Firefly Flightplan

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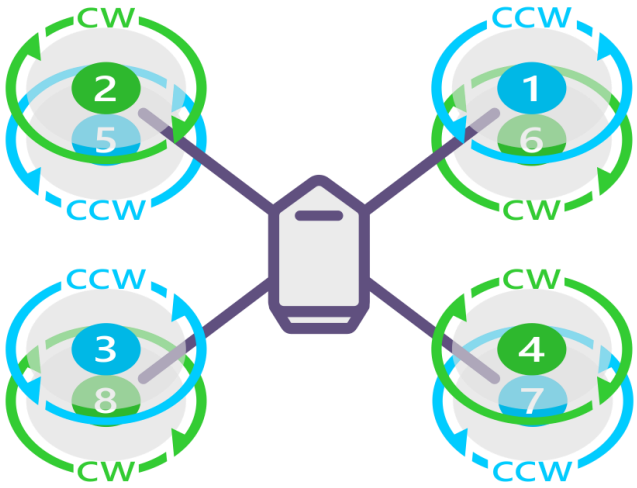
Remote Control and Flight Modes mapping

channel	Mode	Active when
6	Offboard	switch F is towards pilot
7	Kill switch	switch B is towards pilot
8	Default ctrlalloc	switch D is towards pilot
5	Stabilized	switch C is away from pilot
5	Position control	switch C is centered
5	Mission	switch C is towards pilot

Checklist of the day before the flight

- Charge ESC batteries and annotate its capacity
- Charge Pixhawk batteries and annotate its capacity
- Charge RC battery and annotate its capacity
- Charge router battery and annotate its capacity
- Charge grass cutter battery
- Charge powerbank for Raspberry Pi
- Check that we physically have the full list of materials
- Check general condition of the Drone (cables, landing gear, etc)
- Check if router has power and network is working
- Check power supply of Raspberry Pi
- Check if Raspberry Pi has connection to Pixhawk and network
- Calibrate all sensors -> preflight?
- Check that we can arm the vehicle
- Check spin direction of motors
- Check that log files are being saved

Spin direction of motors



Taken from https://dev.px4.io/v1.9.0/en/middleware/modules_command.html

```
mc_att_control stop                # if you don't do this, only rotor 1 will spin
fw_att_control stop                # if you don't do this, only rotor 1 will spin
motor_ramp sine 1100 0.5           # Needed first on Pixhawk 4 (Nov 2019)
pwm arm                           # arming the system
pwm test -c 1 -p 1200              #  -c channel (1 to 8) -p throttle
c                                 # to stop the test
```

List of materials to bring to the flight site

- Firefly drone
  - Airframe
  - Actuators = ESC + Motors + Blades
  - OBC = Pixhawk + GPS + RC radio + Telemetry radio
  - Connectors and voltage regulators to power up OBC
  - Ribbons to hold ESC batteries and blades in place (4 units)
- Batteries
  - ESC batteries (4 units)
  - Pixhawk Batteries (2 units)
  - RC batteries (2 units)
  - Router batteries (2 units)
  - Powerbank for Raspberry Pi (not available in the lab, but you can use any powerbank)
- Notebook with the following software and files
  - qGroundControl
  - File “flight_xxx.params“
  - File “flight_xxx.plan”
  - File “flight_xxx.fence “
- Ground Station
  - Micro USB cable + Telemetry Radio
- Remote Control
  - Futaba SN 13230504 (fully charged and configured to communicate with the Drone)
- Router
- Toolbox
  - Bubble level
  - Voltmeter
  - Battery checker
  - Compatible Torque Wrench = KDE-TW5030
  - Hexagonal key = 2.5 x 60 for blades (2 pieces if available) + 3.0 x 60 for motors
  - Screwdriver for GPS screws
  - Tapes = Blue Tape + Insulating Tape + Double contact + Aluminum tape
  - Marking pen
  - Wire stripper
  - Screwdrivers (Phillips and flathead)
  - Scissors
  - Pliers
- Spare parts
  - Propellers KDE-CF245-DP
  - Zip ties

