Principles of Engineering

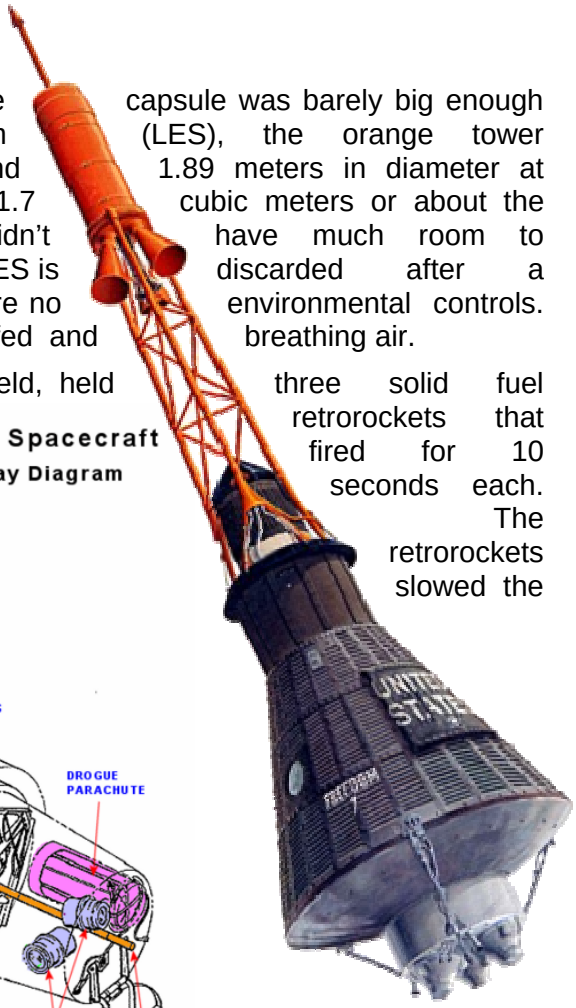
Space Technology

APPLICATION

Objective:

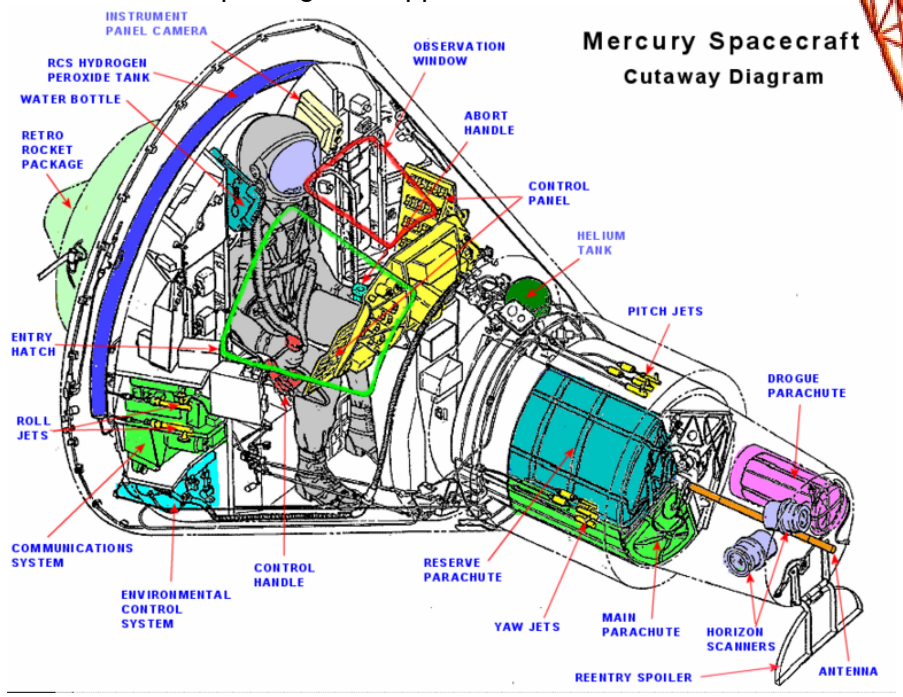
You'll now demonstrate the CAD skills you've developed by creating a 3D solid scale model of the NASA Mercury Spacecraft.

