

## Activity I9: Space Probes

The National Aeronautics and Space Administration's (NASA's) automated spacecraft for Solar System exploration come in many shapes and sizes.

For the early planetary reconnaissance missions, NASA employed a highly successful series of spacecraft called the Mariners. Their flights helped shape the planning of later missions. Between 1962 and 1975, seven Mariner missions conducted the first surveys of our planetary neighbours in space.

All of the Mariners used solar panels as their primary power source. The first and the final versions of the spacecraft had two wings covered with photovoltaic cells. Other Mariners were equipped with four solar panels extending from their octagonal bodies.

Although the Mariners ranged from the Mariner 2 Venus spacecraft, weighing in at 203 Kilograms, to the Mariner 9 Mars Orbiter, weighing in at 947 Kilograms, their basic design remained similar throughout the program. The Mariner 5 Venus spacecraft, for example, had originally been a backup for the Mariner 4 Mars flyby. The Mariner 10 spacecraft sent to Venus and Mercury used components left over from the Mariner 9 Mars Orbiter program.

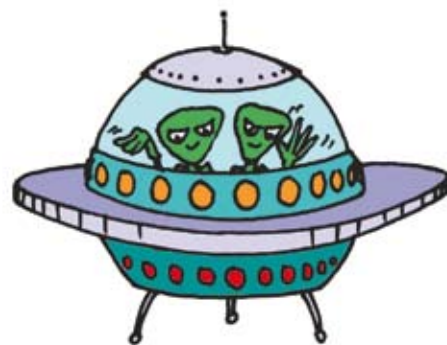
In 1972, NASA launched Pioneer 10, a Jupiter spacecraft. Interest was shifting to four of the outer planets - Jupiter, Saturn, Uranus and Neptune - giant balls of dense gas quite different from the terrestrial worlds we had already surveyed.

Four NASA spacecraft in all - two Pioneers and two Voyagers - were sent in the 1970's to tour the outer regions of our Solar System. Because of the distances involved, these travellers took anywhere from 20 months to 12 years to reach their destinations. Barring faster spacecraft, they will eventually become the first human artefacts to journey to distant stars. Because the Sun's light becomes so faint in the outer Solar System, these travellers do not use solar power but instead were nuclear powered and operate on electricity generated by heat from the decay of radioisotopes.

NASA also developed highly specialised spacecraft to revisit our neighbours Mars and Venus, in the middle and late 1970's. Twin Viking Landers were equipped to serve as seismic and weather stations and as biology laboratories. Two advanced orbiters - descendants of the Mariner craft - carried the Viking Landers from Earth, and then studied Martian features from above.

Two drum shaped Pioneer spacecraft visited Venus in 1978. The Pioneer Venus Orbiter, was equipped with a radar instrument, that allowed it to "see" through the planet's dense cloud cover to study surface features. The Pioneer Venus Multiprobe, carried four probes that were dropped through the clouds. The probes and the main body - all of which contained scientific instruments - radioed information about the planet atmosphere during their descent towards the surface.

A new generation of automated spacecraft - including Magellan, Gallileo, Ulysses, Mars Observer and Cassini - is being developed and sent out into the Solar System to make detailed examinations that will increase our understanding of our neighbourhood in the Universe, and of our own planet. Look out for news items



## Carefully Read The Previous Page On Space Probes.

Column A below contains a number of statements whilst Column B contains a list of NASA's space probes. You have to correctly match the statement in Column A with the space probe from Column B. Write down in your exercise book the correctly matched pairs.

### Column A (Statement)

Developed in the 1970s to explore Mars and Venus. They acted as seismic and weather stations and biological laboratories.

A series of 7 craft that explored the other planets in the 1960s and 70s. They were all solar powered.

Drum shaped spacecraft sent to explore Venus. They were equipped with Radar to look at the surface features of the planet.

Launched in 1972 to explore Jupiter.

Four spacecraft sent in the 1970s to explore the outer regions of the Solar System. They were all nuclear powered.

The latest automatic spacecraft which will increase our detailed knowledge of the planets in the Solar System.

### Column B (NASA's Space Probes)

Pioneer

Mariners

Two Pioneers and  
Two Voyagers

Pioneer 10

Magellan, Galileo,  
Ulysses & Cassini

Viking Landers

Use the information from the "Space Probes" page to fill in the missing words.

- 1 The orbiters which carried the Viking Landers to Mars sent back information about the Martian \_\_\_\_\_
- 2 Pioneer 10 was sent to explore Jupiter which is one of the four \_\_\_\_\_ planets, the others being \_\_\_\_\_, \_\_\_\_\_ and \_\_\_\_\_.
- 3 The Pioneer Venus multiprobe sent back information about the \_\_\_\_\_ of Venus.