OPEN SOURCE SATELLITE

Launch Vehicle Payload Envelope Analysis

Rich Tait, OSSAT Collaborator

June 2021

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Why are Launcher Envelopes Important?

- Spacecraft experience the harshest mechanical environment during launch.
- The mechanical environment can be described across several envelopes:
  - Quasi-Static Loads
  - Random Vibration
  - Acoustic
  - Shock
- Envelopes feed the preliminary design and verification of spacecraft.

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Launch Vehicles

- The analysis extends to the following launch vehicles:
  - Space X Falcon 9
  - Rocket Labs Electron
  - Virgin Orbit Launcher One
  - Firefly Alpha
  - ABL RS1
  - Soyuz
  - ArianeSpace Vega C
- Envelopes have been overlayed to allow an overall envelope to be defined for the OSSAT solution.

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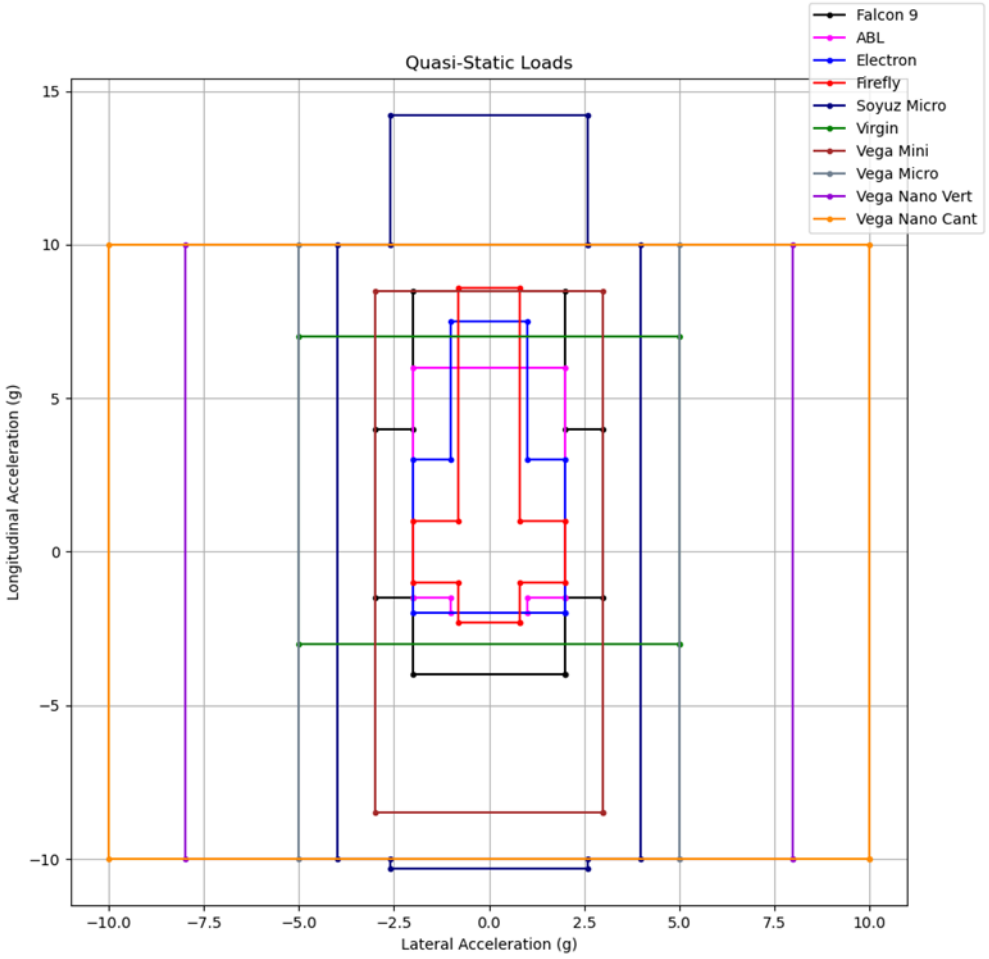
Quasi Static Loads

- Combination of steady state and low frequency loads.
- Mainly concern the primary structure.
- Includes handling loads.



