Necessary

High priority

Low priority

**Clarify**

Functionality

* AHRS/INS data recorder that works in an aerobatic plane - note that many commercial AHRS systems don’t work well for aerobatic planes //necessary -- focus on kenn’s plane first
  + Ken, Steve, Jim, Tomas
* Visualization of flight after the fact from the judge’s position
  + Ken, Steve, Jim
* Record pilot inputs to be able to correlate with aircraft position after the flight - See the difference between actual pilot inputs and what the pilot thought they were doing
  + Ken, Jim, beginner pilots
  + Steve thinks this can be determined from the ground viewpoint
* Easy to install
  + Tomas, Steve, Jim, I assume Ken as well
* Easily removable, take it out of the plane, maybe put it in another plane
  + Tomas, Jim
* Don’t need to interact with it during flight
  + Tomas, Steve, I assume Ken and Jim as well
* **Record values from the dashboard dials - especially airspeed(higher than other high priority)**
* Record video from the cockpit to share online (possibly with auto-editing features, possibly 360/VR format)
  + Jim, Steve
* Real-time data processing and alerts based on location in bounding box in competition
  + Tomas
  + Steve also thinks this is interesting
* “Affordable-ish”
  + Jim
* Automatically recognize which figure the pilot is flying
  + Tomas, although he said this is very low priority

Restrictions

* Won’t become detached during aerobatic flight and hit the pilot //avoiding sticking into the control pedal.
  + Note: Steve and Jim removed some of their equipment during flights because they were worried about this
* Temperature - commercial spec., what a human could withstand
* G-force - withstand up to 15g
* Handle condensation due to pressure change // vibration
* No modifications to the plane
* AHRS/INS equipment needs to be able to handle the unusual maneuvers in aerobatic planes, specifically the quick change in attitude that is not present in normal flight models
* Works for 30 mins (usb/12v lighter). // the supply is not so clean

Conclusions

* **Definitely need to provide AHRS/INS** that works in an aerobatic plane(check if inverted) //RNA code //Opensource AutoPilot //PX4 txoc //cube 6 <https://docs.px4.io/master/en/hardware/porting_guide.html>   
  <https://dev.px4.io/v1.11_noredirect/en/qgc/video_streaming_wifi_broadcast.html>
* The flight data is kind of useless if we don’t do anything with it. **We should provide a visualization.**
* Definitely need a strong mounting solution so stuff won’t detach during flight
* Stuff that’s probably optional:
  + Sharing the flight data socially - either a video from a cockpit camera, or a flight log
  + Detecting which specific maneuver the pilot is doing at each point in the flight

Open questions (the main ones)

* Whether or not to record pilot inputs - probably depends on market composition and ease of recording it
  + yes
* Whether to process data real-time for the bounding box - this feature might only be useful during competitions, of which there are only 3-5 per year per pilot
* What resolution of data do we need? Specifically, how frequently should we collect data points on position and orientation, and how accurate do those need to be?
* Whether to focus at all on the social aspect of aerobatics - i.e. sharing flight experiences online

Required components

* AHRS
* Camera(s)
* Storage

Loop

Slow roll

Hammerhead

Spin

* Data collection:
  + GPS will give a max of around 20Hz
  + Accelerometer can do >1000 Hz
  + Ideally, data collection is ~500Hz
  + Visualization can be down to 20Hz
* <https://bostonu.zoom.us/rec/share/xE99zQoSrHpAvcUR5SPNvYzxy89kXlNANJFEf78YNuIupK7KFa2EQYez2YGip4Vv.L6XQH4b1-JL6ay9T> (Password: u=Vr$8bU)