



## Personal Engineering Notebook.

This notebook is beginning at the Sprint #2 Kickoff (10/10). Until this point, the team had been taking group meeting minutes on our team confluence page.

### Sprint 1 Results:

- This started as a project for NASA JSC ERG with Lui Wang to complete work for Gateway MBSE team.
- Working with NASA is no longer feasible due to software licensing requirements from the academic license.
- The project is now working to demonstrate the MagicGrid framework to explore MBSE in the context of Spacecraft Avionics.
- We identified the final model as the goal for the Fall semester.
- The stretch goal is to demonstrate FMEA and FTA with MBSE



10/25/2023

Previous notes have been taken via Confluence. This is the start of my engineering notebook.

Kathryn indicated we start with the structural views of the system.

- Black Box: System Context
- White Box: Conceptual Subsystems

System context (Follows Stakeholder needs)



Draft of Stakeholder needs ("Typically Provided")

### Problem Domain

- Purpose: To analyze stakeholder needs and refine them with SysML model elements, to better understand the System of Interest (SOI).
  - First Phase: Black Box Perspective
    - Purpose: How the SOI interacts with its environment without knowledge of its structure or behavior.
  - Second Phase: White Box Perspective
    - Purpose: How the SOI is expected to behave and what its conceptual structure might be.
- Problem definition is not about logical or physical architecture of the SOI

### Black Box Perspective continued

- Goal: To understand how the SOI interacts with its environment to solve given challenges
- Not concerned with internal structure or behavior, defining main inputs and outputs and blackbox function of the SOI in a variety of system contexts.

10/26/2023

Today I added the Stakeholder needs we drafted in a meeting last night. I printed some NASA documents and CCRs (WIFIs) and I drafted some Stakeholder needs ~~and~~ and I then uploaded them into a Magic Grid Model today and pushed it into a gitlab branch.

Draft



### SN - 1 Stakeholder Needs

#### SN - 1.1 User Needs

SN - 1.1.1 Cislunar crewed Mission

SN - 1.1.2 Exploration Science Mission

SN - 1.1.3 Forward compatibility

SN - 1.1.4 Manual Flight Control

SN - 1.1.5 Automatic Flight Control

SN - 1.1.6 Independent Power

SN - 1.1.7 Crew Safety

SN - 1.1.8 Crew Mission Extrusivity

SN - 1.1.9 Extra-Vehicular Activity

SN - 1.1.10 Visiting Vehicle Docking

SN - 1.1.11 Vehicular Logistical Transfer

SN - 1.1.12 Lander Surface Communications

#### SN - 1.2 Design Constraints

SN - 1.2.1 User Interoperability

SN - 1.2.2 Crew Size

SN - 1.2.3 Mission Duration

SN - 1.2.4 Orbital Access

SN - 1.2.5 Earth communication



10/27/2023

Today we met with Kathryn, and our Model went over pretty well. The Stakeholder needs and System context were apparently good first drafts. However, she had sufficient comments on things we could improve.

### Future Work:-

- Capture traceability when making use cases and Moe's next week
- Functional Analysis can be kind of nasty
- Stakeholder needs "Should" do things and NOT be in FIRST PERSON
- Use refine from use case to need and a trace from Moe to need.

### Use Cases

- Problem Domain, Black Box, Behavioral definition
- What is it?
  - Functional Stakeholder needs are refined with use case scenarios.
  - Use cases are more precise in telling what the system should provide and what external users should expect or want to achieve.
  - Each use case must provide belong to one or more system contexts
- What does it produce?
  - Functional use cases meaningful to the user
  - Use case Scenarios how the system should interact with other systems.

10/30/2023

Today we evaluated the system also  
case for the crewed operations  
system context. I'm not super  
confident with our conceptual model  
at this point, because it is not very  
highly detailed. We really have a pretty  
large scope to evaluate here, and  
I think that makes it difficult to  
focus on the avionics subsystem just yet.

10/31/2023

Today, and really for the rest of this week,  
we are working on completing SRS and  
SDD drafts including the complete  
Sprint #2 review.

11/03/2023

Today I found that NASA Marshall  
Space Flight Center has an  
RFP out for this kind of work  
and is willing to fund universities  
to perform this kind of research.

11/16/2023

We met with Kathryn before  
she went jeeping in Mexico today.  
It was a very productive conversation.  
I think the team is starting to  
get into bonded system modeling.



