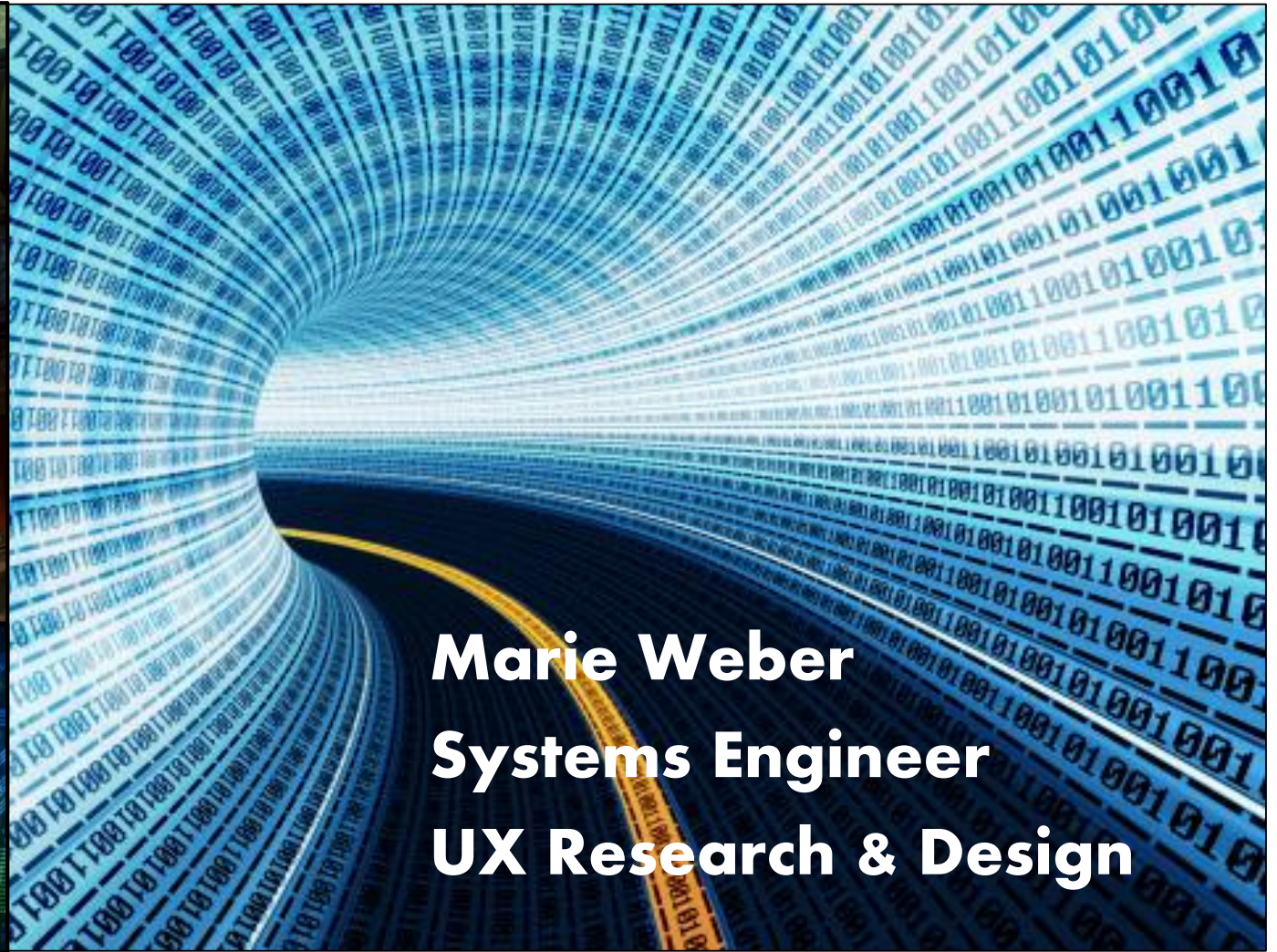


# LOCKHEED MARTIN



**Marie Weber**  
**Systems Engineer**  
**UX Research & Design**

# Agenda

## Systems Engineering

- What is it?
- Lifecycle

## Resources

## Bonus: Cyber



# Trivia

**What world changing satellite system was first launched in 1978?**

**Global Positioning System (GPS)**



Free STEM lessons: <https://www.gps.gov/students/>

# What is Systems Engineering?

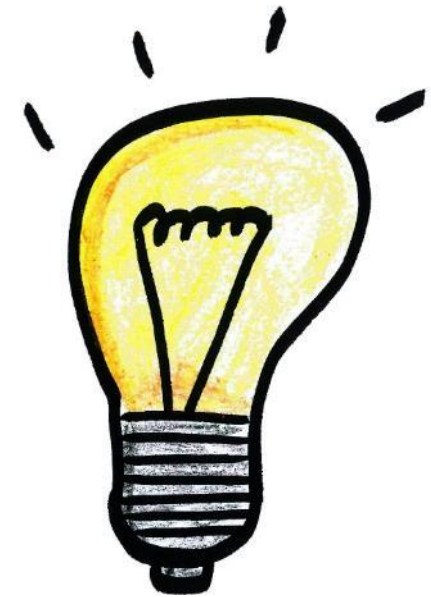
Systems Engineering is an *interdisciplinary* approach and means to enable the realization of successful systems. It focuses on defining

- customer needs and
- required functionality early in the development cycle,
- documenting requirements,
- then proceeding with design synthesis and
- system validation while considering the complete problem.

Systems Engineering considers both the business and the technical needs of all customers with the goal of providing quality product that meets the user needs.



INCOSE Handbook v.3, page 1.5  
(Formatting added)



