

EXAMPLE LONG RESEARCH THEME

Prompt: Choose a science topic, and write a long multi-section theme about it, based on your research. Be sure to have at least three sections and two paragraphs per section in your theme. Include in-text citations where needed and a reference list. Use the APA style.

TITLE OF PAPER: Robotic Spacecraft: Can They Do Everything People Can Do?

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Robotic Spacecraft:

Can They Do Everything People Can Do?

Robotic space vehicles are some of today's most valuable explorers of the Universe. By way of definition, these spacecraft are ships that travel through space without a live pilot on board. Because no humans are on board, they can go places that are dangerous to people, and they can travel for years without ever returning to base. As a result, they can do several jobs that are helpful to people. These jobs allow people to study and explore new worlds from a distance. Three types of robotic space vehicles that have special jobs that they can do as well as people are probes, satellites, and landers which contain rovers, and examples of each type demonstrate the tasks that they can do.

Pure Space Probes

The most basic type of robotic spacecraft is the pure space probe. By way of background, a pure space probe is a spacecraft that is launched into space to take measurements. It is not usually designed to return to the planet from which it was launched. It typically flies through space, and, as it passes a celestial body, like a planet or a moon, it measures certain features of that body. Necessarily then, it carries instruments which can take measurements. For example, it might carry special cameras that can take photos from which measures can be taken. It might also carry instruments that can determine the composition of an atmosphere. Furthermore, it carries instruments that enable the probe to communicate with its home base. These instruments allow the base to send commands to the probe about what measures to take and where to go. They also allow the probe to send photos and other measurements back to the base.

An example robotic space probe was Mariner 10, which was launched from Earth in 1973. The launch site was Cape Canaveral, Florida, and NASA sponsored the project. Importantly,

Mariner 10's purpose was to fly by and take measurements related to Mercury and Venus, two planets that are located relatively close to each other. Measures related to the atmosphere, the environment, and the body characteristics of each planet were to be gathered. Additionally, the purpose of the project was to test out a new slingshot gravitational maneuver whereby the probe would pass by Mercury, circle around Venus, and then be sent back to Mercury. As a result, about 7000 photographs of Mercury and Venus were sent back to Earth before Mariner 10 lost power in 1975 ("Missions to Mercury," 2010).

Satellites

The next most complex type of robotic space vehicle compared to the pure space probe is the satellite; satellites are different from pure space probes in several ways. Unlike pure space probes, satellites are designed to orbit around a planet or moon many times. That is, they are launched from the Earth and then placed into orbit when they reach a certain destination. They can orbit the Earth or some other celestial body. Like space probes, these vehicles carry a variety of instruments. Their instruments allow them to do a variety of jobs. Such jobs include communication, weather detection, military observation, and research. Interestingly, more than 8000 satellites are now orbiting the Earth. Only about 560 of them are operational; the rest are not operational and are classified as space "junk" ("Satellite," 2012).

The numerous operational robotic satellites orbiting the Earth today make human life livable. For example, the satellite named Galaxy 14 sends digital TV signals to the East Coast of the U.S. It carries programs such as ESPN, CNN, and the History Channel. For another example, the satellites named GOES-13 and GOES-15 send information about weather conditions in North America to weather watchers ("After 10 years," 2013). As a result, people can be warned about storms and other upcoming weather events. For a third example, the KH-13 series is a class of

spy satellite. Each satellite can take photos of objects that are bigger than 5 inches from a distance of 200 miles away (“What is a keyhole satellite,” 2014). It can keep track of the activities and movements of military troops and terrorist organizations. All of these satellites send people information that is used daily to make their lives more enjoyable, safer, and easier.

Landers with Rovers

The third type of robotic space vehicle is the lander which contains a rover. Unlike the other two types of robotic spacecraft, the lander is designed to land on a planet or other space body, open up, and allow the rover to travel around the surface of that celestial body. Because the rover can actually touch a surface, it can gather and analyze samples. It can also take “up close” photographs and conduct experiments that are guided by scientists on the Earth. Because the rover can move around, it can be directed to interesting features of the celestial body, it can be placed in sunny locations to gather solar energy, and it can move to many different locations. In this way, the climate of different areas can be determined, and the geology and composition of rocks and soil in each location can be analyzed.

An example of a rover is Curiosity, which landed on Mars in August of 2012 (“Curiosity,” 2014). Specially designed to maneuver across Mars’s rocky terrain, Curiosity looks somewhat like a silver “space car” without an outer shell. It is a wheeled vehicle with lots of instruments attached. Its purpose is to investigate Mars’s climate and geology and to determine whether life is sustainable on Mars. Scientists work around the clock every day to keep Curiosity actively performing experiments and traversing the planet. Since future manned missions are planned for Mars, the work of Curiosity will allow preparations to be made for those missions.

Summary

To conclude, robotic space vehicles are vitally important members of our exploratory

work force for a variety of reasons. For one thing, probes can be launched into space to take basic measurements of celestial targets. Additionally, satellites can orbit a target for long periods of time to tell us how the target is changing over time. Moreover, landers can land on a target, and their rovers can roam around on it and do up-close experiments. Since robotic spacecraft can perform all of these jobs as well as people, there is no sense in risking people's lives in space for this kind of exploratory work.

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