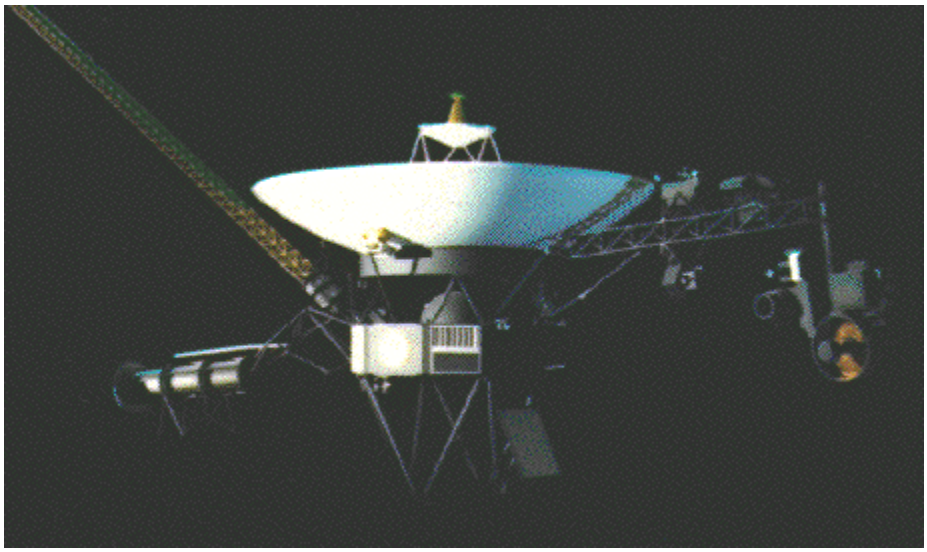
Spacecraft



Mission Team Leader's Notes
Strongly encourage Mission Team members to research spacecraft prior to the actual mission night. A lot of data about spacecraft and their missions is available on Internet (NASA and European Space Agency – ESA, web sites) or in the library. Mission Team members should find three different spacecraft. Write down their names and missions.

Discussion

What is a spacecraft?
A spacecraft is any machine that goes into space. It can be a rocket, a satellite, the Space Shuttle, or a robot to explore other planets. Basically, any machine that goes into space, even for a little while, is a spacecraft. They can do many different things, like carry people, watch the weather, send television signals, and explore planets. These things are called a spacecraft's **mission**.

What makes a spacecraft?
A spacecraft is made of many different parts that work together. Each spacecraft is different and has different parts depending on its mission. The parts are grouped together into groups called **subsystems**. A subsystem is a set of parts that work together to do a specific task. Some common subsystems for most spacecraft include the following:

Power Subsystem – The power subsystem provides electricity for the spacecraft. The spacecraft needs this to operate its sensors, antennas, and computers. Some power subsystem items include solar panels and batteries.

Communications Subsystem – The communications subsystem sends information to the controllers on earth and accepts commands. It tells the controllers how healthy the satellite is and passes commands from the ground to the other subsystems. Some parts of a communications subsystem include antennae and electronics.