Big picture ideas &  
detail coordination

Aeronautics



Missiles and Fire Control



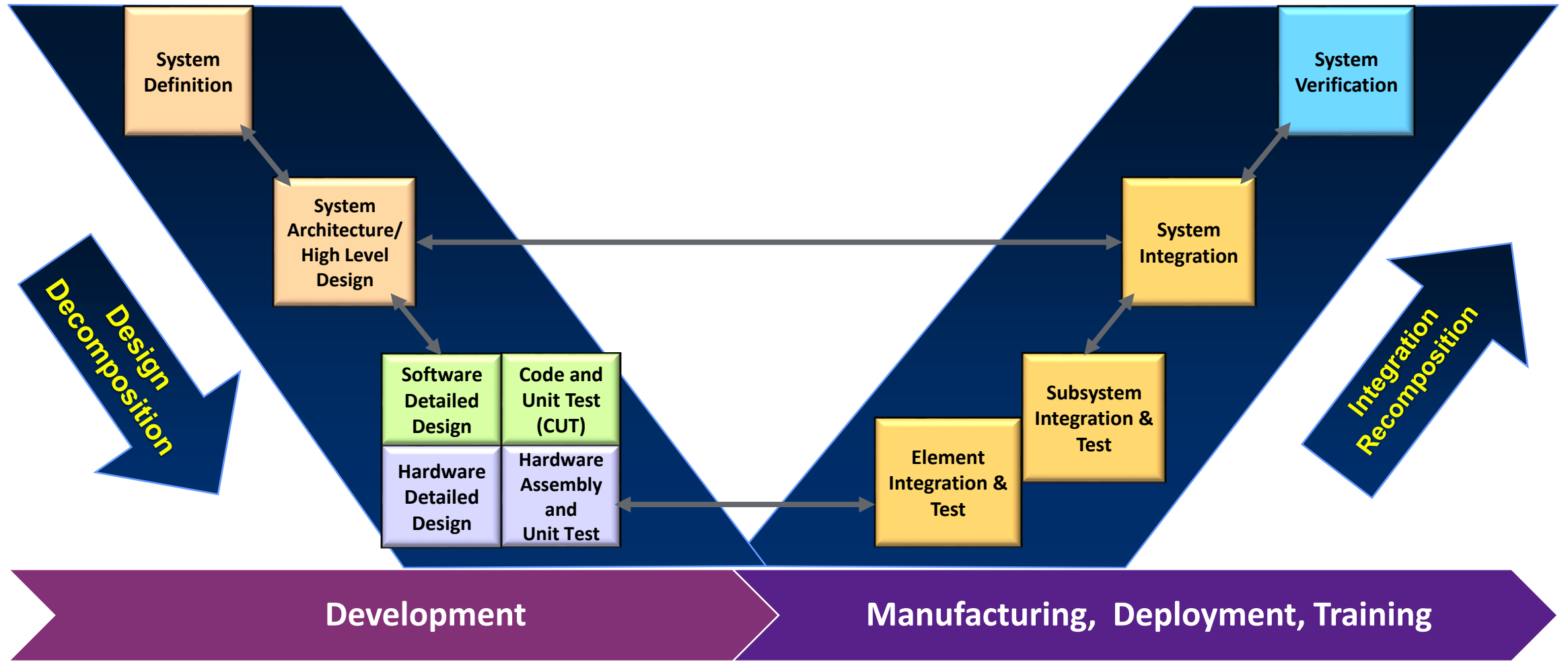
Rotary and Mission Systems



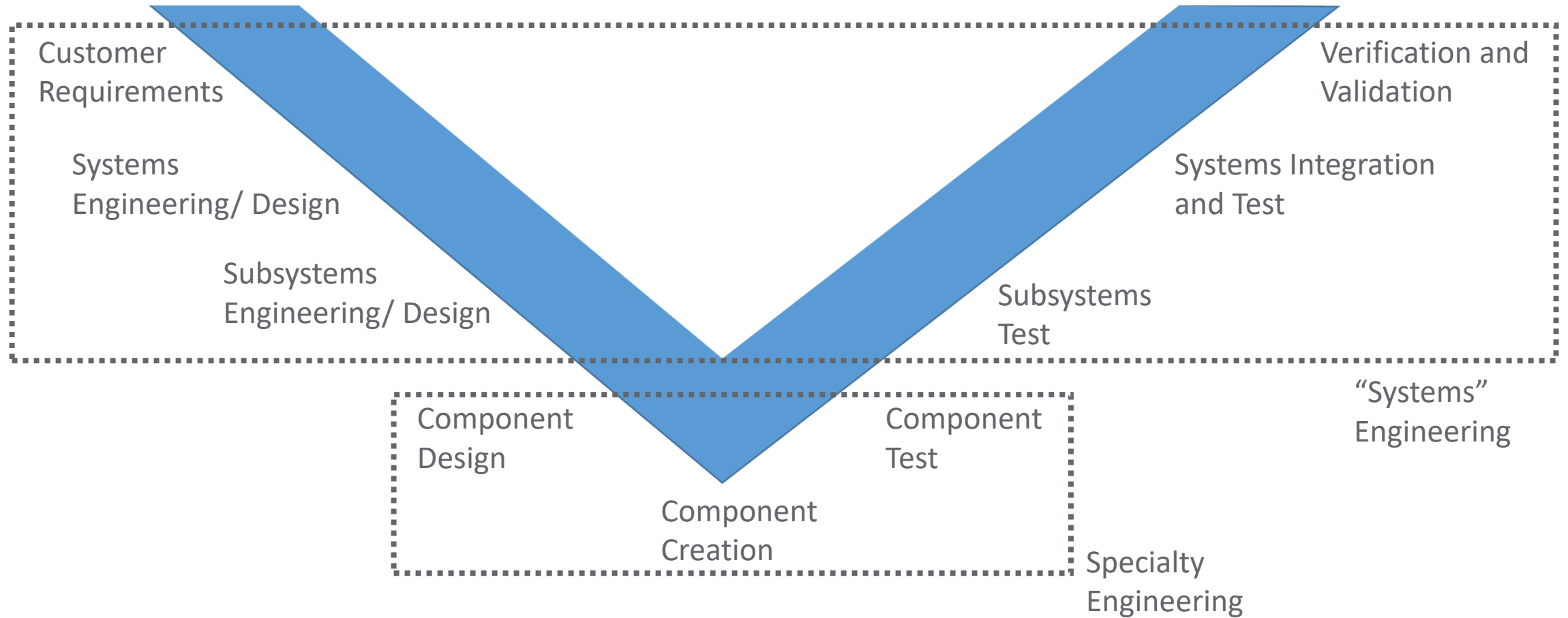
Space



