EE4130 - Homework 1

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Question 1

Select a man-made system of your choice (preferably NOT one from the textbook) and describe the components, attributes, and relationships between the components and attributes of that system you chose.

- **Man-made system:** a satellite in geostationary orbit around the earth
- **Components:** communications dish, reaction wheels, on-board computer, solar panels, gimbals, radar altimeter
- **Attributes:**
  - Communications dish: bandwidth, frequency
  - Reaction wheels: orientation, radius, mass
  - On-board computer: RAM, CPU speed, disk space
  - Solar panels and power system: area, power, voltage
  - Gimbals: degrees of freedom
  - Radar altimeter: frequency, resolution
- **Relationships:** The communications dish receives commands and transmits these commands to the ob-board computer which collects data from the radar altimeter. The on-board computer process the telemetry data from the radar altimeter and sends it back to the ground via the communications dish. The gimbals point the communications dish at the ground station and point the radar altimeter at the target. The solar panels and power system provide power for the satellite.

Question 2

List some of the likely benefits from using systems thinking and the systems engineering process, when developing a new system or product.

Some likely benefits of using systems thinking and the systems engineering process when developing a new system or product:

- Allows a new system or product to be viewed from different levels of complexity. For example, one can take the "50,000 ft view" that shows a high-level overview to get a basic idea of how the system or product is made. Or, one can take a low-level over to see how individual components operate and interconnect.
- Periodic reviews can ensure that the stakeholders and product/system developers are in agreement of what the product/system that what is being developed is what was intended.

Question 3

> Of the three systems engineering process models described in the lecture in week 1, choose one and explain how it can help in the process of system design and synthesis...

The spiral process is an iterative design process that has several different phases. At each phase, a different type of prototype is developed. The different phases with different prototypes coupled with feedback allows for the discovery of what the stakeholders actually want versus what the designers think that the stakeholders want. Also, it allows a product to be designed that is more consistent with what the stakeholders want as well. Because it is an adaptation of the waterfall method, the spiral method is well suited for large-scale, complicated systems such as satellites and aircraft.