# APM on Flymaple

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2014-02-17

Introduction

This document contains information about how to use the Flymaple port of the APM Ardupilot Project.

In particular it shows how I set up APMrover2 running on a Flymaple board to control a buggy-type ground vehicle.

APM Ardupilot is an open source software suite that implements an autopilot for unmanned aircraft and ground vehicles. More information at http://ardupilot.com/
Ardupilot runs on a variety of commercial and open-source hardware, including Flymaple.

This is the Flymaple board:
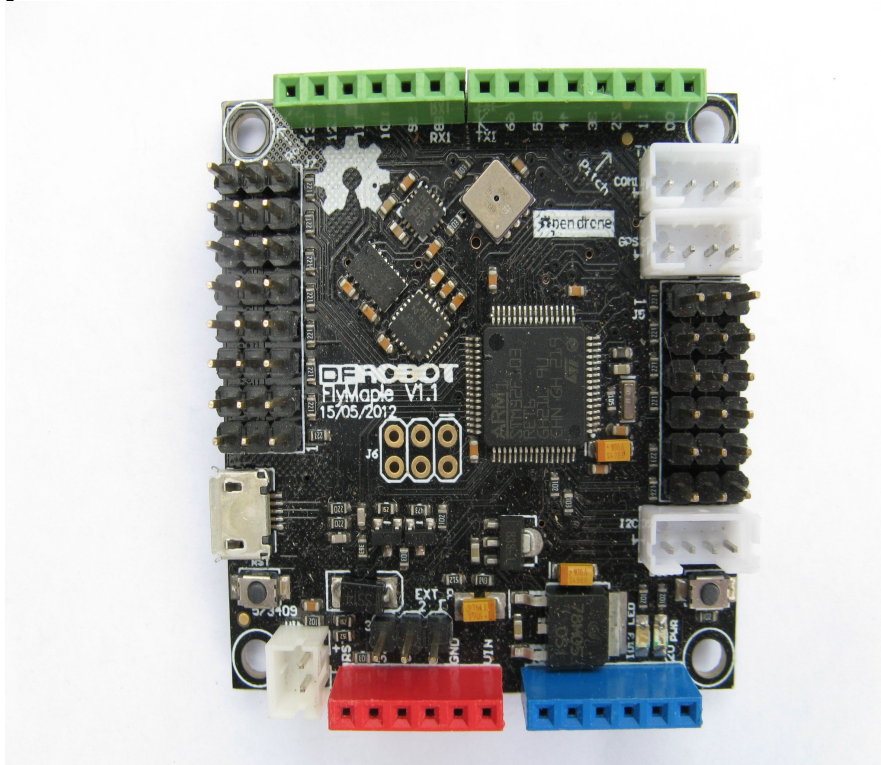
It contains a 75MHz ARM Cortex-M3 processor, 64kB SRAM, 512kBFLASH ROM, 3-axis gyroscope, 3-axis accelerometer, 3-axis compass and barometer, as well as various serial, digital and analog IO ports. More information at http://www.open-drone.org/flymaple
Adding a GPS and a radio control receiver results in a full featured, high performance, programmable autopilot suitable for a variety of vehicles.

The APM Ardupilot software is open source and available as a git repository at

https://github.com/diydrones

You can find detailed instructions on how to build Ardupilot for Flymaple and download it into a Flymaple board in libraries/AP_HAL_FLYMAPLE/FlymaplePortingNotes.txt of the Ardupilot software. It is assumed that you have completed this process before you continue.

