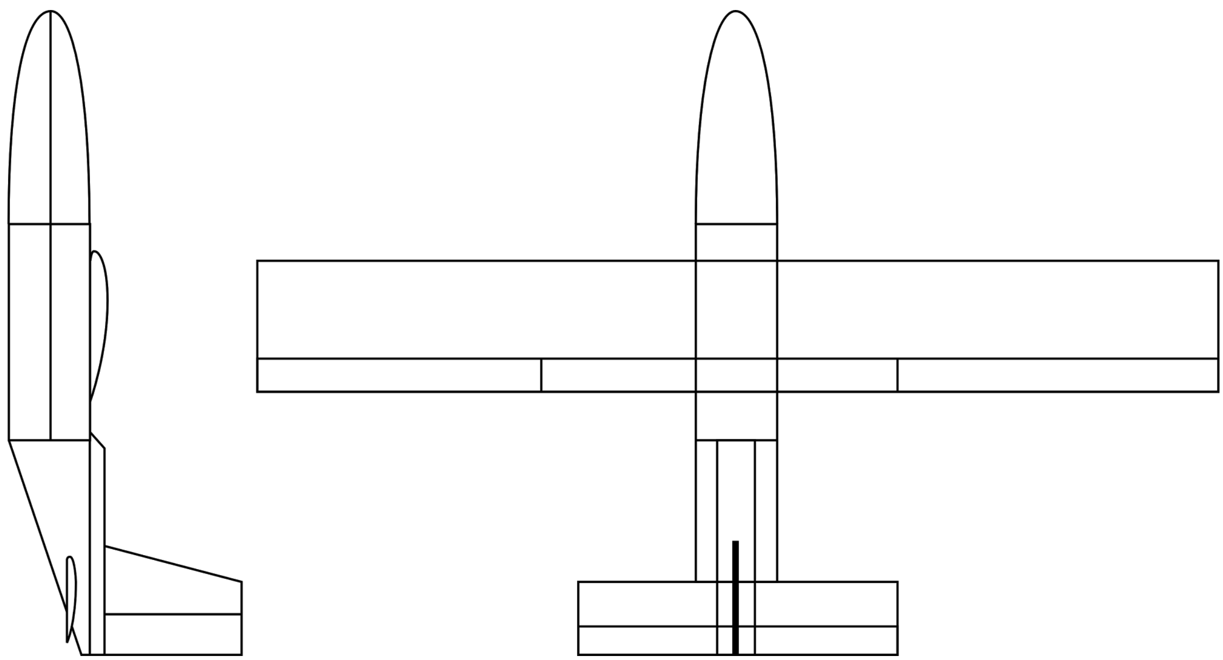
Maja D Operator Manual



Introduction

The Maja UAV is a fully autonomous, small unmanned aerial vehicle commonly referred to as UAV or Drone. It is designed to be operated in small spaces. 100 * 100 meter of open and rather flat area should be large enough for automatic takeoffs and landings. By design, the aircraft flies relatively slow (cruise speed is 12 m/s) to be able to map areas at low altitude and high resolution.

Because of the low flying altitudes, this aircraft is usually operated in unregulated airspace (usually Class G) and in line of sight. In most countries around the world an aircraft can be operated without special permission and certification from authorities.

This manual explains the various aspects of the Maja UAV.

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Maja D

The Maja D is a fully autonomous unmanned aerial vehicle (UAV). It is equipped with a downward looking high resolution photo camera for mapping landscapes. Depending on the setup it may also carry a forward looking high definition video camera.

The airframe offers easy access to batteries and payload. It's flight characteristics are optimized for hand launch, flying mapping missions at 100m above ground (and higher) as well as landing rough terrain.

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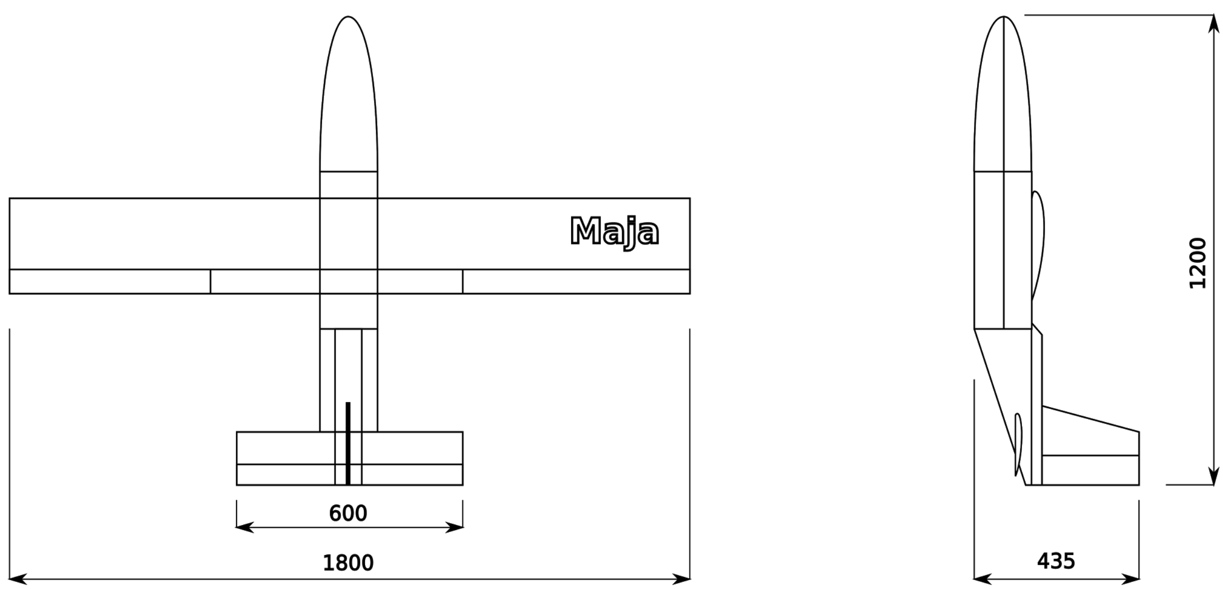
Technical Data

		Remarks
Length	1200 mm	
Wingspan	1800 mm	
Max take-off weight (MTOW)	3000 g	
Empty weight	1200 g	
Payload capacity	1000 g	
Battery weight	800 g	With 2*5000 mAh batteries
Endurance	1 h	Depending on mission and wind
Range	40 km	Depending on mission and wind

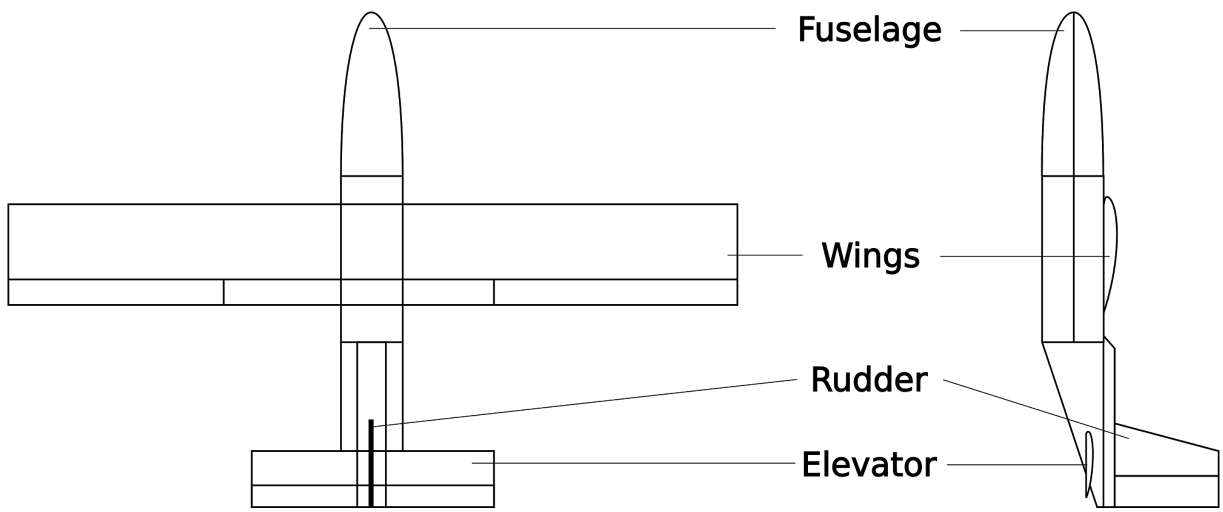


Airframe

Parts

The airframe consists of the following parts

- fuselage
- wings
- elevator
- rudder (tail fin)



Moving surfaces

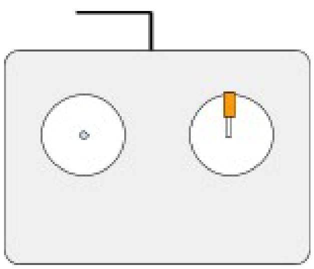
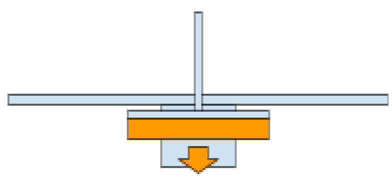
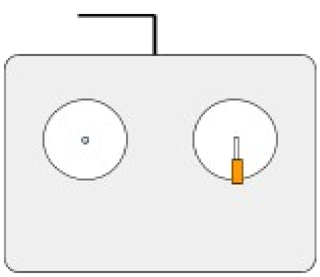
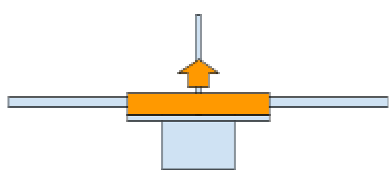
Manual input

