Mission Planner

Mission Planner Home

Tip

The ArduPilot Developer Ecosystem is Evolving! Find out more here …

The Mission Planner, created by Michael Oborne, does a lot more than its name. Here are some of the features:

- Point-and-click waypoint entry, using Google Maps/Bing/Open street maps/Custom WMS.
- Select mission commands from drop-down menus
- Download mission log files and analyze them
- Configure APM settings for your airframe
- Interface with a PC flight simulator to create a full hardware-in-the-loop UAV simulator.
- See the output from APM's serial terminal

Please use the sidebar menus for instructions and more information.

Full Table of Contents

Mission Planner Overview

Mission Planner is a full-featured ground station application for the ArduPilot open source autopilot project. This page contains information on the background of Mission Planner and the organization of this site.

What is Mission Planner

Mission Planner is a ground control station for Plane, Copter and Rover. It is compatible with Windows only. Mission Planner can be used as a configuration utility or as a dynamic control supplement for your autonomous vehicle. Here are just a few things you can do with Mission Planner:

- Load the firmware (the software) into the autopilot (APM, PX4...) that controls your vehicle.
- Setup, configure, and tune your vehicle for optimum performance.
- Plan, save and load autonomous missions into you autopilot with simple point-and-click way-point entry on Google or other maps.
- Download and analyze mission logs created by your autopilot.
- Interface with a PC flight simulator to create a full hardware-in-the-loop UAV simulator.
- With appropriate telemetry hardware you can:
  - Monitor your vehicle's status while in operation.
  - Record telemetry logs which contain much more information the the on-board autopilot logs.
  - View and analyze the telemetry logs.
  - Operate your vehicle in FPV (first person view)

All of these and many more features are covered here.

History

Mission Planner is a free, open-source, community-supported application developed by Michael Oborne

for the open-source APM autopilot project. If you would like to donate to the ongoing development of Mission Planner, please select the Donate button on the Mission Planner interface.

Support

The Help Screen:

Clicking the Help icon at the top of the Mission Planner interface will open a screen with general information about help with Mission Planner. The “Check for Updates” button will check for available updates to Mission Planner manually. Mission Planner automatically checks for updates upon start up and notifies you if an update is available. Please always run the most current version of Mission Planner, although it is not necessary to check for updates more often than upon start up. The check box “Show Console Window (restart)” enables the console window during Mission Planner operation. That window shows Mission Planner activity and is primarily for diagnostic purposes. It sometimes shows some interesting information. A restart of Mission Planner is required for the option to take effect. (TBD need a link to console page TBD)

Getting Help:

The support for Mission Planner comes from the community of users like you. All of the documentation is created by users who volunteer their time. If you have questions, first look through the table of contents (upper left of every page) for a topic that may address your question. Next, try a search of the website. If you still need help, then the community forums are the place to go. There you will find may friendly users, developers and often, even Michael will chime in. There are two primary forums. The

diydrones.com forum here and the APM forum here. The diydrones forum has existed for years and has a very large community and numerous general topics. The APM forum is new and is more specific to the ardupilot and ardu-vehicles.

Reporting Issues:

Usually, you can either resolve a question on a forum. Sometimes you will discover a bug and can confirm the problem on a forum. If you have discovered a bug, use the forums to request it be logged as an official issue. One of the developers will normally be glad to do so.

If you see a need to change or enhance the documentation, please let us know - again using the forums. We welcome your suggestions and there are dozens of qualified editors who can implement your suggestions.

Navigating the Documentation

Use the table of contents at the top of each page to navigate the Mission Planner Manual - and the contents of the vehicle specific areas.

This section of our website contains information on how to use Mission Planner as a “general” application. However, some of the pages will also have some vehicle specific information. Those pages will also be contained in the specific vehicle’s section of the website. Information that is primarily specific to a particular vehicle will only be located in that vehicles section so, if you cannot find information here, try the section of the website for the vehicle you are using.

Mission Planner Features/Screens

Mission Planner Features are detailed in each of the following sections.

The sections are organized to match the major section of the Mission Planner as selected in the menu along the top of the Mission Planner window.

- Connect (Upper right corner) - How to connect the Mission Planner to your ArduPilot. Selecting communication devices and rates.
- Flight Data - Information about what you see, and things you can do in the Flight Data screens.
- Flight Plan - Information about the various aspects of preparing flight plans (Missions).
- Initial Setup - Information about what you see and things you can do in the Initial Setup screens.
- Configuration Tuning - Information about what you see and things you can do in the Configuration/Tuning screens.

- Simulation - How you can use the Mission Planner and a flight simulator to ‘simulate’ flying.
- Terminal - Information about what you see and things you can do in the Terminal screens.
- Help - About the help screen, and how to get help with your questions about Mission Planner.
- Other Mission Planner Features - Catch all for miscellaneous items.