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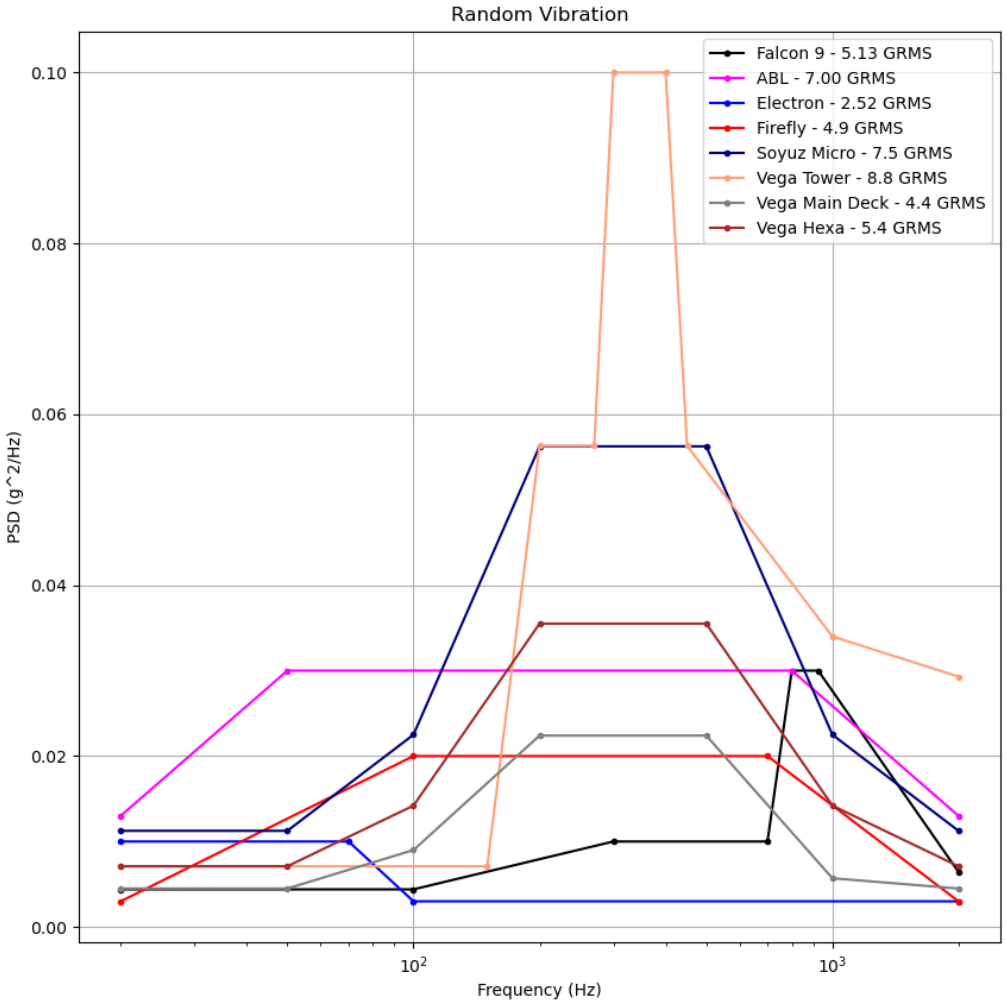
Random Vibration

- Statistically repeatable between launches.
- GRMS gives the overall intensity of the launch.



