

imupload

inav Mission Plan tool

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[imupload](#), aka **iNav Mission Plan Loader**, is a cross-platform, command line tool to upload missions in a number of file formats to iNav. It can also download missions and convert between file formats.

1.1 Mission File formats

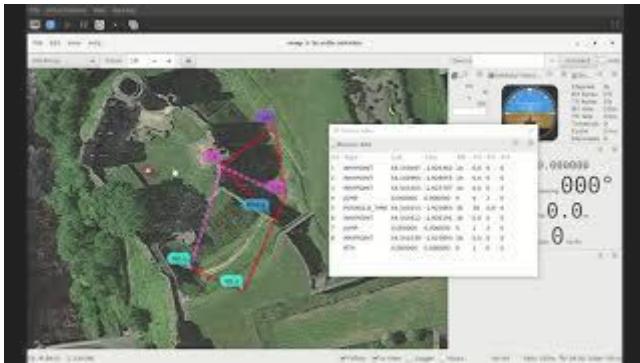
[imupload](#) supports the following file formats:

- **Multiwii XML**: (MWXML) The mission file format used by iNav mission planners such as [mwp](#), [ezgui](#), mission planner for iNav and the iNav configurator.
- **APMPlanner2 text** files: Mission files generated by APMPlanner (and older qgroundcontrol); "QGC WPL 110" files.
- **qgroundcontrol JSON Plan** files (recent versions of qgroundcontrol), simple mission and complex (survey).
- **GPX**: A common format often used for GPS information. [imupload](#) works with GPX files containing tracks, routes or waypoints.
- **KML (and KMZ)**: Another common format; the export format for a number of well known tools like Google Earth. Mission should be defined as 'paths'.
- **mwp JSON**: mission files.
- **Simple CSV**: See below for detail

1.2 Use Cases

- Plan missions in apm planner, (QGC WPL 110) upload (& save) to iNav
- Plan missions in any GPX creating GIS tool
- Plan missions in Google Earth, save as KML, upload to FC
- Convert "alien" formats to MW-XML.

1.2.1 Youtube tutorial



1.3 Installation

From source: `go get github.com/stronnag/imupload`, binaries end up in `go/bin`, source in `go/src/github.com/stronnag/imupload`. Requires `go` and `git`.

Binaries in the Release area (linux ia32/x86_64/arm7, Win32, MacOS, FreeBSD) if you don't want it build it locally. The [release area](#) provides standalone binaries for ARM Linux (arm7), Linux on ia32 and x86_64, MacOS, FreeBSD and Windows .

1.4 Usage

Run the executable for your platform in a terminal (Windows `cmd` or `powershell`). The majority of the examples are from Linux where the serial device should be auto-detected; the examples are also relevant to MacOS and Windows, however you will need to specifically define the serial device, e.g. `-d COM7` on Windows, `-d /dev/tty.usbmodem14211` on MacO (where 14221 is possibly a random number).

```
$ implead --help
Usage of implead [options] command [files ...]
-a int
    Default altitude (m) (default 20)
-b int
    Baud rate (default 115200)
-d string
    Device Name
-force-land
    Adds RTH / Land for 'external' formats
-force-rth
    Adds RTH for 'external' formats
-s float
    Default speed (m/s)
-v
    Shows version
command
    Action required (upload|download|store|restore|convert|test)

implead v0.150.433 commit 9a82ede / 2018-05-30
```

1.4.1 Commands

upload

The upload command uploads the specified file as a waypoint mission to the flight controller.

store

The store command uploads the specified file as a waypoint mission to the flight controller and then instructs inav to save the mission to EEPROM.

download

The download command downloads the waypoint mission in flight controller volatile memory to the specified file. The mission is always stored as an MW XML mission file.

restore

The restore command instructs the flight controller to restore a mission previously saved to EEPROM into volatile memory, and then downloads the mission to a file (as for the download command).

convert

The convert command converts the first file into an MW XML mission file with the second file name.

test

The test command establishes communications with the flight controller and reports the FC name and build, as well as the contents of volatile mission memory.

1.4.2 Options

Options start with a hyphen and must precede the command being run. On Linux, `imupload` will attempt to access `/dev/ttyACM0` and `/dev/ttyUSB0`, so the device does not need to be specified if using these device nodes. On Windows and MacOS, it is necessary to specify the device name / node.