Connecting for bench test

Here is the Flymaple connected ready for bench testing:
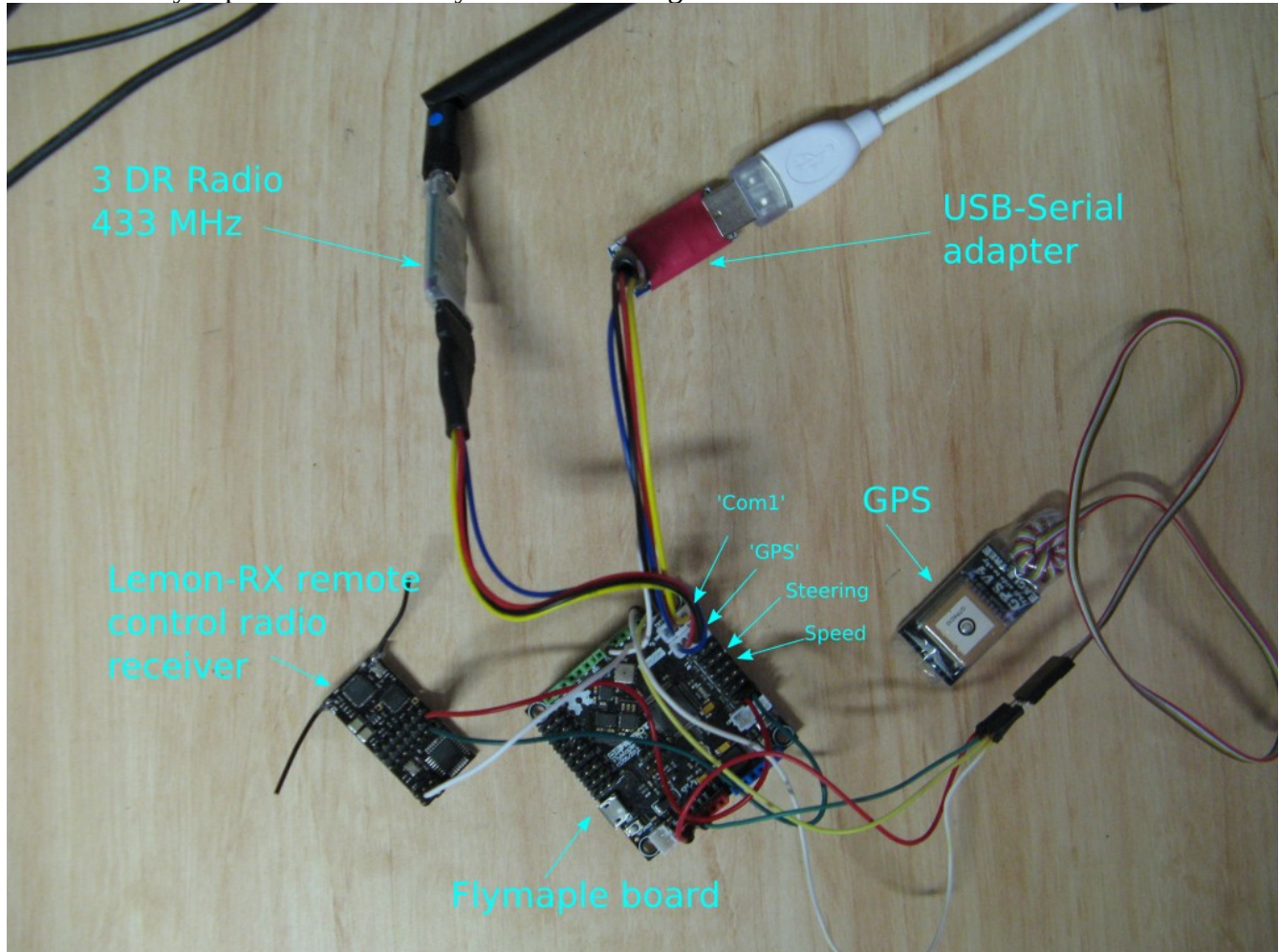
The items shown connected to the Flymaple are:

- 3DR Radio from 3D Robotics. https://store.3drobotics.com/products/3dr-radio. This is a 433 MHz serial radio that connects the Flymaple to a ground station such as Mission Planner running on a PC and with a similar radio attached. This link allows the ground station to monitor, control and upload flight plans to the Flymaple. It connects to the Flymaple serial port marked 'GPS' (which is also called port Serial3), which is 5V tolerant.

