SPACE EXPLORATION AND RESEARCH

Essay No. 01

Synopsis: Space is an endless expanse containing all things like earth, solar system, galaxies etc. It has been an object of great interest to man since time immemorial. Modern research and exploration in space has been phenomenal. It began with the launch of Sputniks by Russia. Americans created history by landing on the moon in 1969. Space probe by manned and unmanned airships and shuttles into solar system and beyond has been quite wonderful. All these heroic and awe-inspiring efforts have revealed a brave new world where sky is in the limit.

Space is the boundless four-dimensional continuum in which matter can be physically extended. It is that part of the universe, without limits, which contains everything known and unknown including the sun, planes, earth, moon, stars, galaxies, and the vast regions between the galaxies. It also means the earth's atmosphere and the area beyond it. It is a limitless expanse in which all things have position and direction. Broadly and colloquially, space and universe are one and the same. Nobody knows for certain if the universe is finite or infinite. According the Einstein it is finite but unbound, that is, it has limits but they cannot be observed or measured. The strange, bright object in the space which looks like stars but are not stars have come to be knows as quasars. Quasar is a shortened form of "Quasi-stellar sources" or QSS. These are said to be the most distant objects in the universe found so far. They are believed to be as far as 16 billion light years from us. And light travels at the speed of 2, 99,792.5 km per second. A light year means the distance covered by light in one year.

Man's interest in the space and universe has been since the time immemorial. The myths, legends and folktales of the world are full of space-stories. The stars, the planets, the sun, the moon and the galaxies have set man's imagination aflame and he has woven a colorful, fascinating and imaginative fabric of tales, anecdotes, stories, myths and poems around them. For instance, consider the names of the stars, their identification with various mythological characters and the shapes of animals, birds, and god's ad goddess in which the constellations have been imagined and framed. The pictorial representation of the constellations is one of man's best imaginative creations.

In ancient days it was believed that earth was at the centre of the universe and the sun and other heavenly bodies revolved round it. Then came Copernicus, who changed it and put sun at the centre of the universe. With the

invention of the telescope, man's horizon of knowledge about space began to expand rapidly and he learnt that the sun and its satellites were only a part of larger system called galaxy. In 1925 American astronomer Edwin P. Hubble further enlightened us by telling that there were many more galaxies like our own one, the Milky Way. This universe has been expanding at an unimaginable great speed like a hot balloon and stars and galaxies have been hurtling away from one another. These studies have given birth to various theories of the origin of the universe. Of these, big bang and the pulsating theories are most prominent and challenging.

Recent researches have produced a new harvest of knowledge. The pictures and images taken by American spacecraft Galileo of the Jupiter's moon Europa suggest the present of a vast ocean containing life. The ocean contains the main building blocks of life water and organic chemicals. Astronomers suspect that there may be life in warm water lying beneath the frozen surface of Europa. This discovery is a milestone in the long search of extra=terrestrial life in our own galaxy. The rapid advancements in space, satellite and astronomical technology has taken our space related explorations and researches further afield significantly.

The modern age has rightly been called the "Space Age" because of spectacular achievements in space research and exploration. It began with the launch of Russian Sputnik-1 on October 4, 1957. It was gaint step forward in man's quest for knowing more and more about the space and heavenly bodies it contained. Sputnik-2 carried a dog, Like and the march continued establishing new milestones. The space research is now 40 years old. The Americans overtook the Russians with their 2-men Gemini launches in 1965, followed by Apollo flights. History was created when American astronauts Neil Armstrong and Edwin Aldrin landed on the moon on July 21, 1969. Neil Armstrong was the first to step down on the surface of the moon followed by Edwin Aldrin. Since then in all 12 American astronauts have landed on the moon bringing back many kg of rock and soil samples for detailed study and research.

Then came shuttles, the reusable spaceships. The use of shuttles, which can be used as aeroplanes, has brought down the cost of space exploration considerably. America launched space shuttle Columbia on April 12, 1981. Challenger was the second U.S. 1.2 billion $ space shuttle which was used for 24 times but in its 25th flighting it exploded on August 30, 1984. In one of its flights Discovery took with it the Hubble space telescope and was released from the shuttle on 26 April, 1990 to drift off in space on its long search for new worlds. This telescope is orbiting the earth every 97.3 minutes at an altitude of 611 km.