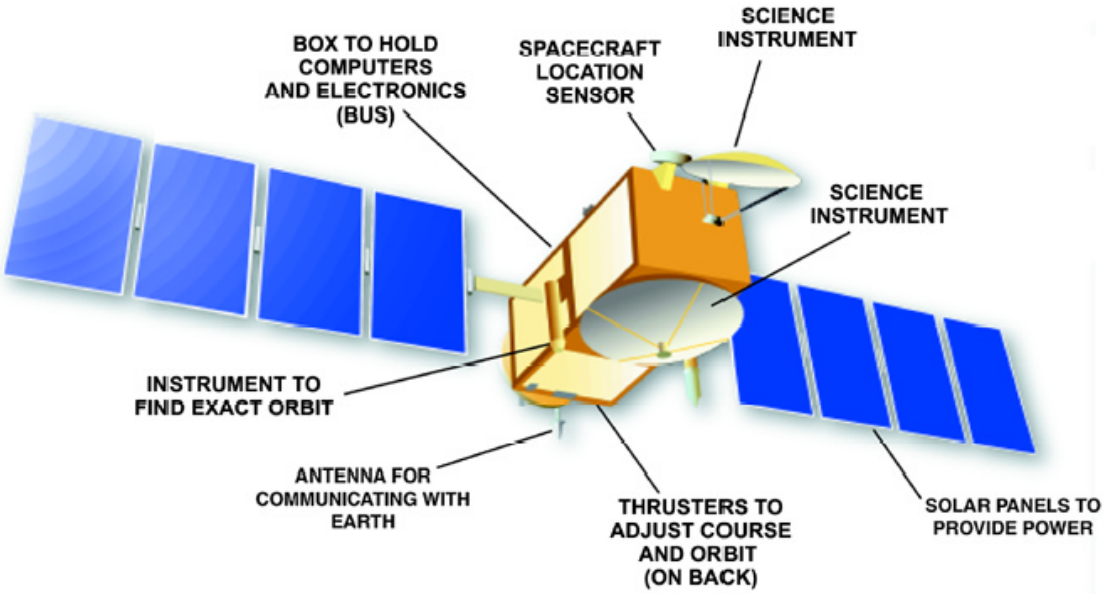
Structure Subsystem – The structure subsystem holds the spacecraft together, kind of like a skeleton. This needs to be strong and light weight. The main body of a spacecraft is part of the structure subsystem.

Payload Subsystem – The payload subsystem performs the spacecraft mission. This can be anything, from cameras that take pictures to astronauts. In the case of rockets, this can even be another spacecraft!

Control Subsystem – The control subsystem is used to point the spacecraft. Computers are usually used to fire thrusters to do this. The control subsystem also includes sensors that tell the spacecraft where it is and where it is pointing.

Life Support Subsystem – The life support subsystem is only used when people or animals will be on the spacecraft. This subsystem provides clean water and air to the spacecraft occupants.

Thermal Subsystem – Many spacecraft parts have to be at a certain temperatures to operate correctly. The thermal subsystem is used to keep the spacecraft warm or, in some cases, cold. Some common thermal subsystem parts include thermal blankets and electric heaters.



Some parts of spacecraft subsystems

Activity
List all of the subsystems of one of the spacecraft researched by Mission Team members and describe their purpose.

How are spacecraft built?
Spacecraft are built in factories on Earth. Usually, a spacecraft's life begins when somebody has an idea. This idea may be to search the universe, send television signals, or carry people to the moon. The idea becomes the mission of the spacecraft. Engineers take this idea and design a spacecraft to perform the mission. They think about the mission and decide what subsystems and parts are needed for the spacecraft.

Once the design is finished, the spacecraft is built in a factory. A spacecraft must be built very carefully so it is not damaged. Dirt, dust, and even gravity can damage a spacecraft when it is built. The factories have special **clean rooms** that prevent dirt and dust from getting to the spacecraft. Special structures must be built so gravity doesn't damage the spacecraft.

How does a spacecraft get into space?
Once the spacecraft is finished being built, it is sent into space using rockets. The rockets take the spacecraft to a very high speed to get it into space, sometimes fast enough to visit other planets. Sending spacecraft into space using rockets takes a lot of energy and is very expensive. One day, spacecraft may be built in space on space stations or even on the moon.