- `-d device` : define the device name
- `-b baudrate` : define the baud rate (if not 115200 baud)
- `-a default-altitude` : sets the default altitude unless it's otherwise defined. MW XML mission files, apm mission files and CSV *may* define altitude values, so the default value given on the command line is only used for missing (zero) values. The value is in metres.
- `-s default-speed` : defines the default speed. This is used where a leg speed is not set in the input mission file. MW XML mission file, mwp-json and QGC (apm planner2, qgroundcontrol) are the only formats that specify a speed value. If not set, the mission is flown at the speed set in FC configuration.
- `-force-rth` : For GPX only, adds RTH after the final waypoint.
- `-force-land` : For GPX only, adds RTH with land after the final waypoint.

Device Names

`imupload` supports a subset of the mwp device naming scheme:

- `serial_device[@baudrate]`
- `tcp://host:port`
- `udp://remotehost:remote_port`
- `udp://local_host:local_port/remote_host:remote_port`

The baud rate given as an extended device name is preferred to `-b`

For ESP8288 transparent serial over UDP (the recommended mode for ESP8266), the latter form is required.

Device Name examples

```
/dev/ttyUSB0@57600
/dev/ttyACM0
COM17@115200
tcp://esp8266:23
udp://:14014/esp-air:14014
# both sides use port 14014, remote (FC) is esp-air, blank local name is understood as INADDR_ANY.
```

1.4.3 Files

The `imupload` commands require zero, one or two file names. If file names are missing or are a single hyphen, then `stdin` (standard input) is used for readings and `stdout` (standard output) is used for writing. This allows pipelines to be used.

1.5 Usage Examples

1.5.1 Convert a GPX track file to MW XML mission file

```
$ imupload convert test.gpx gpx_trk.mission
```

1.5.2 Store a apm planner2 mission file to EEPROM

imupload supports the following QGC WP types:

- Waypoint (16)
- Poshold_time (19)
- RTH (20)
- Land (21)
- Jump (177)
- SET_ROI (201)
- DO_SET_ROI_LOCATION (195)
- DO_SET_ROI_NONE (197)
- DO_CONDITION_YAW (115)

with the following recommendations / restrictions:

- Provide explicit positions rather than 'use previous' values
- Jump to geo-referenced WPs

[Tabular list of WP types](#) showing conversions and more detail on the ROI / YAW settings and restrictions.

```
$ imupload store samples/qpc_0.txt
2018/05/24 18:09:10 Using device /dev/ttyUSB0 115200
INAV v2.0.0 SPRACINGF3 (e7ca7944) API 2.2 "vtail"
Waypoints: 0 of 60, valid 0
upload 12, save true
Saved Mission
Waypoints: 12 of 60, valid 1
```

1.5.3 Upload a KML file to inav

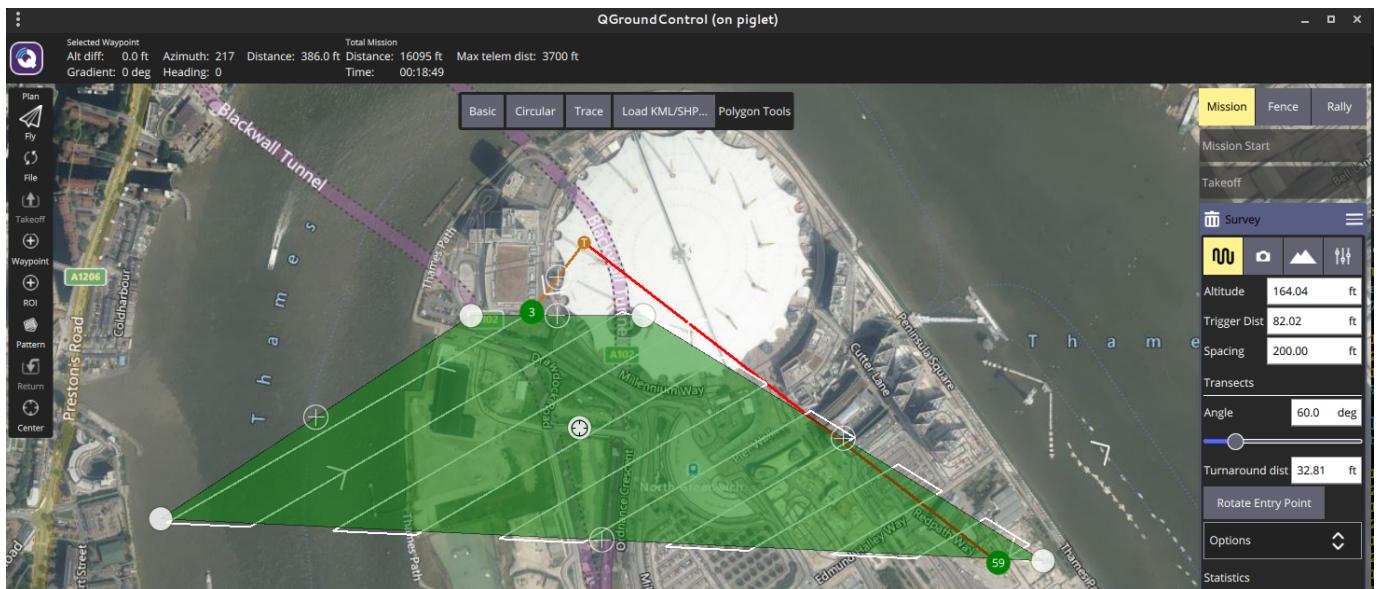
```
$ imupload upload samples/google-earth-mission.kml
2018/05/29 20:07:26 Using device /dev/ttyUSB0 115200
INAV v2.0.0 SPRACINGF3 (6cc0cc9) API 2.2 "vtail"
Waypoints: 0 of 60, valid 0
upload 9, save false
Waypoints: 9 of 60, valid 1
```