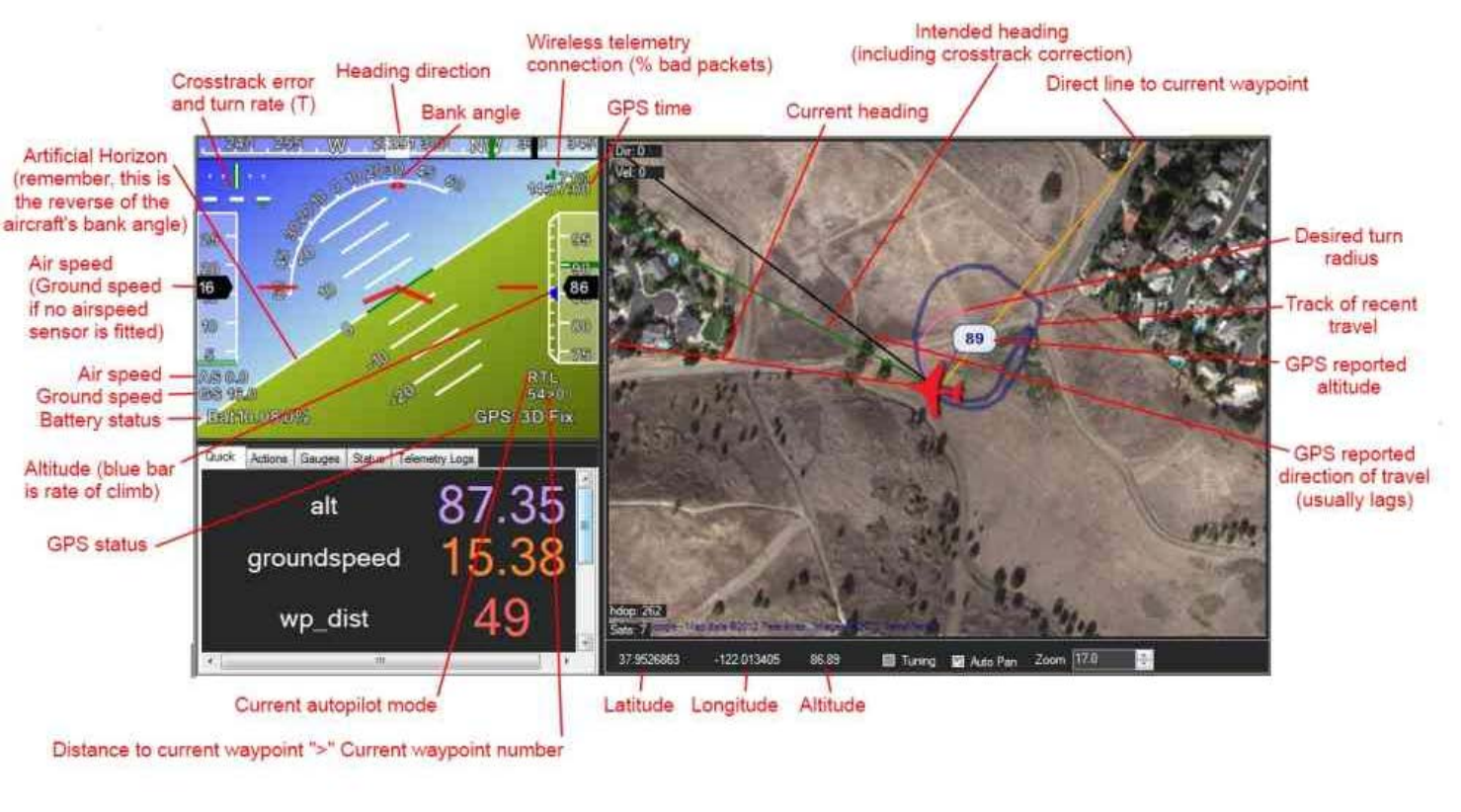
Note

Many of the articles are in this section are incomplete. Additional information about many of the screens can be found in the configuration instructions for the optional hardware. The UI itself is also largely self explanatory and has been translated into a number of languages.

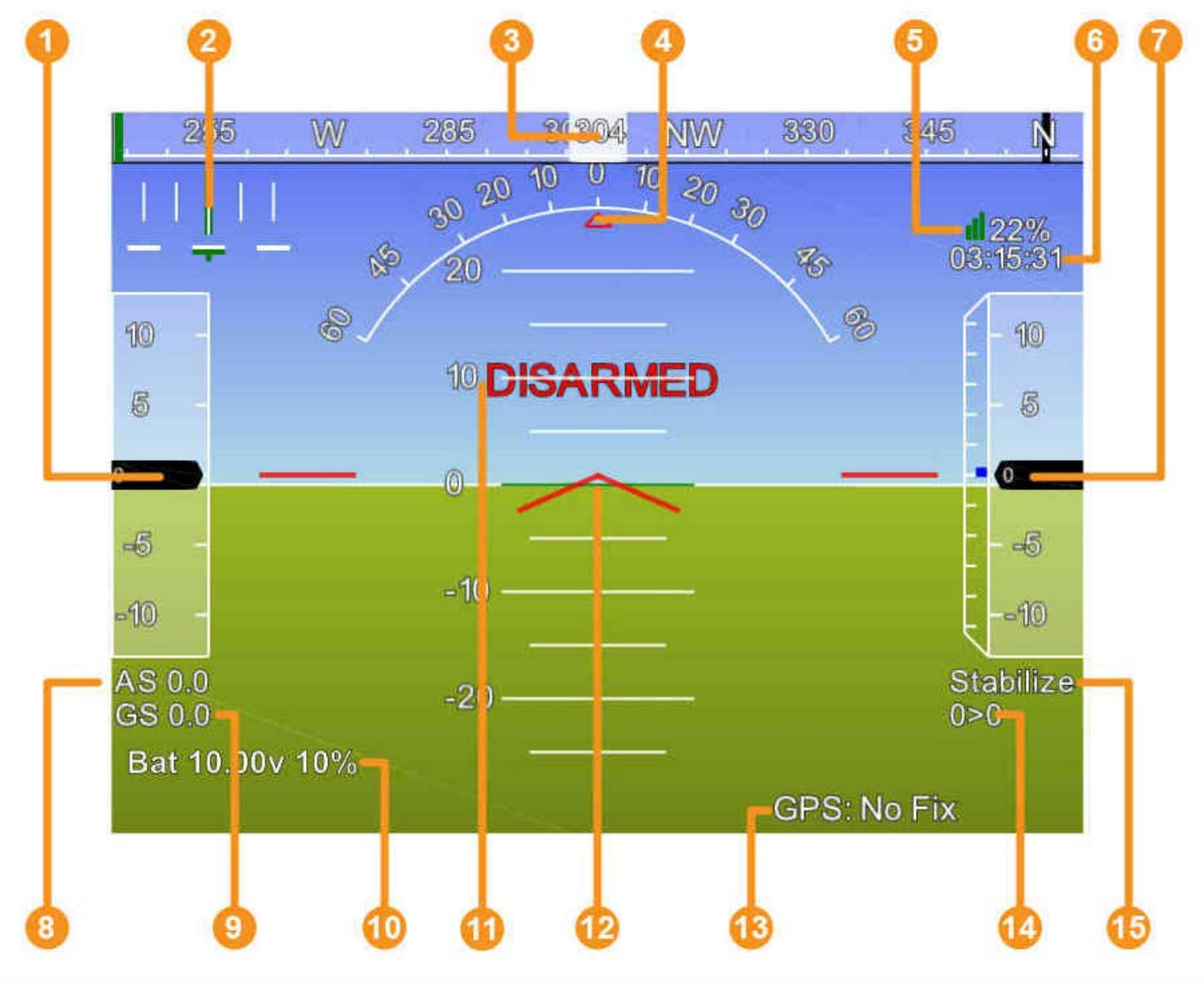
Mission Planner Ground Control Station

The GCS Flight Data Screen

The screenshot below shows the main “Heads-up Display (HUD)” view of the Mission Planner Ground Station. Once you have connected to a vehicle this screen will display the telemetry sent by ArduPilot.



A more detailed view of the HUD (with legend) is given below.