# Systems engineering "V"



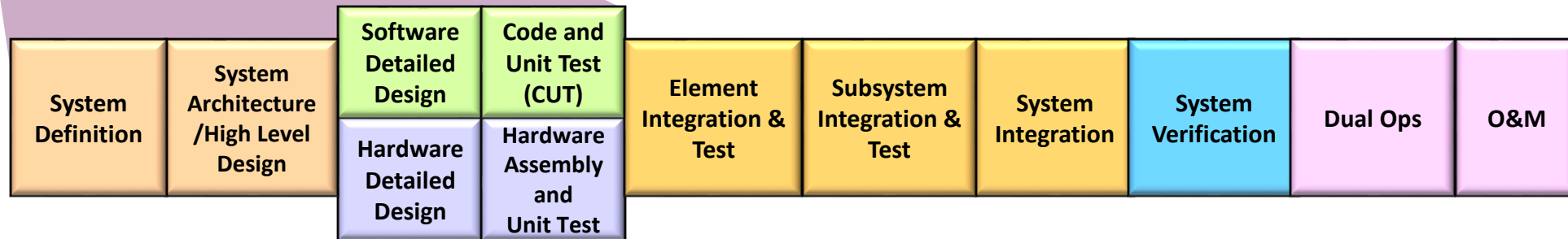
# WHAT IS A SYSTEMS ENGINEER?



# Phases of the lifecycle



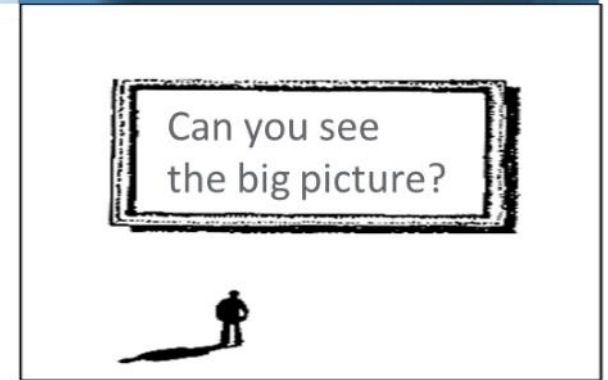
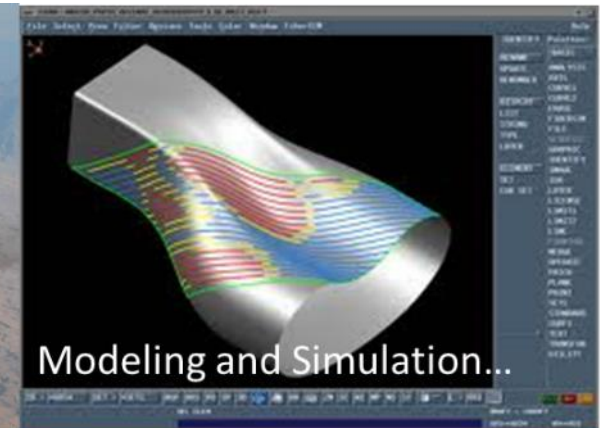
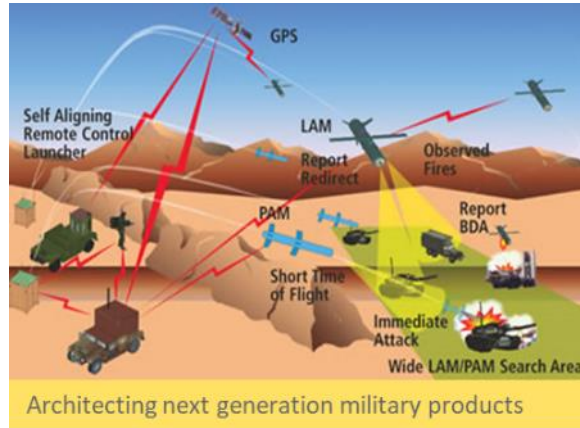
- Development period involves concurrent design iterations
- The period ends with the transfer of design specifications to manufacturing, deployment, and training



