**Fuselage Wind Tunnel Test 6th March 2023**

* We zeroed everything, and set up the fuselage in wind tunnel
* With no wind, we changed the pitch angle in increments of 5 degrees in the range –10 to 30, tracking changes in weight distribution
* Turning on wind, we incremented wind speed by 5 m/s
  + 5 m/s - no issues
  + 10 m/s - slight wobbling on HTP
  + 15 m/s - more wobble
* Fixed the wind speed to 15 m/s due to tail plane flexibility
* Sweep of different elevator angles: 5, 10, 15, and 20, positive and negative
* Logged data with elevator angle at zero, changing fuselage pitch angle in 5 degree increments from 20 degrees nose down to 20 degrees nose up
* Set fuselage free in pitch (retracting pitch angle ram), bringing wind speed up to 15 m/s
* Actuated elevator and observed changes in pitch angle. Elevator angles: 6, 10, 15, 20
* Simulated a step input impulse (Steve hits the tailplane with a stick) and observed recovery, with and without PID
* With elevator turned off, the fuselage recovered very quickly, which means the fuselage is very aerodynamically stable
* With PID, strangely, more instability was observed (perhaps due to the PID demand being servo input, not elevator input)
  + Using a proportional gain of 45, we observed very unsteady behaviour
  + Using a P gain of 4.5, the recovery was better, but there was very little elevator movement to begin with
  + P gain of 9 also showed slight movement in the elevator, but seemed to be slightly less damped than with no PID
  + P gain of 15 showed a fairly good recovery
* We suspected that the issue was with PID overshoot, so we used derivative gain as such:
  + P gain of 6 and D gain of 21 – still showed signs of overshoot
  + P gain of 15 and D gain of 5 – better but still not great
  + P gain of 15 and D gain of 10 – same as above
  + P gain of 15 and D gain of 50 – this was unstable
* We then tried using only the derivative gain, with no proportional or integral gain, with D gain values of 15 and 20