

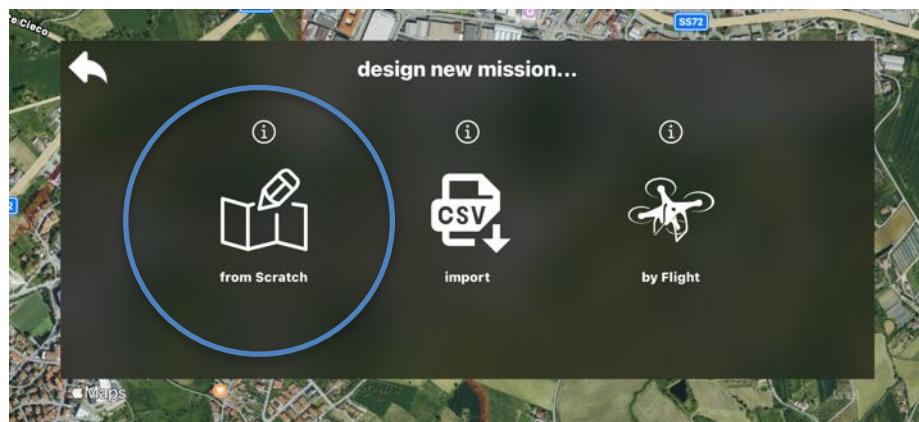
Autonomous Waypoint Navigation

Tap the icon  from the main screen of the app or from the pilot screen, to enter into the Waypoint Mission Manager

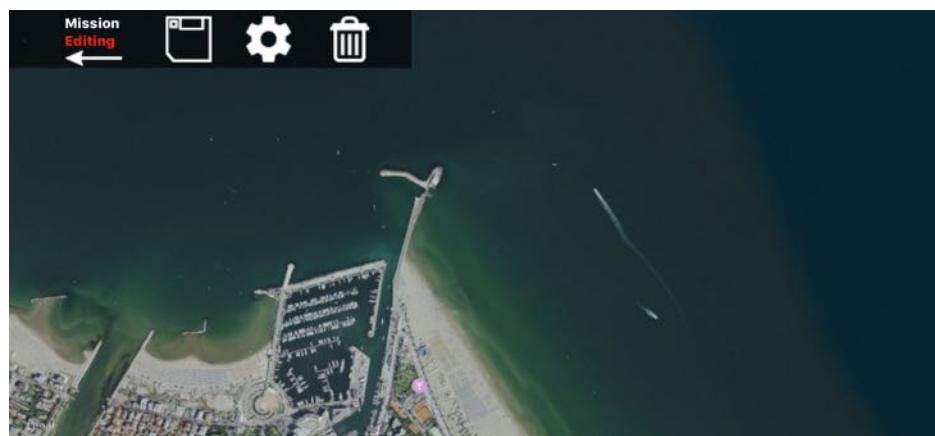


From here you can access to your previous saved waypoint missions, or create a new one

New mission



tap New Mission, then choose “from Scratch” to start to design your waypoint mission,

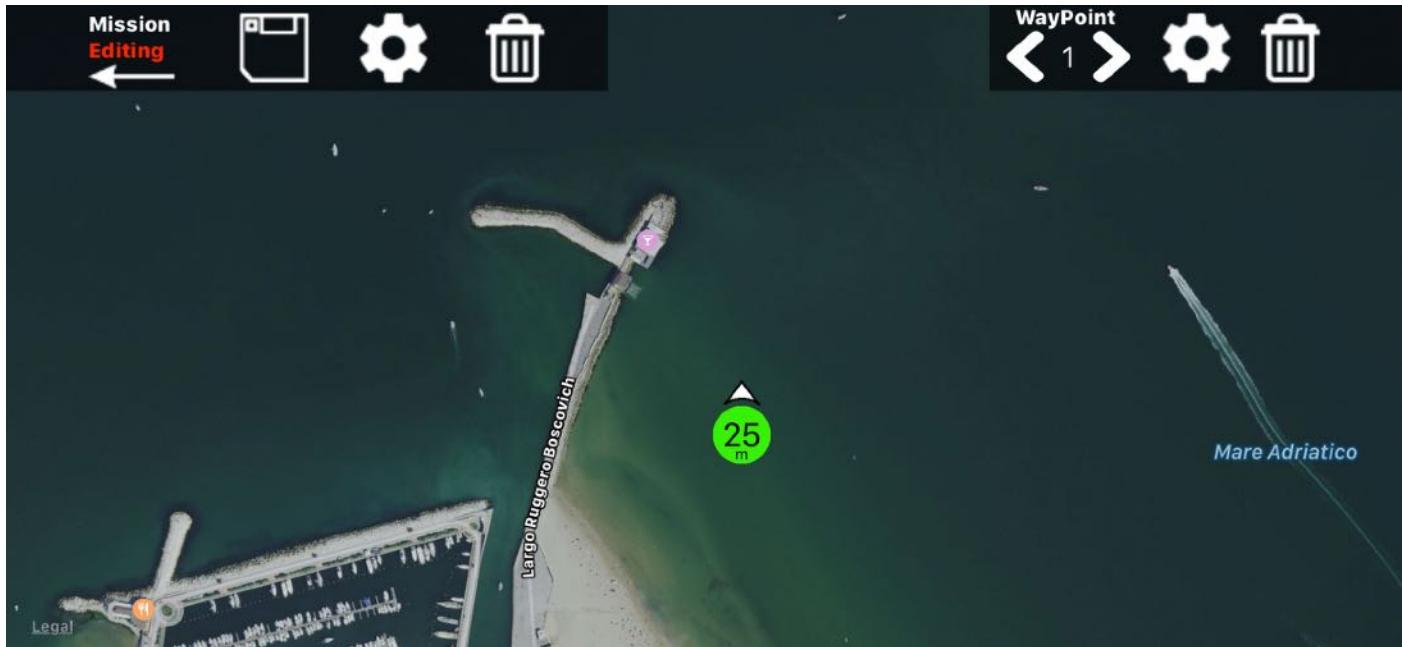


you will enter to a map view where you are already in “edit mode” to start to draw your mission route.

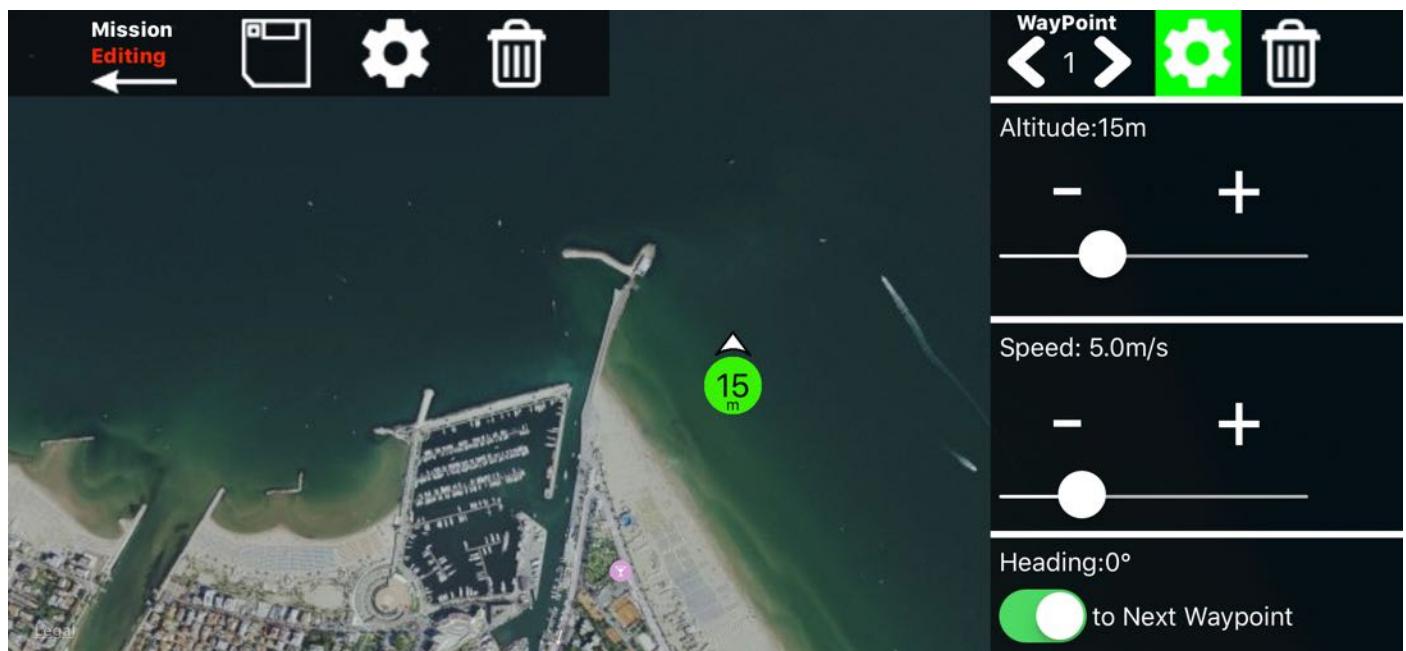
Important note: to ADD or MOVE a waypoint you will need a “long tap” (0,5s)

ADD a waypoint:

so do not tap the map, but touch it for 0,5s



here you have added your first waypoint, the number inside is the altitude of the waypoint, we now also have a new mini toolbar on the top right, where you can delete the selected waypoint, or open the menu to configure the selected waypoint.



