A blue letter p on a black background

AI-generated content may be incorrect.

Connor Major

20755762@student.curtin.edu.au

*Logbook*

|  |  |
| --- | --- |
| **Date** | **Work Accomplished** |
| **2/04/25** | **Preliminary work & general advice**   * **Set up a git repo for my project** * **Set up logbook** * **Sought advice from a BINAR member in my tutorial class for AERO3000 about general design considerations (usage of single materials, avoiding outgassing materials, fasteners to avoid, thermal considerations to make, and general design directions re: internal structure)** * **Obtained JAXA specs, previous design files and design specifications from a mechanical member (Sam)** * **Set timeline to have deliverable 1 done and deliverable 2 started by next week** |
| **6/04/25** | **Deliverable 1 draft**   * **Began work on deliverable 1** * **Took notes on relevant JAXA specs both as summary and verbatim in a text file** * **Set timeline to review and have notes satisfactory by next week’s meeting** * **Set goal to have CAD process practiced** * **Noted some points to be clarified for the Cubesat structure requirements, to define the scope of the design. Chiefly, requirements such as access windows, rails needed and deployment are mentioned in the JAXA specs**   **Noted additional specifications referenced in JAXA specs to follow up on: MSFC-HDBK-527F: MATERIALS SELECTION LIST FOR SPACE HARDWARE (JSC-0904F) JMX-2012694 Structure Verification and Fracture Control Plan for JAXA Selected Small Satellite Released from J-SSOD** |
| **7/04/25** | **Deliverable 1 draft**   * **Reviewed and updated deliverable 1 text** * **Received and reviewed the design documents for the current design from Samuel** * **Updated my copy of inventor to the latest version, to be able to open the current design files** * **Followed up on previously noted add’l specifications and updated deliverable 1** |

|  |  |
| --- | --- |
| **9/04/2025** | **Week 3 Workshop**   * **Attended Week 3 workshop** * **Updated inventor, again. (Woo….)** * **Updated my design drawing template as part of updating inventor to meet standard Australian guidelines** * **Finished deliverable 2** * **Received guidance on later deliverables regarding the resolution of required design, assumptions.**     **Design Template**  **Updated github with Deliverable 1**    **Sample of Deliverable 1** |
|  | **Updated Inventor and made a test model + drawing**  **FEA learning [list resources]**  **Add sc’s for all Formatted Deliv. 1 as .md file** |
|  | **Researched different approaches to cubesat structure**  **Took notes**  **Began research document**  **Asked team members about research document** |
| **11/04/25** | **Researched conceptual designs for cubesats**   * [**https://pressbooks-dev.oer.hawaii.edu/epet302/chapter/4-6-structural-analysis/**](https://pressbooks-dev.oer.hawaii.edu/epet302/chapter/4-6-structural-analysis/) * [**https://www.researchgate.net/publication/317209080\_CubeSat\_System\_Structural\_Design**](https://www.researchgate.net/publication/317209080_CubeSat_System_Structural_Design)   **Read and took notes on NASA cubesat structures documentation**   * [**https://www.nasa.gov/smallsat-institute/sst-soa/structures-materials-and-mechanisms/**](https://www.nasa.gov/smallsat-institute/sst-soa/structures-materials-and-mechanisms/) * **6.2.4 particularly relevant** |
| **13/04/25** | **Researched COTS cubesat designs**   * **EXA KRATOS 1U platform** * **Pumpkin CubeSat Kit** |
| **16/04/25** | **Week 4 Workshop**   * **Further work on deliverable 2** |
| **23/04/25** | **Week 5 Workshop**   * **Further work on deliverable 2** * **Investigated AlAinSat-1** * **Worked together with Thomas Unipan. Had him go over my design notes** * **Investigated Greek cubesat** |
| **27/04/25** | **Made first 2 designs. Wrote selection criteria for my designs** |
| **30/04/25** | * **Week 6 workshop** * **Reviewed concepts with Sean** * **Began first CAD concept (ran out of time)** |

|  |  |
| --- | --- |
| **07/05/25** | **Week 7 workshop: Further design work**  **Started CAD model and refined design further with mechanical and electrical leads**    **CAD frame model** |
| **14/05/25** | **Week 8 workshop: Logbook finalization**  **Began the process of finalizing my logbook and my work to submit. Wrote a reflection on my work.** |

