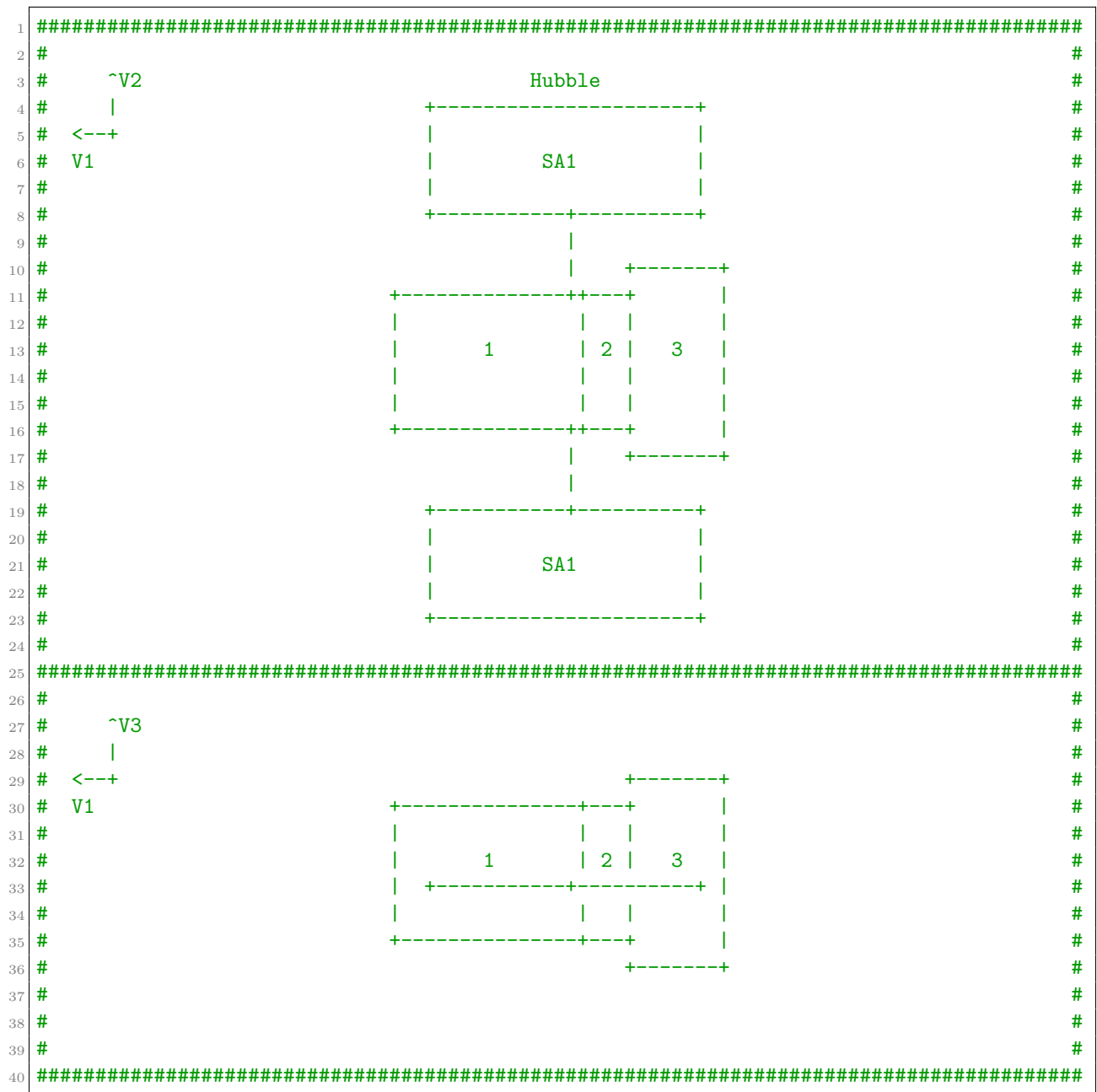
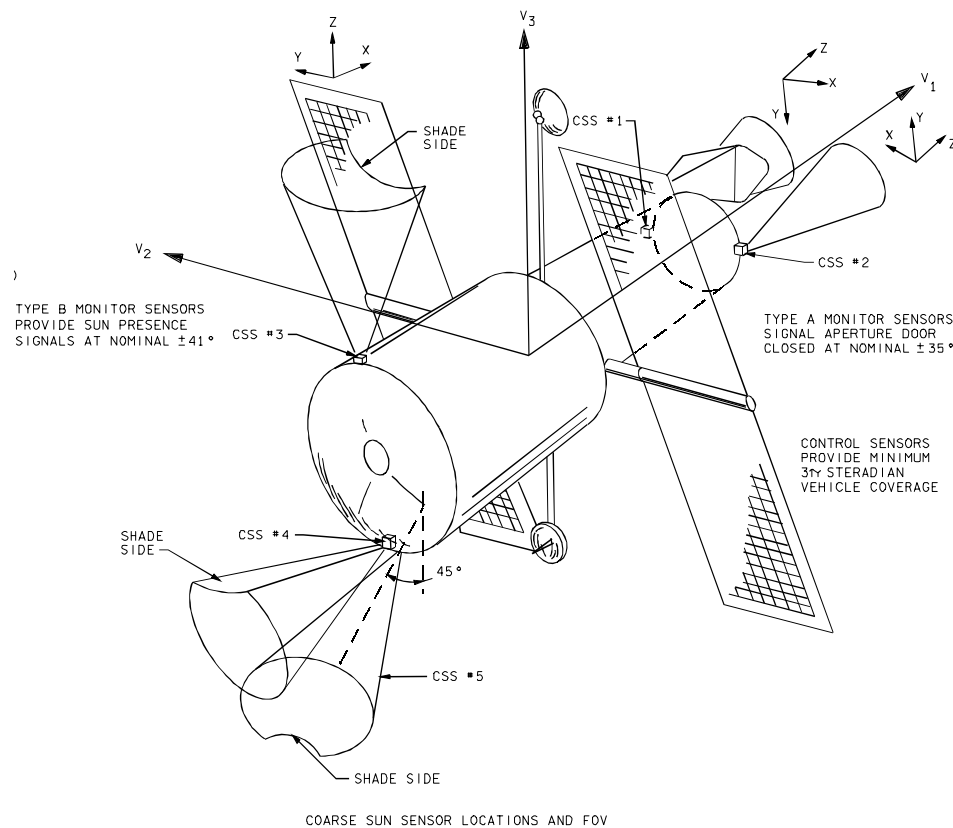


