

SREE CHAITANYA COLLEGE OF ENGINEERING KARIMNAGAR, TS

Department of Mechanical Engineering

A REPORT ON INDUSTRIAL VISIT TO ISRO SDSC SHAR



An Industrial visit to SDSC-SHAR (ISRO), Sriharikota has been organized by Department of Mechanical Engineering of Sree Chaitanya College of Engineering for 45 students of B.Tech II, III & IV year on 22nd October, 2019 who were accompanied by five faculty members, Dr. Ch. Shashikanth, Prof., Mr. T. Vinay, Assoc. Prof., Mr. M. Satish Kumar, Assoc. Prof., Mr. I. Venu, Asst. Prof. and Ms. C. Harmith Kaur, Asst. Prof.

The objective of the visit was to provide a Technical Exposure to the students about Space Technology and advancements in Technology. The visit not only provided a good insight into the quality of research happening in the area of space technology but also gave great exposure to the students about the future career prospects and areas of research in applied sciences.

ABOUT ISRO AND SDSC SHAR:

ISRO is the primary space agency of India and one of the largest space research organizations in the world. SATISH DHAWAN SPACE CENTRE (SDSC) or SRIHARI KOTA HIGH ALTITUDE RANGE (SHAR) is a rocket launch centre operated by Indian space research organization (ISRO). It is located in Sriharikota in Andhrapradesh. The Sriharikota range has been chosen for its proximity to the equator and to use the rotation of the earth .It is close to lake PULIKAT and it is about 100km north of Chennai and close to the BAY OF BENGAL.

Summary of the Visit:

One bus with students started from College Campus at 11.00A.M. on 21/10/2019 and reached Sullurpet, a near by town to ISRO at 2 :30 A.M, on 22/10/2019 where accommodation was provided to the students and faculty at Kinnera Grand Inn hotel. After Breakfast, we started to ISRO SDSC Centre and reached there by 10.00. A.M.

After several security checks and administrative formalities, Students were taken to a central building. In this place, they were shown a video – ‘Gateway to Space’ – on the ISRO, its history, and the current facilities available.

THE ‘GATEWAY TO SPACE VIDEO’

The GSLV and PSLV are the two launch vehicles used currently by ISRO to launch satellites into the geosynchronous and polar orbits respectively. The GSLV has 3 stages – the first is a solid (fuel) stage, the second a liquid (fuel) stage and the third is a cryogenic stage. The satellites launched so far have applications such as National development/infrastructure, telecom, disaster warnings, resource management, etc

The PSLV can launch multiple satellites simultaneously at a low cost and high reliability. The various facilities at SDSC were listed and their functions are explained in brief. Weather prediction is another important factor at the time of launch, and the SHAR boasts of this facility too. The latest addition to the SDSC was the S200 propellant plant. The strap on motors, their dimensions and use were elucidated.

The countdown begins at (t-57) hours. At this time, the liquid propellants are filled into the system. At (t-16) hours, the mobile service car is withdrawn and the system is connected to the Launch and Mission control centre (which are placed 6km from the launch site) through electrical wires only. The cryogenic fuel is set around the launch site. The performance is monitored in real time. At about 17 minutes after blast off, the GSLV completes the mission – puts the satellite in geosynchronous orbit.

After this, students were taken to several locations within the SDSC, with a guide to explain the locations.

SECOND LAUNCH PAD

This is the location that we see every time a launch is broadcast on television. The rocket is assembled and brought to the launch pad. The rocket is electrically insulated from lightning by 4 lightning protection towers. These towers also house high resolution cameras at several levels to monitor the various stages of the rocket. These cameras are protected by concrete enclosures. The launch pad itself is about 70m high. This means that the protection towers are even taller. An anchor is present to hold the rocket in place until the time of blast off.

Separate pipes are present to deliver cryogenic fuels, which are supplied at 180 degrees Celsius. Finally, there are exhaust deflection ducts which deflect the exhaust gases through underground tunnels to a place which is a few tens of metres away. In case the flame returns to the rocket, balance will be lost and the rocket may topple. The tunnels are filled with water to reduce pressure and temperature. Also, cryogenic fuel tanks are available in separate towers. Each floor in the launch pad is 4m high. This launch pad is called 'umbilical' due to the presence of the pipes which feed fuel to the rocket.

FIRST LAUNCH PAD

Unlike the 'umbilical' type, this is a pedestal type. The whole tower moves away from the rocket just before the blast off. As there is a PSLV launch in the next month and that process was taking place at the time, entry was denied and we were allowed to see this from a distance.

MISSION CONTROL CENTRE

The mission control is the focal point of controlling the vehicle. There are 8 'hold buttons' at different places around the range. In case of abnormalities in subsystems (affecting the health of the rocket), the hold button is used to terminate the countdown. In case the abnormality has been resolved, the first row is used to supervise the control of the launch vehicle. The second and third rows control the operations on the vehicle. Various chiefs of operations are seated in these rows. These computers are connected by Ethernet and fibre optics.

There is a separate ring safety server which is controlled by a senior scientist. In case of abnormalities in the path of the rocket, this person can detonate the rocket so that the rocket is blown up over the sea and does not affect neighboring human population. There are 45 levels of information relating to the launch of the rocket. The vehicle Director authorises the launch at (t16) minutes. An automatic sequence program checks the health of the rocket (with respect to various parameters) and ensures that any deviations in the parameters are within specific limits.

ASSEMBLY AND STATIC TEST AND EVALUATION COMPLEX

- Two buildings constitute the complex – the assembly building and the test buildings which are placed adjacent to each other. Motors which are in excess of 2m diameter are present and they are fabricated in Mumbai.
- Several tests are done on a launch vehicle, such as vibration test, centrifugal test, and static test. Of these, only the static test is done in SHAR. There are two kinds of static tests – ballistic test and the other is to optimize insulation. After assembly, the motors are tilted horizontally and they are integrated to floating members. From a calibration curve, the strain is converted to thrust and the motor is characterized. Flexible nozzles of the strap on motors are also tested on this test bed.
- At around 10.30 am A.NAVEEN KUMAR, Scientist/Engineer-SF, Entity, has addressed the students with all the technical information related to SHAR.. At around 2.15. P.M., we had lunch at ARYABHATTA canteen facility at SHAR. After having our Lunch, visited the Space Museum and the Library facility at SHAR. Here , we were allowed to take the Photographs, where we got an opportunity to know about the History of SHAR with the aid of many models related to the centre , visit was concluded and the students has started to at around 5.30 P.M., moved to the Hotel facility where accommodation was provided and concluded the day. Return journey was started from Sullerpet at 10 A.M.
- We (all students and staff member/s) are very much thankful to the Management of Sree Chaitanya College of Engineering M.Ramesh Reddy Secretary ,Dr .M. Madhusudan Reddy Director , Dr.G.Venkateswarlu, Principal of Sree Chaitanya College of Engineering and Dr.Ch.Shashikanth, Head of Mechanical Engineering Department for giving their valuable support.
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