- USB-Serial adapter. This is a conventional USB-Serial adapter that connects the Flymaple to your host computer for testing. Run something like mavproxy (https://github.com/tridge/MAVProxy) on the host to allow you to manually configure and test the flymaple. This is optional, and is not connected when the vehicle is being flown or driven. It connects to the Flymaple serial port marked 'Com1'

(which is also called port Serial1), which is 5V tolerant.

- Remote control radio receiver. This is a DSM2 compatible radio control receiver with PPM-SUM output connected to Flymaple digital input pin 6. I used the Lemon-RX receiver:
http://www.lemon-rx.com/shop/index.php?route=product/product&path=70&product_id=66
Caution: Make sure you use one made after Oct 2013: earlier versions had a proprietary and incompatible PPM output. 5V power for this module is from any 2 power pins on J5.

- GPS. This is a serial GPS connected to Flymaple pins:
0 GPS data serial input to Flymaple. 3.3V logic NOT 5V tolerant.
1 GPS control serial out from Flymaple. 3.3V logic
I used an Eagle Tree GPS V4 module which operates and 3.3V and has 10Hz updates. Flymaple adjusts to whatever baud rate the GPS is configured for.
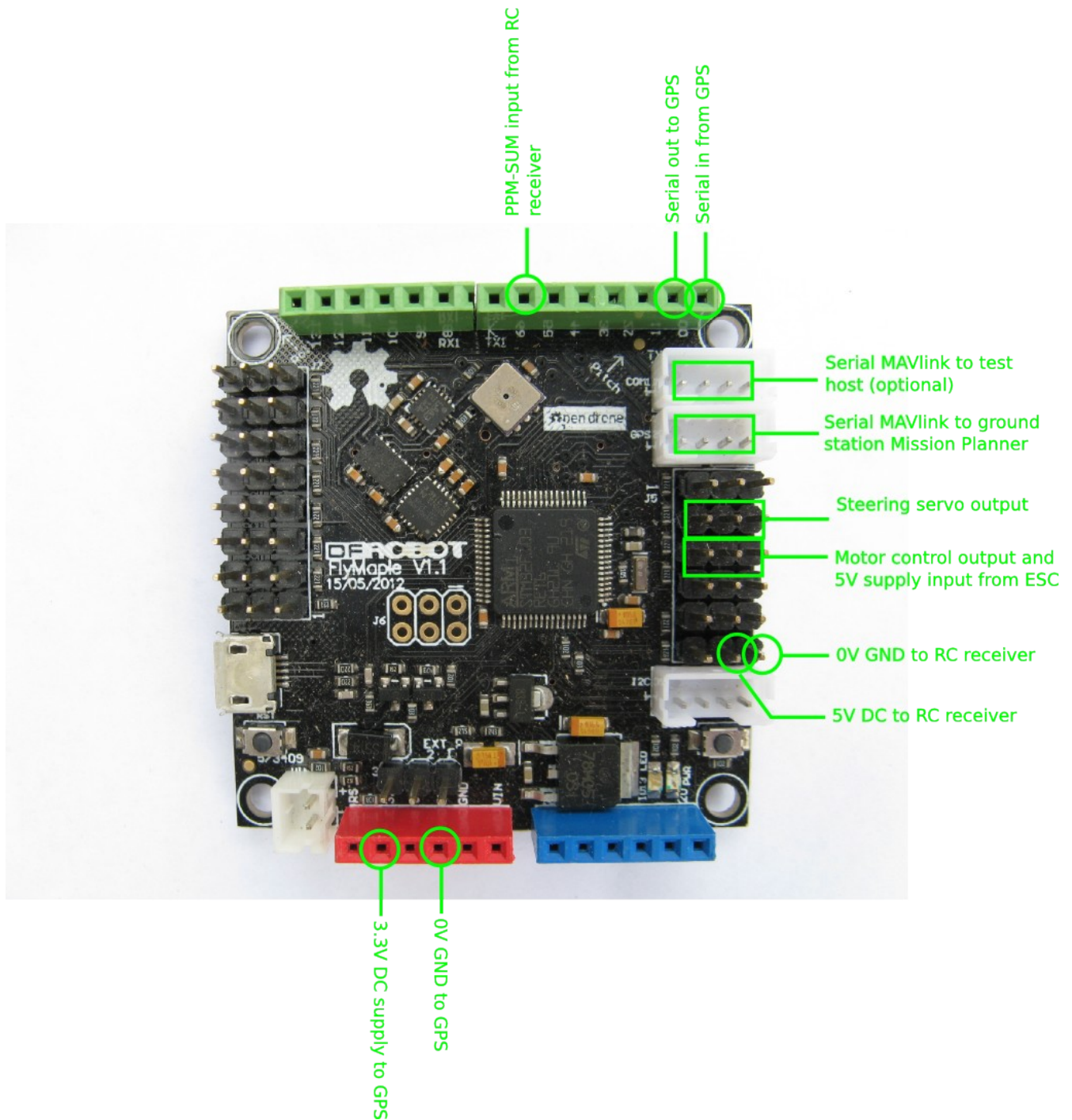
- Steering servo connected to J5 position 2 (D27). Conventional 5V servos may be used.