1.5.4 Sample Images

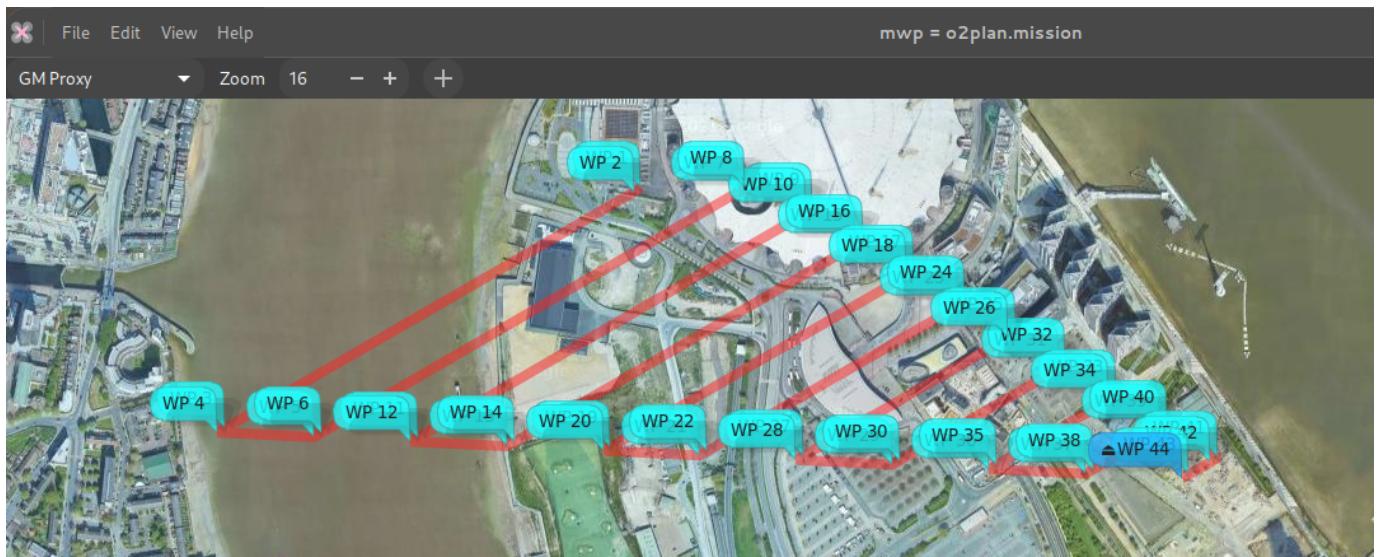
Note that 'home' is notional in all cases, as we're not at the field. It is not required by inav mission planners ([mwp](#), [ezgui](#), mission planner for inav et al).