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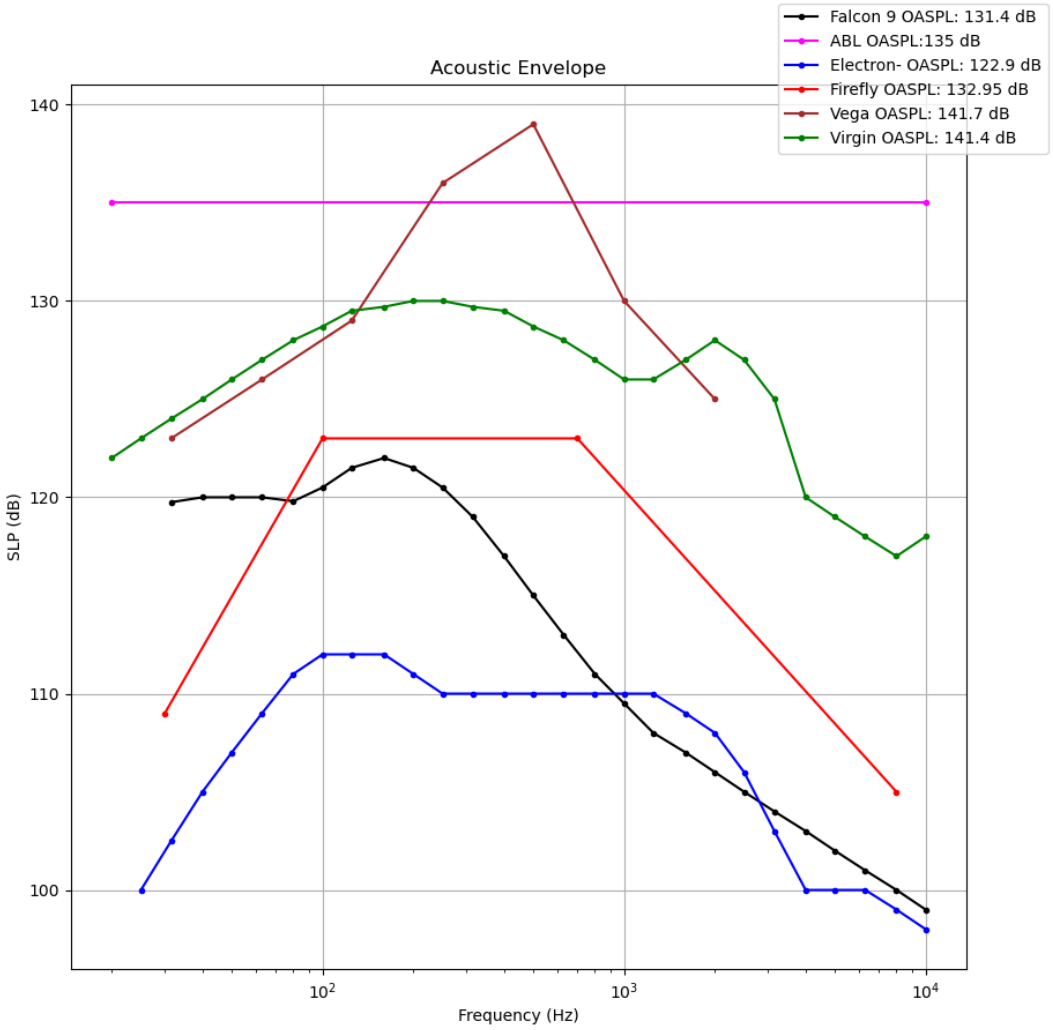
Acoustic

- Acoustic loads are incident on the exterior panels of the spacecraft.
- OASPL gives the overall intensity of the launch.