- Motor control servo/speed controller (ESC) connected to J5 position 3 (D11). Conventional 5V servos may be used. In my case, this is also the BEC 5V supply input from the ESC to power the Flymaple.

You also need a DSM2 remote control transmitter. I used the Spektrum DX6i. Follow the manufacturers instructions to bind the RC receiver to the transmitter.

Heres a detail of the connections:

Labels on image:
- PPM-SUM input from RC receiver
- Serial out to GPS
- Serial in from GPS
- Serial MAVlink to test host (optional)
- Serial MAVlink to ground station Mission Planner
- Steering servo output
- Motor control output and 5V supply input from ESC
- 0V GND to RC receiver
- 5V DC to RC receiver
- 3.3V DC supply to GPS
- 0V GND to GPS

Orientation

The way you mount the Flymaple in your vehicle will determine the AHRS orientation that you must configure into Ardupilot. The default orientation (AHRS_ORIENTATION=0) of the Flymaple yields an orientation like this, which might be appropriate for a quadcopter:
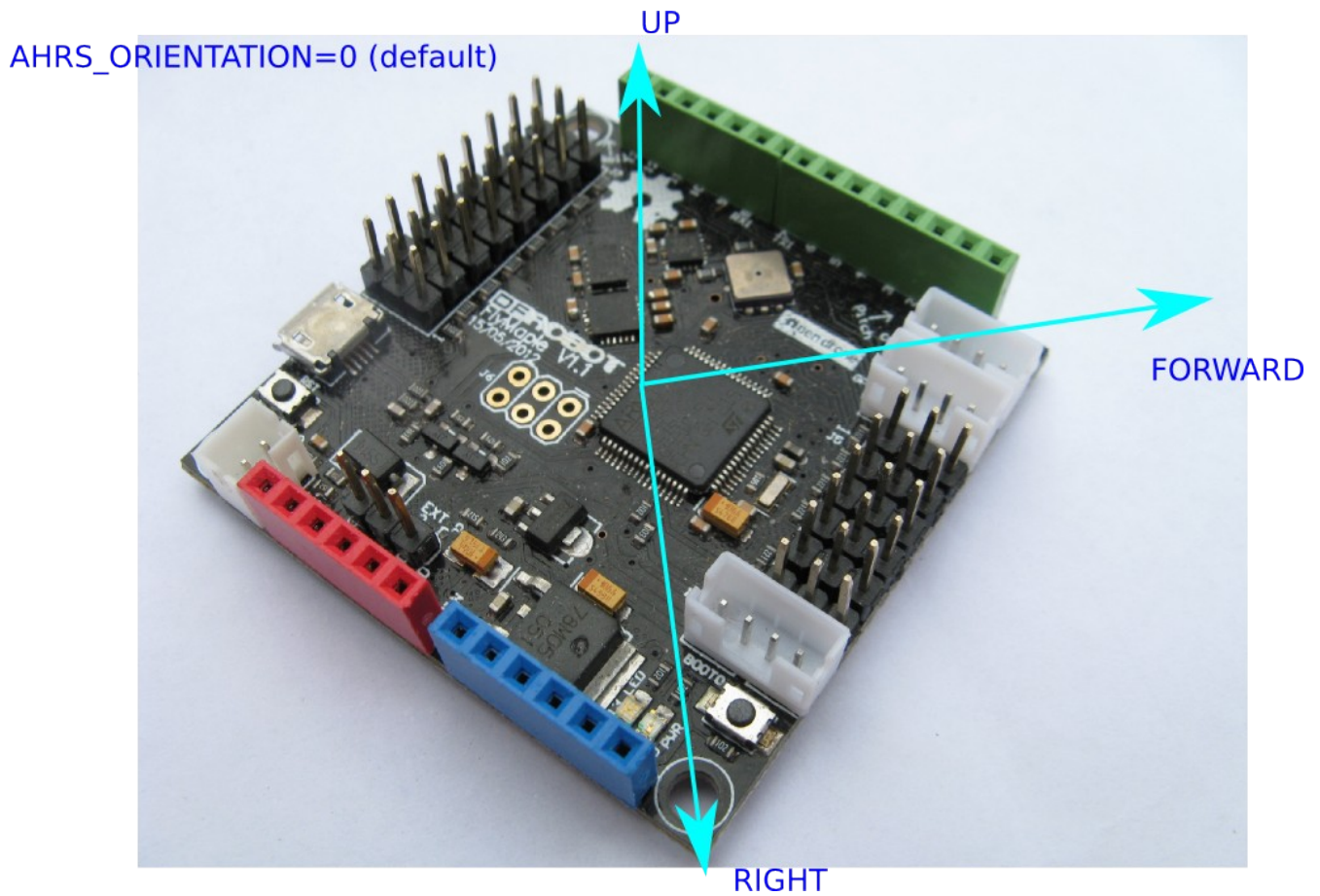
