Meeting with Scott Miller and Geno Pinczewski, General Atomics

8:30AM MST (9:30AM CST) Thursday, Jan. 21, 2021

Anticipated outline of meeting

Introductions

      Introduce team members, Geno and Scott from GA

Project

      Discuss NDA

      Discuss goals, requirements, constraints from project description

            Clarify Item #5: *"The center of gravity of the fixture, without the CubeSat but with the fixture mounting features in the approximate location where the CubeSat matches the center of gravity position, to match the center of rotation for the spherical bearing to minimize the effect of the fixture upon the third (3.) requirement."*

      Questions about the project

            How quickly does the satellite move in rotation and in tilt? (impacts design weight, moment of inertia, etc)

            Does the mount need to *prevent* falling, or just not *cause* falling?

            Adaptable to 3U and 6U: 3U has different mounting rails?

            Nonmagnetic components – not attracted to magnets, or not producing their own field?

      Discuss previous team's work

            Materials (plywood, aluminum extrusions, air motors, Arduino, steel(?) lead screws)

            Active, electrical control of weight positions

                  Arduino, solenoids, force transducers

                  Is this needed? Once the CG is set, why does it need to move? Why use sensors? Can it be set manually?

            Weight (½" plywood, concrete weights, lead screws, etc)

            What were its strengths/weaknesses, what requirements did it meet, what needs to be addressed?

      Budget (Omen)

            What is budget?

            How does funding work?

Timetable

Strategy moving forward, next steps to complete

Questions for us

Thank you and we look forward to working with you!

Meeting notes (Sean):

Meeting available every Thursday morning

Not req every week, email Scott if meeting is not needed so he can cancel it

GA staff on call, introductions

Geno

Manages design engineers in Huntsville, Tupelo, etc

Scott

Test engineer for EMS Huntsville

JT

Test engineer for sat program?

Robert Oakley

ME, sat programs, others

GA satellite program

10 satellites to be put in orbit in next year or two

Next week:

Scott will send "charts explaining design problem", solution they're looking for

Function of bearing, bearing mount:

Testing: Energize inertial wheels in sat to check "sign convention" e.g. Inputting CCW about Y does as expected

Adjust CG "depending on where the payload is" for a given satellite etc.

CG is in maximum envelope described by CubeSat requirements

No "on-the-fly", mid-test adjustment needed

CG position varies from satellite to satellite

Bearing provides "as near a frictionless, free environment as possible" for tests

Last team's design:

Uses sensors to auto translate weights during set up, air hoses are disconnected for testing

Did not feature on-the-fly, automatic control as we previously thought

Last team was "in the process of making a crude prototype"

Now, "How do you implement the design?"

Look at design, do we agree with their approach? Tweak? Redesign?

Scott: "I think probably tweaking"

Better define operational procedures, eg instructions for use

Mount CG position:

Colocate with CR of bearing to ensure removing CubeSat does not cause bearing, mount to topple off stand

CubeSat design, layout, specifics

Typ. mounting inside canister for launch

Planetary Space Systems Corporation CSD "Canisterized Satellite Dispenser"?

https://www.planetarysystemscorp.com/product/canisterized-satellite-dispenser/

Specs, requirements: https://www.planetarysystemscorp.com/wp-content/uploads/2014/07/2002337F-CSD-Data-Sheet.pdf

Sat has "keep out zones" for access panels, our mount cannot obscure these

Our system is designed for 12U sats

Nonmagnetic — may not produce field, assumed ferrous is acceptable

Arduinos, etc: Magnetic field acceptable? Geno says he is unsure, they will check

Investigate how to minimize field

Q: Is there a maximum threshold of field strength or are we just to minimize the field as much as possible? Scott: "Just minimize"

NDA coming soon by email, sign and return

We will be working with classified information, cannot share outside of ourselves, GA, instructor etc. As needed

Weight

As with mag field: Minimize weight, no "limit" per se, just minimize impact on dynamics

Threshold of mass: Air bearing capacity

This limit is a "Larger number than ideal", but provides an absolute maximum upper-bound

CG adjustment

Not locked-in to auto or manual adjust, automatic as with last team "is a nice feature"

Anticipated budget:

GA provided a "gift" to NAU with the "unwritten understanding" of GA providing projects of interest to students

"Gift" is limit you can spend, previous team used funds from this same amount

Ask Dr. Oman, Scott believes this is ~$5,000

"If you're at a point where you have a concept but no money to execute it, we can discuss that"

Mentioned GA potentially manufacturing things – assumed not sending to NAU, then sending back, probably just for them to mfg and construct there

This week, next week:

They will forward info provided to last team, design problem etc

"Use Wednesday *[Thursday?]* to answer questions going into details"