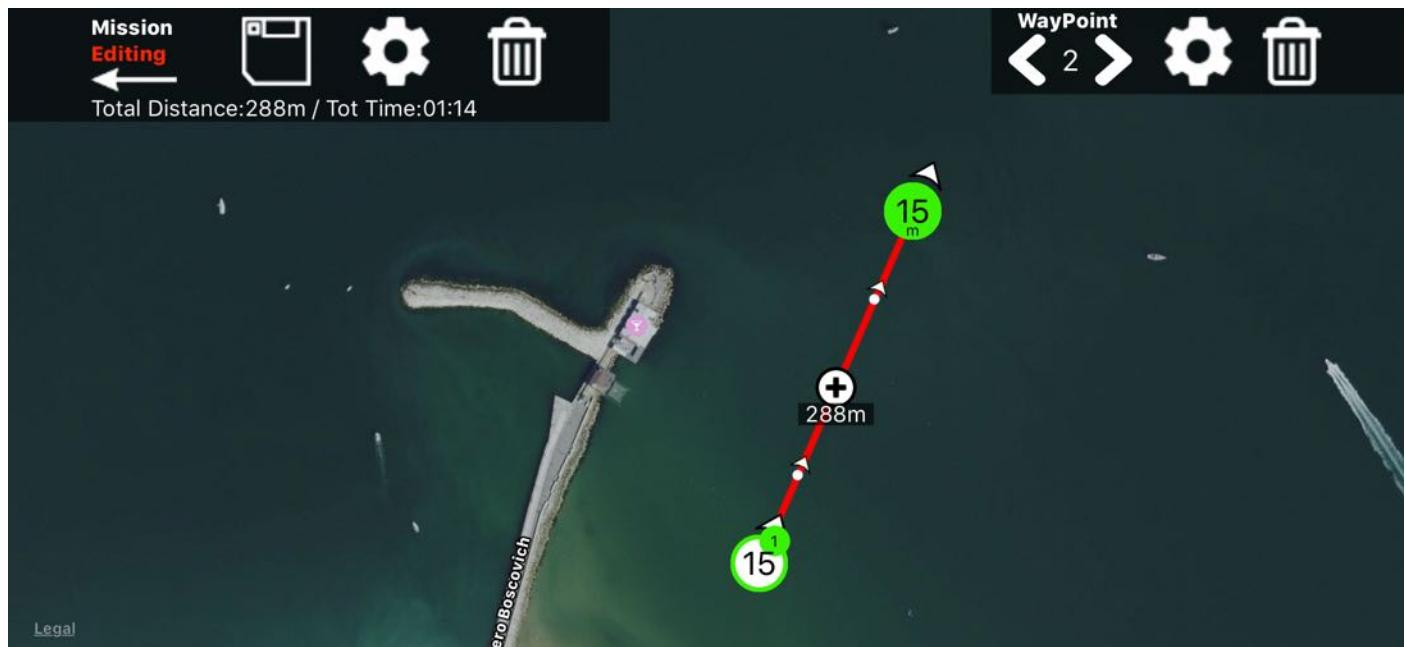
here you can configure your waypoint: altitude, speed, heading, gimbal pitch angle, position and action.

Altitude: is the altitude that the drone will have when it's reach the waypoint, (altitude relative to take off point)

the drone will gain or loose altitude progressively from previous waypoint altitude.

If it's the first waypoint, the drone will first reach the waypoint altitude (if currently lower) then it will start moving towards the waypoint

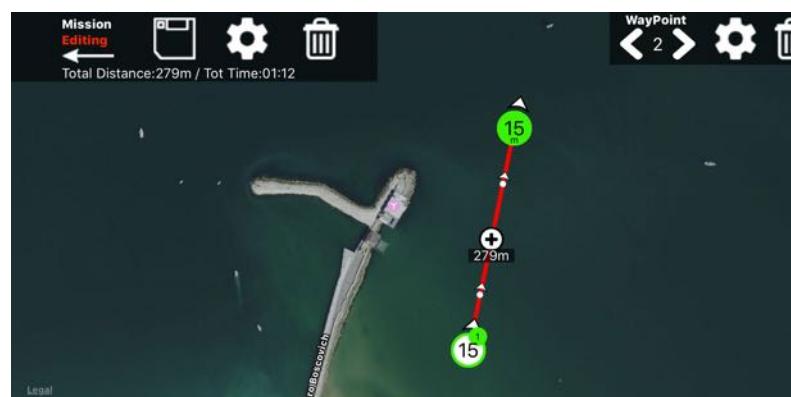
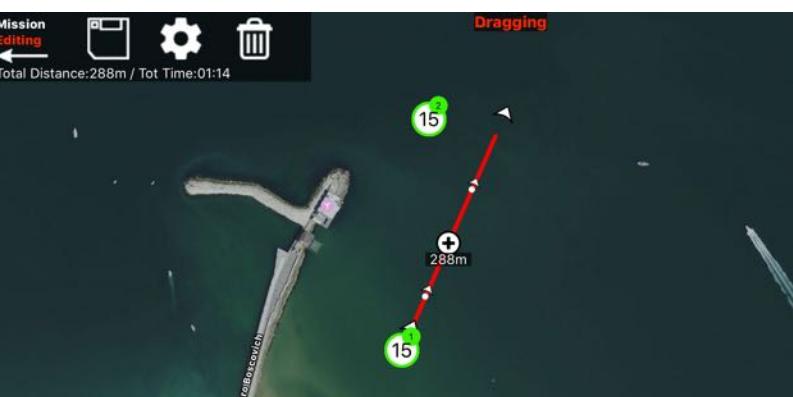
Let's add more waypoints: (long tap)



as you add more waypoint you will see also draw the path of the mission, and the distance between the 2 waypoints. (note: units meters or feet are configurable)

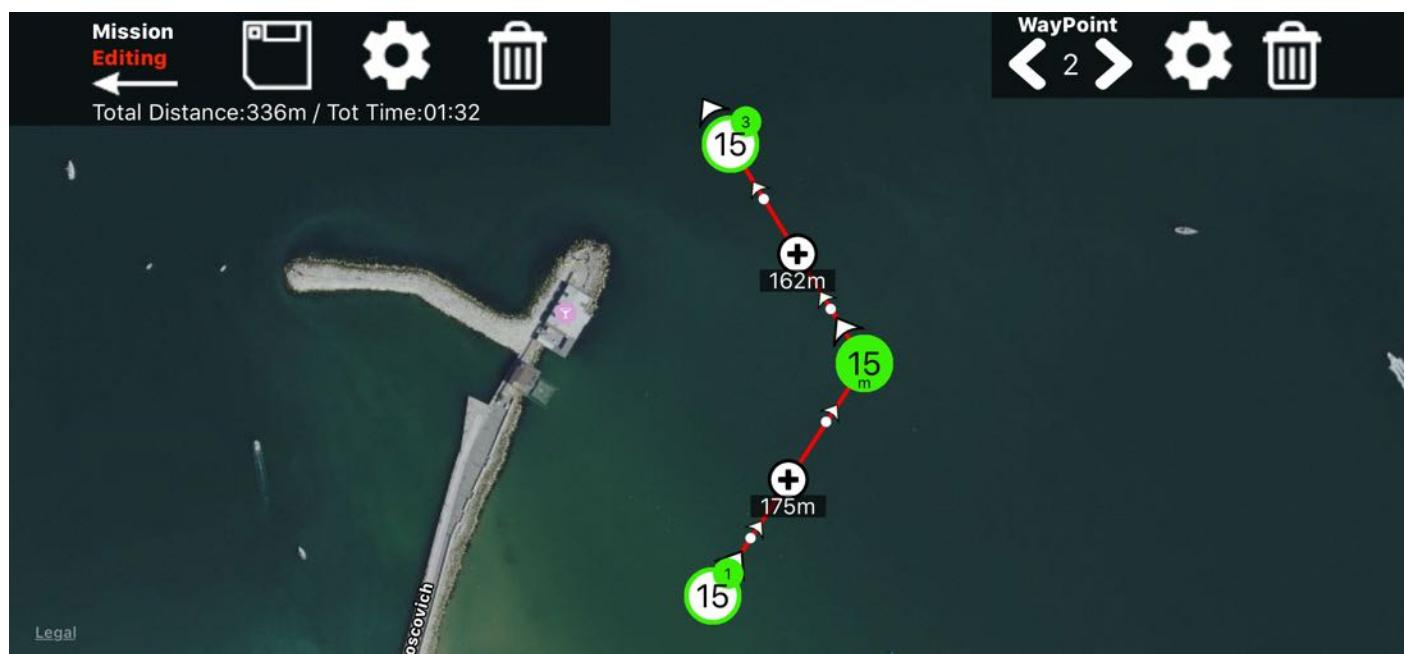
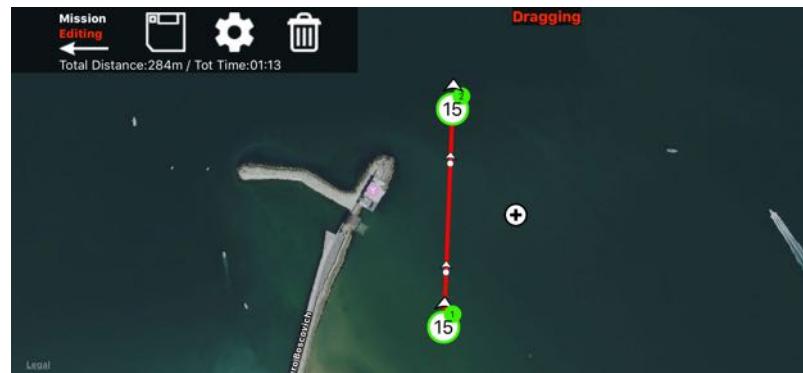
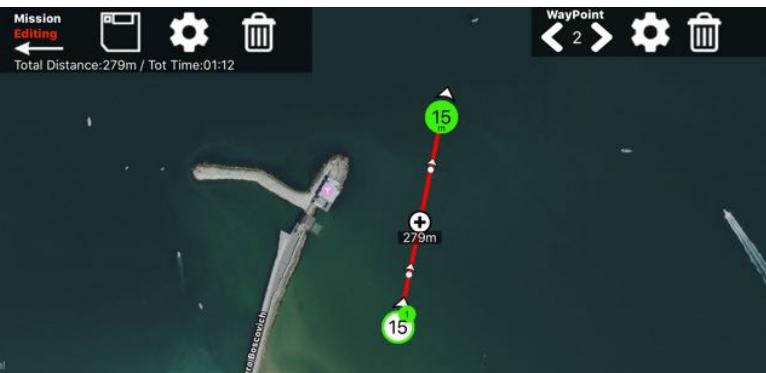
Move a waypoint:

To move a waypoint touch it for 0,5s to start to “drag”, now you can move it and drop where you want!

