Topic: Writing Requirements

Problem: Now that you are familiar with what requirements are and how to write requirements 'well', generate a set of derived & decomposed requirements, using your list of capability requirements from exercise 10 and mission descriptions from exercises 3, 7 and 11.

Pointers/Tips:

- Try to decompose or derive requirements for each of your capability requirements from exercise 10.
- Ensure each requirements contains a subject, a verb, an object and some measure to test the requirement to ensure compliance. Preconditions are optional.
- Use positive case "shall" instead of negative "shall not".
- Indicate if a term should be defined in a dictionary or glossary of the specification. Use bold type of italics for defined words for instance.
- Ensure each requirement is for a single function or feature. If you use the word "and" in your requirement, this is a good indication it is not a single function or feature.
- Avoid conjunctions.
- Ensure each requirement is a short, unambiguous statement. Justification for the requirement should not be provided with the statement itself.
- Use active tense, rather than passive tense.
- Use definite, rather than indefinite article.
- Use Threshold (T) and Objective (O) Measures of Performance (MOPs) to quantify your requirements if possible. This opens up trade space and gives design teams an idea of their limitations.
- Ensure each requirement is necessary and aligns with the goal(s) of your missions and the overarching need for the system.
- Ensure each requirement is independent and does not depend on other requirements.
- Whatever you do, do not dictate or drive solutions into the system. Let the design teams choose the solutions. Systems engineers should not be directing or dictating solutions.
- When you are first beginning to write a lot of requirements, a good practice is to generate a spreadsheet or checklist for each requirements to ensure each is 'well written':

	Subject, verb, object?	Dictionary terms?	Positive shall?	Single function/ feature?	No conjunctions?	Short, unambiguous?	Active tense?	Definite article?	Threshold (T) and Objective (O) MOPs?	Necessary / aligns with mission / need?	Independent?
REQ.1.3.2The system shall…	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
REQ.1.3.3The system shall…	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

- After some practice, this checklist will enter your long-term memory and you can quickly realize if a requirement is well written or not.

- I have attempted to decompose only 2 of my primary capabilities for the ATM here:
  - REQ.5.1 The ATM shall be available for use 30 days over a 31 day period.
    - REQ.5.1.1 The **ATM** shall possess and **Inherent_Availability** (A_i) of 96.7% (T) 98.3% (O) over 31 continuous days of **Normal_Operation**.
      - REQ.5.1.1.1 The ATM shall possess a **Mean_Time_Between_Failure** (MTBF) of 325 hours (T) 558 hours (O) over 31 continuous days of **Normal_Operation**.
      - REQ.5.1.1.2 The ATM shall possess a **Mean_Time_To_Repair** (MTTR) of 11 hours (T) 9.5 hours (O) over 31 continuous days of **Normal_Operation**.
  - REQ.12.1 The ATM shall **operate** in **Weather_Conditions** experienced in the Continental United States (CONUS).
    - REQ.12.1.1 The ATM shall **operate** in ≥8 (T) ≥15 (O) cm/hour **Rainfall**.
    - REQ.12.1.2 The ATM shall **operate** in ≥15 (T) ≥20 (O) cm/hour **Snowfall**.
    - REQ.12.1.3 The ATM shall **provide service** in Cat I (T) Cat II (O) **Sandstorms**.
    - REQ.12.1.4 The ATM shall **provide service** in Cat I (T) Cat II (O) **Winds**.
    - REQ.12.1.5 The ATM shall **survive** in Cat III (T) Cat IV (O) **Sandstorms**.
    - REQ.12.1.6 The ATM shall **survive** in Cat III (T) Cat IV (O) **Winds**.
    - REQ.12.1.7 The ATM shall **operate** in ≥43°C (T) ≥60°C (O) **Temperatures**.
    - REQ.12.1.8 The ATM shall **operate** in ≤-17°C (T) ≤-34°C (O) **Temperatures**.
    - REQ.12.1.9 The ATM shall **operate** in ≥75% (T) 100% (O) **Humidity**.
    - REQ.12.1.10 The ATM shall **operate** in ≤25% (T) 0% (O) **Humidity**.
- How did I determine these measures? By applying Systems Thinking and referring to the mission scenarios. Some basic research was required (such as understanding what Inherent Availability is composed of).
- Smaller details, such as how long a Cat II sandstorm lasts can be answered in the specification dictionary/glossary.
- Notice I have separated the upper limits and lower limits into separate requirements (i.e. Temperature, Humidity). Why? Because they will be tested separately. We wouldn't test both cold conditions and hot conditions in the same test event.
- Submit to support@learnse.com if you'd like me to check it and provide feedback.

