

This is the motor mixer tab and the servos where we control what servo is addressed to what port

Note: Do NOT disable MSP on the first serial port unless you know what you are doing. You may have to reflash and erase your configuration if you do.								
Identifier	Data		Telemetry		RX	Sensors		Peripherals
USB VCP	<input checked="" type="checkbox"/> MSP	115200	Disabled	AUTO	<input type="checkbox"/> Serial RX	Disabled	115200	Disabled
UART1	<input checked="" type="checkbox"/> MSP	115200	Disabled	AUTO	<input type="checkbox"/> Serial RX	Disabled	115200	Disabled
UART2	<input type="checkbox"/> MSP	115200	Disabled	AUTO	<input type="checkbox"/> Serial RX	Disabled	115200	Disabled
UART3	<input type="checkbox"/> MSP	115200	Disabled	AUTO	<input type="checkbox"/> Serial RX	Disabled	115200	Disabled
UART4	<input type="checkbox"/> MSP	115200	Disabled	AUTO	<input type="checkbox"/> Serial RX	Disabled	115200	Disabled
UART5	<input type="checkbox"/> MSP	115200	Disabled	AUTO	<input type="checkbox"/> Serial RX	Disabled	115200	Disabled
UART6	<input type="checkbox"/> MSP	115200	Disabled	AUTO	<input type="checkbox"/> Serial RX	GPS	115200	Disabled
UART7	<input type="checkbox"/> MSP	115200	Disabled	AUTO	<input checked="" type="checkbox"/> Serial RX	Disabled	115200	Disabled
UART8	<input type="checkbox"/> MSP	115200	Disabled	AUTO	<input type="checkbox"/> Serial RX	Disabled	115200	Disabled

This is the ports tab as later mentioned where we connect and associate rx2 tx 2 to uart 2 etc depending on what u are connecting u can select and control what sensors are used,

**Board and Sensor Alignment**

Roll & Pitch board orientation is available only in the CLI. Do not use it to trim the airplane for the level flight! Use Fixed Wing Level Trim on the PID tuning tab under Mechanics instead (fw\_level\_pitch\_trim).

-90.0  Yaw Degrees

CW 270° flip  MAG Alignment

**GPS**

Note: Remember to configure a Serial Port (via Ports tab) when using GPS feature.

GPS for navigation and telemetry

UBLOX  Protocol

Disabled  Ground Assistance Type

Gps use Galileo Satellites

0  Timezone Offset [Mins]

OFF  Automatic Daylight Savings Time

This is the configuration tab where you can see the alignment of the board as well as enable GPS and other functions