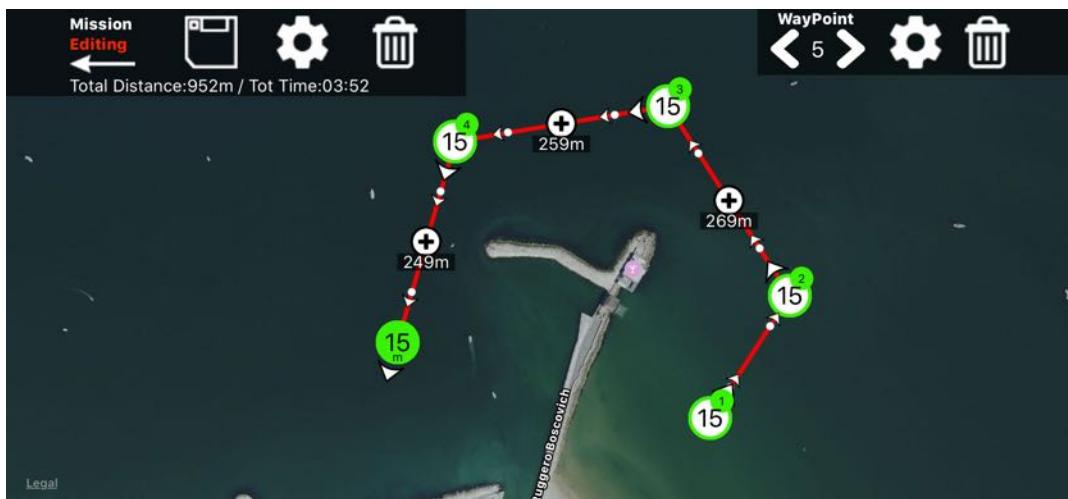


Insert a waypoint:

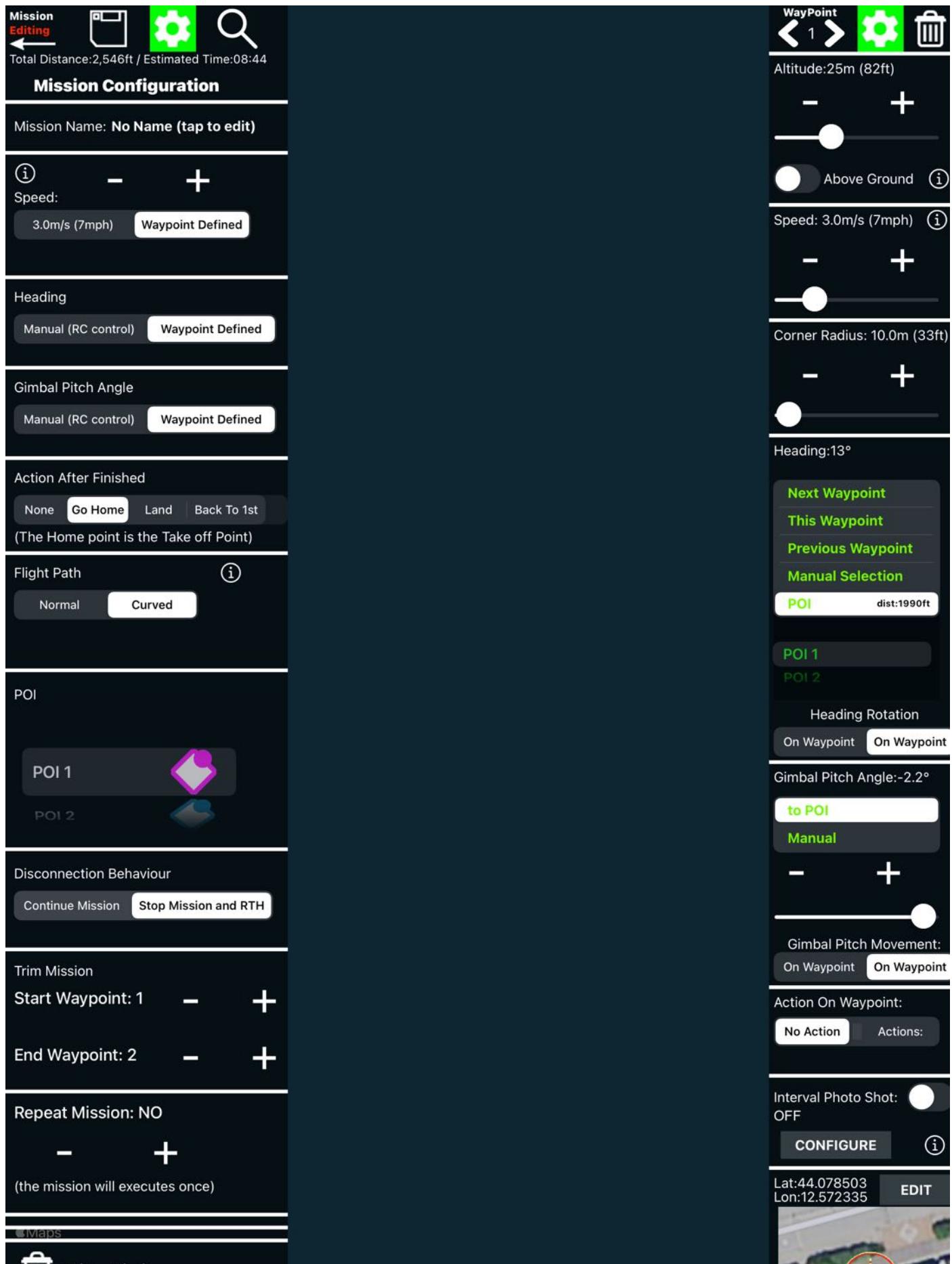
To insert a waypoint between 2 existing ones, you have to “drag” the (+) annotation: touch it for 0,5s to start to “drag” then drop it where you want to insert a new waypoint!



now let's add more waypoint before dig in more waypoint's options



here you can see all the available settings for your waypoint mission:

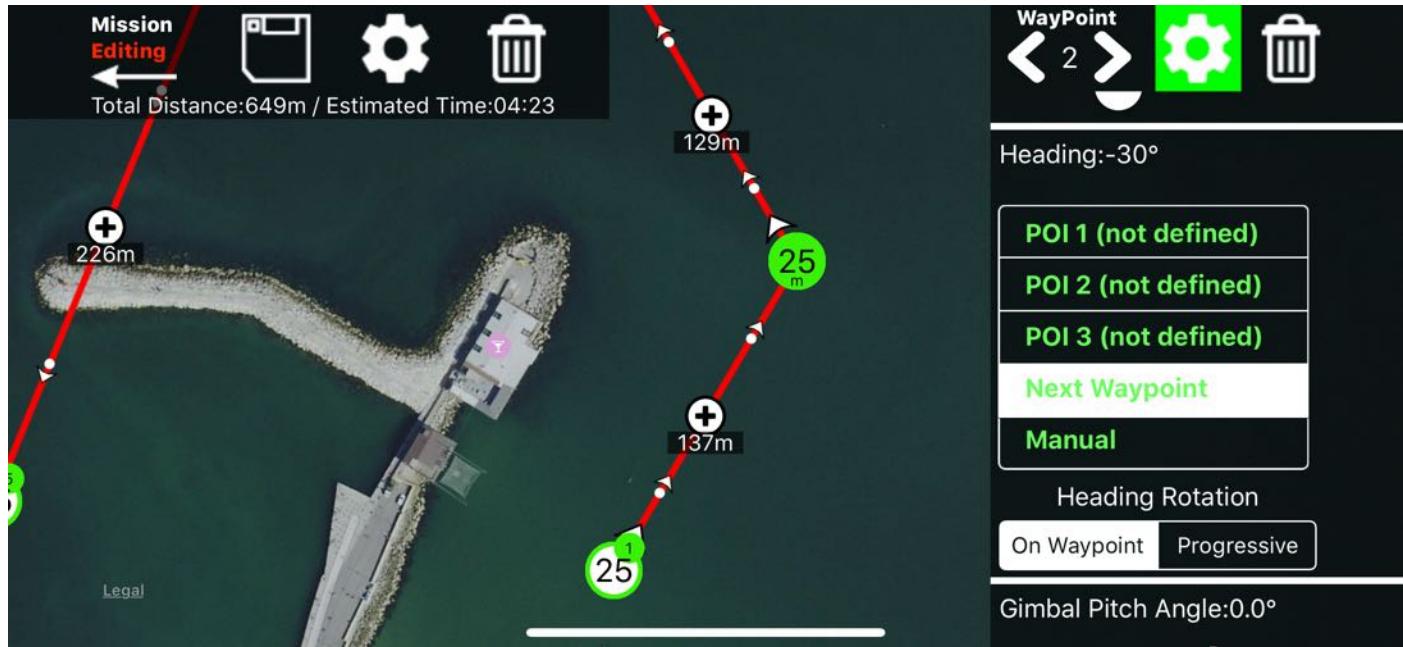


on the left you have “mission options”, on the right are “waypoint options”

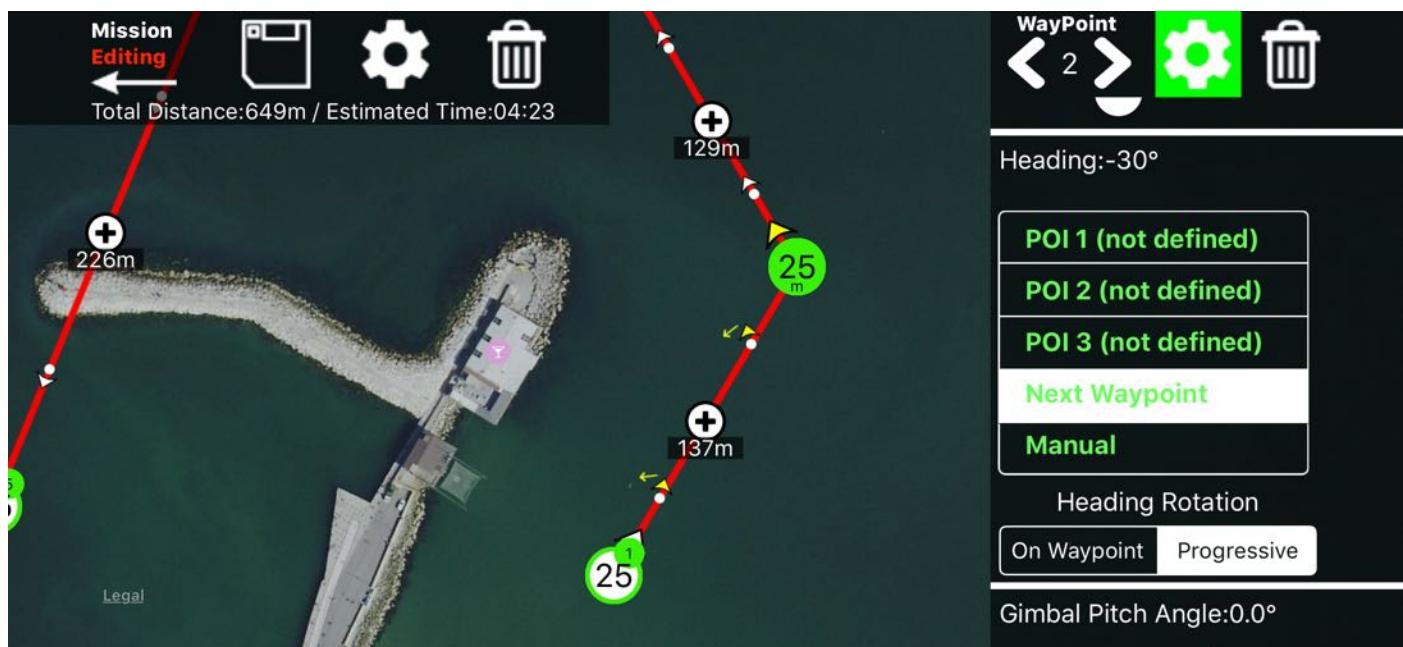
Understanding Waypoint heading

In waypoint settings you can change the heading, by default the drone once reach the waypoint will rotate to look towards the next waypoint, you can manually modify the heading angle or choose to point to a POI (point of interest) also you can choose how rotate: “On Waypoint” or “Progressive”. (more on “POI” below)

“On waypoint” the drone will keep the same heading from the previous waypoint and only when it reach this waypoint will rotate to the angle you set.