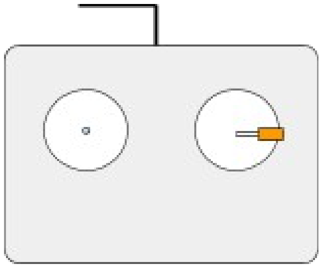
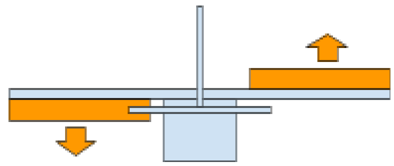
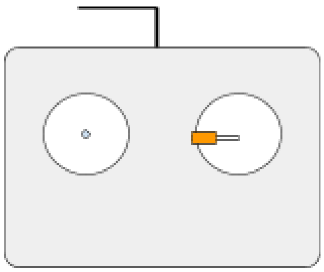
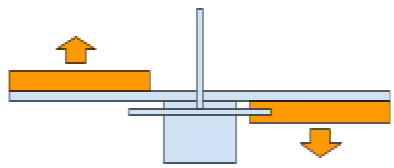
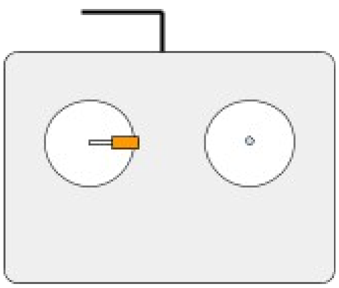
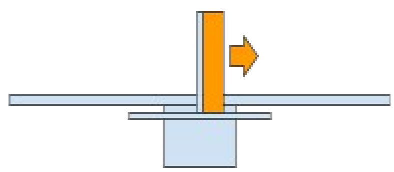
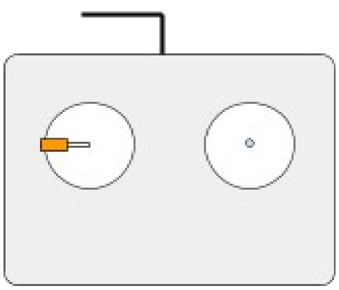
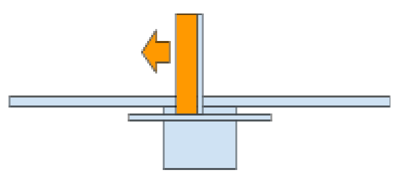
It is important to make sure the transmitter and autopilot are configured to move all moving surfaces into the right direction. Check this before every flight. The illustrations below show in which direction each moving surface should point when moving the stick.

Autopilot input

Banking the aircraft in stabilize/Fly-By-Wire mode should produce the opposite result. In these modes the autopilot will try bring the aircraft into a level flight attitude again. When the aircraft is banked to the right, the autopilot should move the surfaces so that the aircraft banks back to the left until the aircraft is level again.

The orange surfaces show in which direction the stick input will move the surface. All images are shown from **behind the aircraft**.

Transmitter	Surfaces (from behind)	Direction
		Nose down
		Nose up

		Roll right
		Roll left
		Yaw right
		Yaw left

Payload

The Maja airframe allows easy access to it's payload. The payload consist of a still camera and a high definition Video camera. The payload has to be configured and setup before take-off. Data can be obtained after landing via USB cable and/or SD card reader.

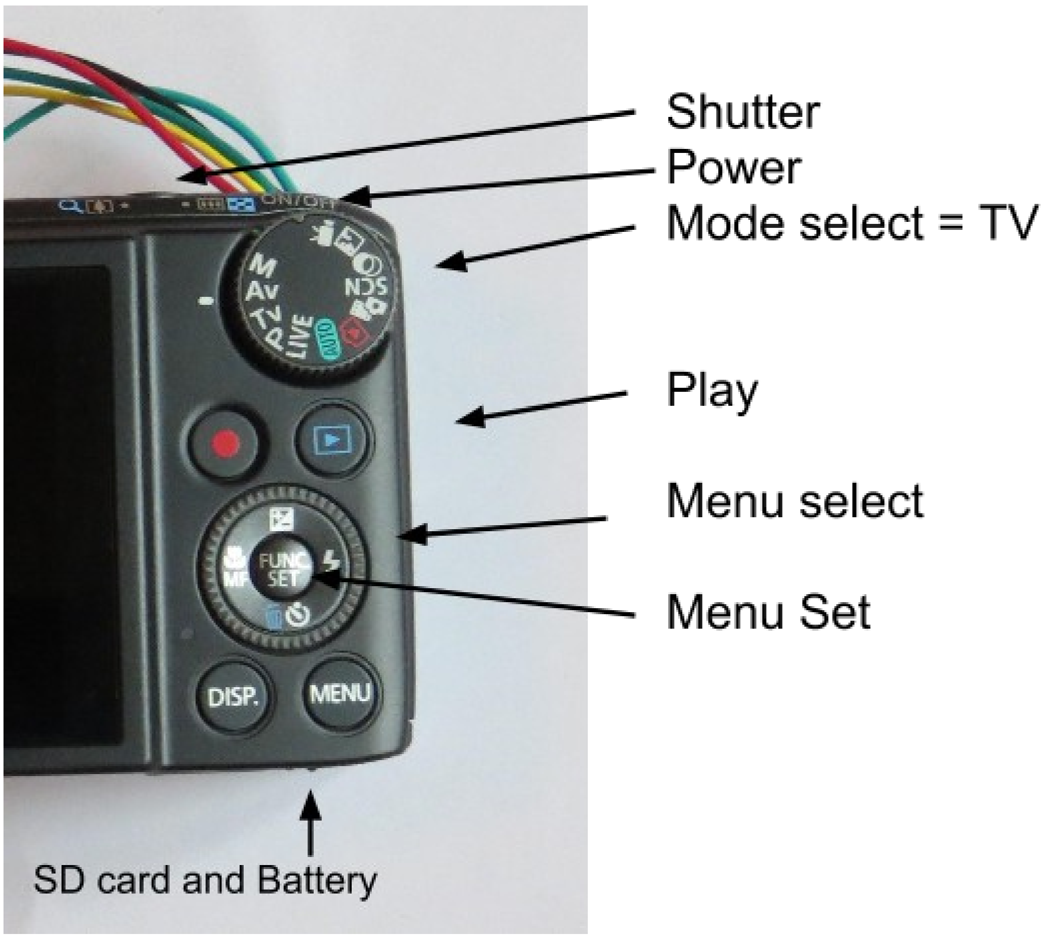
Still Camera

The MAJA D comes with a Canon SX260HS pre-configured and pre-loaded with custom firmware.

Power

The camera's battery lasts for approximately 1.5h and should be recharged before every flight with the supplied battery charger.

Buttons



The Mode select button should always be set to TV. The play button is used to turn the camera on and start the intervalometer script. Menu select and Menu set are used to change the camera's interval and duration settings. The power button is used to turn the camera off.

Camera Configuration

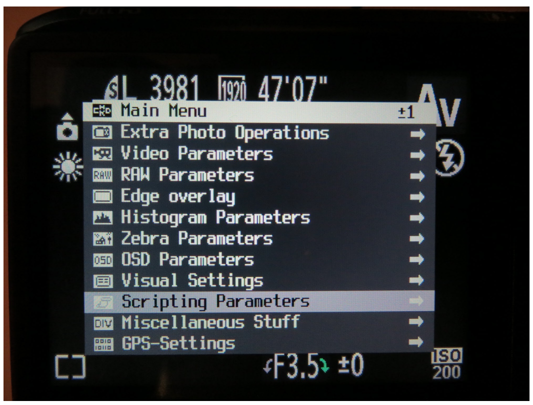
It is possible to change 4 parameters of the cameras interval settings:

- Start delay [s] (default: 5)
- Interval [sec] (default: 0)
- Zoom-Step (default: 0)

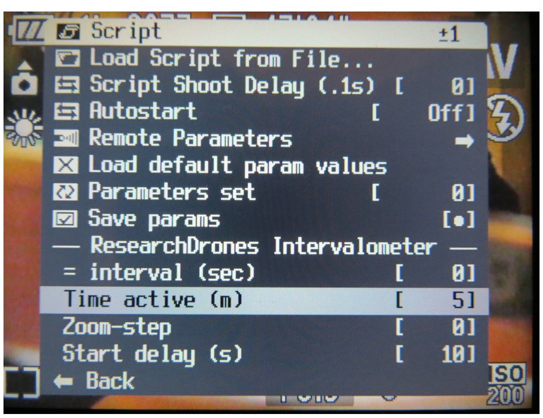
- Time active [m] (default: 5)

Usually there is only a need to change the “Time active” value. This should be set to the planned mission time. Once the time active is reached, the camera will shut down and the lense will close. It is important that the lens is close before landing, that way the lense is protected from dust and dirt during the landing. To change these values, do the following:

1. Turn the camera on via power button.
2. wait a couple of seconds and stop the script via shutter button
3. click the play button and then the menu button, you should see the following menu:



4. Select “Scripting Parameters”
5. At the bottom of the scripting parameters menue you can now change the values of the 4 parameters. Use the “menu set” button to toggle a value for change. Use the “menu select” dial to change the value.



6. When done, hit the “Shutter” button to save the changes.
7. Start the script by hitting the “Shutter” button

More information on camera settings can be found in the Appendix.

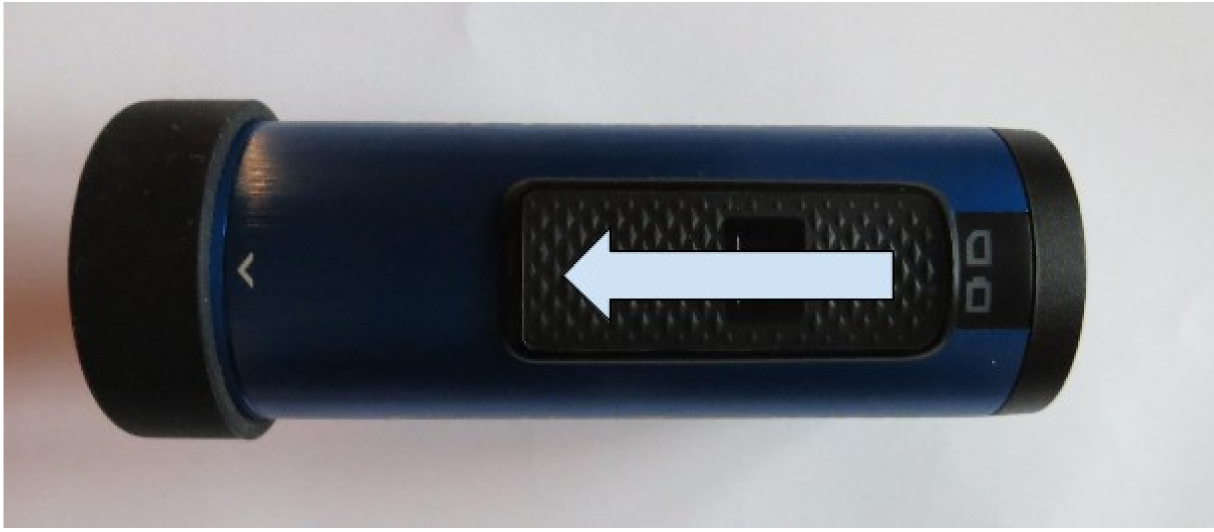
Video Camera

The video camera is mounted on or in the nose. Recharging can be done through USB from a laptop/PC or with an external USB charger (12V inverter or 220/110V).