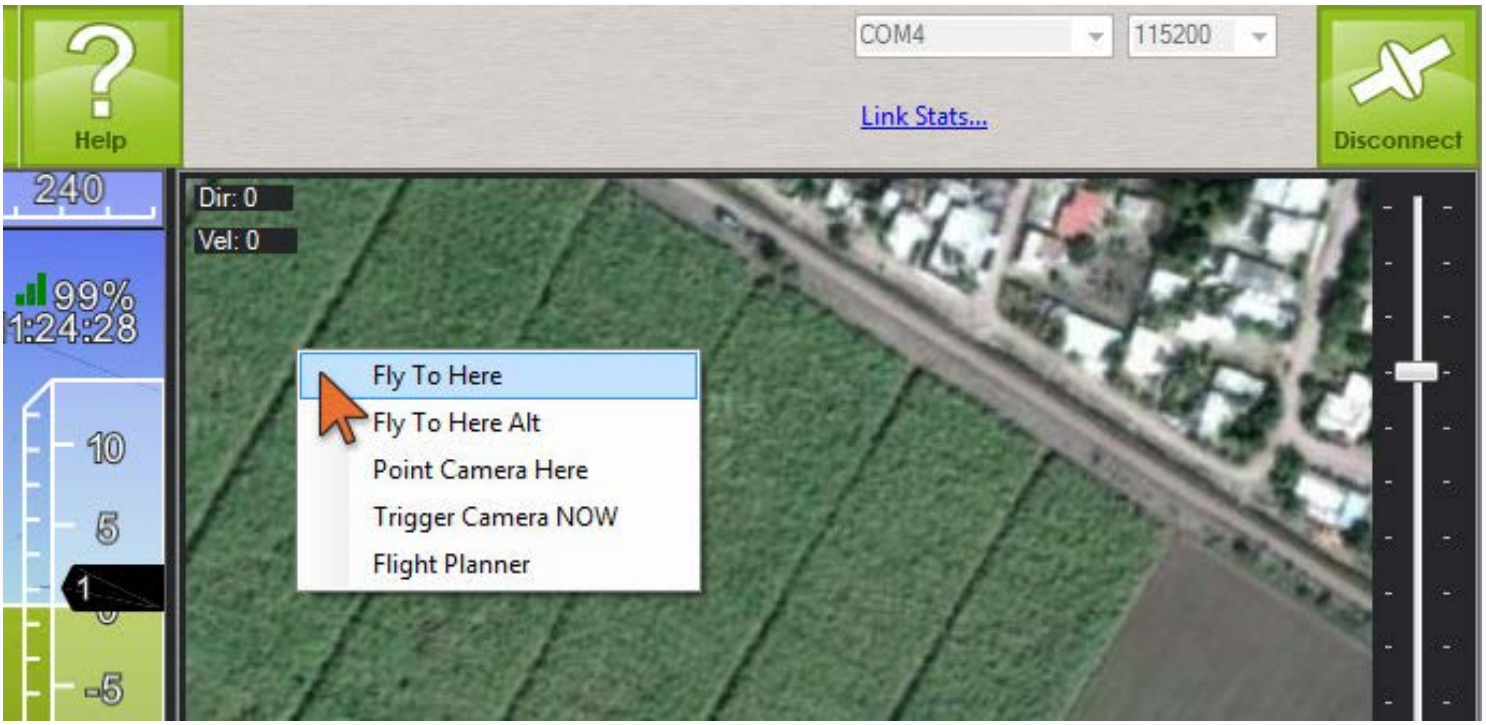


1. Air speed (Ground speed if no airspeed sensor is fitted)
2. Crosstrack error and turn rate (T)
3. Heading direction
4. Bank angle
5. Wireless telemetry connection (% bad packets)
6. GPS time
7. Altitude (blue bar is rate of climb)
8. Air speed
9. Ground speed
10. Battery status
11. Artificial Horizon

Tips for using the Flight Data screen

- The map will only show current position when you have GPS lock or are using a flight simulator
- Remember how artificial horizons work: when the aircraft tilts to the right, the horizon tilts to the left. (Just tilt your head and you'll see what I mean). This is normal! Please don't tell us it's reversed ;-)
- For Plane status, the output meaning is as follows:
  - "WPDist" : Distance to next waypoint in meters
  - "Bearing ERR": How far your UAV is from the perfect line to the next waypoint
  - "Alt ERR": How far your UAV is from the target altitude
  - "WP": Next waypoint to hit
  - "Mode": Current autopilot mode.
- "Plane output" means the autopilot's outputs on the first four channels
- You can issues mode changes and other action commands in the air with the Mission Planner and other GCSs, but note that you must be under autopilot control for them to take effect. When your RC toggle switch is in the Manual position, you are no longer under autopilot control and no commands will take effect. You must be in one of the other positions (Stabilize, Fly-by-Wire, Auto or any other autopilot-controlled mode) for MAVlink commands to take effect.
- You can change the voice used in the speech synthesis in the Ease of Access center in Windows Control Panel. Go to the "Text to Speech" options.
- If you double-click the HUD it will popout, allowing you to run the HUD full screen on a second screen.
- If you double-click on the Speed Guage you can modify the max scale you want to display.
- If you enable the Tuning checkbox and double-click tuning you can graph any data that is available in the status tab. This means you can have alt, attitude, or many other options in real time.
- You can use custom imagery instead of Google Maps. Press control-F. This allows you to upload your own orthophotos. Use will require Globalmapper, as this is currently one of the key steps in exporting in the required format for use in the planner.

Guided Mode



One of the most commonly-used features in pro UAVs is point-and-click mission control in real time. Rather than just pre-planned missions or manually flying the UAV, operators can just click on a map and say “go here now”.

That’s now implemented in the Mission Planner. On the GCS map, you can right-click on the map and just select “Fly To Here”. The UAV will fly there and loiter until you give it another command. We call this “Guided Mode”. There are more commands coming in this mode soon, but the functionality is now built-in.

Note: Guided is a separate flight mode. If you enter it you will remain in it until you do something to change modes. So if you tell it to “go here now”, once it arrives there it will loiter at the Guided waypoint till you tell it to do something else. Something else could either be going to another Guided waypoint (staying in Guided mode) or changing to some other flight mode. If you change to Auto your mission will resume where it left off.

Note

Go to this page for a full description of how to use Guided Mode on Copter.

Mission Planner Initial Setup

DRAFT

This section of Mission Planner, invoked by the Menu item Initial Setup at the top of Mission Planner,

has several subsections. The subsection are where you set up and configure you auto pilot to prepare it for your particular vehicle. Typically these sections are “must do” actions that are required.