QGC Survey

Original survey plan:

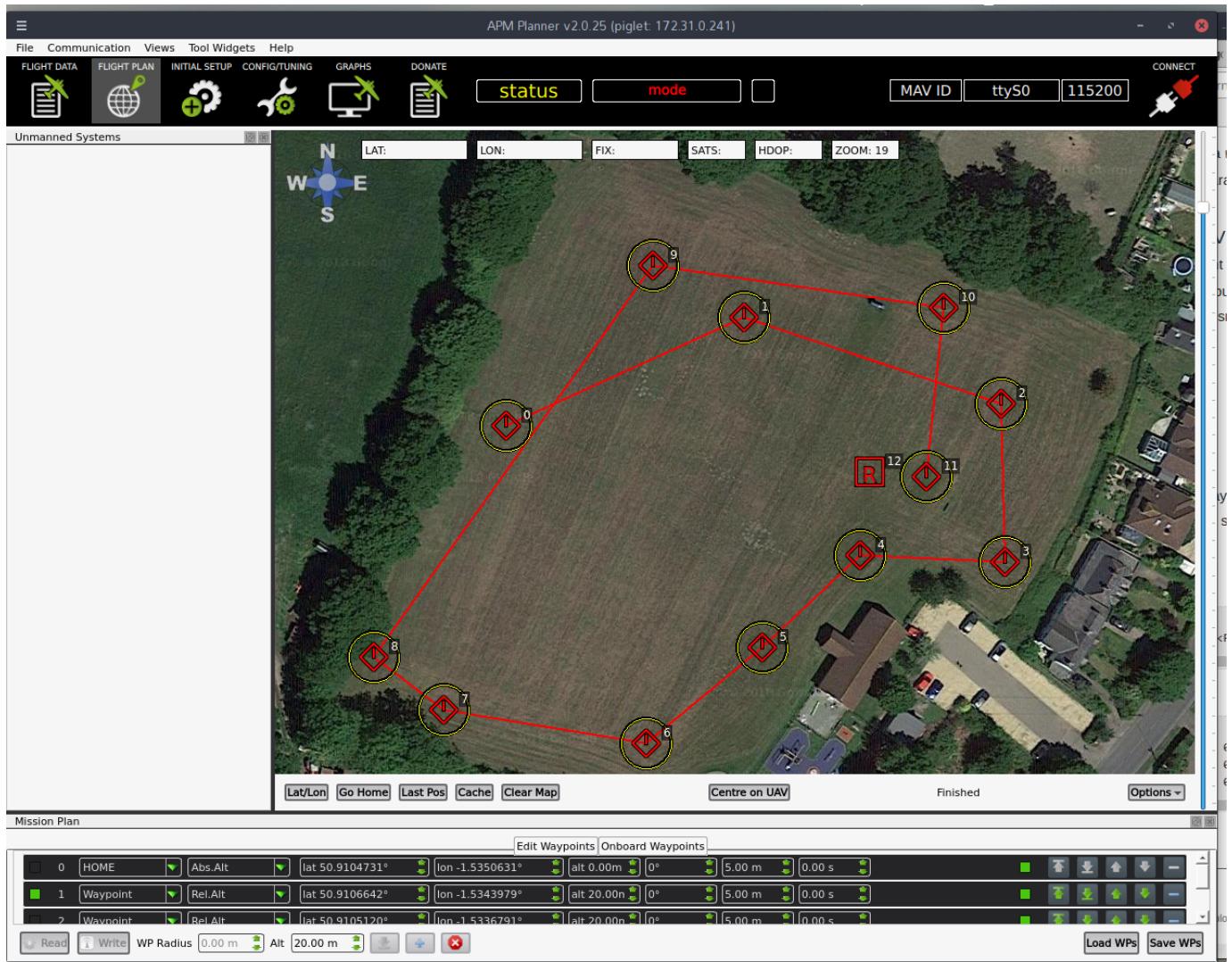


In mwp after imupload convert :