### Deliverables completed

|  |  |  |
| --- | --- | --- |
| Deliverable | Status | Link |
| Deliverable 1: Design requirements | Finished | https://github.com/sudo-ellipsis/PAST-onboarding/blob/main/Deliverables/1.%20JAXA%20Requirements.md |
| Deliverable 2: Cubesat structure review | Finished | https://github.com/sudo-ellipsis/PAST-onboarding/blob/main/Deliverables/2.%20Cubesat%20Structures.md |
| Deliverable 3: Concept designs | Finished, unpolished | https://github.com/sudo-ellipsis/PAST-onboarding/blob/main/Deliverables/3.%20Concept%20Designs.md |
| Deliverable 4: Concept design CAD | Started | None |
| Deliverable 5: FEA | Not attempted | None |
| Deliverable 6: Technical drawings | Not attempted | None |
| Deliverable 7: 3D print | Not attempted | None |

My concept designs for deliverable 3 do not contain all the notes or selection criteria. I ended up accidentally deleting my more extensive notes by mistake in Week 6 (no, seriously!) and had to roll back to an older version.

### Reflections & Learning done

Unfortunately, I couldn’t learn as much as I’d like, purely for time reasons. I didn’t anticipate the workload I’d have this semester, which ended up being by far the busiest semester of my degree (as I’ll be moving to ¾ load from next semester). My biggest mistake, upon reflection, was that I approached this from a deliverables-first standpoint, instead of a learning standpoint – if I had skipped the earlier research documents and just done some FEA work, I might have had some more later-stage learning to show for myself. However, I do believe I learned relevant and useful engineering concepts and developed some skills, purely from research and my concept design work.

While most research documents contain purely guidelines, some have useful insights into design approaches or lessons within them. I selected concept design examples that taught me the most about how and why the design selections were made, not just outlining the possible designs. My lessons learned from the process of researching designs are listed at the bottom of my deliverable 2 document.

I also learned to design from a manufacturing first standpoint. Many of my initial scrapped concept designs were reworked (hence why it took 3 weeks) to be more suitable for manufacturing and use real parts. I learned to reference real parts that were available during the design process and consult with PAST members about the manufacturing capabilities of the team to guide my design concepts. By the end of my concept design work, I started to reference mcmaster-carr and other part websites while making my sketches, to ensure my geometry was achievable. I also had to assess my concepts to select the most suitable one, with reference to real requirements and client considerations. This was my first time having to consider and strictly evaluate concept designs, instead of simply iterating over one concept. I ended up making a ranking of each requirement by priority, and chose my final design concept based on actual criteria, which was a first, and taught me how to weight and consider designs.

Despite not having a satisfactory deliverable for the CAD model, I learned how to work with assemblies and practice constraint driven design from the top down. It was my first time working with such explicit requirements – my only previous CAD work had very few dimensional requirements given, and so I approached it part by part instead of thinking from an assembly first. It was an entirely new way of thinking for me, which led to slower modelling at first but less rework.

While not driven by PAST, I also happened to undertake AERO3000 (space systems design), which ended up delivering relevant learning concepts over the same time period. I learned to model space systems from a thermal standpoint, learned about relevant technology and material selection for space (such as radiation hardened circuitry and suitable space materials) and how to approach the challenges. I am unfortunately unable to provide the code or work done as it’s largely assessed work, and would probably get me in trouble. Nonetheless, I figured it might be useful to mention.

I also learned the importance of documentation. While working on concept and CAD designs, I found myself referencing my relevant requirements document and the CubeSat design concepts document more than the full JAXA requirements and thus was driven to polish my work into a higher quality.

Primarily, I worked slowly. I ended up challenging a lot of my assumptions about what I thought I knew about the design process and challenged myself to deliver at a higher quality, which ended up being harder than I thought – in a good way. Every mistake I made taught me something about how I should work next time. The stupid decisions in my very first concept design (using parts that require extensive CNC work or geometry that would be prohibitively hard to manufacture) were gone by my final chosen concept, and each iteration got faster. While I didn’t achieve everything that I wanted to do, I’m not upset by the lack of progress, because each mistake meant I’d learnt something by the next time I tried it.

Cheers.