What you see when you enter this section depends on whether or not you are connected. Each menu item will bring up a new screen, each is discussed below with links to more detail.

Install Firmware

You will see this menu item If the auto pilot is Not connected. If you have a new auto pilot or if you want to update the control software that resides in you autopilot, you must install (upload) the firmware into it. Before you jump to the details for your auto pilot some basic information is important

Add words about where is the firmware, must have internet connection, how do you select the right version, beta version, what are the funny numbers you see in previous revisions - click one and you will see all the versions under each vehicle icon. .

Here are the details for each auto pilot: Install Firmware

3DR Radio

You will see this menu item If the auto pilot is Not connected. Here is what you can do in this section TBD

Antenna Tracker

You will see this menu item If the auto pilot is Not connected. Here is what you can do in this section TBD

Mandatory Hardware

You will see this menu item If the auto pilot IS connected. Click this menu item to see the items you must complete before you attempt to operate your vehicle. Specifics are located in the area of the web that covers you specific vehicle (Copter, Plane, Rover)

Here is what you can do in this section (TBD just an overview)

Optional Hardware

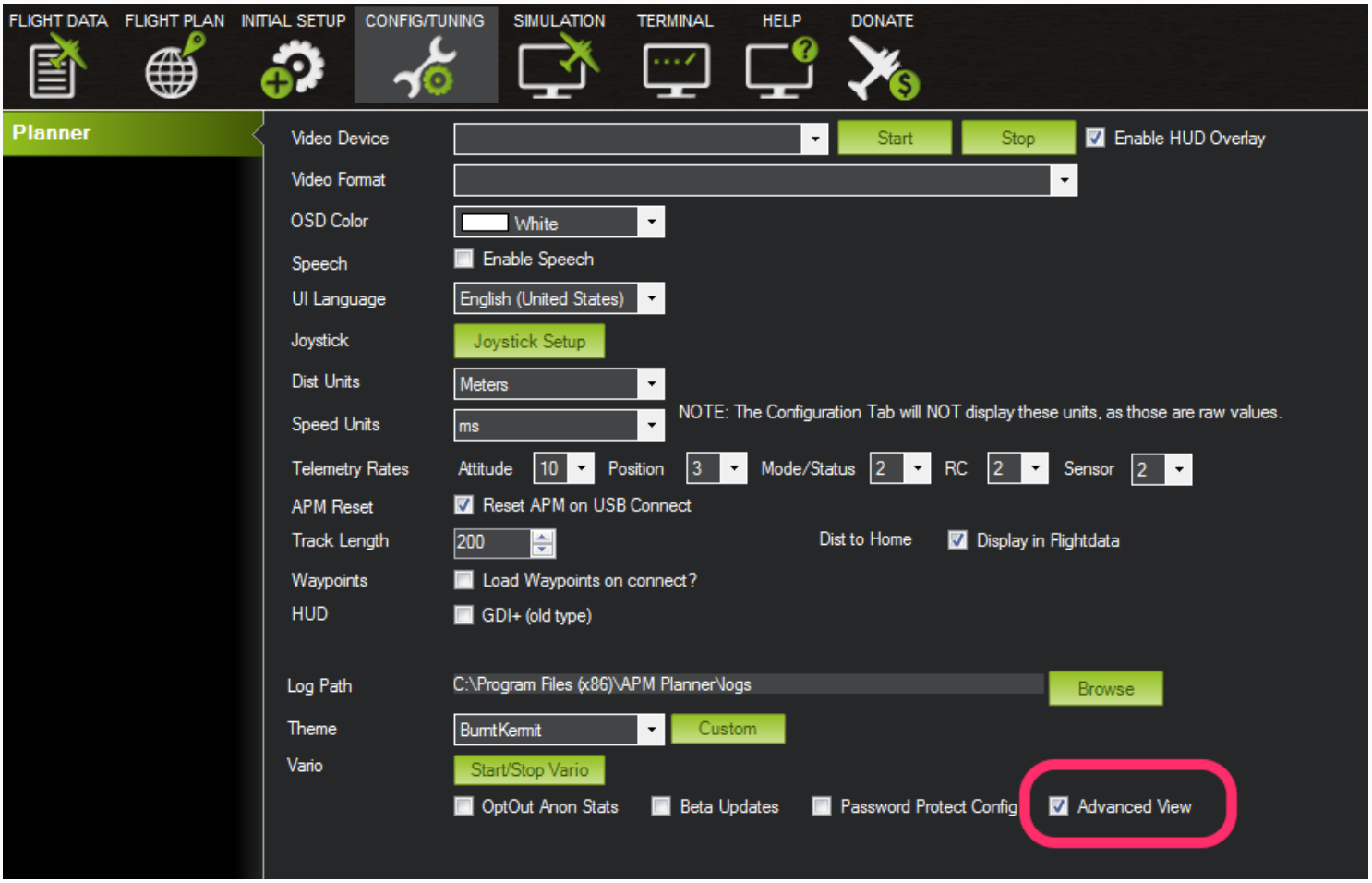
You will see this menu item If the auto pilot IS connected. Click this menu item to see the items you may

want to complete before you attempt to operate your vehicle. Specifics are located in the area of the web that covers you specific vehicle (Copter, Plane, Rover)

Here is what you can do in this section (TBD just an overview)

Mission Planner Simulation

The Simulation tab is visible when the “Advanced View” option is selected in the Configuration tab



This section of Mission Planner, invoked by the Menu item Simulation at the top of Mission Planner, opens a window with configuration options to set when using HIL simulation techniques.

At the moment, this is only supported on Airplanes. Please see Simulation for instructions on how to use it.

Mission Planner Configuration and Tuning

The APM Forum permits developers to respond to your questions and enables you to research similar issues, Please choose the sub-forum that is most appropriate to the wiki page and issues you are having.

Note

DRAFT
This section of Mission Planner, invoked by the Menu item Config/Tuning at the top of Mission Planner, has several subsections. The subsection are where you configure the parameters that control how your auto pilot controls your vehicle. Tuning refers to adjusting parameters in the control loops so your vehicle behaves the way you desire. Most of these parameters are set for you when you first install your firmware but some must be set before your first flight or roaming adventure.

What you see when you enter this section depends on whether or not you are connected. Each menu item will bring up a new screen, each is discussed below with links to more detail.