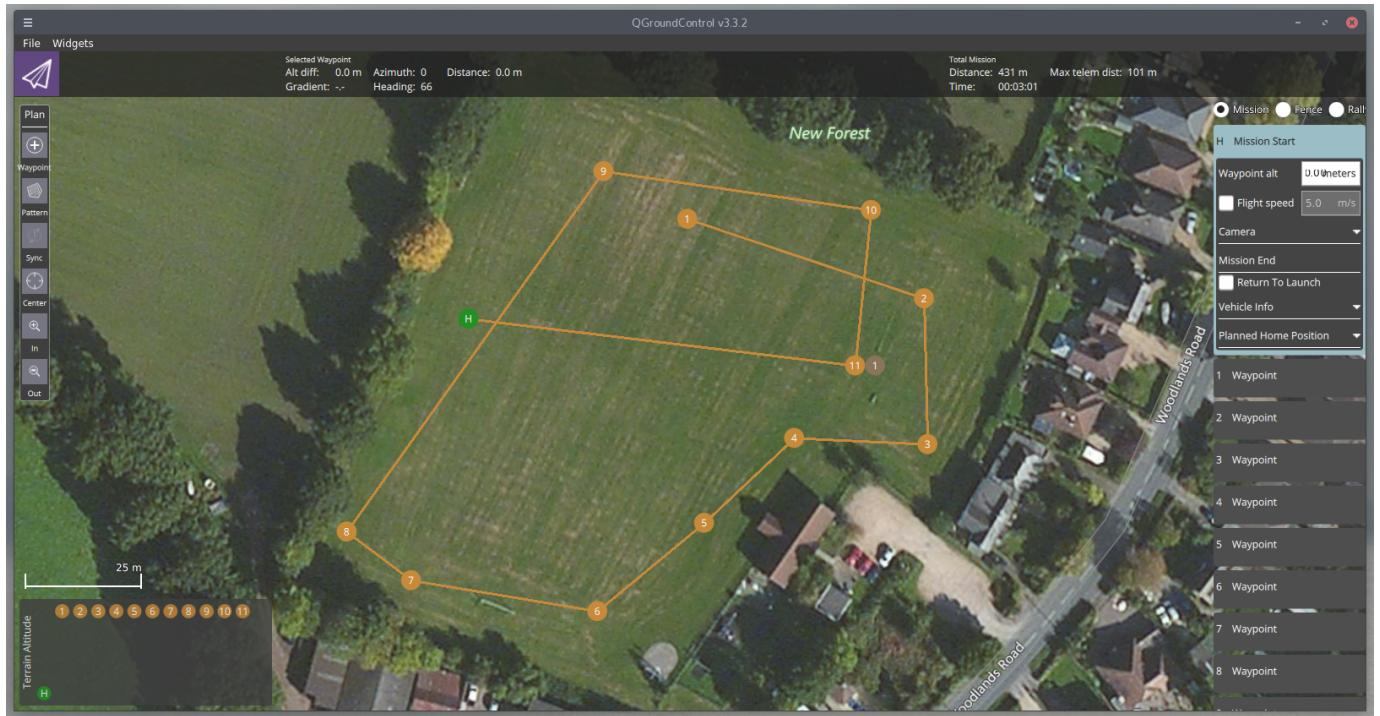


Sample QGC in amplaner2

Note that WP 0 is 'home' and doesn't count; WP 12 indicates RTH.