“Progressive”, the drone will gradually and linearly rotate during the path, from the Heading angle of the previous waypoint, to the heading angle you set here



the little arrows on the path show you how the drone will rotate while flying

Heading Preset:



Next Waypoint: the angle set will be the one to point to the next waypoint

This Waypoint: the angle set will be the one to point to this waypoint looking from the next

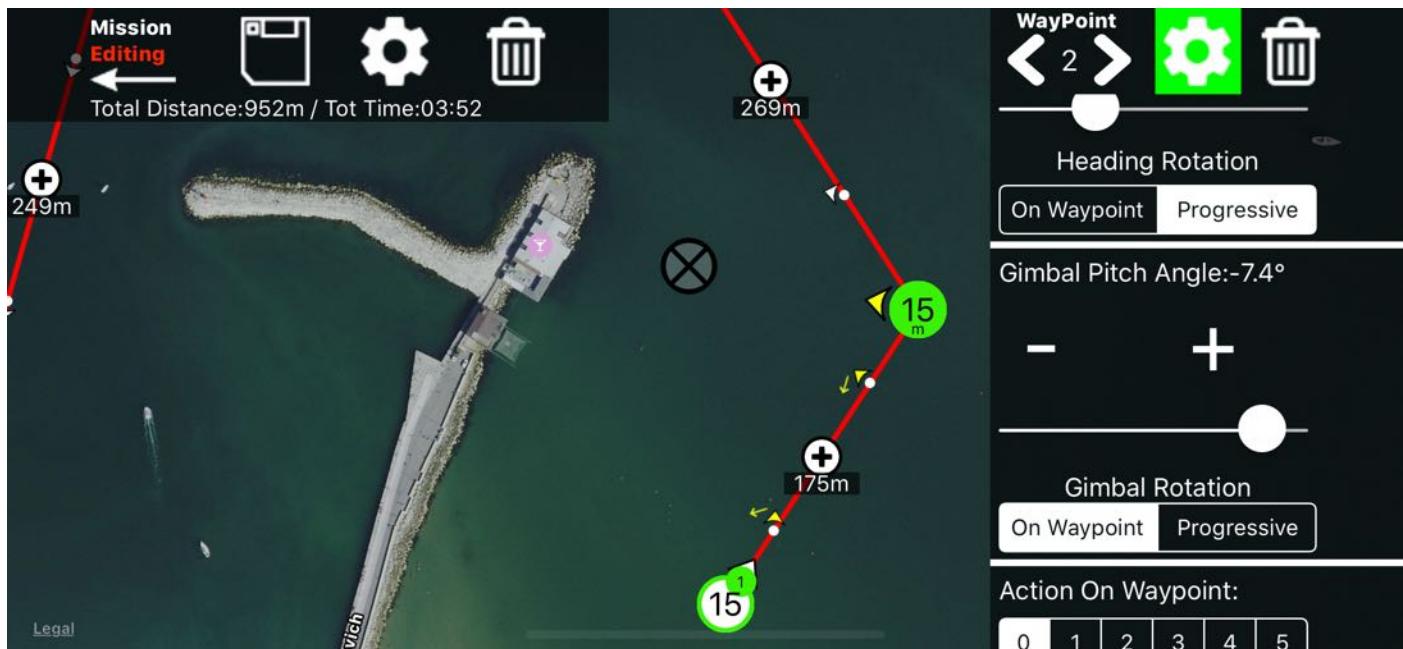
Previous Waypoint: the angle set will be the one to point the previous waypoint

Manual: manually set the heading angle

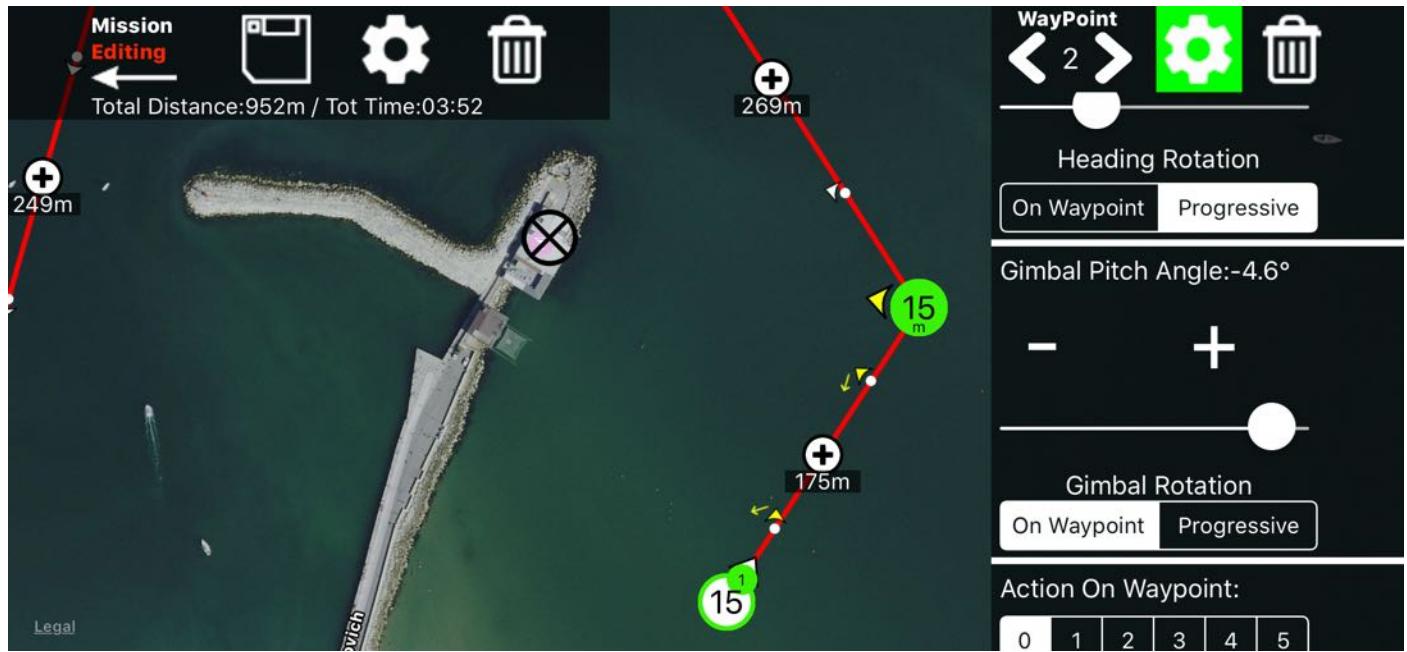
POI: choose the POI to watch

Gimbal Pitch Angle

you can set the gimbal pitch angle, here you can also set “on waypoint” or “progressive” with the same logic explained above for the heading



while you edit the gimbal angle, a “target” will appear that show you what will be in the center of the frame, so you can easily adjust it



note: keep in mind that the target position is calculate by the altitude and the angle, considering that what you see on map is at the same “take-off” altitude.

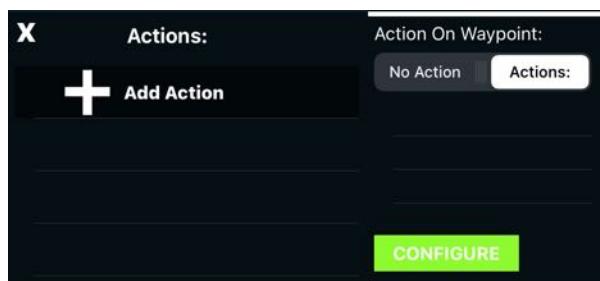
(Using “POI” the gimbal pitch angle will be automatically adjusted also considering the POI altitude)

Waypoint Actions

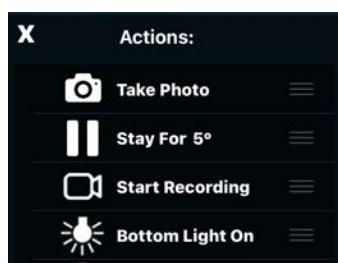
Here you can set actions (take pics, start recording...) the drone will perform after reached the waypoint (also after complete the heading and gimbal rotations), before proceed to the next waypoint.

If Flight Path is “Normal” action will be performed even if the drone is NOT connect , If waypoint behaviour is “Curved” action will be performed only if the drone is connect to the remote.

to define actions select "actions" then tap “configure”



in the actions configuration panel you can add up to 15 actions for each waypoint.



The added actions can be rearranged simply by dragging them from the right side of the list.

The definable actions are: Stay (pause), Take photo, Video recording ON / OFF, Auxiliary light ON / OFF, Drone rotation (yaw), Gimbal rotation (tilt)

Actions are restricted in some cases:

1)Drones that do virtual stick missions (example Mavic Mini, Mavic Air2):

-Any kind of actions can be performed in all missions (no restriction)

2)All other supported Drones (capable of fully autonomous missions)

All actions are always performed with the exception of:

-Yaw and Camera Tilt, for which the "curved path" option must be disabled

-Light action (only for the Mavic 2 series) and requires the "curved path" option to be Enabled

Other action Notes:

you can always manually take pics or start/stop video recording during mission

If you define actions, it is not possible to define a corner radius

Interval Photo Shots

Here you can configure interval photos, you can choose to set them by time or distance, the photos will be taken from the configured waypoint to the next one, the first photo (time or distance) will be taken on the waypoint

Speed

The speed that you set here, is the one that the drone will use **from here to the next** waypoint.

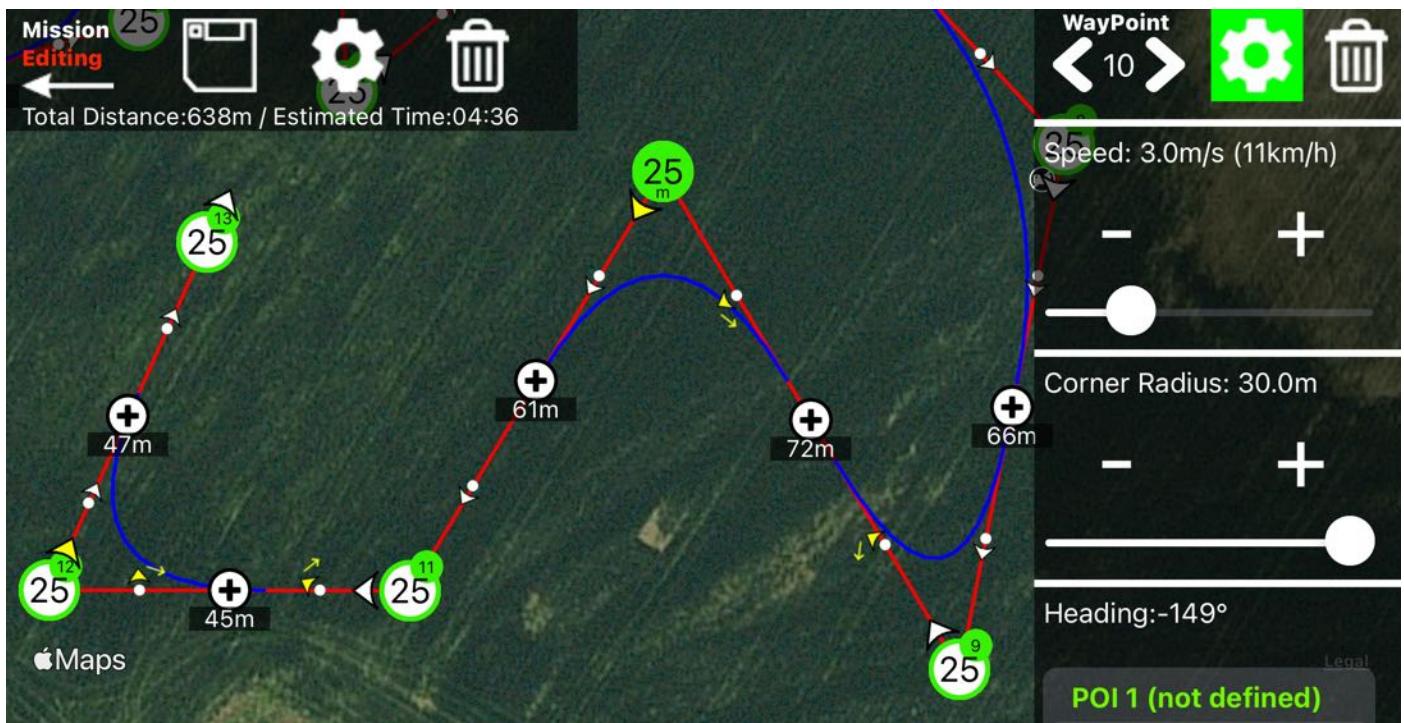
notes:

- only the speed that you set on the first waypoint will be also used as speed to reach it from the point you start the mission
- the speed can also modified while the mission is running acting on the “pitch” stick ⁽¹⁾ on the remote controller. if you push the “pitch” back enough the drone not only go slower, will also go back on the mission path. When you leave the pitch stick on the center the drone will continue the mission at the set speed.
- in “mission configuration” (see below) you can choose a fixed speed for the entire mission instead of defining it for each waypoint
- if speed is set to zero, the drone will move only using the “pitch” stick

Note: altitude and position of all waypoints must be within the drone altitude and range limit, otherwise the mission will not run (see “Flight Limit settings” above)

⁽¹⁾ with the MAVIC™ Mini And Air2 the “pitch” stick will not change the speed during the mission

Corner Radius



To define a corner radius choose "Curved Path" in Mission Options

You can define a radius up to 500m, the drone will perform a Bézier curve near the waypoint, the radius defines the distance from the waypoint where the curve starts

The maximum corner radius is also limited by the distance between 2 consecutive waypoints and their respective corner radius

When a corner radius is defined, the drone will fly close to the waypoint but will not reach it (distance based on radius)

Since the curve is 3D and based on the altitude of previous and next waypoint, the drone may not reach the altitude of the waypoint

If an action is defined in a waypoint, or a rotation (heading or gimbal) is set "on waypoint" the drone must reach the waypoint, so it is not possible to define a corner radius in these cases

Above The Ground

In waypoint altitude options you can select "above ground"

When the "Above Ground" option is selected, Maven will automatically calculate the correct waypoint altitudes given the ground elevation at each waypoint, using the ground elevation at waypoint 1 as the reference.

For the best results and because waypoint 1 is used as a reference, it is strongly advised to place waypoint 1 in a location close to where the drone will take off (i.e. similar ground elevation).

This option requires internet to design the mission, to run the mission internet is not required

Important:

The drone does not know its height relative to the ground, (and therefore not even the app) but only its height relative to the take-off point. The function "above the ground" corrects the height of the various points as a difference with respect to the elevation of the terrain to waypoint 1,

The elevation information is taken from an internet database and may not be accurate anyway.

Elevation Data Provider:

DEM Net Elevation API (<https://elevationapi.com>)

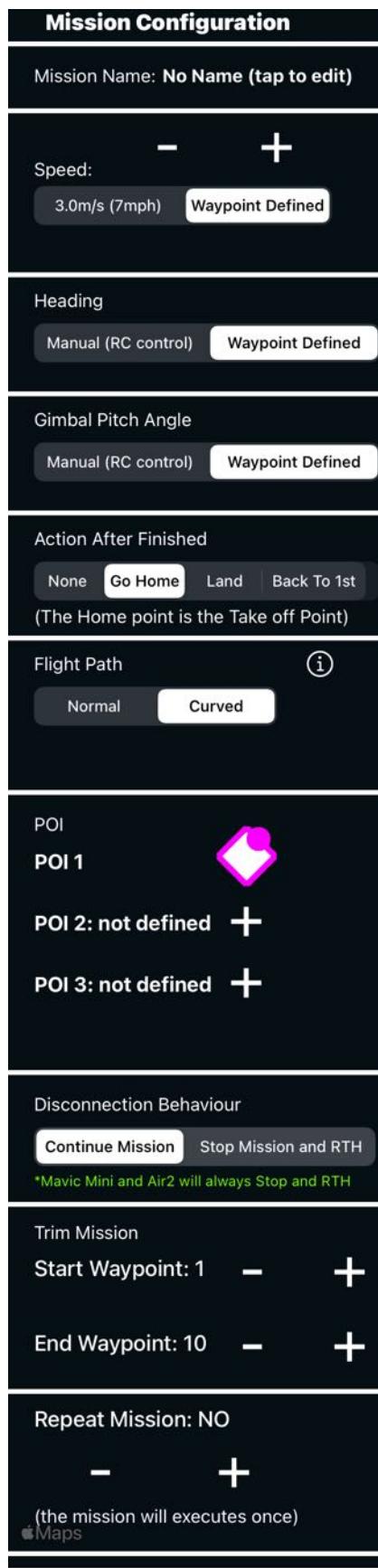
using these digital elevation models:

NASADEM - https://doi.org/10.5067/MEaSUREs/NASADEM/NASADEM_HGT.001

RTM_GL1 OpenTopography - <https://opentopography.org/>

Mission Configuration Menu

These options will affect the entire mission:



Mission Name:

(optional) set a name to the mission

Mission Speed:

set a speed for the entire mission or choose to define on each waypoint

Heading Behaviour:

(manual or waypoint defined)

Gimbal Behaviour:

(manual or waypoint defined)

Action After Finished:

default: "RTH", so you do not have to add waypoints to go back.

Flight Path:

"Normal" will slowdown and stop on each waypoints before continue to the next ,

"Curved" will let you define a corner radius at each waypoint also will allow the "Lock on POI" heading mode when flight between two waypoint with the same POI as target. Notes: if a POI is defined, Curved path is mandatory. The drone will not stop on each waypoint unless an action is defined.

POI:

here you will define POI position for the mission.

Disconnection Behaviour (2):

by default the mission will continue independently (only low battery will automatically stop the mission and start RTH)

Trim Mission:

you can choose where to start or finish the mission without deleting waypoint.

Repeat Mission:

you can choose the repeat the path multiple times

(2) Mavic Mini and Air2 can't continue the mission without connection, it will always Stop and RTH on disconnection

Point of Interest (POI)

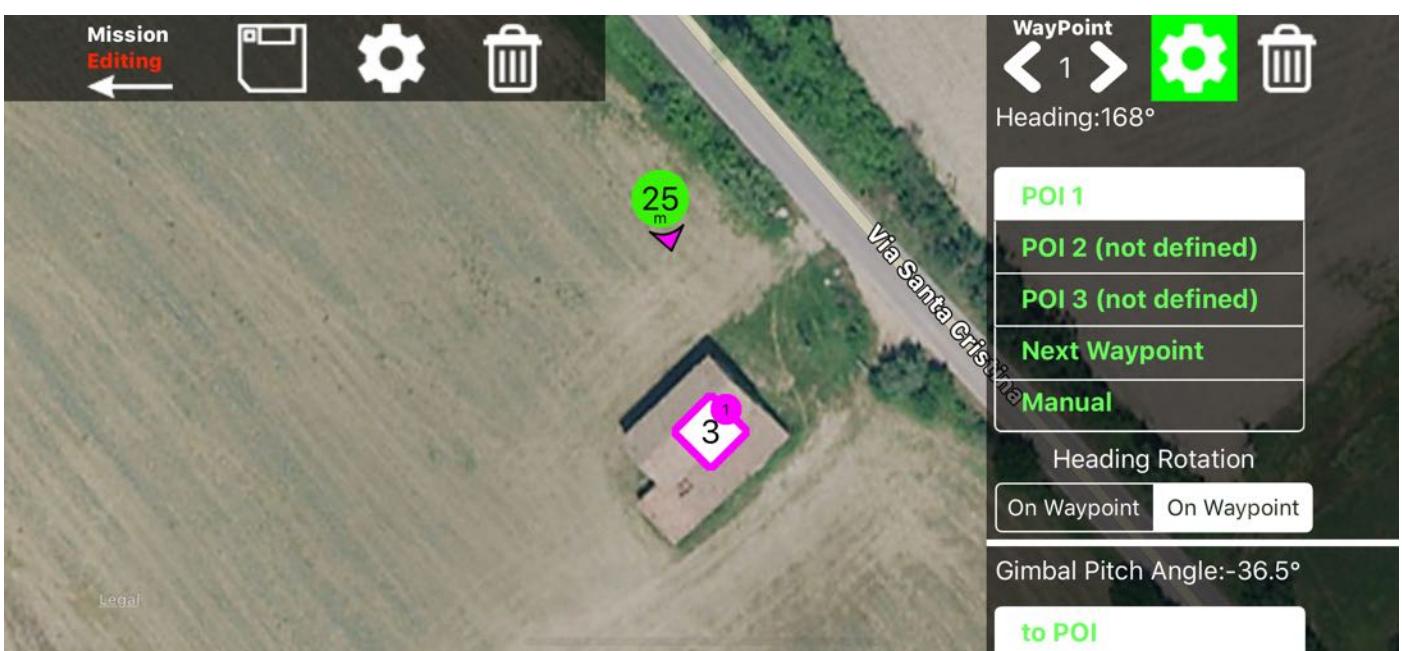
Using POI is really easy, tap the “+” button in mission configurator menu, then tap on map to define the position of your POI.