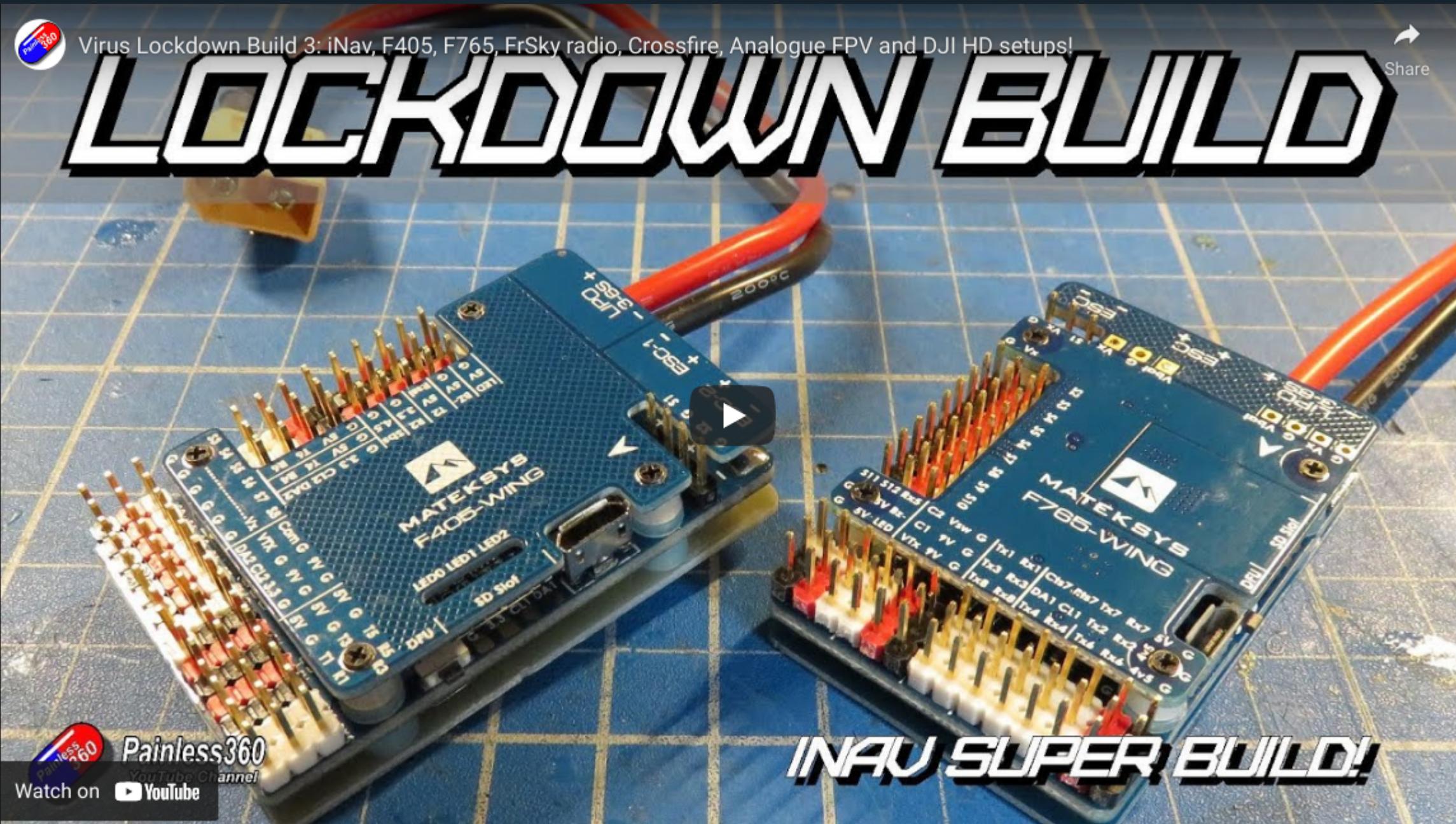
**Receiver**

Please read receiver chapter of the documentation. Configure serial port (if required), receiver mode (serial/ppm/pwm) from ~1000 to ~2000. Set midpoint (default 1500), trim channels to 1500, configure stick deadband, verify behaviour when reverse the channel in the TX. Do not apply any other mixing in the TX.

**IMPORTANT:** Before flying read failsafe chapter of documentation and configure failsafe.

Channel Map	RSSI Channel
TAER	CH8
Roll [A]	1500
Pitch [E]	1500
Yaw [R]	1500
Throttle [T]	885
CH 5	1350
CH 6	1500
CH 7	1500
CH 8	1500
CH 9	1500
CH 10	1500
CH 11	1500
CH 12	1500
CH 13	1500
CH 14	1500
CH 15	1500
CH 16	1500

This is the receiver tab where we can see what channels are being sent to the flight controller via the receiver