Sample QGC in apm planner2



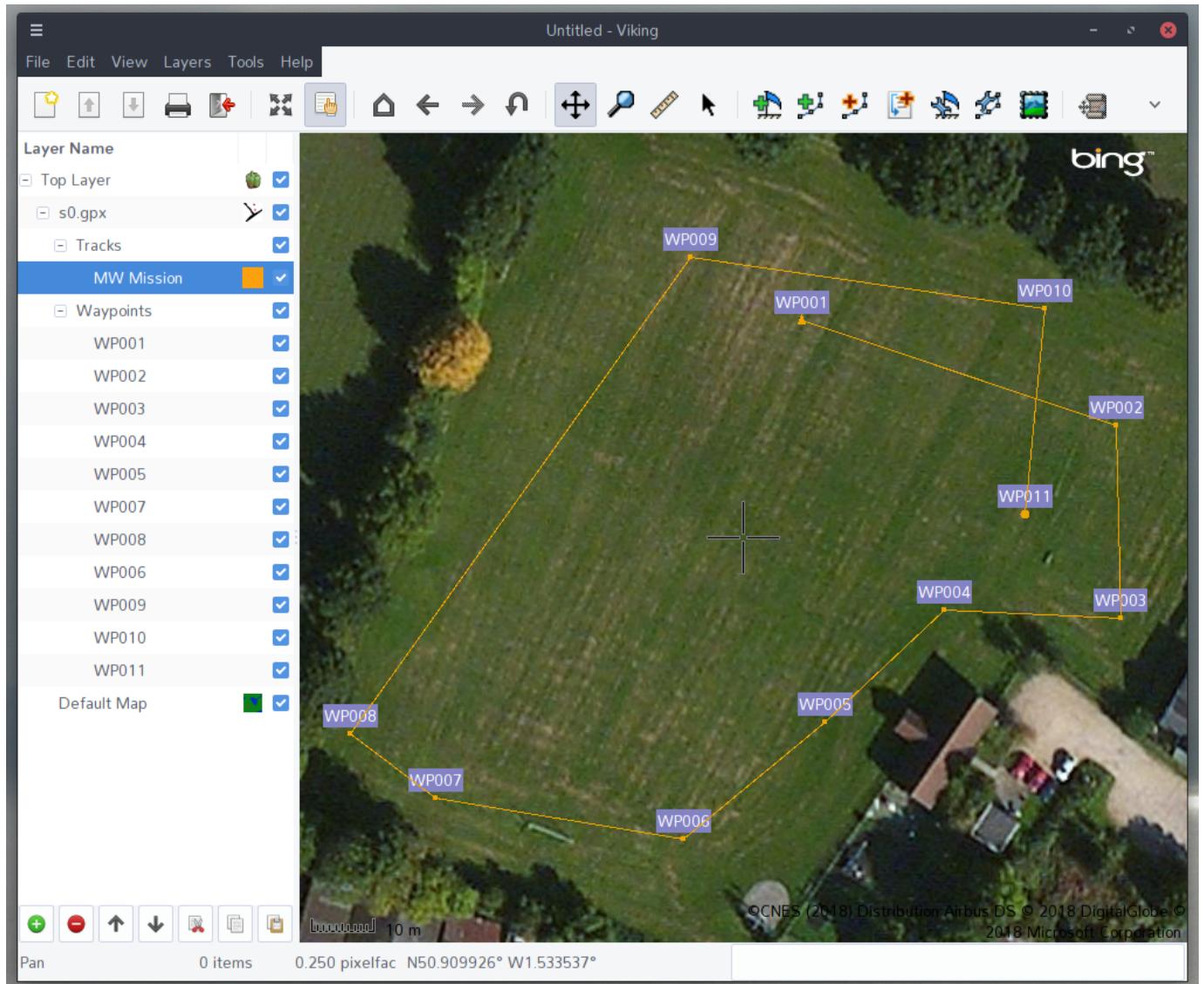
Sample in mwp

The sample `apm` text file was uploaded to the FC, and downloaded into [mwp](#).



Sample as GPX

The sample .apm file was converted to an MW XML mission, then to a GPX (using mwptools' [mission2gpx.rb](#)), then loaded into the FC. Somewhat contrived use case.



```
$ implead convert samples/qpc_1.txt /tmp/qpc_1.mission
$ mission2gpx.rb /tmp/qpc_1.mission /tmp/qpc_1_trk.gpx
$ implead store tmp/qpc_1_trk.gpx
```

1.6 CSV Format

`implead` can upload and convert missions defined by a simple CSV file. The header line **must** be present and must be one of:

```
no,wp,lat,lon,alt,p1,p2
```

or

```
wp,lat,lon,alt,p1,p2
```

i.e. the waypoint number is optional.

As of `implead` v3.021.370 (2021-01-21), `implead` supports all the inav 2.6 waypoint types, as either text or numeric values for CSV import.

Sample files:

```
no,wp,lat,lon,alt,p1,p2
1,WAYPOINT,54.353319318038153,-4.5179273723848077,35,0,0,0
2,WAYPOINT,54.353572350395972,-4.5193913118652516,35,0,0,0
```

```

3,WAYPOINT,54.354454163955907,-4.5196617811150759,50,0.0,0
4,WAYPOINT,54.354657830207479,-4.5186895986330455,50,0.0,0
5,JUMP,0,0,0,2
6,WAYPOINT,54.354668848061756,-4.5176009696657218,35,0.0,0
7,WAYPOINT,54.354122567317191,-4.5172673708680122,35,0.0,0
8,JUMP,0,0,0,1
9,POS HOLD _TIME,54.353138333126651,-4.5190405596657968,35,45,0.0
10,WAYPOINT,54.354847022143616,-4.518210497615712,35,0.0,0
11,LAND,54.354052100964488,-4.5178091504726012,60,0,0