Problem 1. Develop a very simple representation of the Hubble telescope.





22063X276, ART, 3

Figure 1: HST Axes Definition for V_1 , V_2 , V_3

We model both the body (3 sections) and the solar panels (2 sections) of the Hubble Space Telescope (HST). The body sections are connected as such: Section 1 is connected to Section 2, and Section 2 is connected to Section 3. The solar arrays are connected on Section 1, along the centerline, 20.75 inches V_1 away from the connection point with Section 2, and the near edge of the SA is 129 inches from center of Section 1. These sections are modelled with thin walled cylinders (TWC), solid cylinders (SC), and flat plates (FP). The rough layout of the sections is shown on the previous page, and the mass and length properties of each section are listed in Table 1.

Section	Model	V_1 (in)	V_2 (in)	Weight (lb)
<i>Section 1</i>				
Light Shield (LS)	-	153.2	120	-
Forward Shell (FS)	-	156.05	121.2	-
Total	TWC	309.25	121.2	9033
<i>Section 2</i>				
SSM Equipment Section (SSM-ES)	TWC	61.25	121.2	10593
<i>Section 3</i>				
Aft Shroud (AS)	SC	138.00	168.16	3363
<i>Section 4</i>				
Solar Arrays (SA)	FP	476.8 ¹	113.5	735 ²

Table 1: ¹: This length can be fully rotated into V_3 . ²: Weight of both solar arrays. All lengths taken from Hubble technical drawings, NASA, "Cargo Systems Manual (CSM): Hubble Space Telescope," February 13, 2002; all masses from Mattice, J., "Hubble Space Telescope Systems Engineering Case Study."

Problem 2. Use this model as a basis to write a function(s) to determine the Mass Center and Inertia Matrix for any location.

Problem 3. Write a function to find the current angular momentum relative to the mass center.

Problem 4. Choose the optimal location for a torque producing system and explain why you think is the best location.

Problem 5. Using your previous functions, write a program to find the resulting angular acceleration produced from a given torque.

Problem 6. Write what next steps you would take to develop a controller that keeps the craft pointed in a specific direction.