In the POI menu on the right, you can delete, move or adjust the altitude of the selected POI, (the altitude is relative to the take off point)

You can also move the POI by dragging the POI annotation on map (long tap to start to drag)

Now add a waypoint, then in the waypoint configuration panel, choose the heading to “POI 1”



the heading and the gimbal tilt angle will automatically adjusted to frame the POI

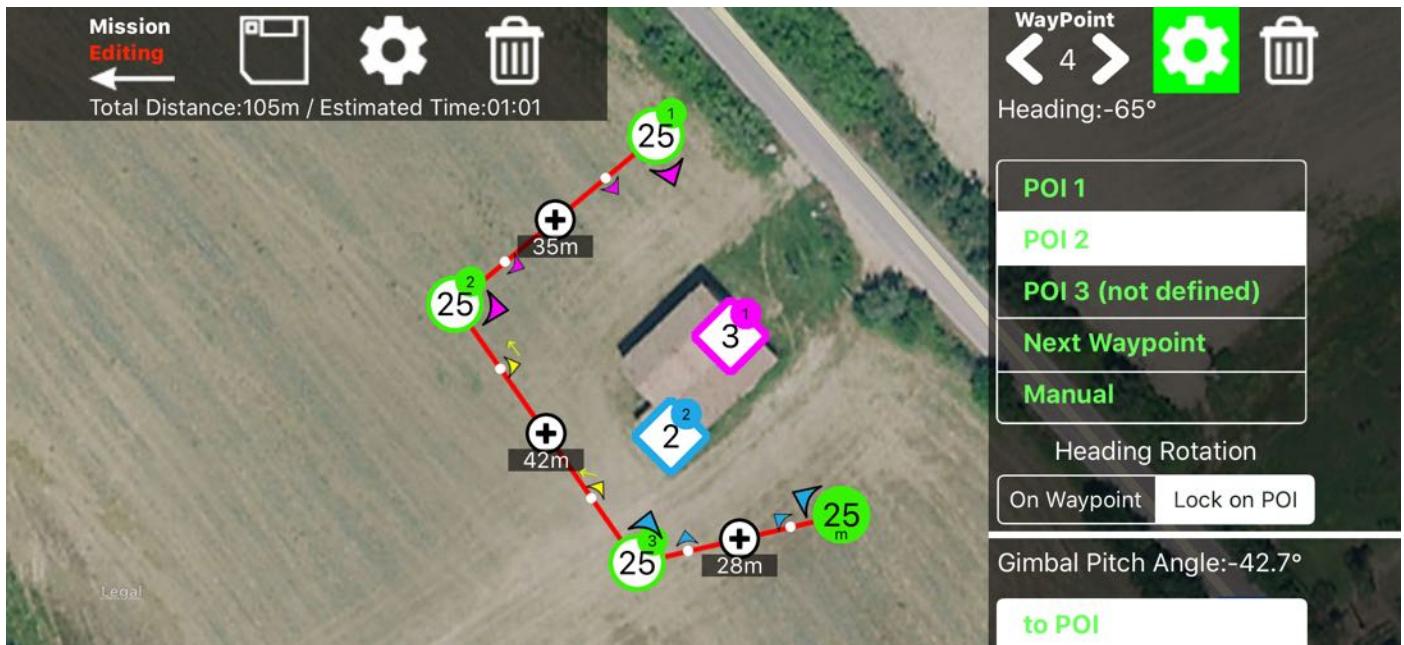
Now add one more waypoint, adding a waypoint next to one that look to a POI, will automatically set it to the same POI.



please note: Heading Rotation: **Lock on POI**

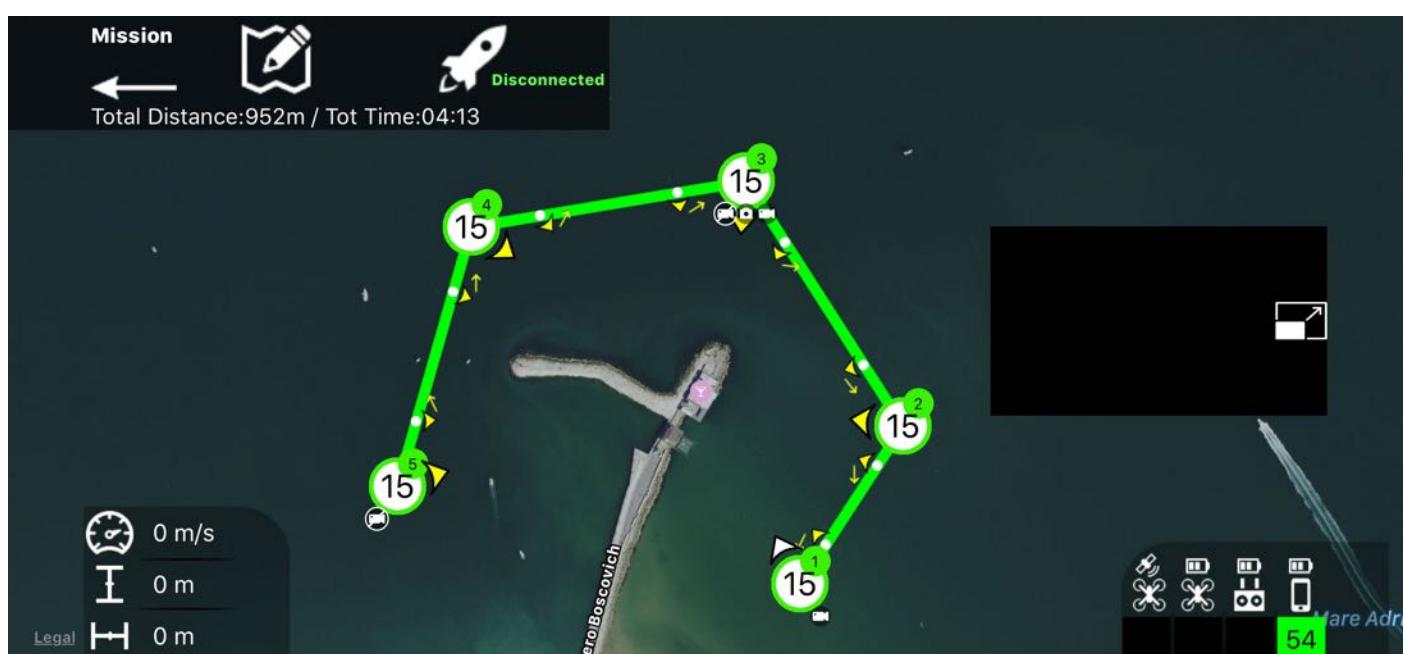
when 2 consecutive waypoint have the same “POI”, the heading rotation will be “Lock on POI” than is different from “progressive”, with progressive the heading will rotate linearly from the first to the second “waypoint heading”, but in many case (such as a fly by on a POI) the heading rotation is not linear, “Lock on POI” will allow to keep the POI in frame during all the path.

Using Multiple POI: you can define and use up to 99 POIs on each mission



Save Mission

Once you have done to plan the mission, hit the save button, and the mission is ready to run! on screen will appear a video preview from the drone (if connected) plus all the necessary telemetry.

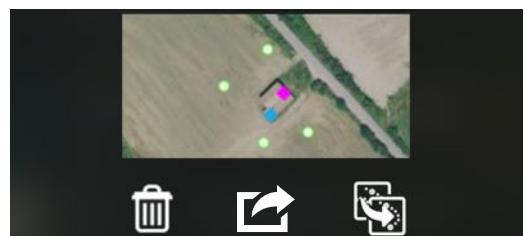


here you can edit again the mission, run the mission, or go back the mission list.

In the mission list you will see the mission that you have just saved on top, with a summary and picture preview.



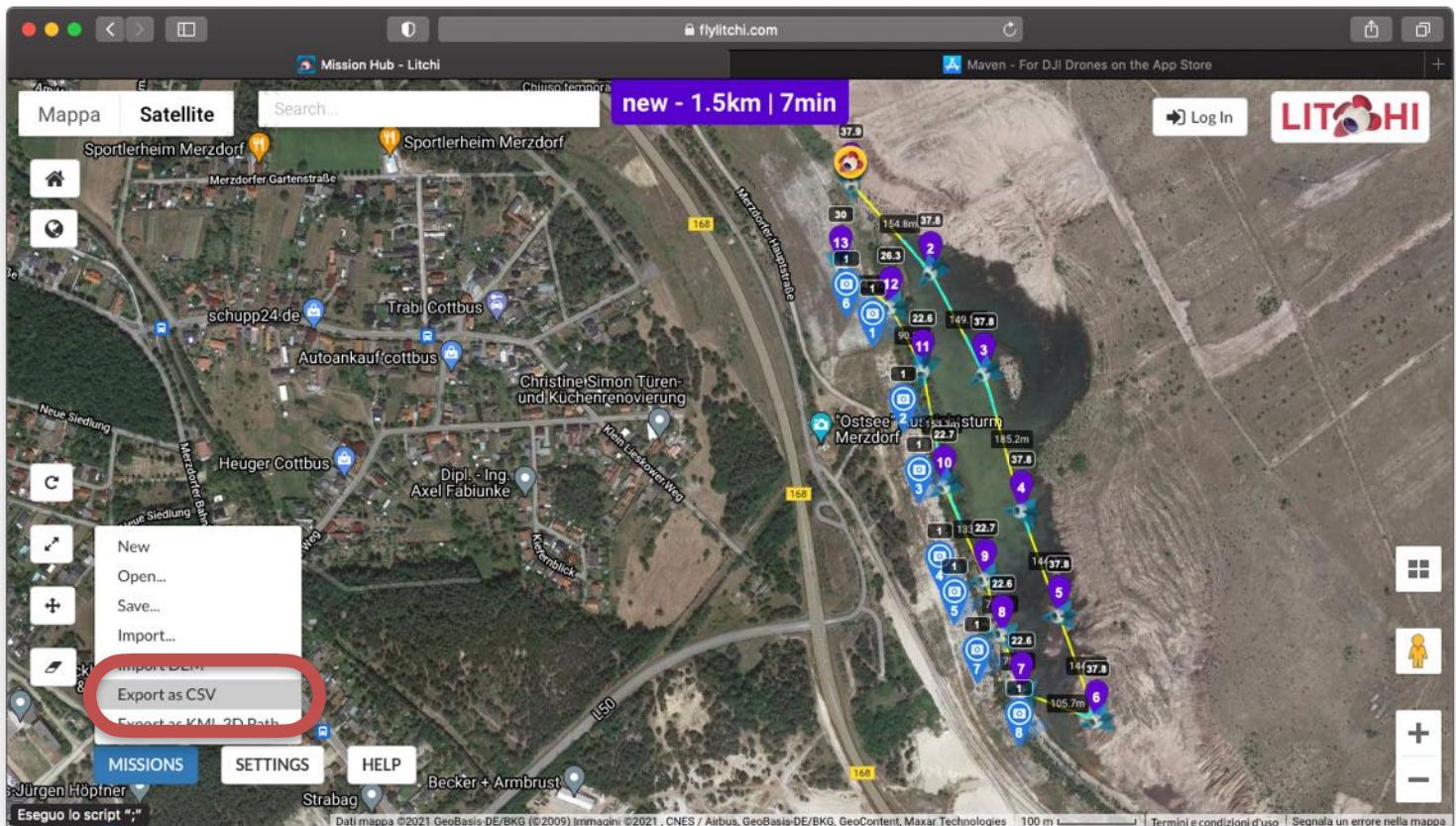
Use the “3 dot” button, to open a mini menu to delete, share or duplicate a mission