```

and without numbers, and 'lazy' wp name and some numeric values.

```

wp,lat,lon,alt,p1,p2
WP,54.353319318038153,-4.5179273723848077,35,0.0,0
WP,54.353572350395972,-4.5193913118652516,35,0.0,0
WP,54.354454163955907,-4.5196617811150759,50,0.0,0
WP,54.354657830207479,-4.5186895986330455,50,0.0,0
JUMP,0,0,0,2,2
WP,54.354668848061756,-4.5176009696657218,35,0.0,0
WP,54.354122567317191,-4.5172673708680122,35,0.0,0
6,0,0,0,1,1
POS HOLD _TIME,54.353138333126651,-4.5190405596657968,35,45,0.0
WP,54.354847022143616,-4.518210497615712,35,0.0,0
8,54.354052100964488,-4.5178091504726012,60,0,0

```

Both result in the following XML mission file:

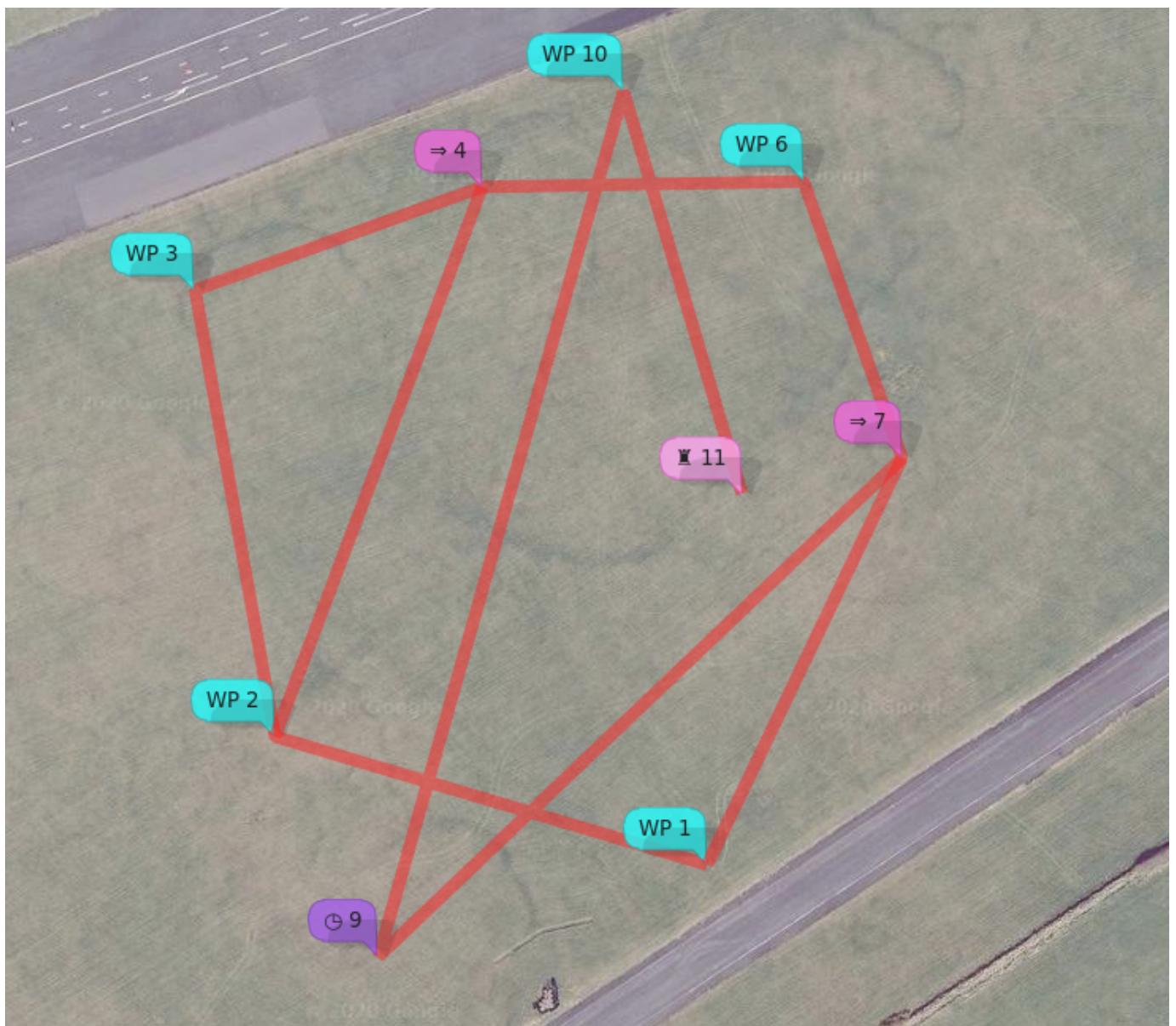
```

<?xml version="1.0" encoding="utf-8"?>
<mission>
  <!--Created by "implode" v2.087.278 on 2020-03-27T07:47:46Z
   <https://github.com/stronnag/implode
  -->
  <version value="implode v2.087.278"/>
  <missionitem no="1" action="WAYPOINT" lat="54.35331931803815" lon="-4.517927372384808" alt="35" parameter1="0" parameter2="0" parameter3="0"/>
  <missionitem no="2" action="WAYPOINT" lat="54.35357235039597" lon="-4.519391311865252" alt="35" parameter1="0" parameter2="0" parameter3="0"/>
  <missionitem no="3" action="WAYPOINT" lat="54.35445416395591" lon="-4.519661781115076" alt="50" parameter1="0" parameter2="0" parameter3="0"/>
  <missionitem no="4" action="WAYPOINT" lat="54.35465783020748" lon="-4.5186895986330455" alt="50" parameter1="0" parameter2="0" parameter3="0"/>
  <missionitem no="5" action="JUMP" lat="0" lon="0" alt="0" parameter1="2" parameter2="2" parameter3="0"/>
  <missionitem no="6" action="WAYPOINT" lat="54.354668848061756" lon="-4.517600969665722" alt="35" parameter1="0" parameter2="0" parameter3="0"/>
  <missionitem no="7" action="WAYPOINT" lat="54.35412256731719" lon="-4.517267370868012" alt="35" parameter1="0" parameter2="0" parameter3="0"/>
  <missionitem no="8" action="JUMP" lat="0" lon="0" alt="0" parameter1="1" parameter2="1" parameter3="0"/>
  <missionitem no="9" action="POS HOLD _TIME" lat="54.35313833312665" lon="-4.519040559665797" alt="35" parameter1="45" parameter2="0" parameter3="0"/>
  <missionitem no="10" action="WAYPOINT" lat="54.354847022143616" lon="-4.518210497615712" alt="35" parameter1="0" parameter2="0" parameter3="0"/>
  <missionitem no="11" action="LAND" lat="54.35405210096449" lon="-4.517809150472601" alt="60" parameter1="0" parameter2="0" parameter3="0"/>
</mission>