Planner

You will see this menu item if the auto pilot IS or Is Not connected. This is where you set up most of the options for how the Mission Planner works. Such things and enabling speach, where the logs are saved, the units of measure you want to use, ETC. Some of the specifics are covered here. (TBD Add details or links to other pages with details. What is each of the entries for, what does it effect, TBD

Basic Pids

You will see this menu item if the auto pilot Is connected. Here is what you can do in this section TBD

Flight Modes

You will see this menu item if the auto pilot Is connected. Here is what you can do in this section TBD

Introduction, how to set up 6 channel - add a link etc.

Standard Params

You will see this menu item if the auto pilot Is connected. Here is what you can do in this section TBD

GeoFence

You will see this menu item if the auto pilot Is connected. Here is what you can do in this section TBD

FailSafe

You will see this menu item if the auto pilot Is connected. Here is what you can do in this section TBD

Advanced Params

You will see this menu item if the auto pilot Is connected. Here is what you can do in this section TBD

Full Parameter List

You will see this menu item if the auto pilot Is connected.

Here is what you can do in this section TBD

Options on the right hand side of this screen: You can save the parameters for your vehicle. It is a good idea to do that often. Also, you can reload all your parameters from a saved file. You can also compare the parameters in your vehicle to those in a saved file. This is a very valuable feature in case you forget what you changed or if your vehicle behaves badly after a change but you don't remember the previous value(s) of the parameters you changed - or even what you changed. An important aspect of the compare feature: After you select the file with the save parameters you want to compare, you will get a window that lists every parameter that is different. At the time of the window, nothing has been changed, but if you check some items and then click Continue, those items will be changed in the local memory of Mission Planner. You will then need to click the Write Params parameters button in the right hand panel to copy the changes to the memory in your auto pilot.

Until we get more words here, just experiment.

Clean this up with the right menu words, Load, Save Refres Parms etc.

Copter Pids

You will see this menu item if the auto pilot Is connected to an AruCopter. Here is what you can do in this section TBD

Mission Planner Flight Plan

The APM Forum permits developers to respond to your questions and enables you to research similar issues, Please choose the sub-forum that is most appropriate to the wiki page and issues you are having.

Note

DRAFT
This section covers what you see and what you can do when in the Flight Plan area of Mission Planner - selected in the menu at the top of the Mission Planner application. This section provides for planning and executing flight plans - called missions.

The Flight Plan Screen

- **Upper left corner**: Displays the current latitude and longitude of the mouse position and the distance between way points.
- **Right side**: Displays the Actions panel. To open/close the panel click the green chevron icon [<<]/[>>] in the upper right hand corner
- **Way Point Detail:** At the bottom of the planner view you will see the green “Waypoints” bar with a chevron (up or down icon) on the right side of the bar. Click the chevron to open or close the way point detail. Each mission action entry is entered in the list.

Mission Planning Details

Here is where you will find the details for mission planning:

- Planning a Mission with Way points and Events
- Using Python Scripts in Mission Planner

Mission Planner Flight Data

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This section covers the information you will need to use the features in the Mission Planner Flight Data - selected in the Top menu of Mission Planner.

- **:ref:`An Introduction <mission-planner-ground-control-station>`** An overview with pointers to the various areas of information.
- **Heads Up Area** (HUD) This is the area in the upper left side of the Mission Planner menu.

    - See “An Introduction” above to see what each area and entry displays.
    - You can detach the HUD to a separate window by double clicking anywhere in the window. Close the window to put back in the Mission Planner.
    - Options: Several Options are available by right clicking the HUD.
        - User Items: You can add any of the telemetry parameters to the display by right clicking on the HUD, clicking User Items, and checking the items you want displayed. Note that you can view all of the telemetry in the Control and Status area - Status button.
        - Other options - what they do TBD
- **Control and Status (Lower Left) Area** The Control and Status area of the Flight Data screen is in the lower left hand portion of Mission Planner. In this area you can select any of several different menu items. Some items provide informations (status) and other items allow control of the vehicle using the telemety uplink. (Telemetry radio is required)

    - Quick: Use this area for a quick look at just a few telemetry values in large text. Double click to add items.
    - Actions: Use this area to control your Auto Pilot either for testing (using USB and no motor battery) or for controlling you vehicle More detail TBD
    - Gauges: Use this area to gauges for the four popular telemetry data. Double click the speed gauge to change the top speed.
    - Status: Clicking the Status menu button will display all of the telemetry parameters
    - Servos: TBD
    - **:ref:`Telemetry Logs <common-mission-planner-telemetry-logs>`** Use this section to view, analyze, convert, and play back telemetry logs that are recorded by Mission Planner.
        - Playing Back Missions with Tlogs Specifics on playing back your mission and viewing the mission in the map area.
    - Data Flash Logs This is just a short cut to analyze a data flash log from this area without going to the Terminal mode. Click Browse to open a log file and establish a new window to view/analyze the log. Details here.
    - Scripts: - A different way to create missions
- **Map Area:** The map area on the right side of the Flight Data screen displays the vehicle track as it moves, provides other information and allows the user to enter some control actions - which send commands to the vehicle (telemetry required)

- Right Click Options: Right click on the map area to select one of these options.

- Fly to here: (Command) This is guided mode (see bottom of this page Guided Mode)

- Fly to here Alt: (Command) Lets you enter an altitude.

- Point Camera Here: (Command)

- Trigger Camera Now (Command):

Flight Planner: You can open the flight planner window in the map area and leave the rest of the Flight Data Screen as is.

- Information/options at the bottom of the screen
  - hdop, sats: shows information about the GPS reception quality and the number of satellites in view.
  - Legend: Each color corresponds to the color of the corresponding line showing directions and headings. Black is the GPS track as you vehicle travels.
  - Tuning: Opens/closes the tuning window. Details are found in various areas of the website (Need links for Plane, Copter).
  - Auto Pan: Checking this box will make the map follow the vehicle and thus keep the vehicle in the center of the screen.
  - Zoom: Shows or selects the current zoom level of the map.
- Scroll bar: Use the scroll bar to change the zoom level of the map.
- Other Hints and Tricks for Map area
  - Change the map used: Right Click, select Planner, change the map, then close the Planner view. The new map will now be used in the Flight Data view.

    Note: To open the action pane in Planner view, click the little green chevron button [<<] in the upper right corner.

Mission Planner Language Translations

The steps to do a translation are listed below.

1. Open Mission Planner
2. Press control-f
3. Press Lang Edit
4. Pick the language from down the bottom of the screen.
5. Edit “other lang” column.
6. Click save, once your done.
7. Please then post a link to the contents of the “translation” folder from inside the mission planner directory, on a Github issue. And we will implement your translation.

