Preflight Checklist for the Piccolo Autopilot System

- ☐ Check and record initial battery voltage and current.
- ☐ Configure map page as required for the mission.
- ☐ Verify and/or load flight plans
- ☐ Verify correct controller settings.
- ☐ Verify mission limits including deadman status and lost comm waypoint.
- ☐ Verify working aircraft GPS, check number of satellites and PDOP.
- ☐ Set altimeter to local base pressure, or choose GPS update.[i]
- ☐ Select manual control and verify manual control indicated in autopilot page.
- ☐ Verify control surface trims in manual mode. Adjust using pilot console.
- ☐ Verify manual control, both magnitude and direction, for all control surfaces.
- ☐ Verify the reported control surfaces match the actual control positions.
- ☐ Check air data readings and zero them if needed.[ii]
- ☐ Check the correct operation of the gyros and accelerometers by physically rotating the aircraft and verifying the sensor outputs[iii].
- ☐ Verify that the pitot tube is clear by blowing into it and seeing the airspeed response.
- ☐ Set the initial fuel weight or battery charge state of the vehicle.
- ☐ Configure the autopilot loops as needed, typically all auto, with the waypoint set for the launch plan.
- ☐ Start the engine and verify correct operation through the entire RPM range. Check sensor readings for signs of excessive noise due to engine vibration at different RPMs.
- ☐ Check communications at the far end of the runway strip. RSSI signal should indicate close to the maximum reading (-71 dBm)[iv].
- ☐ Check for aircraft traffic and make any radio calls mandated by air traffic control.
- ☐ Final check on the system: Battery voltage and current, GPS health, RSSI, and sensors.
- ☐ Takeoff and start watch or timer.

[i] The altimeter base pressure, also called the altimeter setting, is the atmospheric pressure *at sea level* for the current location. It is typically available from the local airport or weather service. If you don't know the base pressure than use 101325 Pa or 29.92 in-Hg, which is standard pressure. You can still zero the altimeter, but you won't be able to update the base pressure once the aircraft is flying, hence the barometric altitude will drift with the atmospheric conditions.

[ii] When zeroing the air data sensors the vehicle must be not moving, with the pitot tube shielded from the wind (or, at least, turned 90° from it). Ideally you want to wait approximately five minutes after turning the system on before doing a sensor zero. This gives the avionics time to equilibrate in temperature; which will result in the best sensor zero. You do not have to always perform a zero but you should do so if the dynamic pressure is off by more than 15 Pa.

[iii] To verify correct gyro operation rotate the aircraft nose right and nose left. Verify the yaw rate sensor indicates positive and negative values respectively. Rotate the aircraft nose up and nose down. Verify the pitch rate sensor indicates positive and negative values respectively. Rotate the aircraft roll right and roll left. Verify the roll rate sensor indicates positive and negative values respectively.

To verify correct accelerometer operation note that when level the X, Y, and Z accelerometers should read 0,0, and –1 g respectively. With the vehicle rotated 90° right wing down the X,Y, and Z accelerometers should read 0, -1, and 0 g respectively. With the vehicle rotated 90° nose down the X,Y, and Z accelerometers should read –1, 0, and 0 g respectively.

[iv] RSSI is the receive signal strength indicator. It is reported from the radio in units of dBm, and ranges from –71 to –115. –71 is the maximum reading. Communications performance will begin to degrade when the RSSI reaches –101 or lower.