While these phases look like distinct phases, they often overlap, or even iterate



# A 'Day' in the Life of a Systems Engineer at Lockheed Martin



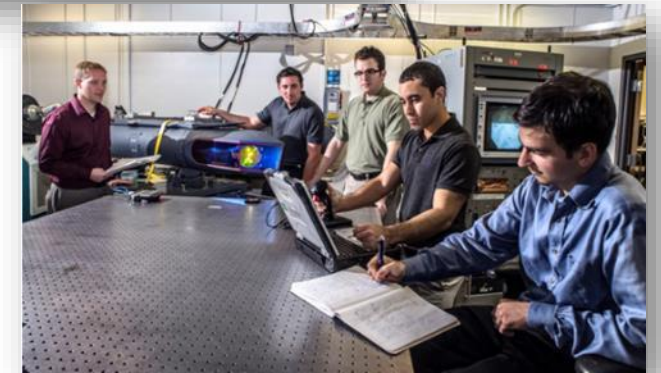
# Working with People

- Stakeholders
  - Users
  - Customers
- Engineers
  - Transition from high-level to low-level design
  - Other teams / components
- Trainers
- Managers
- Other companies
  - Colleagues
  - Suppliers

Communication skills are  
very valuable

# What makes a good Systems Engineer (SE)?

- Good Communicator
- Customer Focused
- Technical Depth and Breadth
- “Big Picture” Perspective
- Strong Teaming Skills
- Flexible
- Willingness to learn additional disciplines
- Not afraid to ask dumb questions!



# WHAT IS A REQUIREMENT?

Requirements are legally binding statements set forth in a design document. Customer requirements come straight from the customer and are usually delivered as part of a Statement of Work (SOW). Systems engineers will usually derive further requirements from the customer requirements *and refine them through customer interaction, research, and trade studies.*

REQUIREMENTS ARE  
LEGALLY BINDING  
STATEMENTS SET FORTH IN  
A DESIGN DOCUMENT.

# WHAT IS A GOOD REQUIREMENT?

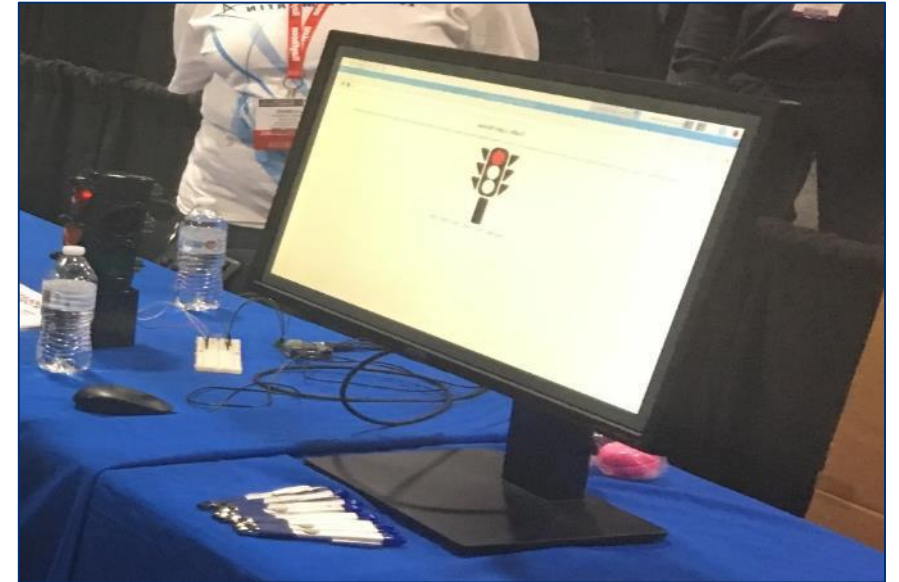
Good requirements constrain the design space only as much as is necessary to describe the system's desired behavior or properties. Good requirements are as concise and clear as possible. Good requirements are testable.