Other Mission Planner Features

Other features that aren’t specific to the modes already described in the menu:

- The Mission Planner Console: When you first open Mission Planner you will see a small window with a black background with a lot of text scrolling by. When Mission Planner finally opens, the window may disappear. That window is called the console. You can keep it alive by checking a box at the bottom of the Mission Planner help screen.
- Shortcut Keys:
  - F12 - disconnect or connect from/to USB or Telemetry
  - F5 - Refresh parameters
  - F2 - change to Flight Data tab
  - F3 - change to Flight Planner tab
  - F4 - change to Configuration tab
  - F5 - Refresh parameter list
  - CTL-G Nmea Output
  - CTL-W Wizard config interface
- You can display video from your aircraft on the Mission Planner's HUD if you are digitizing it with the same laptop (with a video capture card or USB device). Just select the device in the Configuration/Planner screen, chose video format and press "Start" to begin recording. If you select the HUD checkbox, the video display will replace the artificial horizon in the HUD.
- You can also record the video that you're displaying to an AVI file. Just right-click in the HUD and choose from the menu that will pop up.
- You can send NMEA (GPS) output to the serial port. Press control-g and you will get a box asking for a comport and baud rate to output standard NMEA data at 2 Hz, to any serial port. One application would be to use com2com to emulate a serial port to use with third party applications.
- You can have the Mission Planner load non-standard firmware (any .hex files that you've made or got elsewhere) to APM by pressing Control-C on the firmware loading screen.
- Mission Planner can give you audio speech alerts for events that you choose, such as hitting waypoints or low battery. Just go to **Configuration | Planner | Speech | Enable Speech**
- Mission Planner source code can be downloaded and compiled (built) by those with programming skills in C# and who are familiar with Microsoft Visual Studio - see Building Mission Planner with Visual Studio (Dev Wiki).
- Mission Planner can be scripted - see Using Python Scripts in Mission Planner (planner wiki)

Using Python Scripts in Mission Planner

One of the cool features of the Mission Planner is that it can run Python scripts, which is an easy way to extend the functionality of the program beyond its built-in functions. It can also enable integration easily with other dlls and modules far beyond the original scope of the Mission Planner.

Overview

You can easily program your UAV to do anything, from robotic acrobatics to just script-driven missions. Python 2.x is currently supported, up to 2.7 (Mission Planner uses an implementation of IronPython internally)

Aside from the regular Python commands, these are the special Mission Planner commands you can use:

```
cs.VARIABLENAME = currentstate
```

Any variable on the status tab in the planner can be used.

```
Script.METHODNAME(...)
```

options are

- `Script.Sleep(ms)`
- `Script.ChangeParam(name,value)`
- `Script.GetParam(name)`
- `Script.ChangeMode(mode)` (same as displayed in mode setup screen 'AUTO')
- > `Script.WaitFor(string,timeout)`
- `Script.SendRC(channel,pwm,sendnow)`

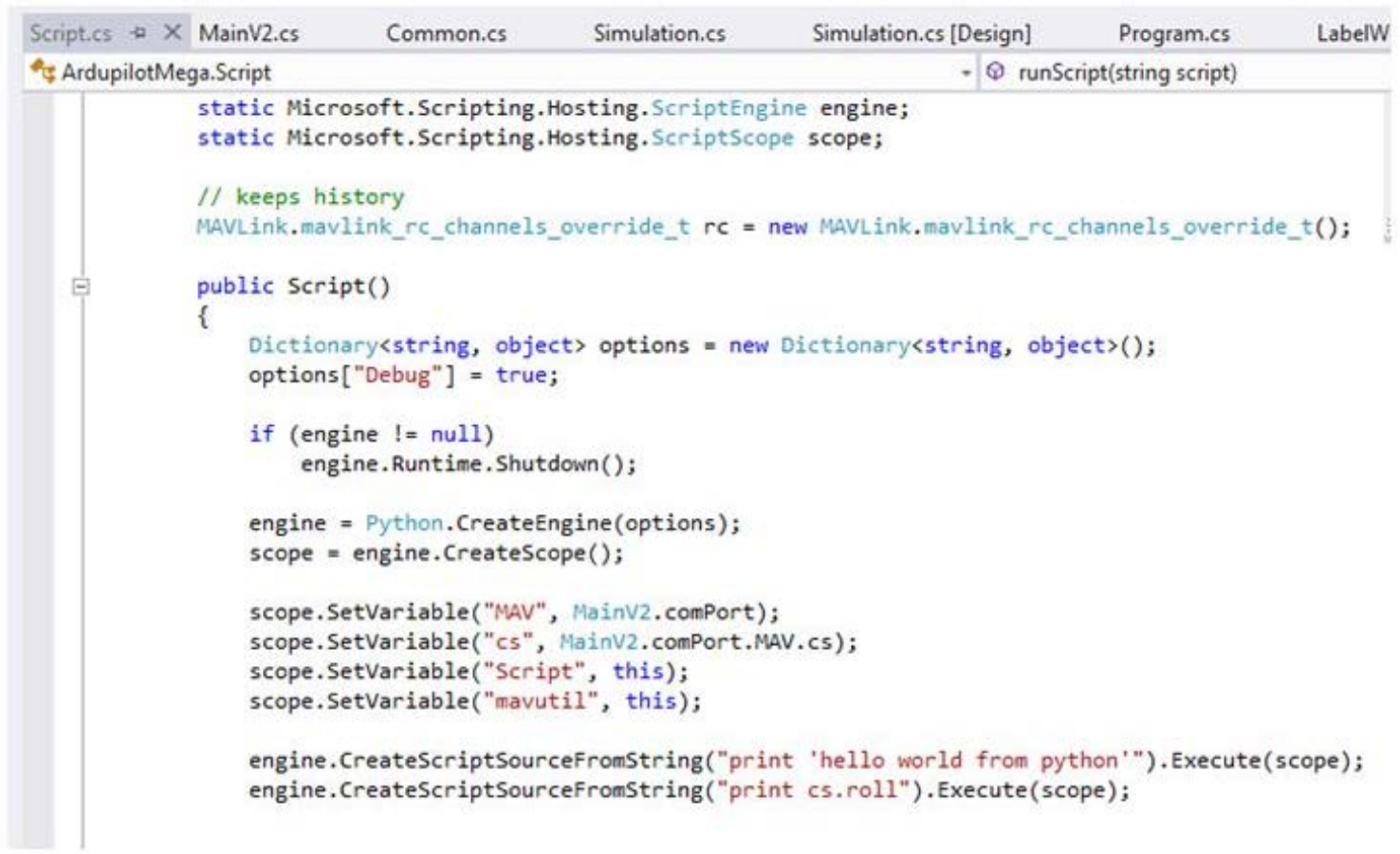
Here's an example, which tells a multicopter to do a roll in the air!

```
print 'Start Script'
for chan in range(1,9):
    Script.SendRC(chan,1500,False)
    Script.SendRC(3,Script.GetParam('RC3_MIN'),True)
    Script.Sleep(5000)

while cs.lat == 0:
    print 'Waiting for GPS'
    Script.Sleep(1000)
    print 'Got GPS'
    jo = 10 * 13
    print jo
    Script.SendRC(3,1000,False)
    Script.SendRC(4,2000,True)
    cs.messages.Clear()
    Script.WaitFor('ARMING MOTORS',30000)
```

```
    Script.SendRC(4,1500,True)
    print 'Motors Armed!'
    Script.SendRC(3,1700,True)

while cs.alt < 50:
    Script.Sleep(50)
    Script.SendRC(5,2000,True) # acro
    Script.SendRC(1,2000,False) # roll
    Script.SendRC(3,1370,True) # throttle

while cs.roll > -45: # top half 0 - 180
    Script.Sleep(5)

while cs.roll < -45: # -180 - -45
    Script.Sleep(5)
    Script.SendRC(5,1500,False) # stabilize
    Script.SendRC(1,1500,True) # level roll
    Script.Sleep(2000) # 2 sec to stabilize
    Script.SendRC(3,1300,True) # throttle back to land
    thro = 1350 # will descend

while cs.alt > 0.1:
    Script.Sleep(300)
    Script.SendRC(3,1000,False)
    Script.SendRC(4,1000,True)
    Script.WaitFor('DISARMING MOTORS',30000)
    Script.SendRC(4,1500,True)

print 'Roll complete'
```