By changing the AHRS_ORIENTATION configuration using Mission Planner or MAVproxy, you can install the Flymaple in your vehicle with other orientations. I set mine to AHRS_ORIENTATION=1 (Yaw45) which produces this orientation:
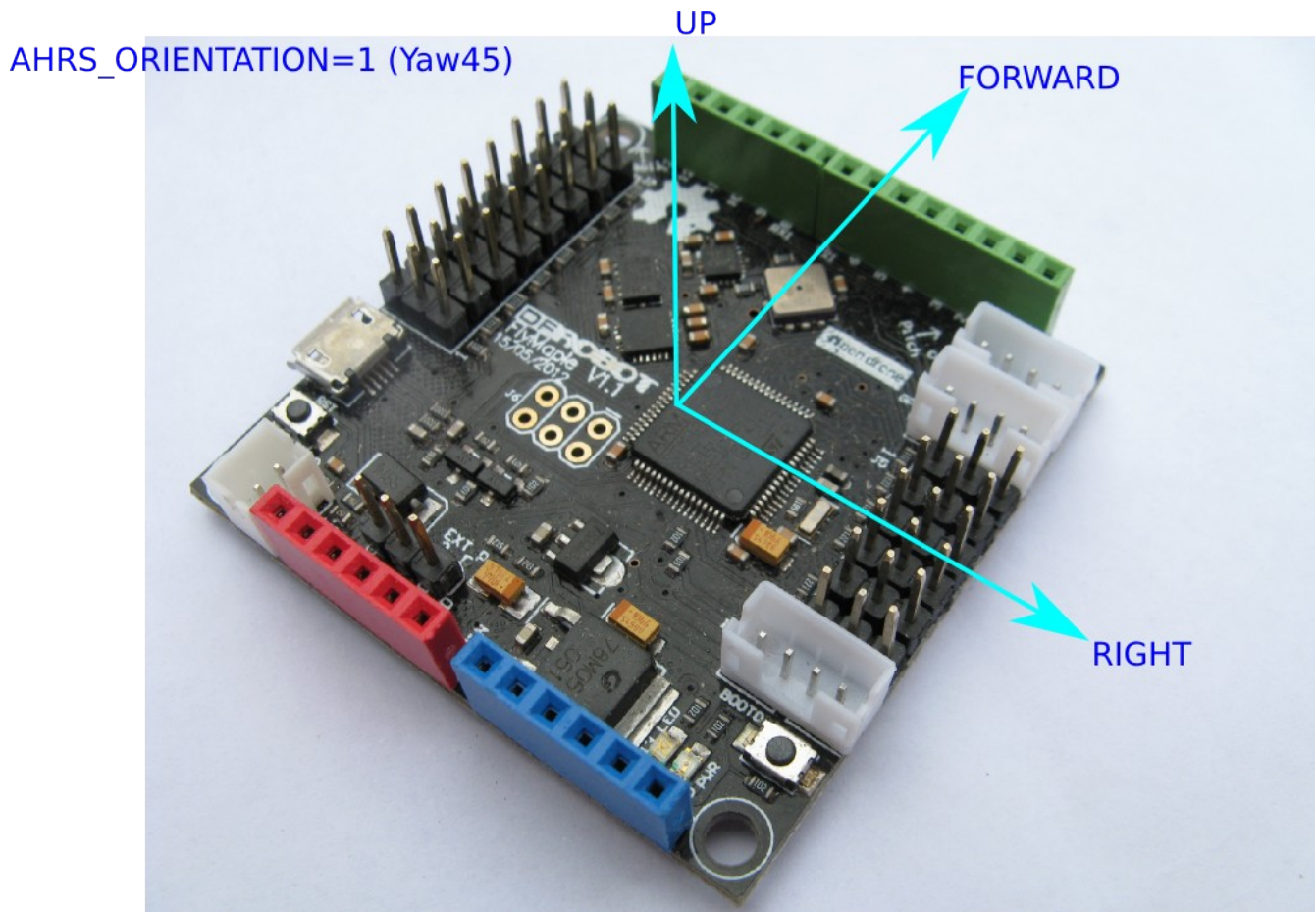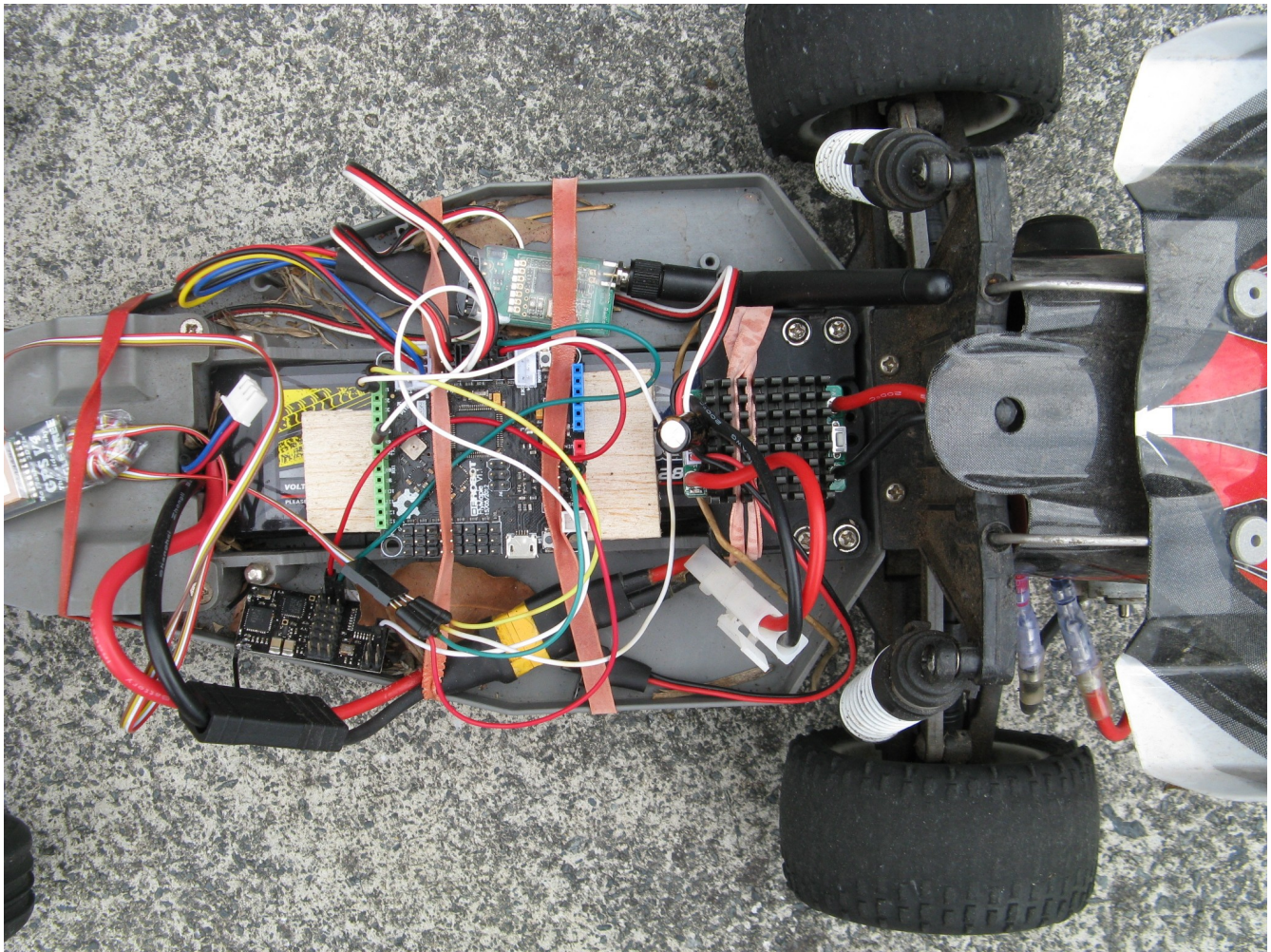
Installed in the buggy.