Good Requirement Taxonomy examples:

The [Name of System] shall [perform some measurable behavior].

The [Name of System] shall [have some measurable quality].

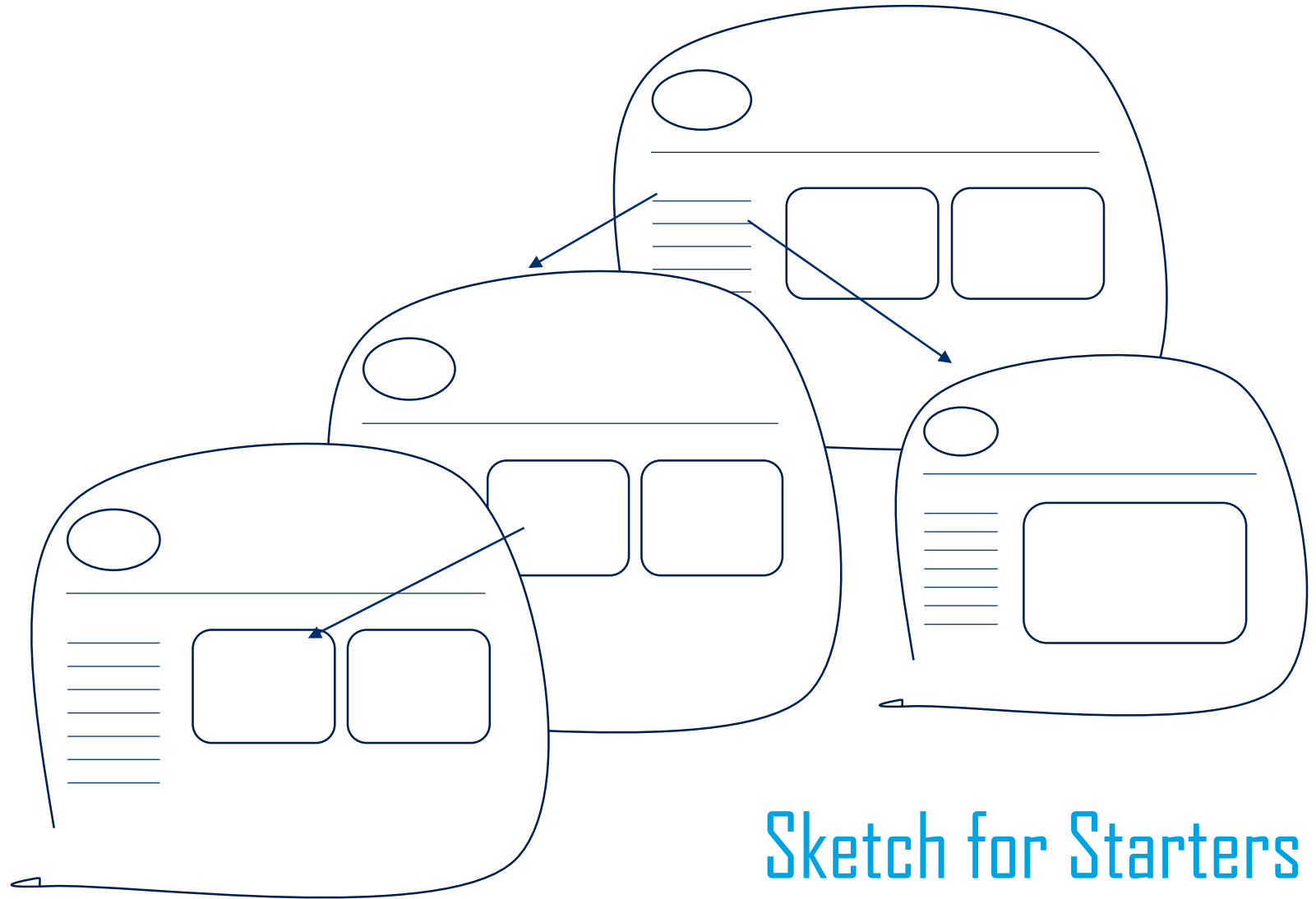
When [triggering condition] is true, the [Name of System] shall [perform some measurable behavior].