The U.S. Astronauts aboard the space shuttle Endeavour completed the biggest repair job in Space history on December 13, 1993. On 6 October, 1990 Ulysses was launched aloft the space shuttle Discovery with a mission into unknown deep and limitless space. On April 18, 1991 the U.S. Space shuttle Atlantis launches a 17-tonne observatory in the space which could provide clues to the origins of the universe and other mysteries.

The space explorations by the Russians have been equally amazing and fruitful. They sent their first space shuttle Barun (Snow Strom) into space on 15 November, 1988 from Bikonour cosmodrome. They created space history by launching their spaceship Mir (Peace) on 20 February, 1986, a third generation space laboratory which later joined the Salyut-7 space station. Cosmonauts abroad the Mir has set many endurance and other records. The Americans shuttle Discovery docked with Mir on June 29, 1995. Russia has also been launching a series of Soyuz-I Spaceships to space stations for prolonged stay and space research. The First Soyuz T-15 was launched on 13 March, 1986.

During these space-flights many significant experiments like walking in the space with or without safety line, refueling of the craft in the space, orbital repair job, docking of two spaceships or stations, retrieving of the lost satellites etc. have been successfully undertaken.

The space-probe by unmanned space ships has been no less wonderful. America launched Voyager-1 and 2 in 1977 to study Jupiter and Saturn at a close range. The voyager-2 completed its 12 years old space mission on 25 August, 1989 as it sped past Neptune and discovered its 2 moons. The Russian Phobes-2 was launched in July 1988 on Martain mission. In October 1988 America launched Galileo aloft space shuttle Atlantis for a comprehensive study of Jupiter. Similarly, other space probes including that of Pioneer 1 and 2 and Viking 1 and 2 deserve mention here.

These space probes, explorations and researches, by manned and unmanned spaces shuttles and ships, have yield a rich crop of knowledge abut stars, planets, the solar system, the Milky Way and the universe. The U.S. space agency NASA is busy developing wedge shaped futuristic spaceships that would be used and reused like an aeroplane and carry people and payload into space more cheaply than a space shuttle. It will be built by Lockheed Martin Corporation of the U.S. for NASA.

Space exploration is full of great excitement, fascination, enlightenment and no less heroism and adventure. The space is full of the stars, galaxies, planets, satellites, asteroids, meteorites, comets, pulsar, quasars etc. Each of

these heavenly objects is a wonderful, awe-inspiring and exciting world in itself. To know about them to have contact with them is to share in the creation. The universe is full of countless mysteries and secrets. Unraveling a secret, a discovery made means a milestone in human progress and development. The study of celestial bodies is its own reward, a great source of thrill, joy and deep satisfaction. Moreover, these researches would yield very rich rewards in due course. For example, the close appearance of the lives experience because this much brighter celestial visitor would make its reappearance again after 4,000 years. It was a matter of great delight and satisfaction to see it because it was visible with the naked eyed in the evening.

Essay No. 02

Space Research

Man is adventurous, intelligent and his thirst for knowledge is limitless. This insatiable thirst has urged him to probe and unravel the mysteries of space, the continuous and limitless expanse extending in all directions. Space is everywhere and all around us, an ever-expanding phenomenon. Space contains the whole universe, including all the planets, the sun, the moon, the earth, the stars and whatever there is known and unknown in the universe. The limit where the earth's atmosphere ends is called outer space. The universe and space are almost synonymous. Space is eternal, universal and ageless. It can neither be destroyed nor created. It is estimated that observable space or universe is 25 billion light years in diameter and one light year distance means approximately 9460,000,000,000 km. It contains countless galaxies. Each and every galaxy, like our own Milky Way, is a grouping of innumerable stars. It is all so wonderful, mysterious and awe inspiring.

Man's curiosity about space and eagerness to unravel its mysteries is quite natural. Indian and world mythology and literature are full of cosmic tales, adventures and allusions. The progress in space-probe and technology during the last few decades has been spectacular and staggering. Now we have means as fast as, or faster than, sound to travel from one place to another. Consequently, the world has almost become a global village. During this period many satellites and spacecrafts have been launched for various purposes. It has revolutionized the means of mass communication, like radio, T.V. and broadcasting. It has not only enhanced our communication capabilities but also helped us in providing advanced disaster warning, search and rescue measures, distance education, and remote sensing, etc. Space research can help us in unraveling many mysterious phenomena, such as the origin of the universe, the

age of our earth and other planets. It may ultimately help us in the distant future to know whether life exists on any other planet or heavenly body.