The microSD card and the USB port are accessible behind the lid at the end of the camera. lift the lid up and the camera opens.

Accessing the SD card

Turning the camera on and off



Check that the red light is on. If the icon on the top is red, there is a problem with the SD card

- the SD card might be full
- the SD card might be unformatted
- SD card not inserted

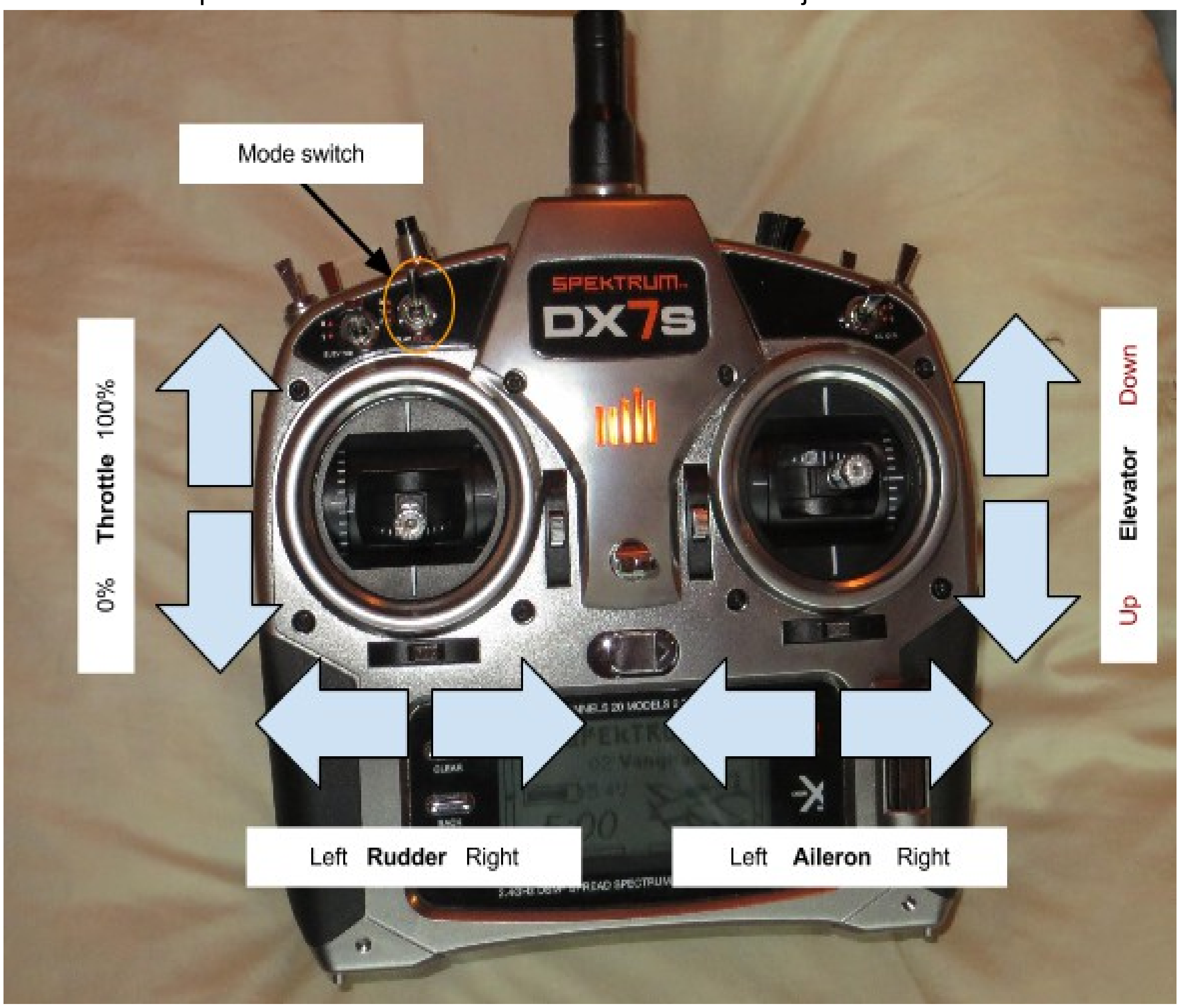
The battery icon changes color from green to orange to red to indicate the battery status. Green indicates that the battery is fully charged.

Hardware

Transmitter

The transmitter is primarily used by the operator to select the flight modes and for small corrections during auto landings. Advanced operators might also use the transmitter for manual control of the UAV while in line of sight. From experience we know that at least 40-60 hours experience of flying r/c planes is required to safely fly the aircraft in manual mode.

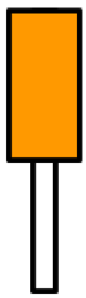
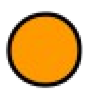
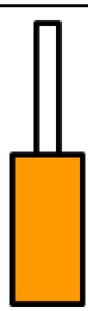
This is a description of the used buttons and levers on the Maja D UAV:



See “moving surfaces” on a detailed explanation of what effect the 2 joysticks have. See “Mode switch” for a more detailed explanation of the modes and function of this switch.

Mode switch

The mode switch on the transmitter is used to set the different modes the autopilot should execute.

	**Manual Mode** This mode gives control to the pilot. It is used for initialisation test and ground handling. Make sure to always have the **throttle stick to 0%** before moving into manual mode while on ground.
	**RTL (Return To Launch)** The RTL mode is used to command the aircraft back to it's initialisation position which is usually where it took off. The altitude for RTL is set in mission planner. The default altitude is used.
	**Auto** This mode is used to fly a mission. Once enabled, the engine will start. Be very careful, do this only shortly before take-off.In auto mode, as long as a valid mission is planned, the UAV will take-off, fly it's mission and land without intervention of the operator. However, Joystick inputs are active and may disturb the autopilots flight path, do not move the joysticks unless you really intend to change the flight path (for example during a landing to correct drift caused by wind).

Telemetry link

Although the MAJA UAV is able to fly a fully autonomous mission, it is possible to change commands and flight paths via telemetry link. this is the preferred method of controlling the UAV because it does not require any knowledge of lying an aircraft. New commands are planned on a laptop or tablet and sent up via telemetry link to the aircraft.

The telemetry link is primarily used as control channel to visualize the state of the flying UAV on a laptop/tablet. All known autopilot parameters are constantly sent down to the computer where they are visualized and logged. If a mission does not work out as planned the telemetry logs are very valuable for analyzing the systems parameters at any time of the flight.

The telemetry link has a limited range, depending on a country's regulation, ground antennas, terrain and type.

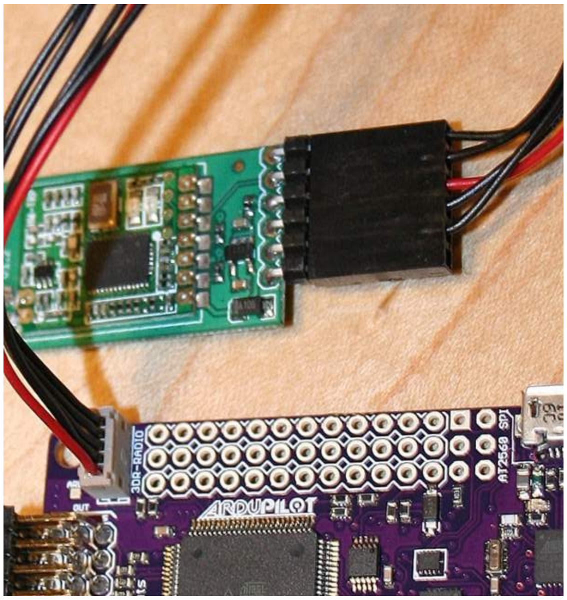
Short range Telemetry

The short range telemetry has a range of up to 1km (with rubber duck antennas). It is available at 2 frequencies:

- 433 MHz
- 900 MHz

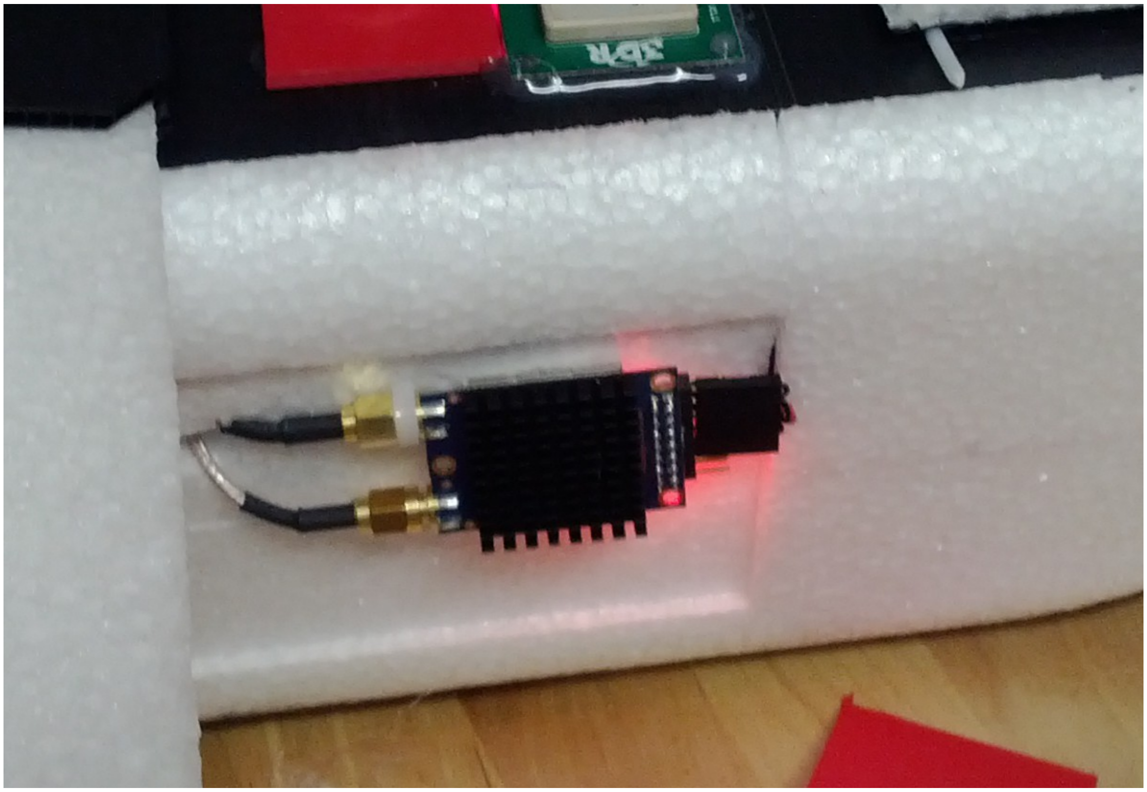
433MHz is mostly recommended for use in Europe, Australia and Brazil. 900 Mhz in the rest of the world. Be aware, that mobile networks (mostly 900 MHz) often are in the 900 MHz range, so make sure you do not get interference from mobile towers.

