When constructing the prototype drone, we must complete a number of tasks in order to test a fully working unit. Generally, each of the separate modules must be tested individually before being brought into the main build.

We will build a frame consisting of four main arms and a body, using a 3D printer to construct each of the elements. The electronics will be housed in the body, and the motors for the propellers will be on the end of each arm. The frame itself is relatively arbitrary for testing. Once we are certain that the electronics are adequately held in place, we can complete the building of the entire frame.

Electronic components are available in modules where available, such as the Arduino. This allows prototyping to be completed more easily, as there is no need to design our own circuit boards. However, there are some aspects of circuitry that can’t be made with simple interlink between modules. These parts will be attached to perfboard, which will allow for fast construction of electronics, and debugging during the construction phase.

When testing the stabilizing behaviour of the drone, tests will be completed on each of the units that contribute to working rotor function before being integrated into the build. First, the gyroscope/accelerometer will be tested with the Arduino in order to verify that the two modules are communicating. By moving the sensors about, we can verify that the data is behaving correctly. The Arduino can then be connected to electronic speed controllers, which will regulate the speed of the motors/propellers. Code will then be implemented that allows the feedback of the gyroscope to modulate the motor speed. The propellers will be held down to the workbench at this point, as they should be safely tested before being implemented into the frame. Once we have verified that the motors compensate for the position of the gyroscope, we can consider the system complete, pending stabilization testing.

We are then able to connect the second Arduino, which handles the Bluetooth communications. After uploading the code and connecting this Arduino into the circuit, we can test whether commands we send are capable of changing the motor speeds as expected.

We can then integrate the electronics into the frame itself. This will allow us to test whether or not the drone can be kept stable. By carefully holding on to the drone at a height, and slowly letting it go while monitoring its behaviour, we can ensure that the drone is able to stabilize itself. At this point, we can experiment with software values for the PID to achieve re-stability from multiple angles of orientation.

Once stability is reached, still carefully monitoring the drone, we will send commands through Bluetooth to slowly move the drone. This will finally ensure that our drone works to specification. We can then move on to testing the behaviour when a weight is being carried by the drone.