The Flymaple was installed and tested in a Traxxas Bandit (but with an aftermarket ESC and battery). This is the finished installation (pretty rough but working):
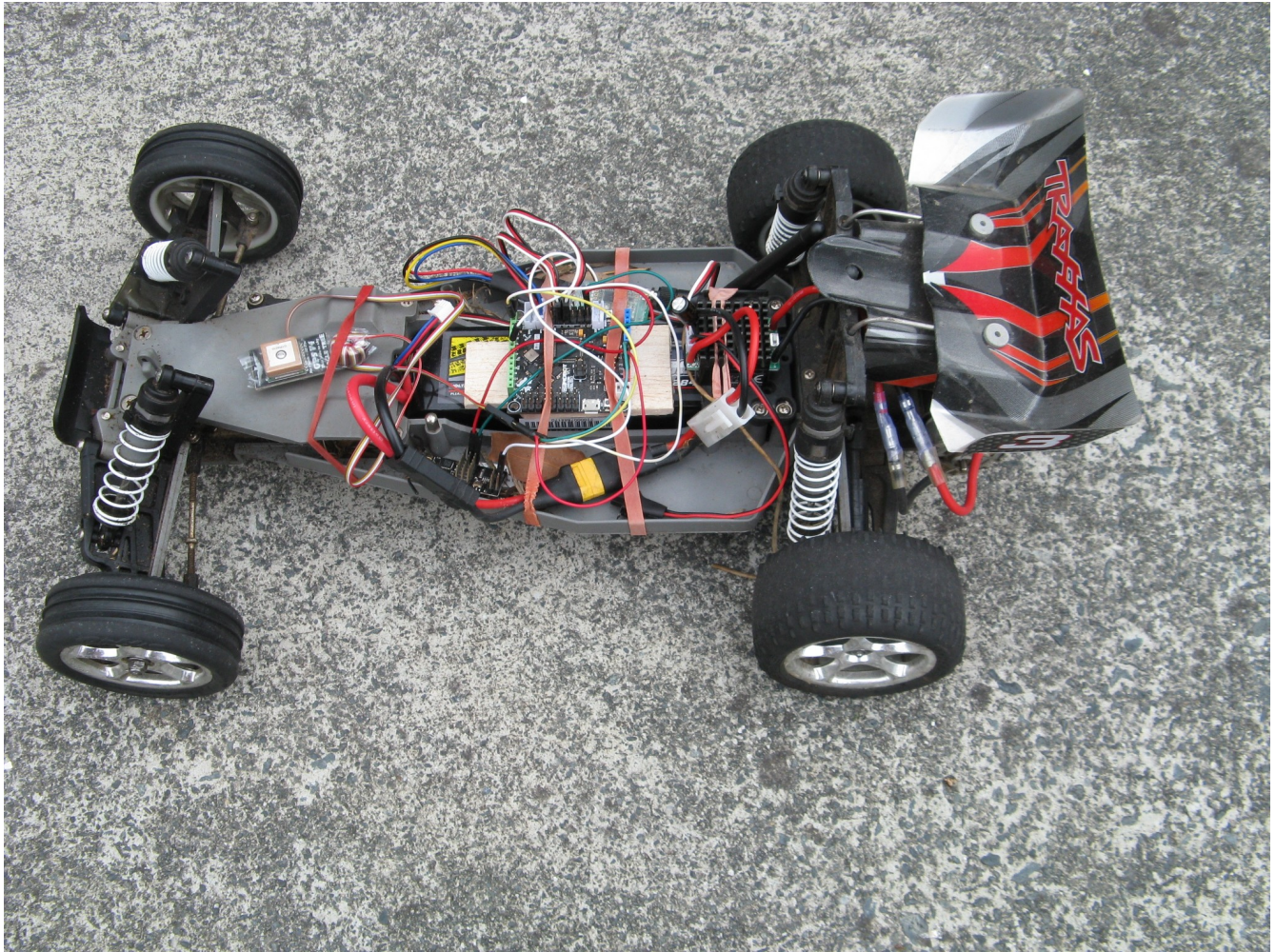
and in detail:

You will notice that the Flymaple has been mounted on top of the battery instead of on the platform at the front between and behind the front wheels (where the GPS is now mounted). This is because the magnetic field from the steering servo just under that platform interfered with the compass on the Flymaple if it was mounted there.

Configuration

I needed to make some changes to the default APMrover2 configuration to work correctly with my transmitter and rover:

AHRS_ORIENTATION   1

RCMAP_PITCH   1

RCMAP_ROLL   2

RCMAP_THROTTLE   3

RCMAP_YAW   4

MODE_CH   5

LEARN_CH   6

CRUISE_SPEED	3	m/s
CRUISE_THROTTLE	40	%
NAVL1_DAMPING	0.76	
NAVL1_PERIOD	10	
SPEED2THR_D	0.2	
SPEED2THR_I	0.2	
SPEED2THR_IMAX	4000	
SPEED2THR_P	0.7	