The invention of rocket was a revolutionary step in the field of space travel and research. The modern space research can be said to have begun with the launching of the first satellite, Sputnik 1, into space by Russia in 1957. Sputnik 2 sent in the same year carried a dog named Laika. It successfully supplied valuable data for a week, after which the radio transmitter of the satellite suddenly stopped transmitting signals to the earth. It was a milestone in the space research programme. In 1961 Yuri Gagarin, of the then Soviet Union, became the first man to go into space and orbit round the earth. This was followed by American space launches carrying men and other living beings. In 1969, a Russian spaceship passed by the moon within a distance of about 6500 kms. Then was launched Lunik III, which landed on the moon. In the same year U.S.A. sent its Ranger 7 to the moon. These were spectacular achievements heralding an era of miraculous feats in space travel, technology and research. In July 1969, Neil Armstrong became the first man to land on the moon. He was later joined by his colleague astronaut Edwin Aldrin. They reached the moon on board the spaceship Apollo-11 and spent 21 hours on its surface, collecting rock and soil samples and then safely and triumphantly returned to the earth to the great wonder, awe and exultation of the whole world. Then again in November 1969 the American scientists repeated this feat by landing Charles Conrad, Richard Gordon and Alan Bean on the moon on board the spaceship Apollo-12. They returned to the earth after spending 32 hours on the moon, which is our nearest neighbour, at a distance of about 380,000 km. The Americans again landed on the moon for the third time in 1971 in their spaceship Apollo-14. Then Apollo-15 landed for the fourth time on the moon.

But it was just the beginning of a brilliant saga of space travel and research. The conquest of the moon is not enough as man’s search into the unknown knows no limits. And so flights to other planets began. The Americans launched Pioneer I in March 1972 on a 21-month mission into space, past Jupiter, Saturn, Uranus, Neptune and Pluto. It was the first man-made object to travel the solar system. Since man’s first landing on the moon, there have been scores of space flights by the U.S. and the then U.S.S.R., marking a beginning of a bold, new and dynamic era. In 1978, the Russian scientists sent the first international crew in space, consisting of a Russian and a Czech cosmonaut. In 1979, the Soviet cosmonauts succeeded in growing onion sprouts on board Salyut 6. In 1977, the U.S. launched Voyager I to probe the outer space and the solar system. The Voyager II was sent into space the same year, past the planet Saturn.

Columbia, the first space shuttle, was launched by America on April 12, 1981 and returned to the earth after 54 hours in space. Unfortunately, on February 1, 2003 Columbia space-shuttle exploded in mid-air, just minutes before landing while returning from a successful space voyage, killing all its crew members. Columbia was a multipurpose and reusable spacecraft which took-off like a rocket. It could be used both as a satellite and a glider. It was used to launch satellites, contact, retrieve, and repair spacecrafts in the orbit. The U.S. spaceship Pioneer 10 was launched in June 1983 to travel to the stars past the planets and the sun. In 1984, the space shuttle Challenger became the first spaceship to retrieve and repair an ailing solar satellite in April, 1984.

The end of the Cold War has ushered in a new era of space co-operation, research and technology. It has also removed the dangers of space weapons and the star wars to a great extent. Now, the possibilities of world destruction through space weapons like missiles, etc. have receded because of this understanding between the two superpowers of the world. It ensures the use of space for peaceful purposes only, at least, for the time being.

On March 16, 1995, the Soyuz capsule launched by the Russians docked with the orbiting Russian space station Mir. This space capsule carried a U.S. astronaut, Norman Thagard. Space station Mir had been in orbit for 9 years but it was for the first time that an American astronaut was transported to a Russian space station in a Russian space capsule. Soon the U.S. space shuttle, Discovery, also docked with Mir. This paved the way for the4 proposed joint mission to Mars in the future. This co-operation in the field of space research between America and Russia is really welcome. It now seems certain that the day is not far when the combined efforts of Russia and America will achieve the goal of permanent human settlement on the moon and landing of man on Mars. Co-operation in space technology can further boost the unmanned explorations of the solar system and beyond.