```

Note that p1 (aka parameter1 in MW XML) is the leg speed (m/s) for WAYPOINTS and the landing flag for RTH (1 = land). alt (altitude) is integer metres. These parameters (and others) are fully described in [the inav wiki](#). There is also an animated preview of this mission [as a short youtube video](#).

1.6.1 CSV upload visualised in mwp



1.7 Note also

- implead enforces inav mission sanity rules.

1.8 Postscript

The author knows how to spell "implode".

1.9 Conversion between QGC waypoints and inav

QGC WP 110 Type	QGC numeric value	inav WP
WAYPOINT	16	WAYPOINT
WAYPOINT (with hold time)	16	POSHOLD_TIME
Loiter Time	19	POSHOLD_TIME
Jump to index	177	JUMP
Return to launch	20	RTH
Land	21	LAND
SET_ROI	201	SET_POI
DO_SET_ROI_LOCATION	195	SET_POI
DO_SET_ROI_NONE	197	SET_HEAD (-1)
DO_CONDITION_YAW	115	SET_HEAD

Conversion will fail for any other QGC WP 110 WP types.

Note that the whole SET_POI / SET_HEAD / SET_ROI / DO_SET_ROI_LOCATION / DO_SET_ROI_NONE / DO_CONDITION_YAW is somewhat problematic.

- SET_ROI / DO_SET_ROI_LOCATION are always mapped to SET_POI regardless of any QGC parameters (which don't seem to be set consistently / if at all between apm planner and qgroundcontrol).
- DO_SET_ROI_NONE is always mapped to SET_HEAD with P1 = -1
- DO_CONDITION_YAW with P1 = 0 and P4 = 0 is mapped to SET_HEAD P1 = -1, any other combinations are mapped to SET_HEAD P1.