A rocket launching a satellite

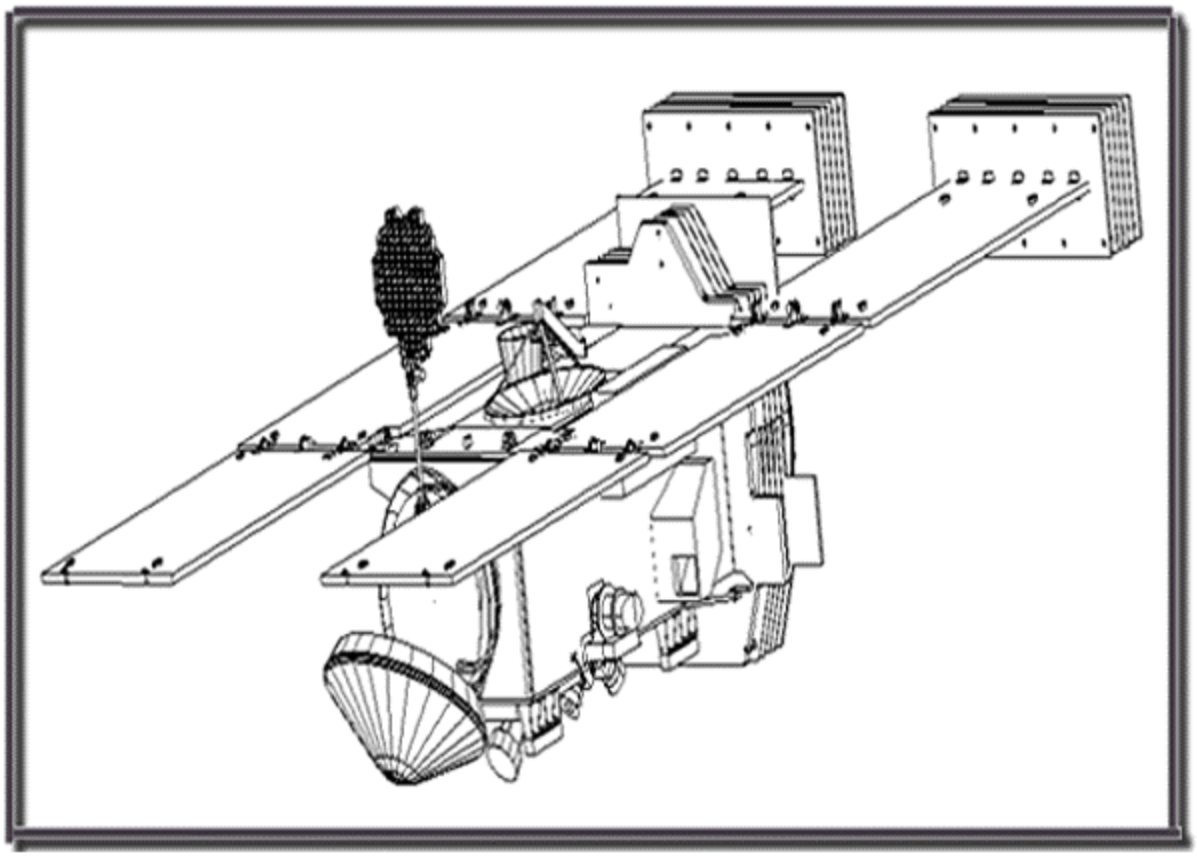
Activity #2

Design and build a model spacecraft using some common household items. Think about what your spacecraft's mission will be. Will there be people on your spacecraft? Will it visit other planets? Will it be a rocket? Once you have an idea, decide what subsystems you will need to use. Draw your spacecraft on paper first and use that as the design. Once the design is complete, build a model of your spacecraft.

Some common things you can use for building are as follows:

- Empty paper towel rolls
- Bottle caps
- Aluminum foil
- Popsicle sticks
- Styrofoam
- Egg cartons
- Cotton Swabs
- Paper clips
- Plastic cups or bottles
- Aluminum cans

Your spacecraft can do whatever you want. It can be small or large, go around the planet or around the universe… it is completely up to you're imagination!!



Stardust

Optional Activity

Stardust is a NASA spacecraft on a mission to study comets. It will fly through the solar system and visit a comet called Wild-2. The above image is a sketch of Stardust from NASA. Color the spacecraft, and using the internet or library, label its various subsystems.