Import CSV mission

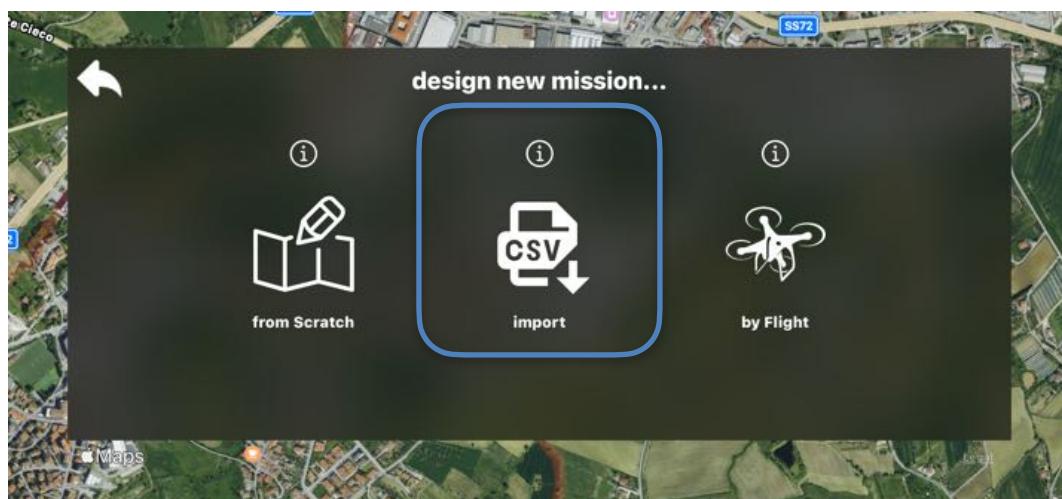
The supported CSV file is the format that can be exported from the “Litchi Mission Hub” a free online mission planner. You can access the mission planner here: <https://flylitchi.com/hub> from your PC/MAC.

Once your mission is ready, choose “Export as CSV” from the Mission Menu

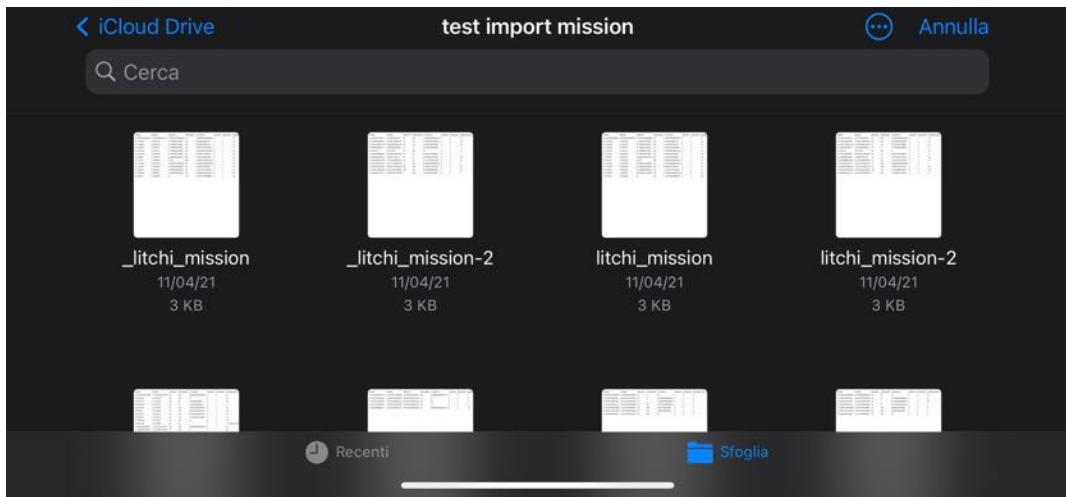


Save your CSV mission file somewhere accessible from your iPhone, for example iCloud Drive or Google Drive

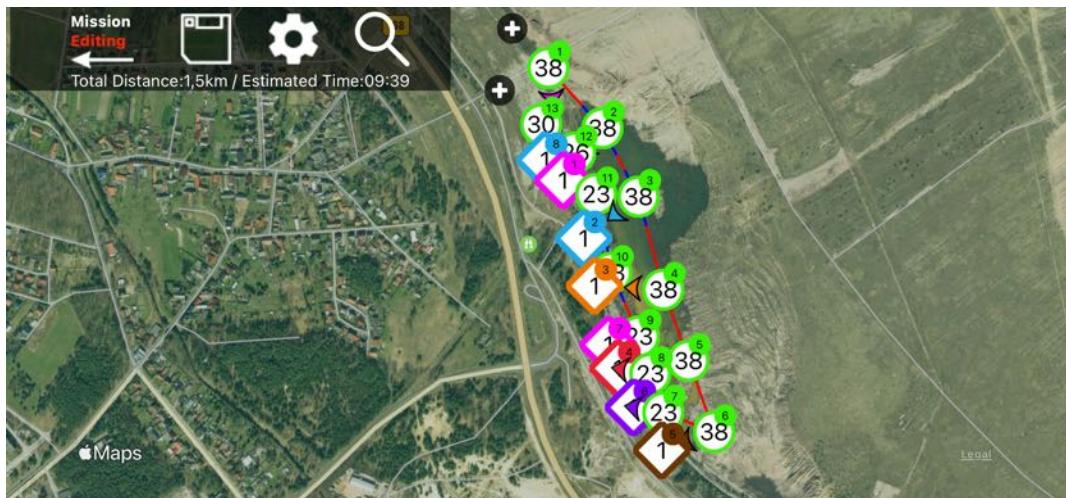
To import the mission in Maven:



Select New Mission from the mission list, then select “import”.

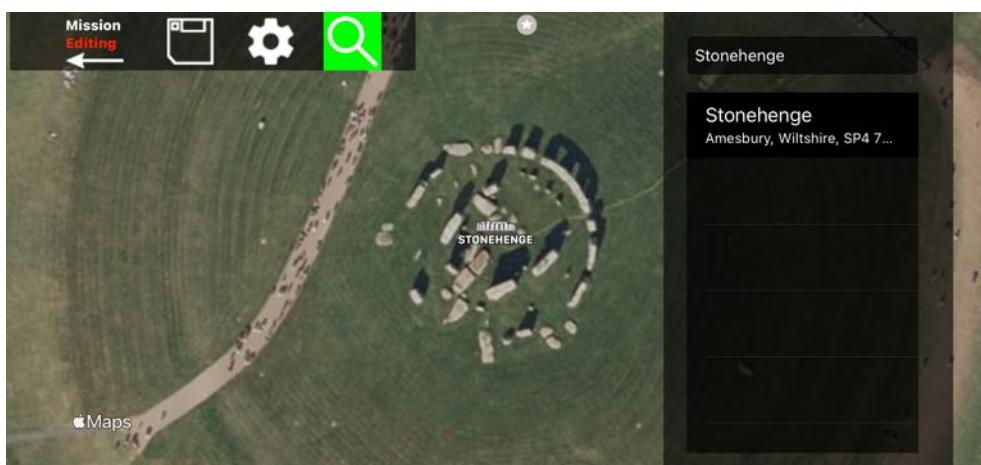


Then browse your iPhone files to locate the mission you want to import and select it



The Mission will be automatically imported and ready to be used.