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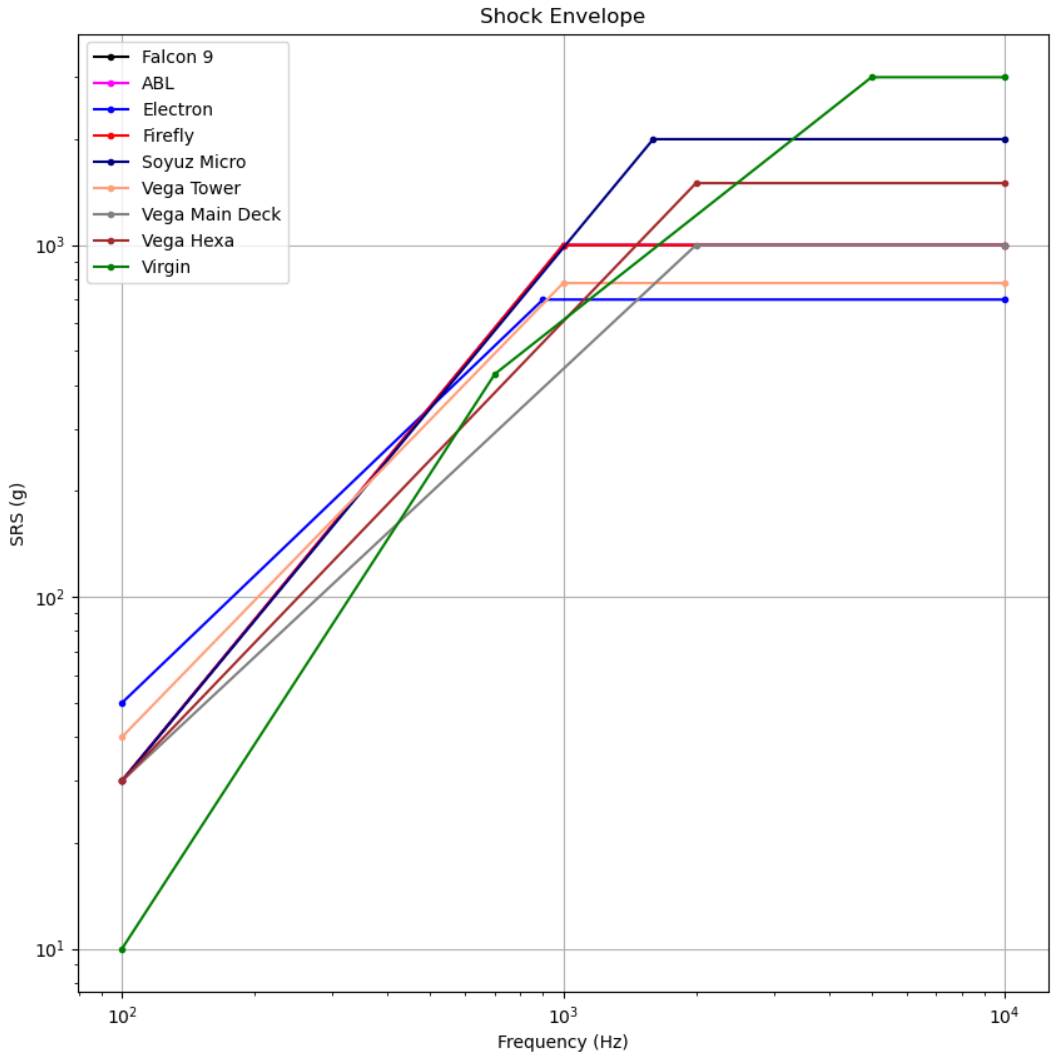
Shock Loads

- Caused by events such as stage separation and payload separation.



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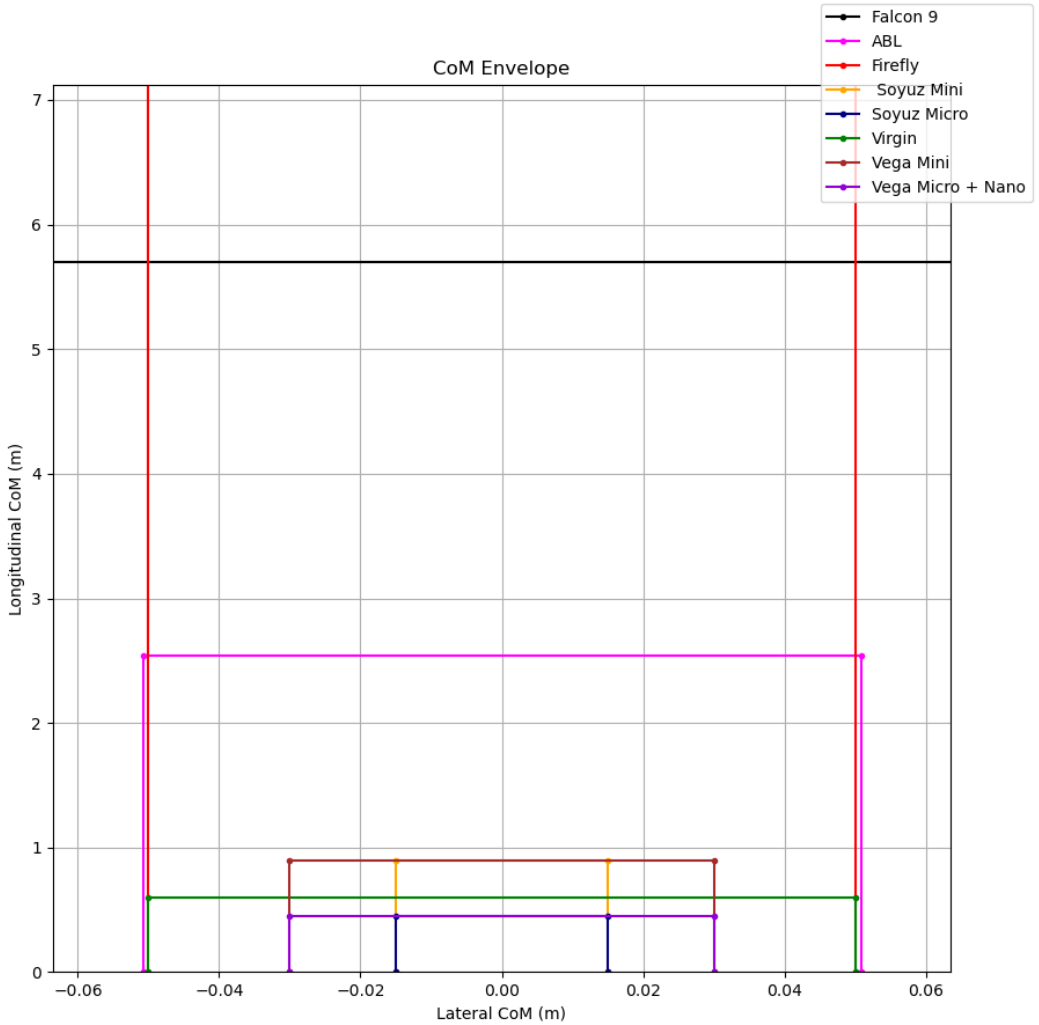
Centre of Mass