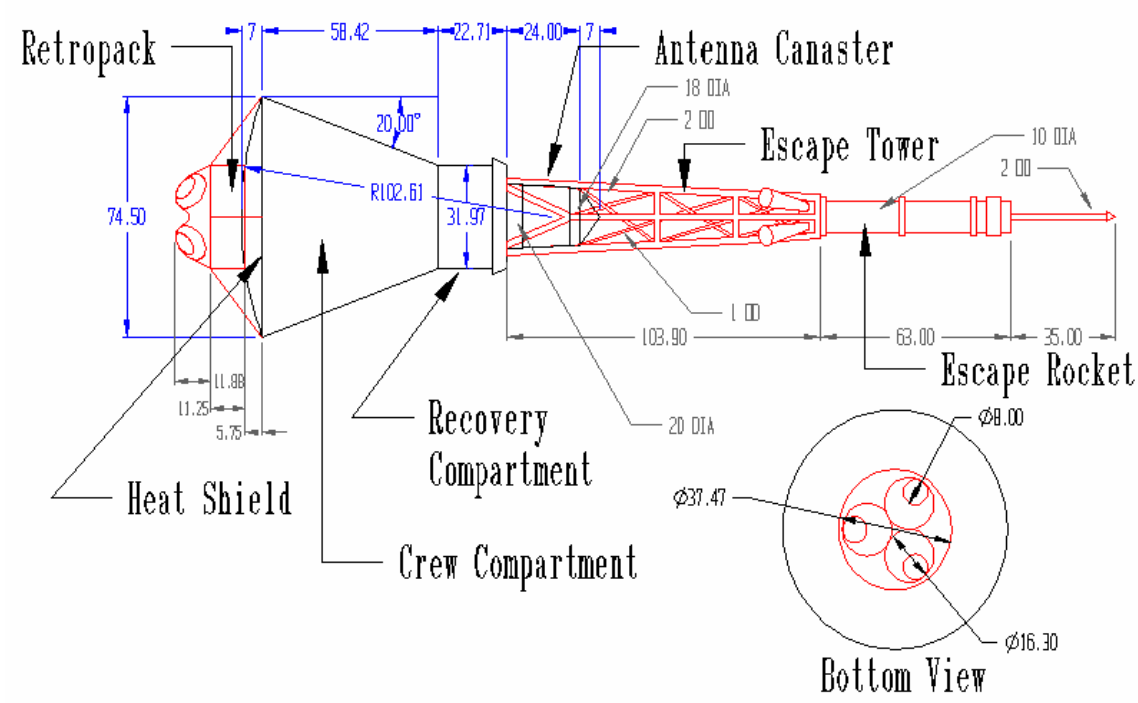
Discussion:



Mercury spacecraft were small, so small that the capsule was barely big enough to hold its pilot. Without the Launch Escape System (LES), the orange tower shown here… The capsule was 3.51 meters long and 1.89 meters in diameter at the heat shield. The volume of the craft was a mere 1.7 cubic meters or about the size of a phone booth. Inside the craft, the pilot didn't have much room to access the 120 controls needed to fly the craft. The LES is discarded after a successful launch. This was the 1950's, so there were no environmental controls. The space suit kept the pilot warm, pressurized, fed and breathing air.

The retrorocket package, strapped to the heat shield, held three solid fuel retrorockets that fired for 10 seconds each. The retrorockets slowed the spacecraft for reentry. Once the retrorockets had fired, the retrorocket package was jettisoned so it wouldn't interfere with the heat shield on reentry. There was also a small metal flap at the nose of the spacecraft called the "spoiler". If the spacecraft started to reenter nose first, airflow over the "spoiler" would flip the spacecraft around to the proper, heat shield first reentry direction.





Scenario:

Modern Models, Inc. is focusing on a new line of space technology models. You're design team has been assigned to create a scale model of the Mercury "Friendship 7" Spacecraft with the Atlas booster. Your supervisor wants you to CAD a solid model of the Mercury capsule and LES, meaning the heat shield, crew compartment, recovery compartment, antenna canister, retro pack, escape tower, and escape rocket.

Deliverables:

You're to produce one CAD drawing depicting the Mercury spacecraft drawn at full scale using the dimensions shown in the multi-view drawing above. The drawing is to be created using solid modeling techniques with the compartments a shell. No surface details are to be included in the drawing.

Assessment Rubric:

Item	Criteria	Assessment	
		Student	Instructor
A	**3D Solid Model – Space Capsule**		
1	Does the model adhere to the specified dimensions?	Yes/No	
2	Is the heat shield a shell?	Yes/No	
3	Is the crew compartment a shell?	Yes/No	
4	Is the recovery compartment a shell?	Yes/No	
5	Is the antenna canister a shell?	Yes/No	
6	Is the LES escape rocket drawn correctly?	Yes/No	
7	Is the LES escape tower truss drawn correctly?	Yes/No	
8	Are the model components an appropriate color and texture?	Yes/No	
9	Is the model presented in an appropriate border?	Yes/No	
10	Is the border title block information complete and accurate?	Yes/No	

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