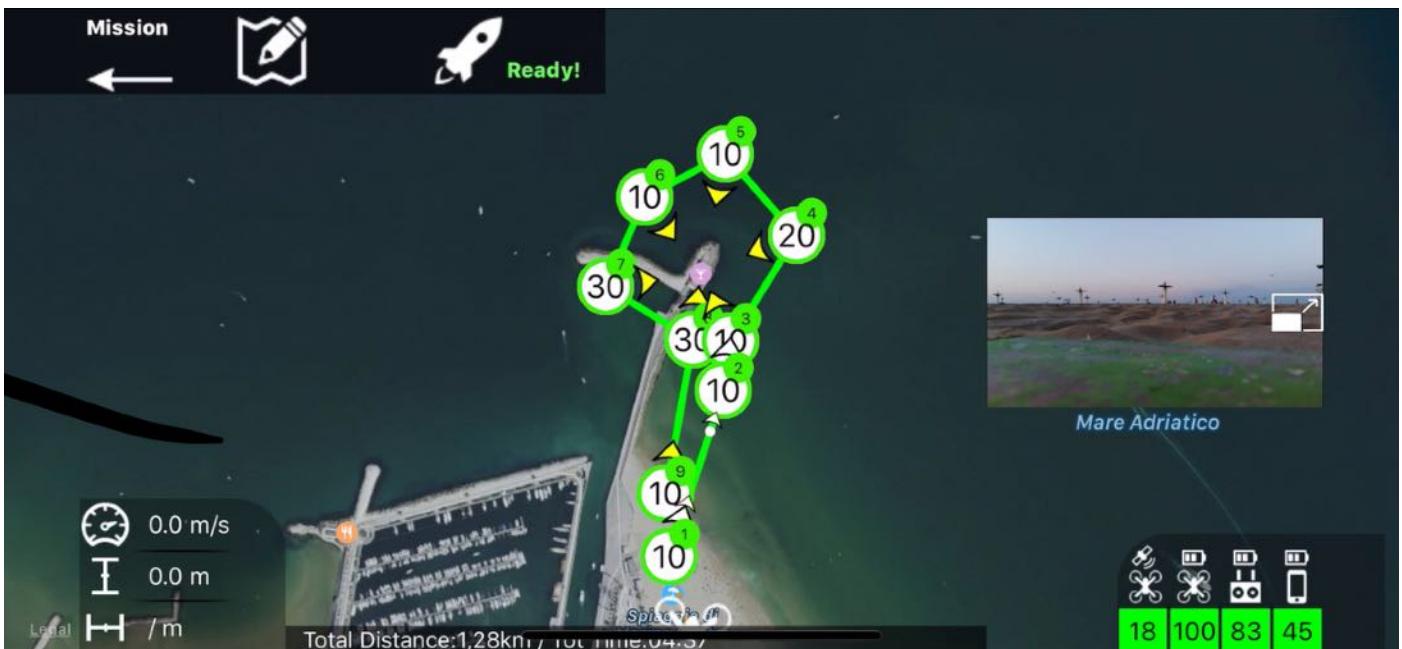
Search for places



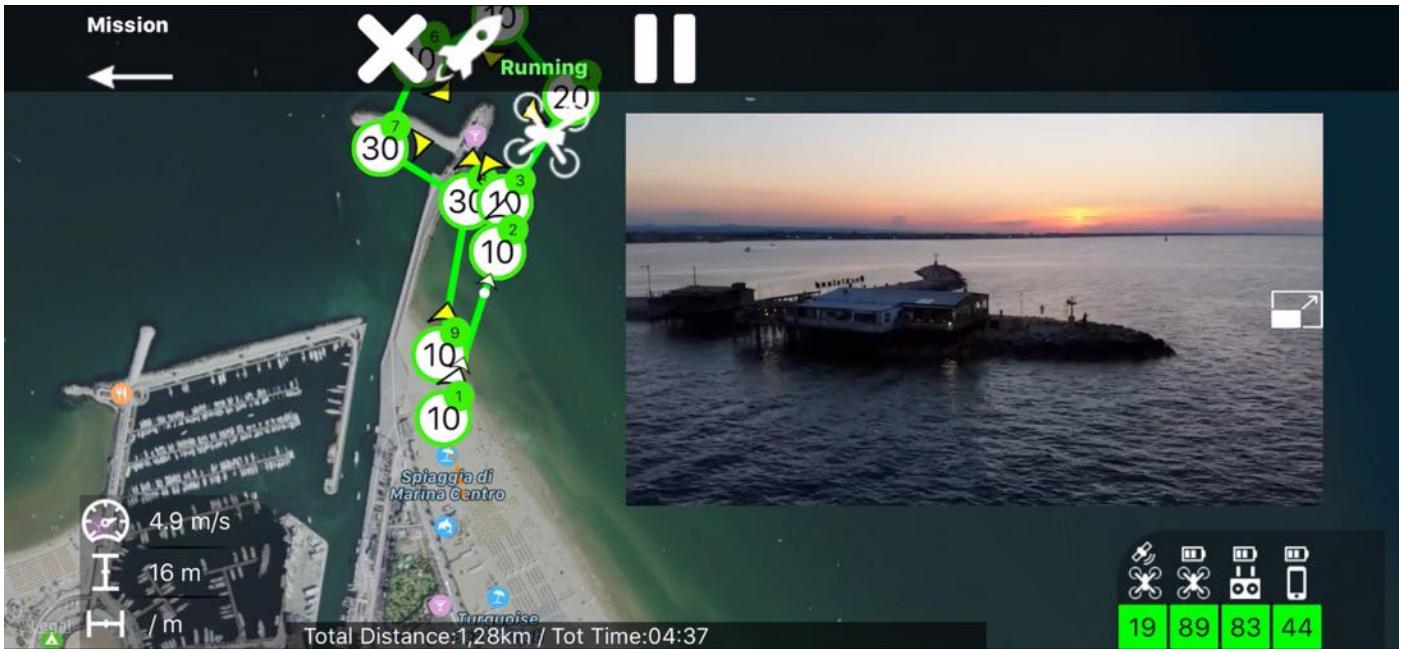
use the search tool to find the place to plan your mission, you can search for anything from cities, addresses or places of interest, then simply tap the result from the list to position yourself on the map

Run Mission

To run a mission choose one from the list, connect the drone and wait for it to have a GPS fix (you will see the drone icon on the map)



now, hit the “Rocket” button to start the mission!! and your drone will automatically perform the entire mission.

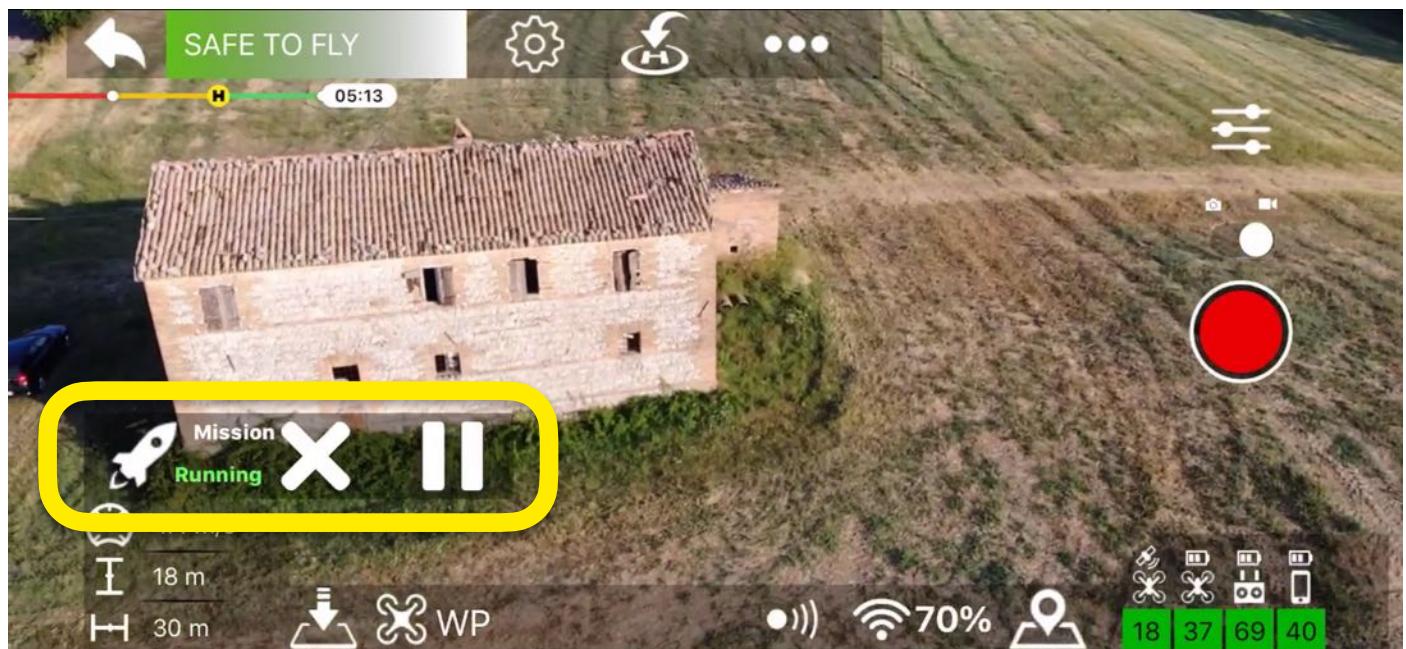


Stop / Pause Mission (3)

While you are connected to the drone you can anytime stop the mission with the “X” button, or you can pause/resume the mission with the “||” button.

The Mission can also paused/resumed with the “pause” button on your remote controller.

You can exit from the “Mission screen” while a mission it is running(or paused), now if you go to the normal “piloting screen” of the app, you will have a new small toolbar to pause or stop the mission.



Tapping the rocket icon on this mission toolbar will bring you back to the mission view.

(3) Mavic Mini and Air 2 can't PAUSE a mission and Can't exit the WAYPOINT SCREEN while a mission is Running

Mission + VR mode (4)

You can combine both functionality of the app, run a mission as explained above, then pause the mission and enter in VR mode.



Now on screen you can see that the drone is in “Mission mode” (small rocket on the screen) and if it’s running or paused. Use the pause button on your remote to resume the mission and enjoy it in first person view!



In this case in “mission configuration” it might be useful to choose “manual” both for the heading and for the gimbal, so as to be able to control them live while the drone performs the route!

(4) Mavic Mini and Air2 Can't exit the WAYPOINT SCREEN while a mission is running so can't combine mission and VR mode

Mission Dimension

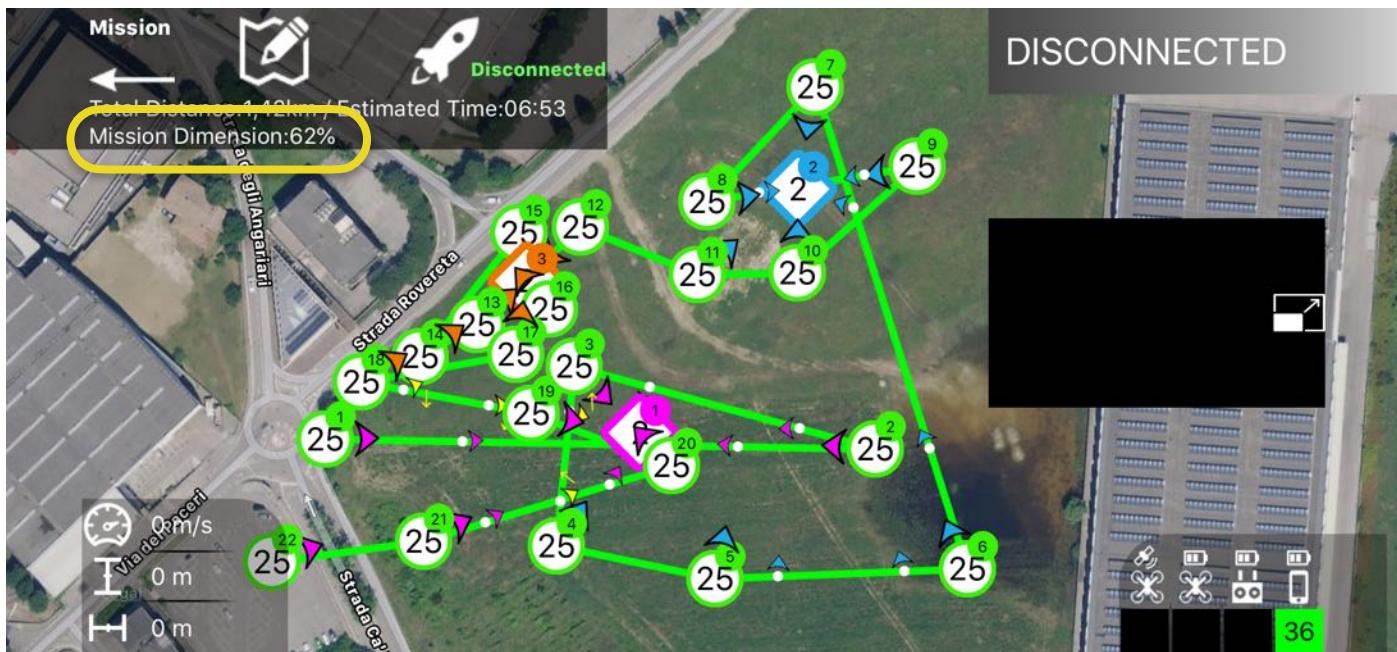
The drone have a limited memory dedicate to store a waypoint mission, so it can not be too much “big”, the memory occupied by a waypoint vary based on many factor but mainly from the “heading mode”, as indication:

if you use all waypoint with “progressive” heading you will able to add up to 99 waypoints in a single mission.

if you use all waypoint with “on waypoint” heading you will able to add up to 49 waypoints in a single mission.

if you use all waypoint with “Lock on POI” heading you will able to add up to 20-30 waypoints in a single mission.

when you save the mission you will able to see the dimension of your mission (only if bigger the 50% of total capacity of the drone)



note: if the mission dimension is more than 100%, the drone will not accept it and will not run then mission.

Notes for Mavic Mini and Air2:

-the Mavic Mini and Air2 has some firmware limitations which do not allow waypoint mission like other Mavic drones. While other drones are completely autonomous in carrying out the mission, the mini requires continuous input from the app, so a perfectly stable connection is required for the whole duration of the mission.

-The Waypoint Mission cannot work properly with the APAS function activated, so APAS will be automatically disabled if necessary, the anti-collision sensors will still remain active to stop the drone in case of obstacles .