11/17/2023

Everything since October has been chaotic to say the least. We met with Kathryn yesterday and learned a lot, but we are still only 5% through defining our Problem domain. This is mostly, in part, due to the ~~size~~ scope of our scope. In the weeks that have passed since my last entry, the team has met and performed work. However, our notes are mostly on Confluence, and our work is best tracked by viewing the Model. I also think that the team is finally starting to have a better grasp of the MSE Pedagogy. Due to my multiple sicknesses and exams, I was more hands off than usual when it came to decision making. This is a good thing I should have learned earlier because the team does require to be more independent with planning and modeling. With this in mind, I think future meetings with Kathryn should be led by Walter and Clay. This is because I believe I have been keeping them from fully internalizing the value of our work by organizing everything. I think they are just as driven to succeed, and I should begin to make sure they own this project just as much as I do.

11/17/2023 (continued)

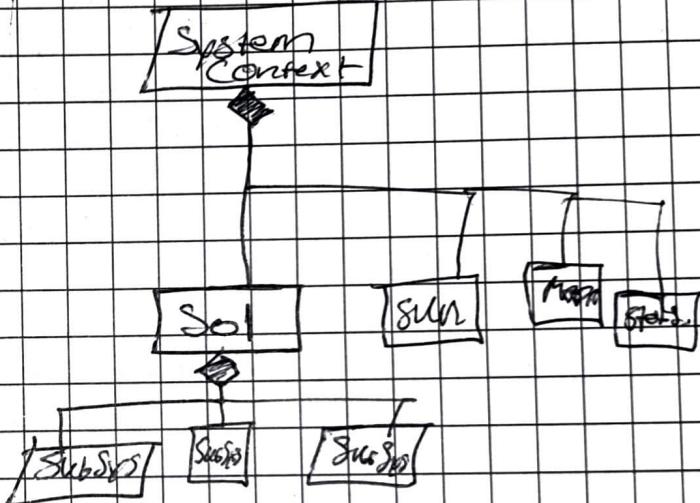
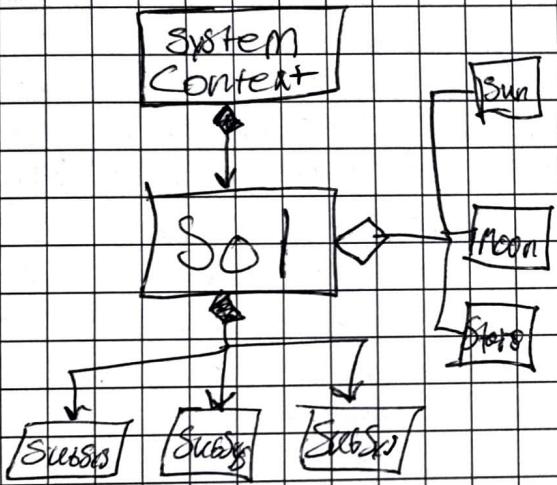
I have been reviewing a book called "Architecting Spacecraft with SysML", and come thus far closer to ~~the premise~~ the Magic Grid Framework. I think it's a great source for SysML concepts.

One conflict is presented in the ~~System context definition~~

( $SOL = \text{System of Interest}$ )

Kathryn/MagicGrid

SysML Book



This fundamental difference in definitions changes the way these external factors are considered. Kathryn/MagicGrids are to say the external factors are logically part of the system context, but do NOT comprise it. Where the SysML Book says the system context is actually composed in part, and composed of these external factors. Why can't both be true?



11/28/2023

I found a Boeing Aviation Safety Poster Session I thought we should attend to get feedback on our research. I also want to continue our work to apply for a conference or Emory-Riddle publication.

12/30/2023

Today we finished our models and prepared a slide deck for our final presentation.

After the presentation: I think our presentation went well. It's not clear if most of the audience knows what System Modeling is, but that is an opportunity for us to address.

12/04/2023

today I finished the poster draft for the Boeing CAAS event and submitted it to the organizers.

12/05/2023

so we missed the INCOSE Seminar deadline, but we can still apply to other conferences like

- The ESA HBSE Advisory Conference
- The AIAA Student Conference, South East Section.

12/07/2023

## 3 minute Video Planning

Convey context, details, and relevance to general audience.

### Grading:

#### Context

- ↳ What is the Main Objective of the Project?
- ↳ What do you hope to accomplish?
- ↳ What Problem are we Solving?

#### Technical Aspects

- ↳

#### Relevance

- ↳ Why Should Society and the engineering community care?