

Department of Electrical & Computer Engineering

Airborne Sampling/Sensing of Distal Volcanic Ash

Project Group Meeting #17

Minutes

**Minutes of the weekly meeting 12 August 2016**

**Present:**

Maan Alkaisi, Adrian Weller, Jamie Van de Laar, Jake Campbell, Parth Thakur, Mike Shanaher, Ryan Taylor

**1. Apologies:**

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**2. Minutes from last meeting**

* (look at Minutes, July 29 2016)

**3. Matters arising**

* Wind tunnel testing by Parth and Ryan:
  + Injected AC test dust through a tube with holes drilled through it.
  + Only tested for a few seconds, got dust deposit on outside of jar.
  + Tested at approx. 8m/s, but should test at 5 m/s
  + Need to test for longer and see if ash collects inside jar.
* OPCN2 flow rate/pressure testing by Jamie:
  + Correct way to measure pressure drop shown in email.
  + Can use jars and dust to verify flow rate (OPC flow rate reading seems unreliable).
  + Probably better to do some testing in chamber with housing off for unconstricted outflow.
  + May need the outlet unconstricted in the airframe too.

**4. Correspondence**

* All are CC’d in emails

**5. Progress Reports:**

* Ryan Taylor
  + Talked about personal air samplers (info sent through by Adrian)
  + Too late in project to bother buying one but DTA may buy one in future.
  + Inlet design of sampler is important.
  + Smoothing inner surface of cyclone could be useful – could use acetone?
  + Sampler and sensor could be in series, although sampler needs air forced through and sensor doesn’t (this is bad).
  + If cyclone doesn’t work could look again at using SEM carbon tape – could use heat loss from components (e.g. radio) or heat by applying an electric current through the tape so it remains sticky.
* Mike Shanaher
  + Can graph ash data in ground station but not in real time.
  + Standard telemetry data can be graphed in real time, working on being able to graph ash data in real time too.
  + If it becomes a problem, may look at using other ground station software.
* Jamie Van de Laar
  + George has a high volume pump/flow meter/filter arrangement that we could use to verify ash concentration in chamber.
  + Need to know assumptions that the Opacity Meter uses to calculate the mass concentration – i.e. particle density, refractive index.
  + In the final solution, need to send down and/or store on-board ALL data from OPCN2 for particle size distribution.
  + Going to look at being able to graph particle distribution for chamber testing.
* Jake Campbell
  + Looking at power/energy requirements – Raspberry Pi requires more power than Pixhawk, but may be able to turn off unnecessary peripherals.
  + Obviously, most power consumed by motor.
  + Total energy requirement for a 1 hour flight would be 260Wh.
  + Also looked at flight modelling/glide ratio code from last years project.
  + Calculated glide ratio of 3/1, i.e. for an altitude of 10km, can expect to travel 30km horizontally. This assumes journey back is into a headwind (balloon traves downwind).
  + Mini Talon not hugely ideal for long range flying, would probably want to look at another airframe for long range testing, these are relatively cheap anyway.
  + Being able to be heavier would be better – for wind penetration and if other gear (e.g. parachute) is required. Balloon can carry up to 4kg anyway.
  + Adrian is waiting to hear back from CAA about being heavier than 2kg, and about parachute etc. failsafe requirements.
* Parth Thakur
  + Need a 10mV source for electrostatic sensor circuit.
  + Could use a voltage divider but not ideal, might be able to use an adjustable regulator.
  + Planning to test in wind tunnel – could test in chamber but not ideal as need a high flow of ash past plate.

6. **Other business:**

* Maan:
  + Need 2 paragraphs for oral presentation abstract, one on overall project target/aim, and one on our progress.
  + During inspections on 16 September, examiners are looking for testing results/physical prototypes etc.
* Adrian:
  + Should also think about tether release and parachute, how these could interface with the system.
  + Mike and Jamie noted these could be controlled using GPIO pins or servo (PWM) outputs
  + Need to get on to wind tunnel testing!

**Meeting ACTION LIST**

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| **ACTION** | **ASSIGNED TO** | **DUE DATE** |
| Wind tunnel testing | Whole team | ASAP |
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**Next meeting date: 19th August 2016, 10.30am**