- The CoM of a spacecraft must remain within specified limits to keep the launch vehicle stable.



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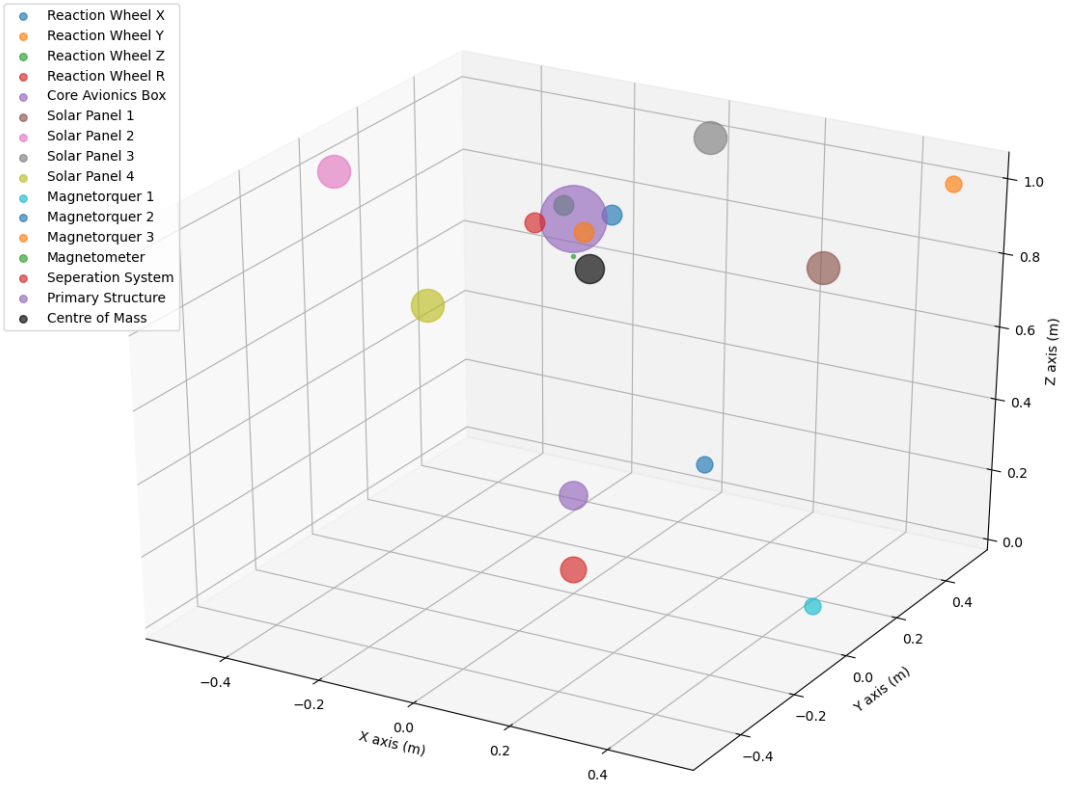
Tools

- Envelope plotter
- CoM finder / plotter
- Both have been compiled into an executable.
- Both make use of csv config files.



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Building A2, Cody Technology Park,
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