- Grass cutter
- Fire extinguisher

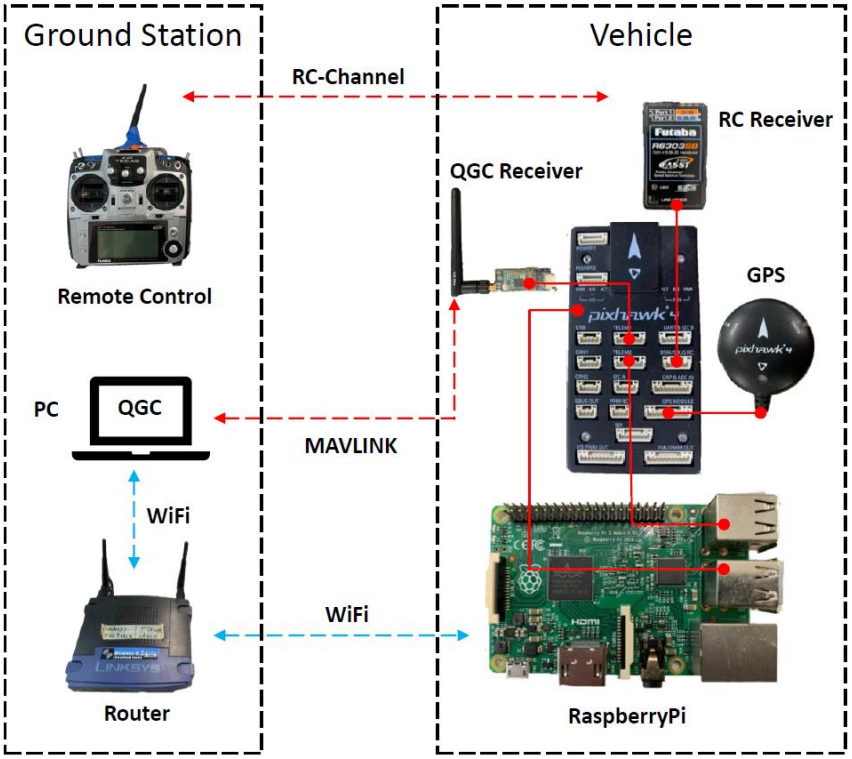
Checklist before the actual flight

1. Connect Router to battery
2. Open notebook and qGroundControl
3. Check if WiFi network “linksys” is available
4. Connect the 3DR radio to the Notebook using the USB cable
5. Connect RaspberryPi to Powerbank
6. Plug Pixhawk batteries
7. Wait for qGroundControl to connect to the Pixhawk and load info
8. Connect to RapsberryPi via SSH:
    - Username: avia1
    - Password: ros4avia
    - In PC terminal use: **ssh avia1@10.42.0.104** and type in password
9. Mount and fix ESC batteries (DO NOT PLUG THEM BEFORE ALL PRE-FLIGHT CHECKS ARE DONE)
10. Because the Firefly is heavy and big, two people should help to calibrate all sensors with a ROTATION_NONE configuration
    1. Gyroscope
    2. Accelerometer
    3. Compass
    4. Level Horizon
    5. Reboot after calibration

11. (If firmware has changed) Load to the pixhawk the “Flight_xxx.params” file and check
    - Multicopter Attitude Control
        - MC_ROLL_P, MC_PITCH_P, MC_YAW_P
        - MC_ ROLLRATE_P, MC_ PITCHRATE_P, MC_ YAWRATE_P
        - MC_ROLLRATE_I, MC_PITCHRATE_I, MC_YAWRATE_I
        - MC_ROLLRATE_D, MC_PITCHRATE_D, MC_YAWRATE_D
    - Multicopter Position Control
        - MPC_LAND_SPEED
        - MPC_TKO_SPEED
        - MPC_XY_CRUISE
        - MPC_XY_VEL_MAX

        - MPC_Z_VEL_MAX
        - MPC_XY_ P
        - MPC_XY_VEL_P, MPC_XY_VEL_I, MPC_XY_VEL_D
        - MPC_Z_ P
        - MPC_Z_VEL_P, MPC_Z_VEL_I, MPC_Z_VEL_D
12. (If using “mission mode”) Load “Flight_xxx.mission” file and check
13. (If using “mission mode”) Load “Flight_xxx.fence” file and check
14. Check RC connection to the Pixhawk and make sure that switches are detected
15. Engage Kill-switch
16. Select “Manual” mode and arm Pixhawk (troubleshoot any problem)
17. Disarm Pixhawk
18. Double check that ESC batteries are disconnected
19. Move vehicle to starting position
20. (If not already done) Mount blades
21. Perform a radio-range check for the RC radio and the Telemetry radio
22. Connect all ESC batteries and check that motors are armed (4 beeps plus 1 long beep)
23. Make sure custom control allocation is activated (Channel 8, Switch D)
24. Double check blade numbers and spinning direction of motors
25. Start data logger on RaspberryPi. (run command: **python3 ./data_logger/run_logger.py**)
26. Check that all connections are working (SUCCESS has to be printed in the terminal 3x)
27. Check for air traffic, humans, animals, birds, snakes, bears, etc.
28. Disengage Kill-switch -> check order of these items
29. Fly

Telemetry Setup



1. Connect router to battery
2.