## Further docs and links

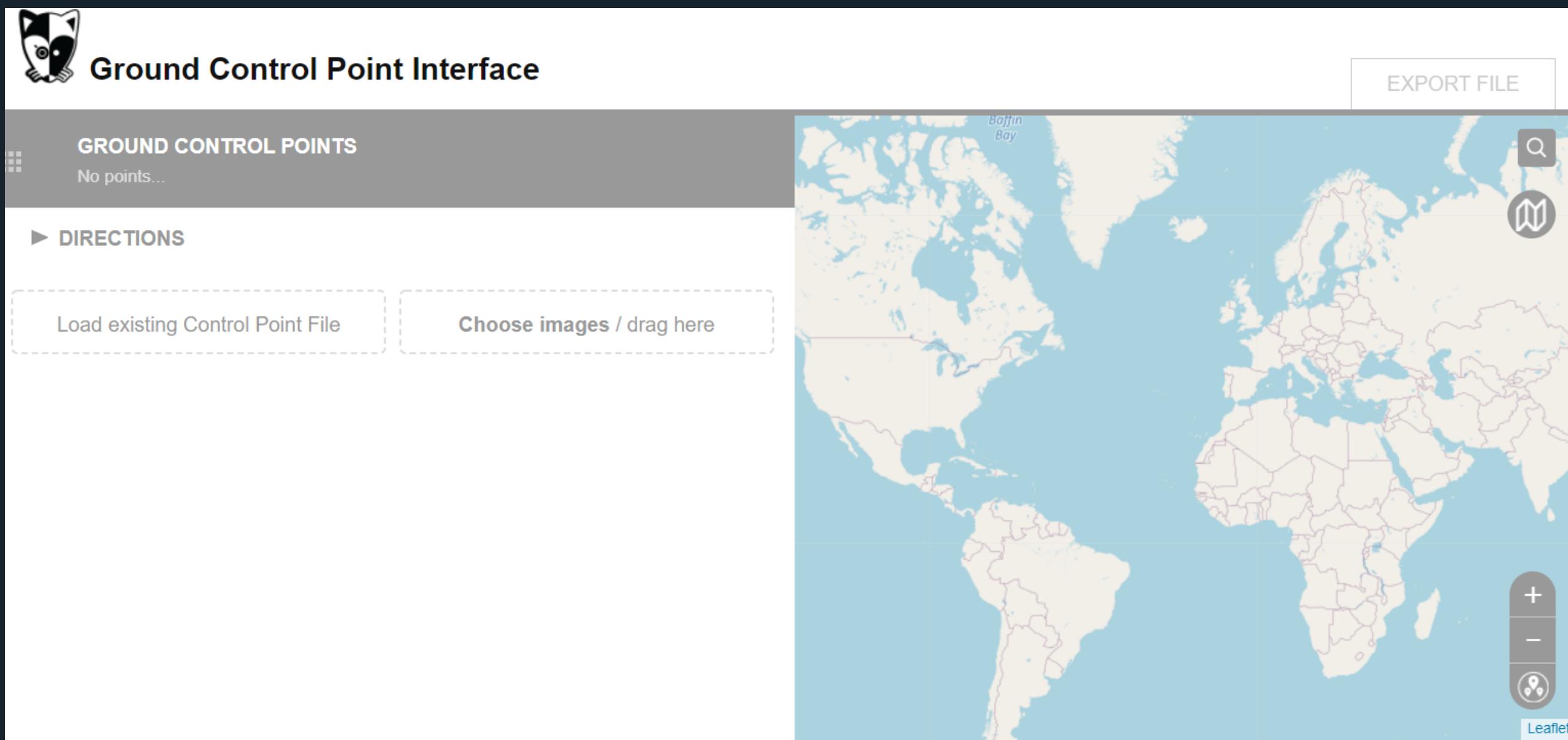
<https://www.opendronemap.org/webodm/>

<https://github.com/OpenDroneMap/WebODM/>

<https://github.com/REEV3/DroneProject>

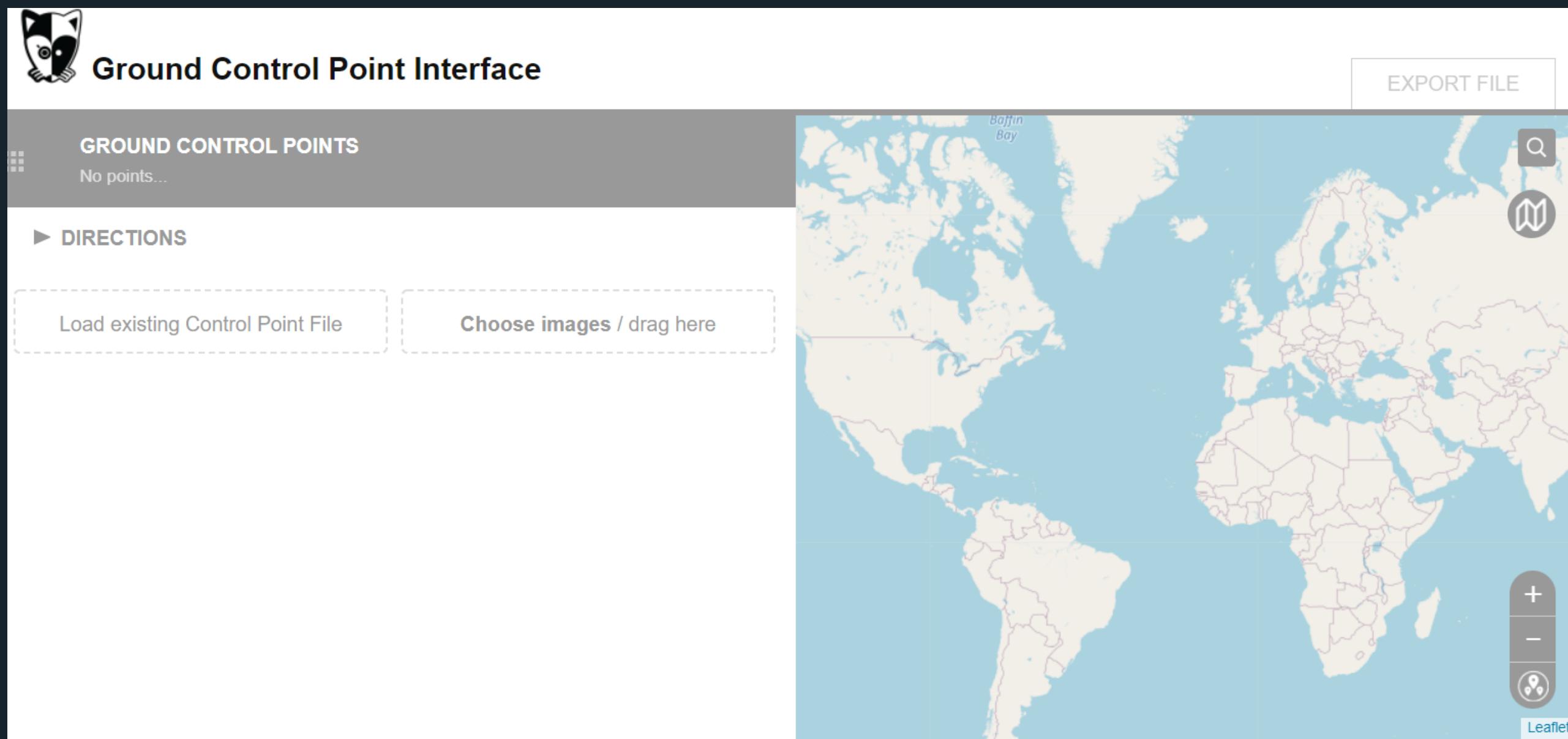


# Mapping Software





# Mapping Software



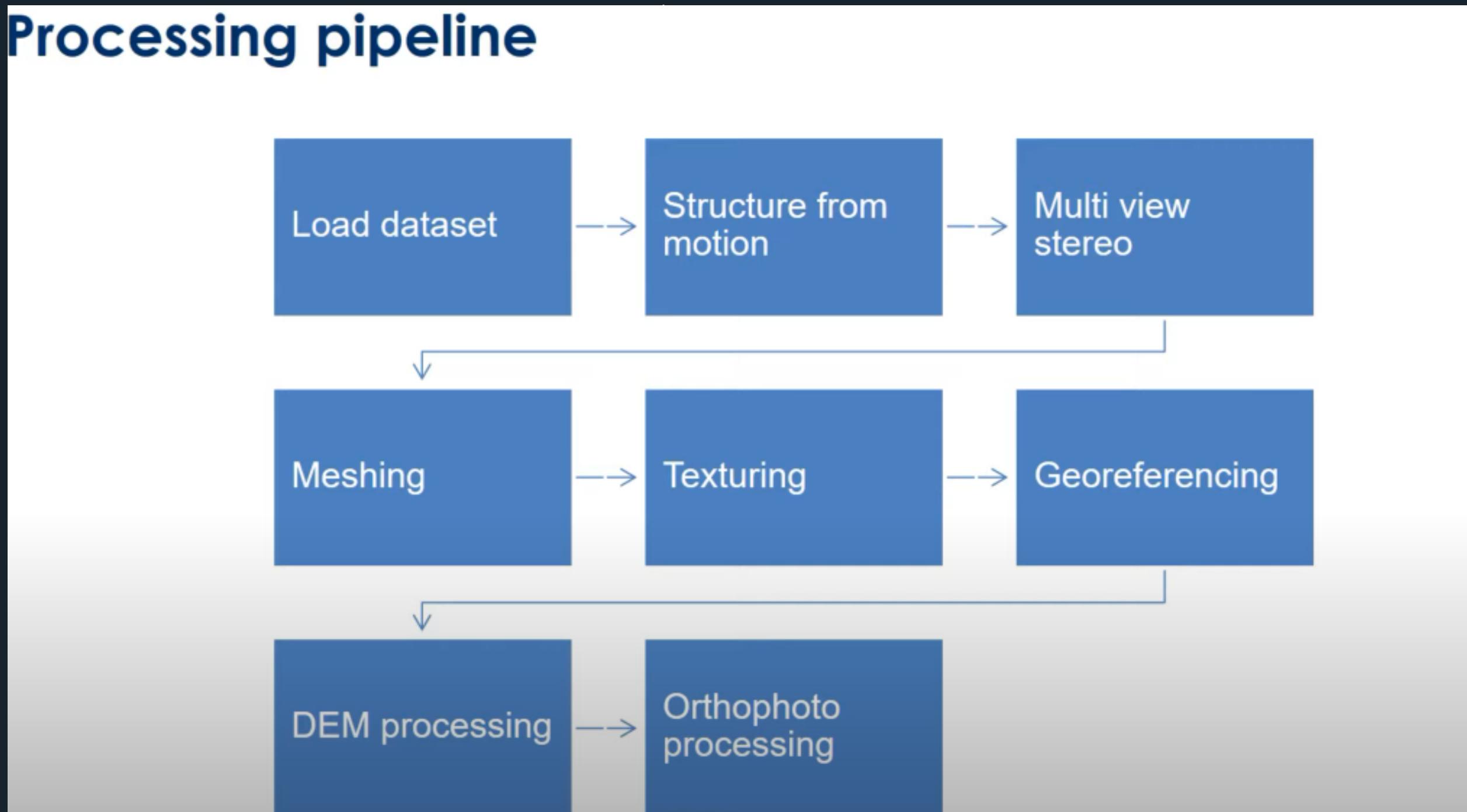
## Further docs and links

<https://www.opendronemap.org/webodm/>

<https://github.com/OpenDroneMap/WebODM/>

<https://github.com/REEV3/DroneProject>

Once we have our mapping software running on a docker container we will be able to process our images easily for example i will use a demo data set to



## Further docs and links

<https://www.opendronemap.org/webodm/>

<https://github.com/OpenDroneMap/WebODM/>

<https://github.com/REEV3/DroneProject>

