

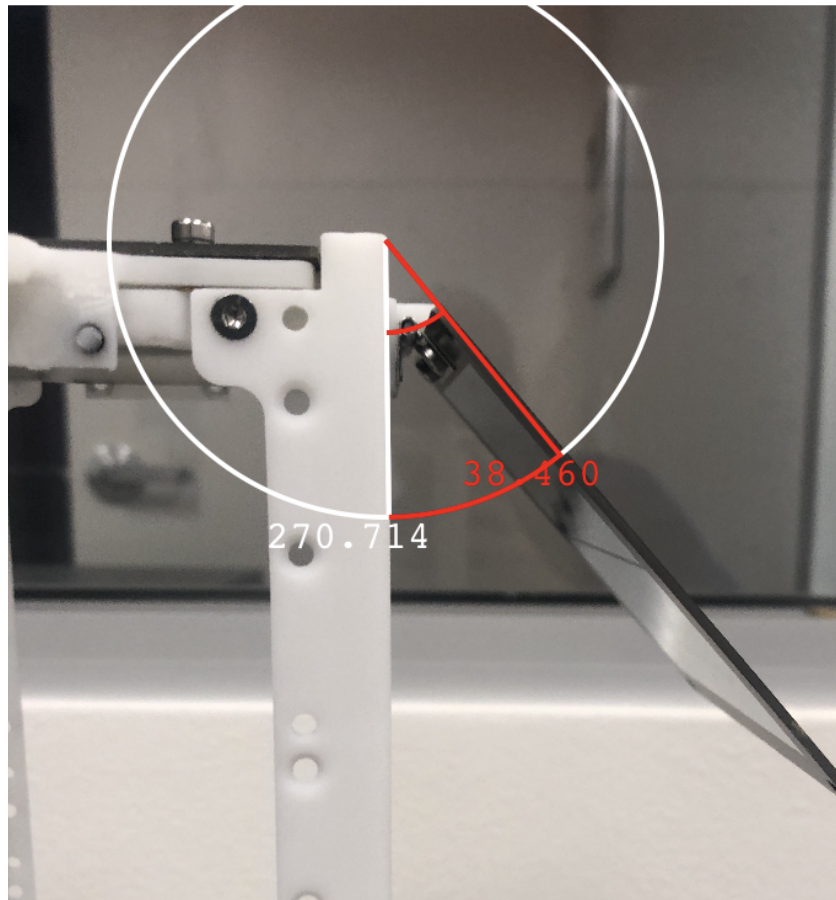
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**Jaime's payload deployer hinge design testing**

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**1. Overview**

As part of the trade study to determine what kind of payload deployment mechanism we'd like to use for the DORA panels, Jaime made a mock model with some basic hinges. There are 2 hinges on the model, on adjacent sides. I wanted to test the accuracy and reliability of the hinges by measuring the panel's deployed angle over multiple trials. To mimic deployment, I held the panel down against the body for 10s before releasing it as quickly as possible. I then measured the angle between the body and the panel using my phone camera and a protractor app. I always placed the vertex of the angle at the top corner of the body, with the starting line going straight down the body edge. The other angle line was placed at my best approximation of parallel to the panel and through the middle of it. There is likely a lot of error in my method of measurement.



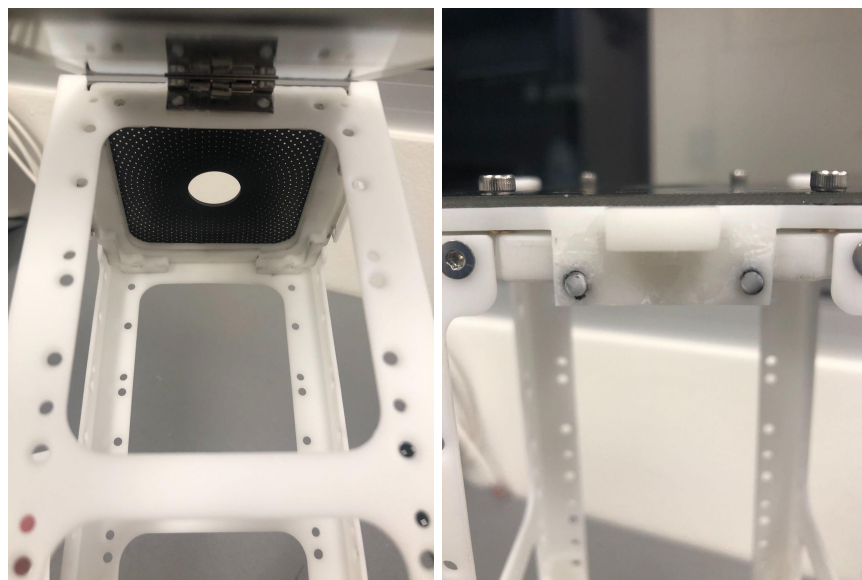
**Figure 1: Method of measurement**

## 2. Results

	Hinge A (no braces)	Hinge B (braces)
Trial #	Angle (deg)	Angle (deg)
1	31.763	38.524
2	31.379	38.198
3	31.934	38.585
4	broke	38.46
5	---	38.074
St Dev	0.2842305402	0.2209212529

Let's look at the complete data of Hinge B first. We see a pretty consistent deployment angle of 38 and some degrees, with a standard deviation of only 0.22 degrees. There is also no apparent pattern that would suggest repeated deployments will decrease the reliability over time, since the 5 trials fluctuated back and forth instead of having a consistent trajectory. I would be interested in seeing this repeated with the harder materials of the bus structure, instead of the plastic that's used in the model.

Hinge A, on the other hand, had quite a hiccup. On my 4th trial, the hinge and panel completely separated from the bus structure once I released it. This would obviously be a critical error in our operations. However, the hinge was not secured to the bus structure very well. It was basically just resting on a couple of protrusions and not secured down. I think this should be retested with the hinges actually bolted into place, so that we can evaluate if this will happen under real conditions.



**Figure 2:** *Left:* hinge attached to plastic pegs. *Right:* plastic pegs where the hinge was separated.