

NFF Developer's Toolbox Quick Start Guide

The NanoRacks Feather Frame (NFF) developer's toolbox is a small collection of helpful resources to assist payload developers in creating their NanoLab experiments. Included in the toolbox are a couple files of sample code for a NanoLab experiment, and a Windows executable program that simulates the flight behavior of the NFF with additional documentation for its use and an accompanying data file.

The sample code in the `nff-sample.ino` file is written in the Arduino programming language and is a helpful starting place for developers in creating their own flight code. The example code provides all the needed functionality to properly connect to the NFF and continually receive and parse its data packets. All of the example specific portions of the code are clearly marked in the comments, and can either be replaced with the appropriate operations for the developer's experiment and uploaded to an Arduino microcontroller, or be easily ported to another C-based programming language and used on another microcontroller.

The sample code in the `nff-sample.py` file is written in python and has some specific instructions for running it on a Raspberry Pi Zero. Similar to the other sample code it can be easily modified to work on any device that can run python programs, and all of the example specific portions are clearly marked as such.

The `nff-sim.py` is the python source code for the simulator and is only included in case there are issues running the `nff-sim.exe` file that is in the simulator folder. To run the `nff-sim.py`, the `nff-packets.txt` file must be in the same folder, you must have python 2.7 installed, and you must have the `pyserial` library installed on your machine. The `nff-sim.exe` is a 32 bit Windows executable program built from the python source code and is designed to emulate the interface between the NFF and NanoLab experiments. The simulator connects to one or more serial devices provided by the user and then sends data packets corresponding to a nominal flight onboard the NFF. This simulator is meant to serve as a development tool for designing and testing NanoLab experiments. The following instructions will help get you started:

1. Navigate to the Simulator folder of the `nff-toolbox.zip`.
2. Consult the `README.md` for detailed instructions on usage and troubleshooting.
3. Connect your serial device to your computer and note the COM port.
4. Run the `nff-sim.exe` program and provide the COM port.

```
*****
**      Welcome to the NFF simulator      **
**      NanoRacks LLC                    **
**      Consult the README.md for        **
**      use instructions                  **
*****

Enter the ports to connect to: COM6

Successfully connected to: COM6

Press <enter> to start the simulation!
```

5. Press 'enter' to start the simulation. Once running, press 'q' at any time to quit, 'p' to pause, and the left and right arrow keys to speed up or slow down the simulation.

```
NFF simulation running..
Connected to: COM6

Sending packet: C,26.00,66.467000,3699.067000,22.338000,-1.094000,-0.166000,48.130950,48.074990,1.460310,-1.803120,-0.009954,0.004104,-0.029334,0.004500,0.004104,-0.016971,0,0,0,0

Flight event: liftoff
Experiment time: 26.00 sec
Altitude: 66.467000 ft
GPS altitude: 3699.067000 ft
Velocity:
  Up: 22.338000 ft/sec
  East: -1.094000 ft/sec
  North: -0.166000 ft/sec
Acceleration:
  magnitude: 48.130950 ft/sec^2
  x-axis: 48.074990 ft/sec^2
  y-axis: 1.460310 ft/sec^2
  z-axis: -1.803120 ft/sec^2
Attitude:
  phi: -0.009954 radians
  theta: 0.004104 radians
  psi: -0.029334 radians
Angular velocity:
  x-axis: 0.004500 radians/sec
  y-axis: 0.004104 radians/sec
  z-axis: -0.016971 radians/sec
Liftoff Imminent warning: false
Drogue Chute Imminent warning: false
Landing Imminent warning: false
Chute Fault warning: false

Simulation progress: [###] 4%

Current speed: x1
Press <- to slow down sim or -> to speed up sim

Press <q> at any time to quit or <p> to pause
```