The screenshot shows the WebODM dashboard interface. At the top, there is a blue header bar with the WebODM logo and a user profile icon. Below the header is a dark sidebar containing navigation links: Dashboard, Lightning Network, Diagnostic, GCP Interface, Processing Nodes, Administration, and About. The main content area features a "Welcome!" message with a smiley face emoji. It includes instructions for creating a map by selecting images and GCP points, or by dragging and dropping images. A bulleted list provides specific guidelines: You need at least 5 images, but 16-32 is typically the minimum; Images must overlap by 65% or more. Aim for 70-72%; For great 3D, images must overlap by 83%; and A [GCP File](#) is optional, but can increase georeferencing accuracy. On the right side of the main area, there is a "Add Project" button. Below the main content, there is a section titled "First Project" with an "Edit" link. At the bottom right of the main area, there are three buttons: "Select Images and GCP" (highlighted in red), "Import", and "View Map". The browser's address bar and various tabs are visible at the very top of the screen.

29 files selected. Please check these additional options:

Name 5 - 2/8/2017

Processing Node Auto

Options Fast Orthophoto ▾ Edit ▾

Resize Images Yes ▾ 2048 px

Cancel Review

This screenshot shows a configuration dialog box for processing 29 selected files. The dialog includes fields for naming the output, selecting a processing node, choosing options like 'Fast Orthophoto', and resizing images to 2048 pixels. At the bottom, there are 'Cancel' and 'Review' buttons.