The telemetry modems are connected via special telemetry cable to the autopilot and with a standard FTDI 3.3V cable to the computer/tablet (OTG cable required for tablet).



Long range Telemetry

The RDF900 long range modem gives a range of up to 3km (with line of sight and rubber duck antenna). If high gain antenna is used on the ground side (for example a patch or yagi antenna).



Telemetry frequencies

Region	Radio Model	Settings	Standard
USA	3DR 900 / RFD900	MIN_FREQ=902000 MAX_FREQ=928000 NUM_CHANNELS=50	FCC 15.247
Canada	3DR 900 / RFD900	MIN_FREQ=902000 MAX_FREQ=928000 NUM_CHANNELS=50	RSS-210 Annex 8.1
Australia	3DR 900 / RFD900	MIN_FREQ=915000 MAX_FREQ=928000 NUM_CHANNELS>=20	LIPD-2000 item 52
Australia	3DR 433	MIN_FREQ=433050 MAX_FREQ=434790 TXPOWER<=14	LIPD-2000 item 17

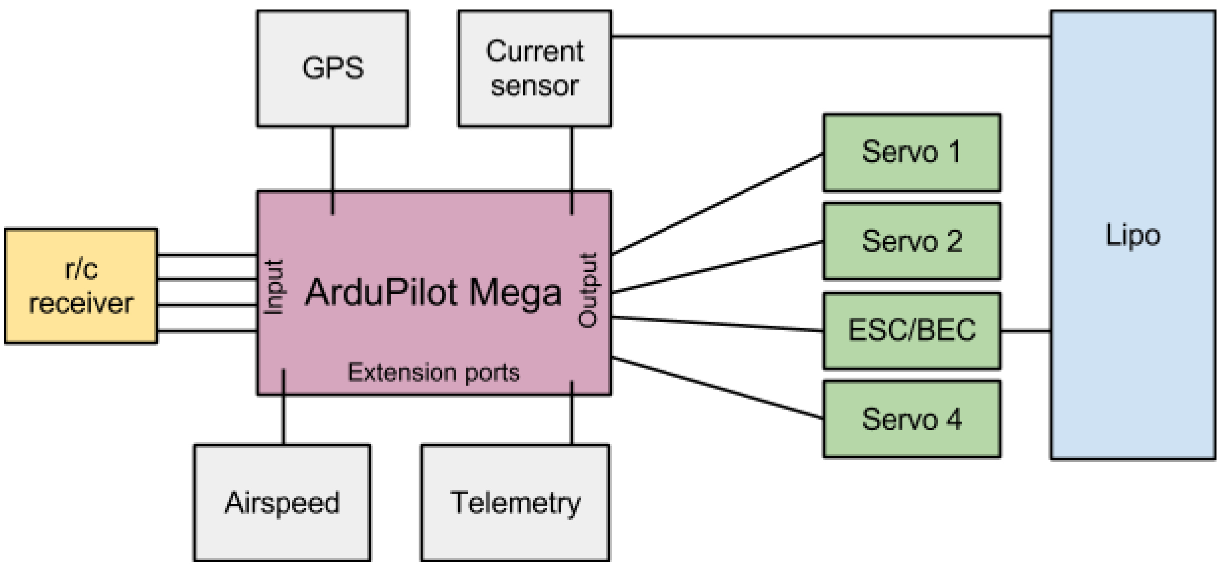
Europe (most countries)	3DR 433	MIN_FREQ=434040 MAX_FREQ=434790 TXPOWER<=8 NUM_CHANNELS>=30	ETSI EN300 220 7.2.3
Europe (most countries)	3DR 433	MIN_FREQ=433050 MAX_FREQ=434790 TXPOWER<=8 DUTY_CYCLE=10	ETSI EN300 220 7.2.3
United Kingdom	3DR 433	MIN_FREQ=433050 MAX_FREQ=434790 TXPOWER<=8 DUTY_CYCLE=10	IR2030/1/10
New Zealand	3DR 900 / RFD900	MIN_FREQ=921000 MAX_FREQ=928000	Notice 2007, Schedule 1
New Zealand	3DR 433	MIN_FREQ=433050 MAX_FREQ=434790	Notice 2007, Schedule 1
Brazil	3DR 433	MIN_FREQ=433000 MAX_FREQ=435000 TXPOWER<=8	Resolução ANATEL nº506/2008
Brazil	3DR 900 / RFD900	MIN_FREQ=902000 MAX_FREQ=907500 NUM_CHANNELS>=11	Resolução ANATEL nº506/2008
Brazil	3DR 900 / RFD900	MIN_FREQ=915000 MAX_FREQ=928000 NUM_CHANNELS>=26	Resolução ANATEL nº506/2008
Argentina	3DR 900 / RFD900	MIN_FREQ=902000 MAX_FREQ=928000	Comisión Nacional de Comunicaciones
South Africa	3DR 433	MIN_FREQ=433050 MAX_FREQ=434790 TXPOWER<=10mW	2008 RR 5.138, Government Gazette No 31127, Notice No 713 of 2008 and Government Gazette No 31290, Notice No 926 of 2008 refer

Wiring

This is a schematic description of the wiring of all components that make up the auto pilot system. A detailed pin description can be found in the drawing which describes the ArduPilot Mega's connectors in detail ("Appendix A").

All connectors are also labelled on the ArduPilot case and board. Most of the connectors do not have a protective measures to prevent you from plugging them in the wrong way. Be careful, we recommend to double check connectors before powering up the system the first time after maintenance work or re-wiring.

A wrong connected component will most probably damage parts or all of the system.

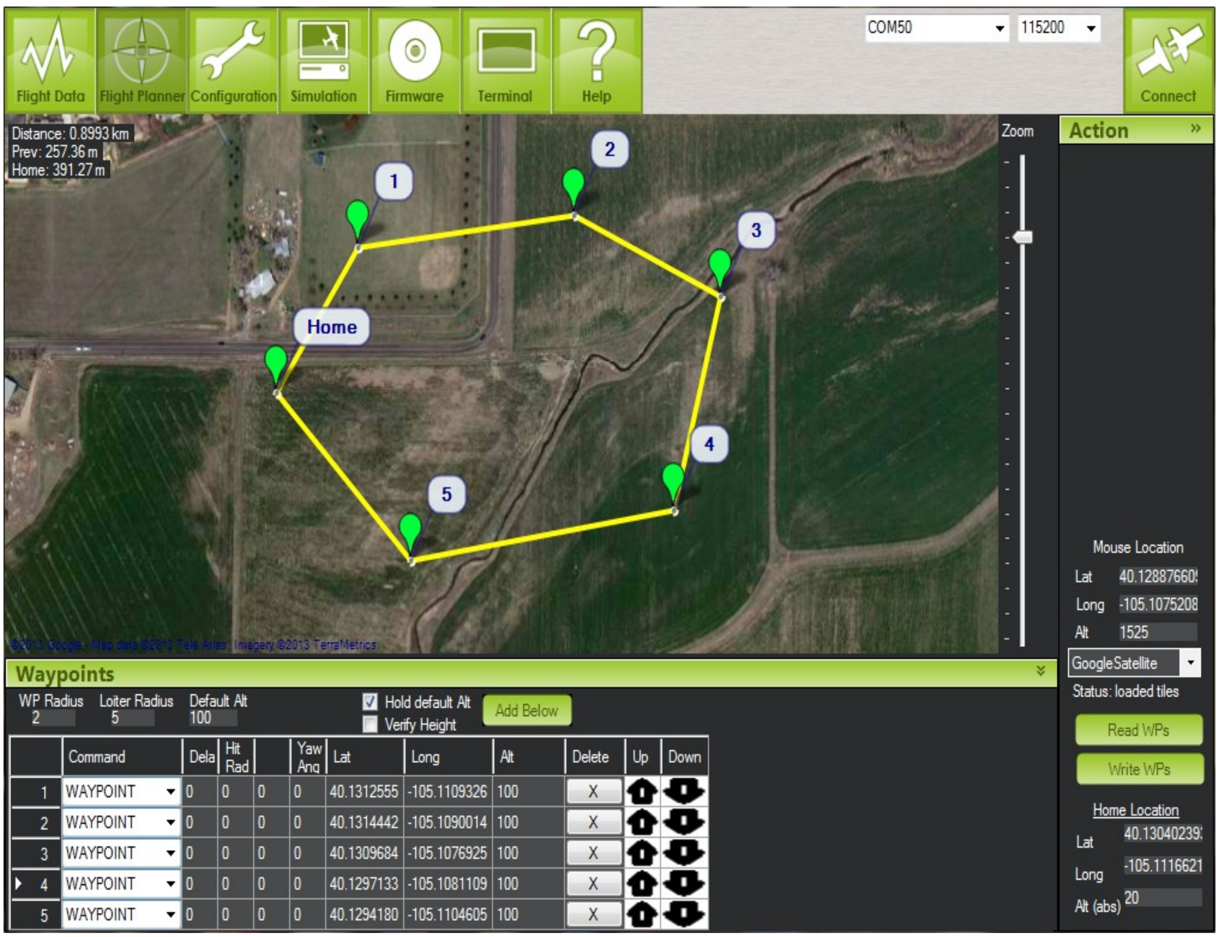


Groundstation software

There are several programs that can be used as groundstation software. The groundstation software is used for:

- Mission planning
- Real time telemetry data display
- UAV control
- analysing log data

Windows[1]



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.