Classes Exposed by Mission Planner to Python

Mission Planner exposes classes using the following code:



Linking classes into python

```
scope.SetVariable(Variablename, ClassInstance);
```

That the following classes are exposed:

- `scope.SetVariable("MAV", MainV2.comPort);`
- `scope.SetVariable("cs", MainV2.comPort.MAV.cs);`
- `scope.SetVariable("Script", this);`
- `scope.SetVariable("mavutil", this);`

This is where you can add your own classes. For now lets us explore the important methods and properties you can use into your script using these classes.

Class Name: Script.cs

Python Variable: Script , mavutil

Method	Description

bool ChangeParam (string param, float value)	
Float getParam (string param)	
bool ChangeMode (string mode)	Changes flying mode
bool SendRC (int channel, ushort pwm, bool sendnow)	Send Chxout values.

Class Name: CurrentState.cs

Python Variable: cs

Method	Type	Description
roll	float	Roll (deg)
pitch	float	Pitch (deg)
yaw	float	Yaw (deg)
lat	float	Latitude (deg)
lng	float	Longitude (deg)
groundcourse	float	Ground Course (deg)
alt	float	Altitude (dist)
altoffsethome	float	Altitude Home Offset (dist)
gpsstatus	float	GPS Status
gpshdop	float	GPS HDOP
satcount	float	Satellite Count
altd100	float	Altitude / 100
altd1000	float	Altitude / 1000
airspeed	float	Airspeed (speed)
targetairspeed	float	Airspeed Target (speed)
groundspeed	float	Ground Speed (speed)
verticalspeed	float	Vertical Speed (speed)
wind_dir	float	Wind Direction (deg)
wind_vel	float	Wind Velocity (speed)
ax, ay, az	float	Acceleration Values in x,y,z

gx, gy, gz	float	Gyro Values in x,y,z
mx, my, mz	float	Mag Values in x,y,z
failsafe	bool	Faile Sate Active or Not
rxrssi	float	
chx1in, chx2in, ... chx8in	float	Input Channels from 1 to 8
ch1out, chx2out, ... chx8out	float	Output Channel form 1 to 8
nav_roll	float	Roll Target (deg)
nav_pitch	float	Pitch Target (deg)
nav_bearing	float	Bearing target (deg)
target_bearing	float	Bearing Target (deg)
wp_dist	float	Distance to Next Waypoint (dist)
alt_error	float	Altitude Error (dist)
ber_error	float	Bearing Error (dist)
aspd_error	float	Airspeed Error (speed)
wpno	float	Flying Mode
mode	String	Flying Mode
dimbrate	float	Climb Rate (speed)
tot	int	Time over target (sec)
distTraveled	float	Distance Traveled (dist)
timeInAir	float	Time in Air (sec)
turnrate	float	Turn Rate (speed)
radius	float	Turn Radius (dist)
battery_voltage	float	Battery Voltage (volt)
battery_remaining	float	Battery Remaining (%)
current	float	battery Current (Amps)
HomeAlt	float	
DistToHome	float	Absolute Pressure Value
press_abs	float	Absolute Pressure Value

sonarrange	float	Sonar Range (meters)
sonarVoltage	float	Sonar Voltage (volt)
armed	bool	True if Armed

Please note that although these properties are read/write howvever writing to some of them can corrupt the status. Use methods from Script class to control the vehicle. for example use Script.ChangeMode(xmode) rather than cs.mode = xmode.

Class Name: MavLink.cs

Python Variable: MAV

Method	Description
bool setParam (string paramname, float value)	Same as Script.ChangeParam()
bool doARM (bool armit)	BE CAREFUL when using it.
byte getWPCount ( )	Gets Waypoints Count.

Using CPython Standard Libraries

You can import standard libraries from your regular Python 2.x folders by adding this line to top of your script (replacing “c:\python27\lib” with whatever the folder is on your drive):

```
import sys
sys.path.append(r"c:\python27\lib")
```

Here, for example, we’re importing the serial, os, and threading libraries, which are in two folders in a typical Python 2.7 installation. Appending the specific folder paths for those three libraries first allows us to import them with the next “import” command:

```
import sys
sys.path.append(r"c:\Python27\Lib\site-packages")
sys.path.append(r"c:\Python27\Lib")
import serial, os, threading
```

Tutorials and sample scripts

- Scripting fixed-wing acrobatics
- Adding new variables and classes
- Writing a time-based script

