Hi, Pai--

I'm pleased to be working with you as well. Please find the answers below.

I would suggest we have an online call at some point soon. We have a remote group of 4 aerobatics pilots and engineers who will be able to answer some of your questions in more detail.

1. Should the “visualizing system” be operating during the flight or on the ground (after the flight) and should it be operating totally online?

After the flight. What portion of the system were you thinking would run online?

1. Could we have a more detailed description of the constraints, including:
   1. What size and shape of cockpit should the device fit in?

I think in order to fully answer this question it would be best to visit the airport where you can look at 3 or 4 different aerobatic airplanes. Cockpits vary by the plane, but there is always some kind of baggage compartment which could house instrumentation.

1. Under what temperature and g-force should it survive?

Storage temperature: -40C - 50C

Operating temperature: 0C - 40C

G forces: -5G to +10G, with a demonstrated 1.5x safety factor (e.g tested not to fail between -7.5g and +15g)

1. What power source is available? Does the device need to be powered by a battery?

There is a 12V power bus available.

1. For what duration of flight should it operate?

Threshold: 15 minutes

Goal: 30 minutes

1. Will the airplane be embedded with INS and AHRS? Will we read this data from an existing INS or AHRS system on the plane, or will we need to create our own INS and AHRS?

You will have to install an INS/AHRS.

It's important to mention that FAA regulations-- as well as good sense-- prevent us from modifying the airplane's instruments. Existing instruments can be read in non-invasive ways, such as with machine vision.

1. What are all the ways to observe pilot input and instrument output? Are there any ways to measure these besides mechanically or optically?

Regarding instruments, this depends on what is being sensed. For instance, engine RPM could be measured acoustically, by monitoring the EMI from the spark plug, by magnetic tachometer, etc...

However, the pilot controls are purely mechanical, and so will have to be observed either via machine vision or via additional sensors.

1. Will this be used in a specific plane, or should it work in multiple models of planes?

The reference plane is [N275AC](https://scontent-lga3-1.xx.fbcdn.net/v/t1.6435-9/162547651_203652684888432_8708922270528117242_n.jpg?_nc_cat=101&ccb=1-5&_nc_sid=e3f864&_nc_ohc=4mTJ1sg6SncAX9FfWHU&_nc_ht=scontent-lga3-1.xx&oh=dcc888f291f33f7cb520866b0d3db4b1&oe=617B4EBF), a Citabria 7ECA. The secondary targets are the [Pitts Special](https://th.bing.com/th/id/R.5c0ddcd1b1c04d60a2bd1f8b808bed8d?rik=KC7kf%2fqsWyYkOw&pid=ImgRaw&r=0), and the [Slingsby T67 Firefly](https://en.wikipedia.org/wiki/Slingsby_T67_Firefly).

1. How many of these boxes should be created? Will there be one custom-designed one, or will this be a more general product with multiple units produced?

Threshold: 1 unit

Goal: a design which can be reproduced by the average pilot

1. What are all the input devices (levers, buttons, etc.) that the pilot interacts with when flying the plane?

The primary controls of interest are the throttle (engine power), the flight stick (roll and pitch), and the rudder pedals (yaw).

1. What will this data be used for?

More accurate judging of aerobatic flights, as well as general telemetry and logging in the GA (General Aviation) fleet.

Finally, for more clear understanding and higher efficiency, could we set up a time to meet and discuss the project in more detail?

Is your team available to come to Mansfield Municipal Airport (1B9)? This Saturday would be an ideal time.

Regarding transportation, 1B9 is just off the Providence MBTA line. Several times a week, I ride the train to Mansfield and from there take a nice stroll down the bike path.

All the best,

Kenn Sebesta

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