[1] Windows XP and 7 are supported at the time of this writing. Windows 8 is not yet fully supported but there are work arounds: http://diydrones.com/profiles/blogs/windows-8-and-how-to-get-your-apm2-working-on-it

- 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

Set up the software

If you haven't done so already, download the Mission Planner here[1] (it will be called APM !Mission Planner x.x.xx.msi).

It requires a Windows machine running .net Framework 3.5+. This is shipped as part of Windows Vista and Windows 7, so if you're using them you don't need to load anything more. If you're using Windows XP you will have to download it yourself here[2]).

The Mission Planner will open a task bar at the top of your screen, and open with the Planner window. In the Options menu on the task bar, select the Com port assigned to your APM board or telemetry link (115200 baud for APM, 57600 baud for Telemetry).

The main Mission Planner function is represented by a tab in the top row of every screen.

[1] http://ardupilot.com/downloads/?category=4
[2] http://www.microsoft.com/net/download.aspx

Using mission planner

GUI components

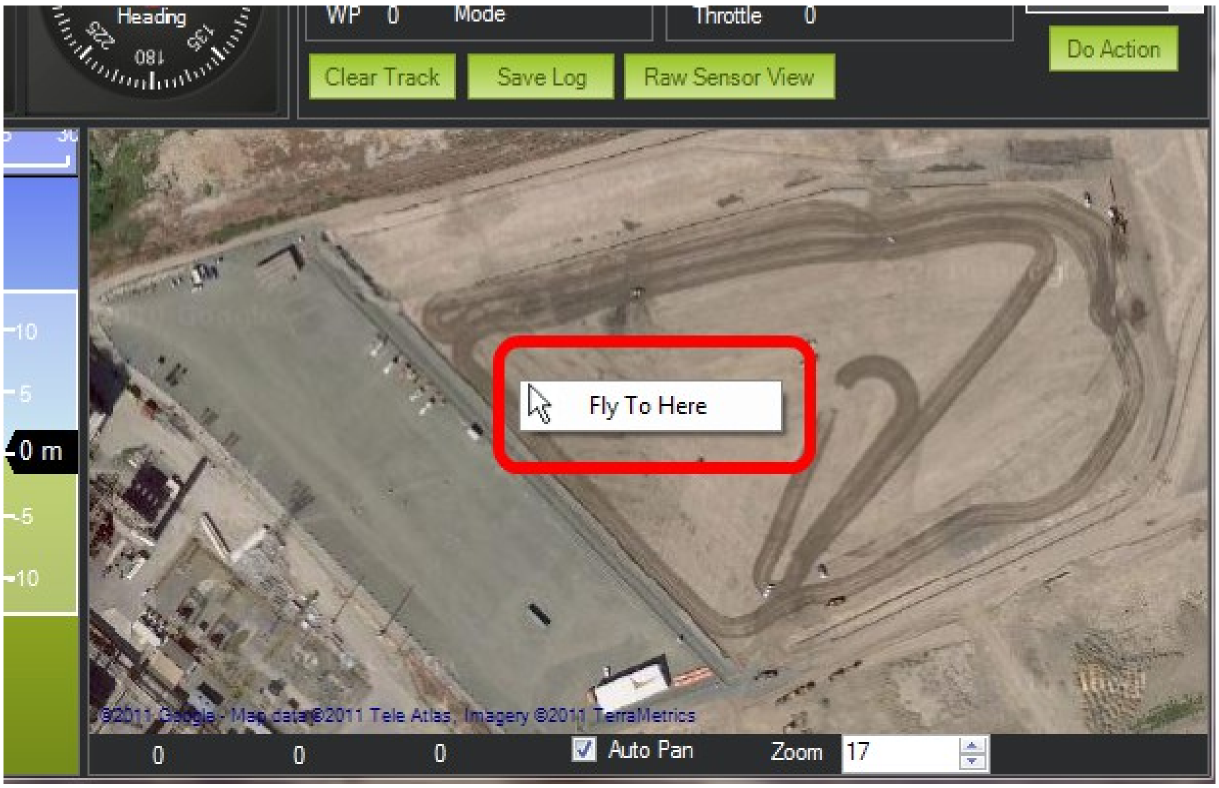
The above is the main Ground Station view of the Mission Planner, showing the Heads-up Display (HUD). Once you have connected via MAVLink over USB or wireless telemetry the dials and position on this screen will display the telemetry sent by APM.

A few tips:

- 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 ;-)
- 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".

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.

Camera settings calculator

TODO

Android

Mission planning

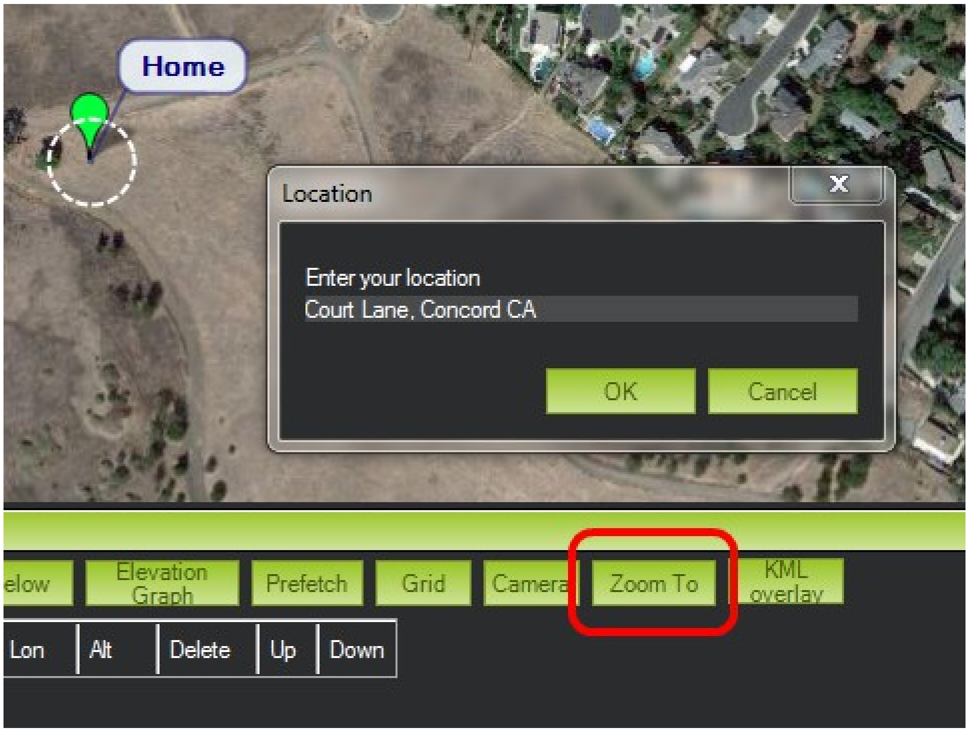
Map caching / prefetching

Planning a mission

Instructions

You can enter waypoints and other commands (see below for the full list). In the dropdown menus on each row, select the command you want. The column heading will change to show you what data that command requires. Lat and Lon can be entered by clicking on the map. Altitude is relative to your launch altitude, so if you set 100m, for example, it will fly 100m above you.

You can set a home position by clicking on the Home lat or lon and then clicking on the map. Or, if the map is not already centered on the field you're going to be flying at, you can search for it by clicking on the "Zoom To" button and entering your location in the search box, as shown:

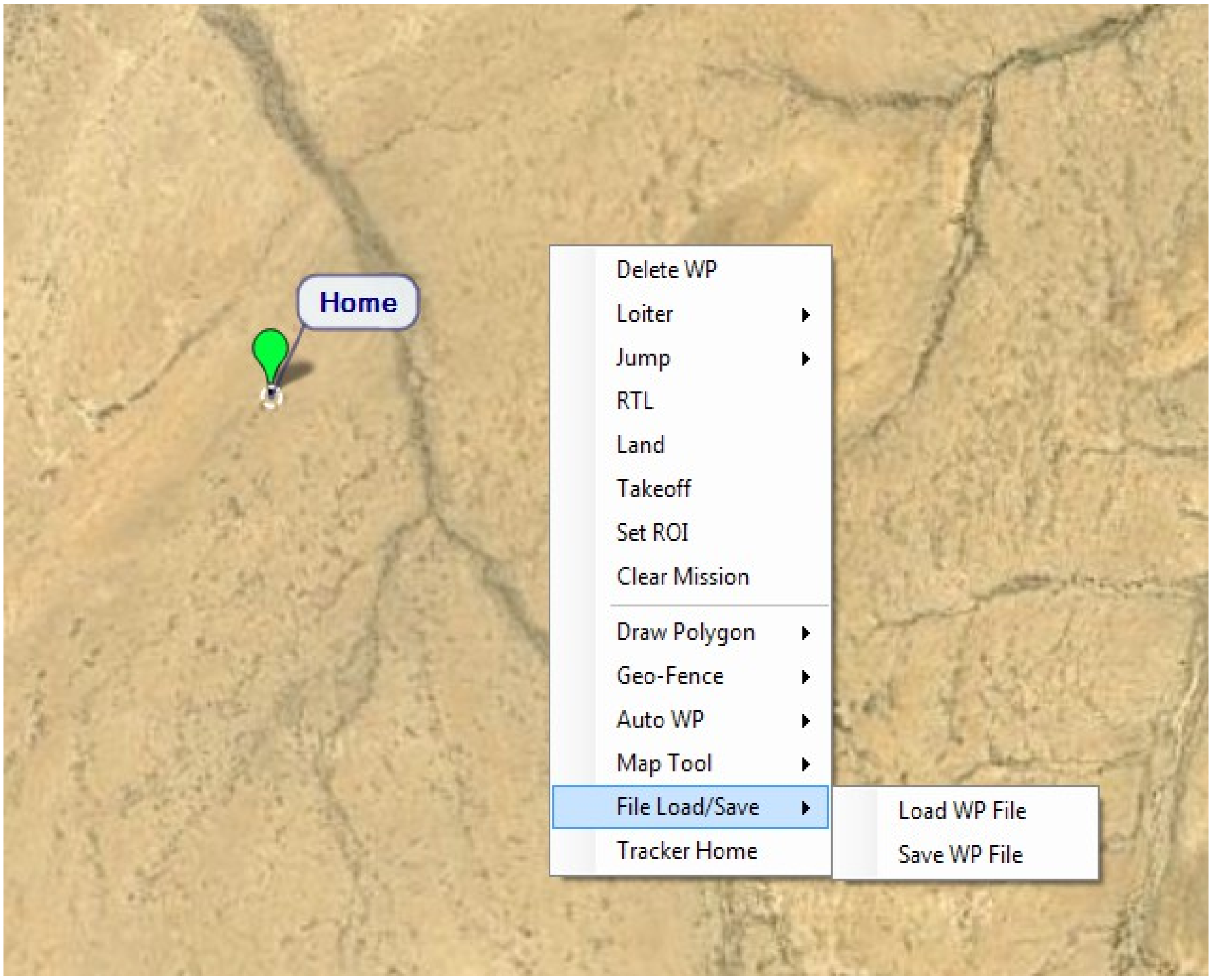


Note that if the "Absolute Alt" box is checked, the altitude used will be **altitude above sea level**, NOT altitude above your launch position. If that box is unchecked, ALT will be relative altitude, so 100m will be 100m above your "home" altitude, or where you're probably standing.

Default Alt is the default altitude when entering new waypoints. It's also the altitude RTL (return to launch) mode will fly at if you have "Hold Default ALT" checked; if you don't have that checked, your aircraft will try to maintain the altitude it was at when you switched on RTL.

Verify height means that the Mission Planner will use Google Earth topology data to adjust your desired altitude at each waypoint to reflect the height of the ground beneath. So if your waypoint is on a hill, if this option is selected the Mission Planner will increase your ALT setting by the height of the hill. This is a good way to make sure you don't crash into mountains!

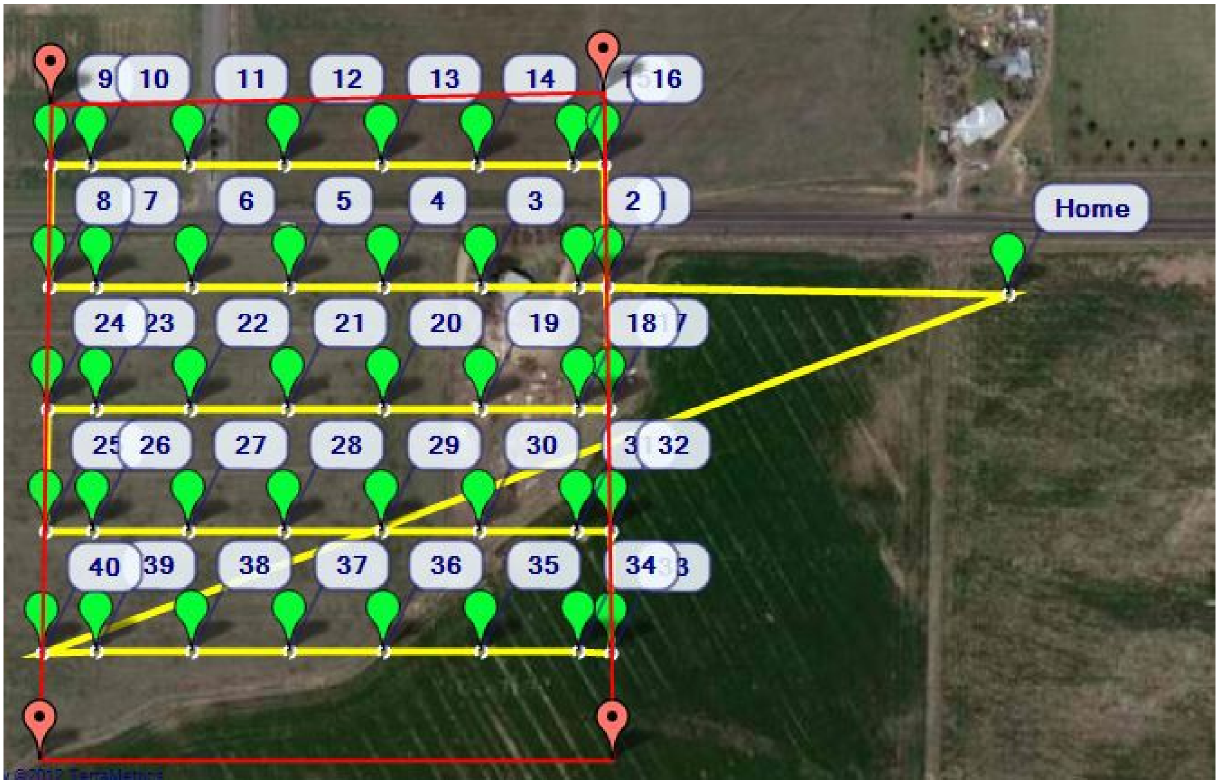
Once you are done with your mission, select "Write" and it will be sent to APM and saved in EEPROM. You should confirm that it's as you wanted by selecting "Read". You can save multiple mission files to your local hard drive by selecting "Save WP File" or read in files with "Load WP File" in the right-click menu:



Auto grid

You can also have the Mission Planner create a mission for you, which is useful for function like mapping missions, where the aircraft should just go back and forth in a "lawnmower" pattern over an area to collect photographs.

To do this, in the right-click menu select Polygon and draw a box around the area you want to map. Then select Auto WP, Grid. Follow the dialog box process to select altitude and spacing. The Mission Planner will then generate a mission that looks something like this:



Basic waypoint commands

A mission file is a little intimidating to the human eye, but is a powerful scripting language for the autopilot. (Again, remember that the GCS will soon take care of all of this for you. You shouldn't have to see it yourself for long!).

You can have as many commands as you want, ranging from pre-programmed ones to ones that you can create. Here are some common ones:

- {NAV_WAYPOINT n/a, alt, lat, lon}
- {NAV_TAKEOFF pitch, target altitude}
- {NAV_LAND n/a, alt, lat, lon}
- {DO_JUMP waypoint, n/a, repeat count, n/a} Goes to that waypoint and resumes mission there. Set repeat count to any number greater than 1 to do it that many times. or to -1 to do it forever. Good for looping missions.

(**Note: DO_xxx commands currently need a dummy waypoint placed after the command**
eg:
WAYPOINT_1
DO_SET_HOME
WAYPOINT_2
Home will be set at WAYPOINT_1 but will not work if WAYPOINT_2 is not there.)

In the screenshot above, I've planned a mission that starts with an autotakeoff to 20m attitude, the three waypoints at 100m, ending with one that sets up a landing pattern. Finally an autoland finishes the mission at 0m altitude.

Tips

- Prefetch: You can cache map data so you don't need Internet access at the field. Click the Prefetch button, and hold down Alt to draw a box to download the selected imagery of a location.
- Grid: This allows you to draw a polygon (right click) and automatically create waypoints over the selected area. Note that it does not do "island detection", which means if you have a big polygon and a little one inside of that, the little one will not be excluded from the big one (see this[1] for more). Also, in the case of any polygon that partialy doubles backs on itself (like the letter U), the open area in the center will be included as part of the flyover.
- Setting your home location to the current location is easy, just click "Home Location" above where you enter your home location, and it will set your home location to the current coordinates.
- You can measure the distance between waypoints by right-clicking at one end and selecting Measure Distance. Then right-click on the other end and select Measure Distance again. A dialog box will open with the distance between the two points.

Automatic Takeoff and Landing

ArduPilot Mega can automatically launch and land an aircraft, as part of a mission plan. Here's how:

Auto takeoff instructions

The basic idea of automatic takeoff is for the APM to set the throttle to maximum and climb until a designated altitude is reached. To cause the plane to execute a takeoff, add a NAV_TAKEOFF command to your mission, probably as the first command. The altitude parameter always specifies the altitude that must be attained before the APM will consider its takeoff complete and load the next Must command.

The APM will initially hold the wings level on takeoff, but as soon as a takeoff heading is established, the APM will adjust roll to maintain that heading.

As soon as the ground speed, as measured by the GPS, exceeds 3 m/s, the takeoff heading will be set to the magnetometer's yaw sensor.

The first parameter of the NAV_TAKEOFF command will specify the minimum pitch the APM will target on takeoff. The APM will adjust pitch to achieve airspeed_cruise which is 12m/s on the Maja (pitch up if airspeed is above cruise, pitch down if airspeed is below cruise), but it will not pitch below the minimum pitch set by NAV_TAKEOFF.