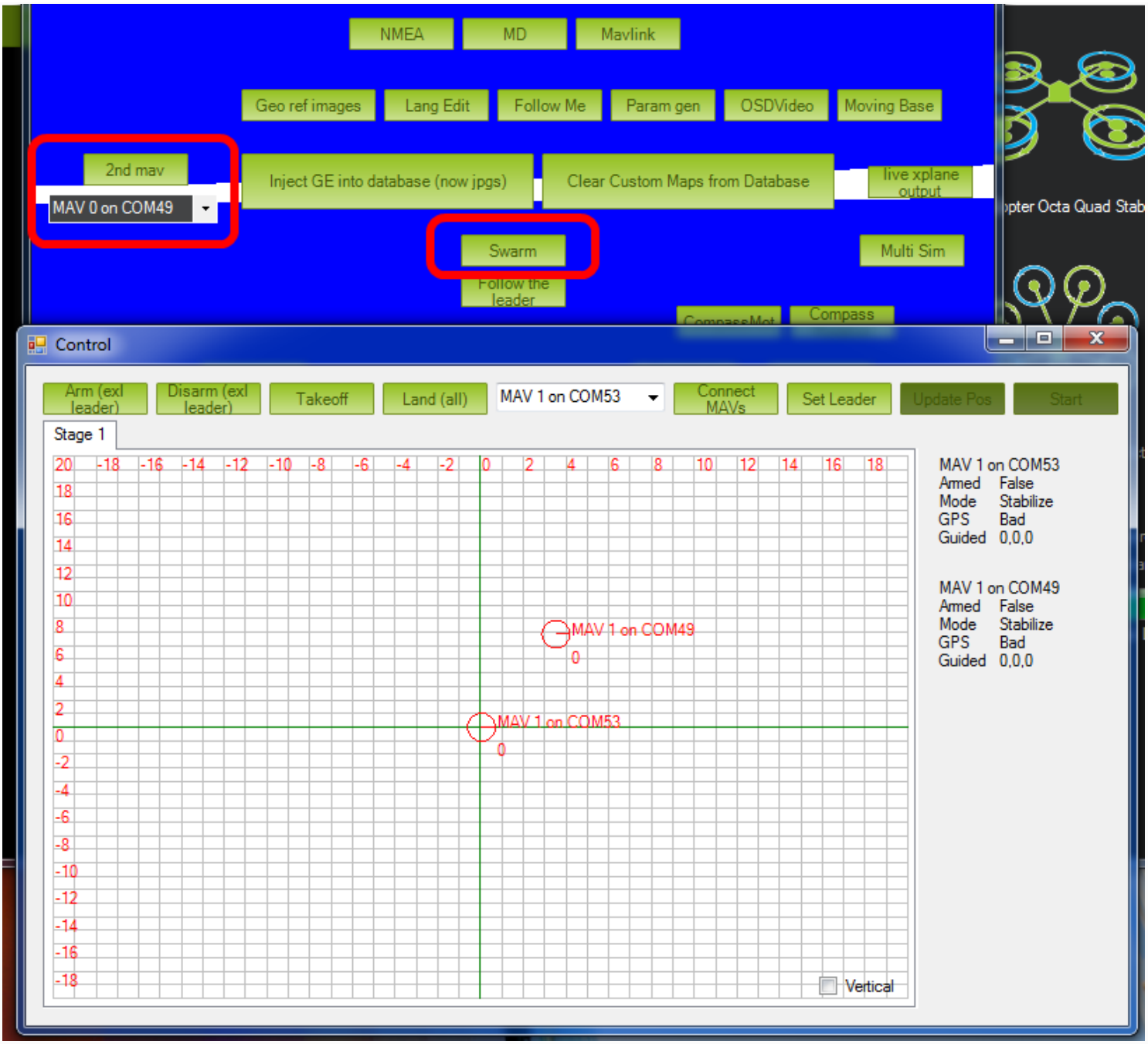
Swarming

Swarming/Formation-Flying Interface (Beta)

Mission Planner supports limited “swarming”, or formation-flying with multiple UAVs. At the moment this is in an experimental beta implementation, which is admittedly neither easy to use nor 100% reliable. However, if you’re interested in multiple-UAV coordination, this is a good place to start.

More sophisticated swarming/multiple-UAV control is available in QGroundControl and APM Planner 2.0, which are both built on a multiple-vehicle architecture. But Mission Planner accomplishes this in a limited way by simply opening multiple serial port MAVLink connections simultaneously (see four-UAV USB hub above) and passing GPS position information from one (“leader”, flying in any mode, from manual to auto) to the other (“followers”, flying in Guided mode). The GPS position of the leader is adjusted by a set offset and then sent to the followers as a series of dynamic waypoints. In this fashion the followers will follow the leader at set X,Y and Z offset distances.

This interface can be entered by pressing Control-F in the Mission Planner. That will bring up a pretty crowded box of buttons (see below), but the key ones are marked below: identifying the serial port of the “follower” UAVs, and the “swarm” button, which will bring up the second window, with a grid showing the relative position offset of the other UAVs.



Mission Planner: Screen with SwarmButton

Setup Procedure:

1. Plug in one 3DR radio per vehicle
2. Connect to the “leader” in the Mission Planner
3. Press Control-F and click “swarm”
4. Click “set leader”
5. Click “Connect MAVs” (“MAV” stands for “micro air vehicle”). Click it once for each MAV. As each connects via MAVLink they will appear on the grid
6. Drag the MAV circles around the grid to set the desired offsets. The Mission Planner assumes that “up” is North.

7. “Start” will start sending Guided Mode waypoints to all vehicles except the leader.

Now, as you may have guessed, getting the starting position can be the hardest. In the grid they are identified by the MAV number and COM port. It’s a good idea to tape that MAV number to the physical vehicles themselves, so you can correspond the on-screen numbers and grid position with the physical layout of the vehicles on the ground.

Currently the code does no path prediction etc. A good place to start is with two quadcopters about 20 m apart to test, and work up from there.

First Flight:

1. Take off with the leader, sit at say 2-10 m high (loiter). The leader flight mode doesn’t matter
2. Click start. This should make the follower take off in guided mode (it will take 3-5 seconds to launch) and sit at the same altitude as the master (assuming you haven’t changed the altitude offsets)
3. Manually move the leaders, and the 2nd quad (follower) should follow.
4. When you’re done, manually land the leader. Use the “Land” button to tell the follower to land, too.

Tips

- Don’t close the swarming screen, as it will stop the swarming. (Since we use guided mode, if you do the quad will just sit at the last commanded location.)
- The main map interface will show both quads.
- If you drag the quad around the grid screen, while its active. the quad should actually move as well.
- Increase the position stream rate in the mp. config>planner>position. to say 5, from the default of 3. to reduce the latency

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