Good requirements define  
"what" is needed and are  
testable

# IDEAS

- Brainstorming
- Concept of Operations
- Organize
  - Techniques such as card sorting
- Sketch ideas
  - Mockups, storyboards
  - Low fidelity
  - High fidelity – try to resist
- Check requirements coverage & scope



Sketch for Starters

# Resources

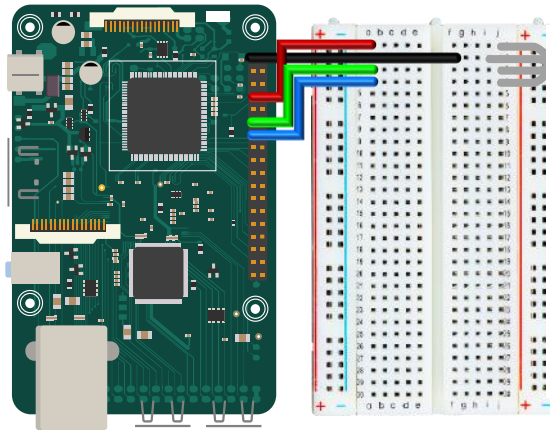
- Your time, school, network, online learning
- TED Talks, [The superpowers of STEM with Stephanie Hill](#)
- Pictures <https://www.flickr.com/photos/lockheedmartin/albums>
- Videos <https://www.youtube.com/user/LockheedMartinVideos>
  
- Play, read, explore, intern, volunteer
  
- AI/ML <https://machinelearningforkids.co.uk/#!/worksheets>
- [Code.org](#), [Girls Who Code](#), [incose.org](#), [SeaGlide](#)
- [Lockheedmartin.com](#) – CodeQuest, CyberQuest, Scholarships
  
- Don't Make Me Think, Steve Krug
- Forms That Work, Caroline Jarrett
- <https://www.nngroup.com/articles/>
- Standards <https://www.w3.org/WAI/standards-guidelines/wcag/>



Grow your STEM  
Superpowers

# HOW TO GET STARTED IN CYBERSECURITY OR CODING

- Code Quest & Cyber Quest– fun day + paid internship opportunity
- Code.org
- CTF challenges (capture the flag)
- Create your own network
- Install Linux on an old computer
- Cyber War Gaming
- Ethical hacking
- Raspberry Pi™





# Why I like my job...

- Balance
- Variety
- Opportunity
- Problem solving
- Creativity
- Helping people
- Good work environment
- Flexible schedule
- Good salary
- Job security

**STEM Ambassadors TIE<sup>3</sup> | TIE ACADEMICS TO CAREERS**



**Teamwork Innovation Enthusiasm Experience Exposure**

**LOCKHEED MARTIN**

***LOCKHEED MARTIN***