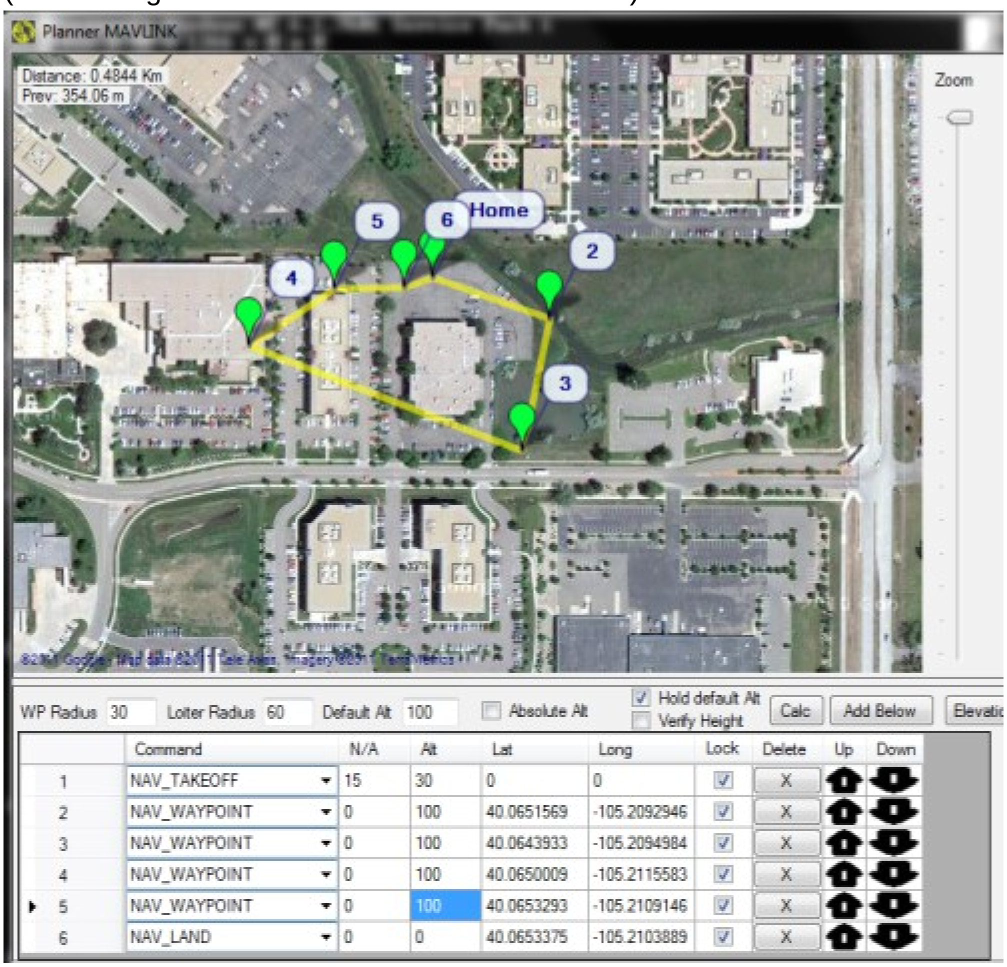
[1] http://wiki.openstreetmap.org/wiki/Relation:multipolygon

Auto landing instructions

To land the plane, simply add a NAV_LAND command to the end of your mission indicating the latitude, longitude and altitude of your desired touchdown point. In most cases, the altitude should be set to 0. During landing, the APM will shut down the throttle and hold the current heading as soon as the plane is within 2 seconds of the touchdown point horizontally, or as soon as the plane is lower than 3 meters above the touchdown point, whichever occurs first.
On approach, the APM will fly normally if you have an airspeed sensor.

Example

Here is an example mission around the Sparkfun building that autotakeoffs, goes around the building and then sets up a landing pattern for an autoland. Note that the waypoints kick in once the plane has reached 30m altitude after autotakeff, and that it lands at 0m altitude (altitude is given relative to home/launch altitude):



Note that in reality the above flight plan probably won't result in a successful landing in the desired area. Waypoint 5 is set with an altitude of 100 meters, and waypoint 6, which is the landing waypoint, is only a short distance away. Unless the particular airplane used has a very fast descent rate when gliding with the motor off, it will not be able to come down from 100 meters in the short distance planned here.

With the Maja it is recommended to use a 500m long leg to glide down from 100m.

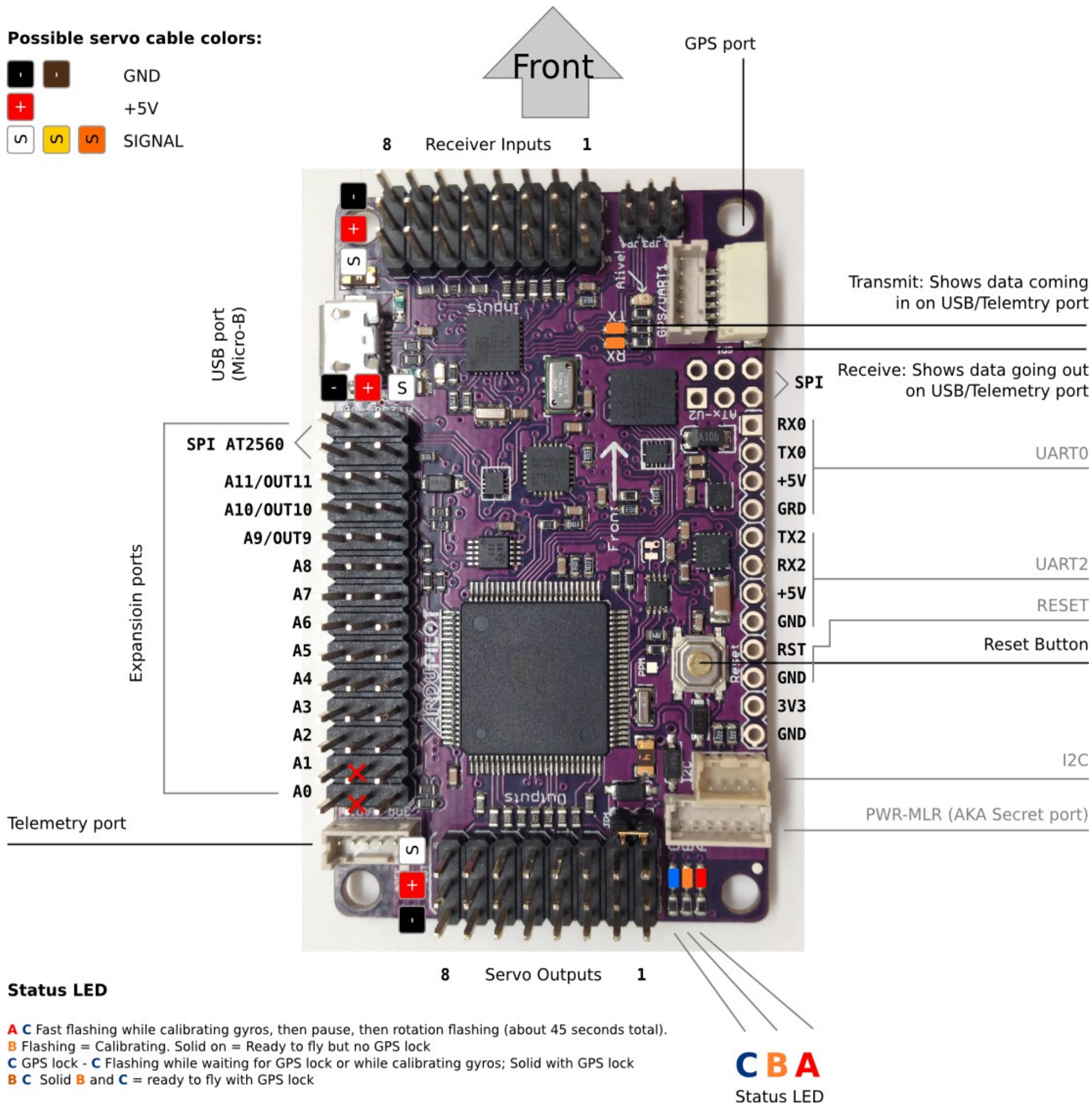
It is more appropriate to step the altitude down over a few waypoints and make sure that the distance between the waypoint before the landing point and the landing point is sufficiently large for the altitude which must be lost. Make sure to stay clear of obstacles in your glide path.

Flying a mission*

TBD

Appendix

A) ArduPilot Mega 2.5 connectors description



B) Checklist*

TBD

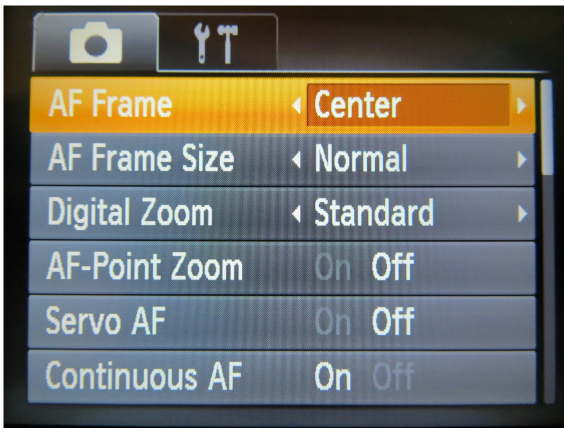
C) Emergency procedures*

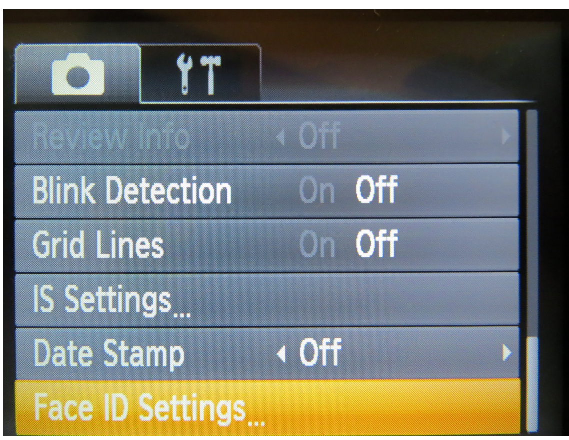
TBD

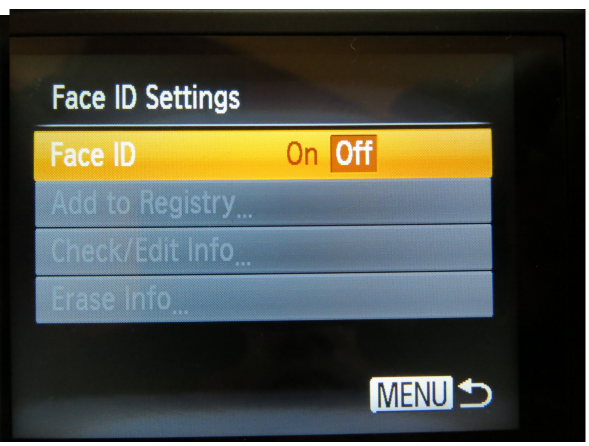
D) Canon SX260HS Settings

If CHDK is used you may get into the canon menu as follows:

- turn on camera
- hit shutter button
- hit menu botton








Mute On Off
Volume...
Sound Options...
Hints & Tips On Off
LCD Brightness
Start-up Image...

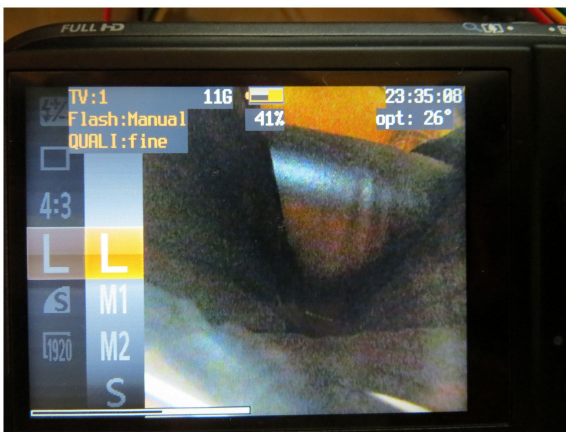

Format... 29.7GB
File Numbering Continuous
Create Folder Monthly
Lens Retract 1 min.
Power Saving...
Time Zone...


Date/Time... 12.01.'12 23:33
GPS Auto Time On Off
GPS Settings...
Units m/cm ft/in
Video System NTSC PAL
Ctrl via HDMI Enable Disable


GPS Settings
GPS On Off
GPS Logger On Off
Display Log Files...
Records GPS information
in image data
MENU


TV:1
Flash:Manual
QUALI:fine
11G
39%
23:34:11
opt: 26°


TV:1
Flash:Manual
QUALI:fine
11G
41%
23:34:49
opt: 26°
ISO 200
100
200
400
800
1600

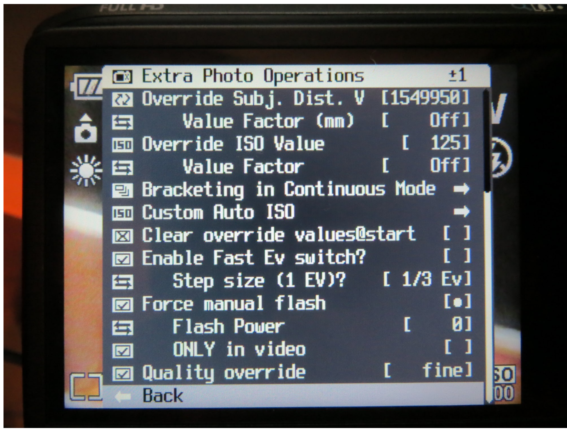

TV:1
Flash:Manual
QUALI:fine
11G
41%
23:35:08
opt: 26°
4:3
L
M1
M2
S

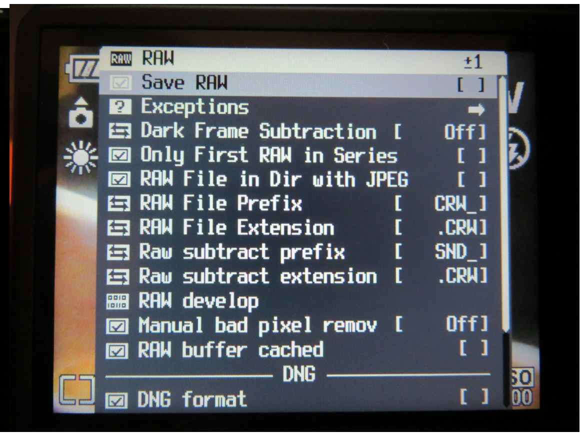

TV:1
Flash:Manual
QUALI:fine
11G
39%
23:35:36
opt: 27°
4:3
L
S

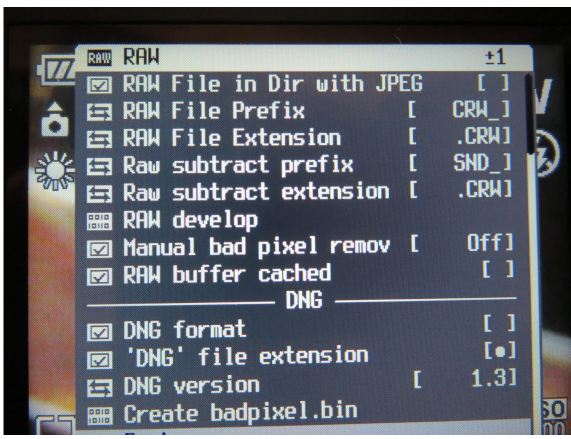
E) CHDK Configuration for SX260HS

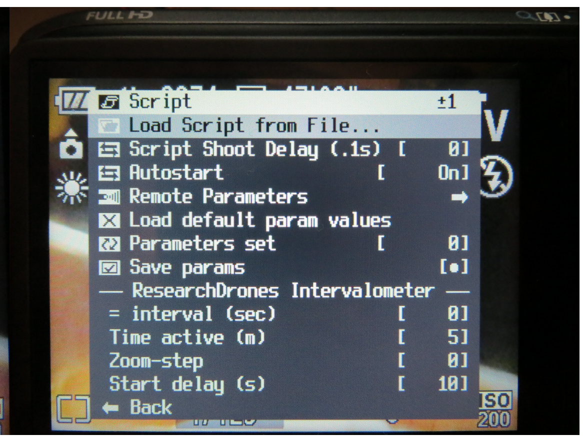
Enter the CHDK menu by

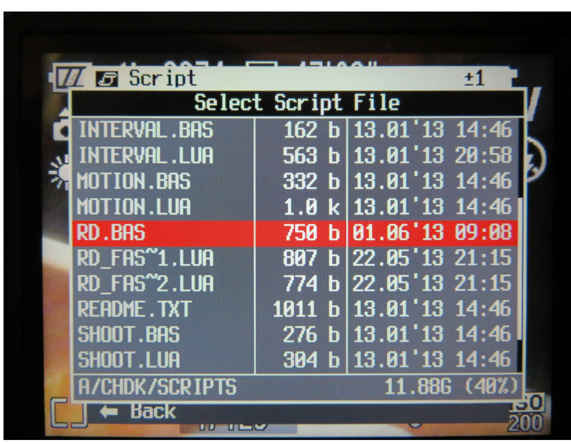
- starting the camera
- hit the shutter button (in case the script is set to auto start)
- hit the Menu button


Extra Photo Operations
Override Subj. Dist. V [1549950]
Value Factor (mm) [Off]
Override ISO Value [125]
Value Factor [Off]
Bracketing in Continuous Mode
Custom Auto ISO
Clear override values@start [ ]
Enable Fast Ev switch? [ ]
Step size (1 EV)? [1/3 Ev]
Force manual flash [•]
Flash Power [0]
ONLY in video [ ]
Quality override [fine]
Back


RAW
Save RAW [ ]
Exceptions
Dark Frame Subtraction [Off]
Only First RAW in Series [ ]
RAW File in Dir with JPEG [ ]
RAW File Prefix [CRW_]
RAW File Extension [.CRW]
Raw subtract prefix [SND_]
Raw subtract extension [.CRW]
RAW develop
Manual bad pixel remov [Off]
RAW buffer cached [ ]
DNG
DNG format [ ]


RAW
RAW File in Dir with JPEG [ ]
RAW File Prefix [CRW_]
RAW File Extension [.CRW]
Raw subtract prefix [SND_]
Raw subtract extension [.CRW]
RAW develop
Manual bad pixel remov [Off]
RAW buffer cached [ ]
DNG
DNG format [ ]
'DNG' file extension [•]
DNG version [1.3]
Create badpixel.bin


Script
Load Script from File...
Script Shoot Delay (.1s) [0]
Autostart [On]
Remote Parameters
Load default param values
Parameters set [0]
Save params [•]
ResearchDrones Intervalometer
= interval (sec) [0]
Time active (m) [5]
Zoom-step [0]
Start delay (s) [10]
Back


Script
Select Script File
INTERVAL.BAS 162 b 13.01'13 14:46
INTERVAL.LUA 563 b 13.01'13 20:58
MOTION.BAS 332 b 13.01'13 14:46
MOTION.LUA 1.0 k 13.01'13 14:46
RD.BAS 750 b 01.06'13 09:08
RD_FAS~1.LUA 807 b 22.05'13 21:15
RD_FAS~2.LUA 774 b 22.05'13 21:15
README.TXT 1011 b 13.01'13 14:46
SHOOT.BAS 276 b 13.01'13 14:46
SHOOT.LUA 304 b 13.01'13 14:46
A/CHDK/SCRIPTS 11.8GB (40%)
Back


GPS-Settings
GPS - CHDK [•]
Show compass
Show navigation
Bring me home
GPX-Track Record
Common Settings
Logging - Settings
Tagging - Settings
Navigation - Settings
Back

F) Intervalometer Script

The still cameras is using a special script to run the intervalometer. The customized software (CHDK) needs to be stored on the SD card, this is the location where the camera boots from. The script below must be stored on the card under «SDcard\CHDK\SCRIPTS\RD.bas» for the intervalometer to work. If you do not have the script, copy and paste the code below to notepad and store it in the mentioned location.

```
@title ResearchDrones Intervalometer
@param a = interval (sec)
@default a 0
@param c Time active (m)
@default c 5
@param j Zoom-step
@default j 0 rem step 30 is equivalent to 50 mm SLR focal length
@param z Start delay (s)
@default z 5

rem Starts indicator sound
playsound 4

rem e is time for script to remain active in milliseconds
e=c*60000

rem First shot
set_zoom j
shoot

rem Delay
for n=0 to z
   print "Starting in ";z-n;"s"
   sleep 1000
next n

rem g is time elapsed and f is start time and p is shots
g=0
f=get_tick_count
p=0

do
   set_zoom j
   s = get_tick_count
                           shoot
   sleep a*1000 - (get_tick_count - s)
   g=s-f
   t=(e-g)/1000
   p=p+1
   if g>e then shut_down
until ( 0 )
```

G) Troubleshooting

ArduPilot Mega

If there is something wrong with the UAV it is most often a Software or AutoPilot issue. You can find a collection of troubleshooting options in the wiki of ArduPilot Mega:
https://code.google.com/p/ardupilot-mega/wiki/Troubleshooting

CHDK

If there are problems with the Still camera, check the CHDK for dummies guide:
http://chdk.wikia.com/wiki/CHDK_for_Dummies