July-September 2000

SPACE india

INDIAN SPACE RESEARCH ORGANISATION

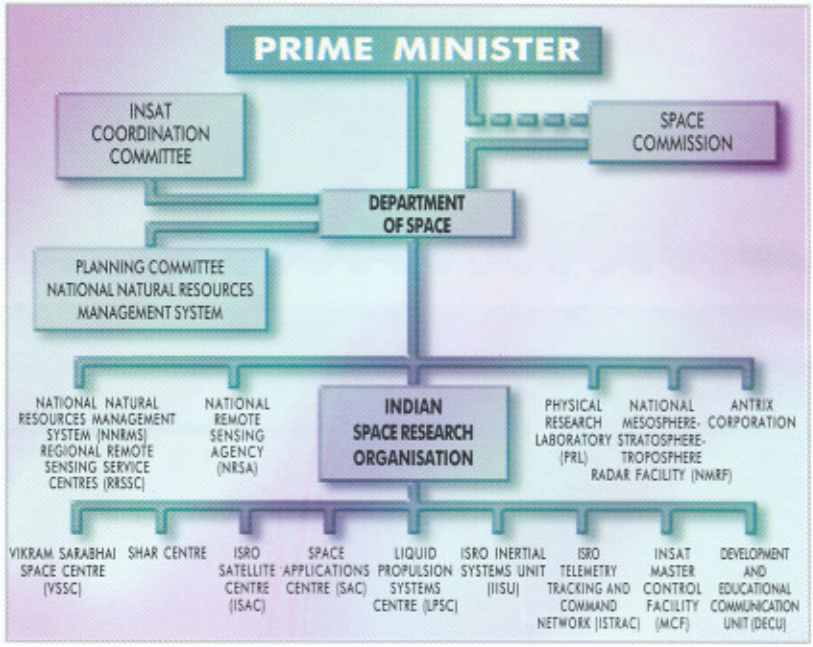
The Indian Space Programme

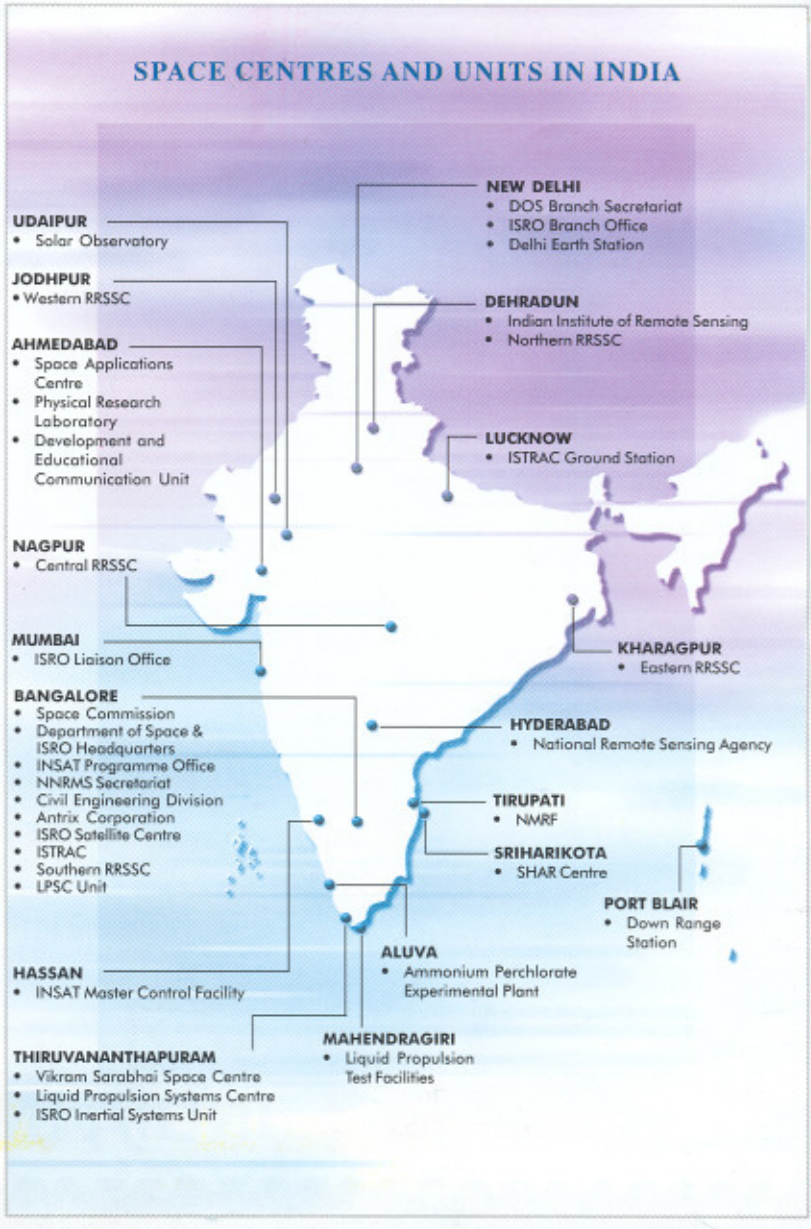
The setting up of the Thumba Equatorial Rocket Launching Station (TERLS) in 1963 marked the beginning of the Indian Space Programme. The Space Commission and the Department of Space (DOS) were established by the Government of India in 1972 to promote unified development and application of space science and technology for identified national objectives.

The Indian Space Programme is directed towards the goal of self reliant use of space technology for national development, its main thrusts being (a) satellite communications for various applications, (b) satellite remote sensing for resources survey and management, environmental monitoring and meteorological services and (c) development and operationalisation of indigenous satellite and launch vehicles for providing these space services.

The Indian Space Research Organisation (ISRO) is the research and development wing of DOS and is responsible for the execution of the national space programme. ISRO also provides support to universities and other academic institutions in the country for research and development projects relevant to the country's space programme.

Both the DOS and ISRO Headquarters are located at Bangalore. The development activities are carried out at the Centres and Units spread over the country.





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One of the stamps on "India in Space" issued by Department of Posts

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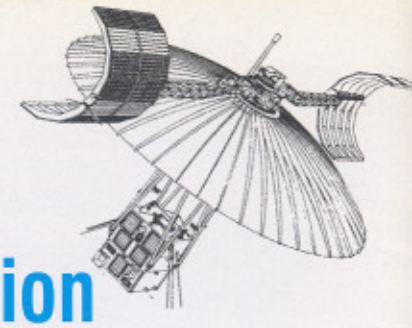
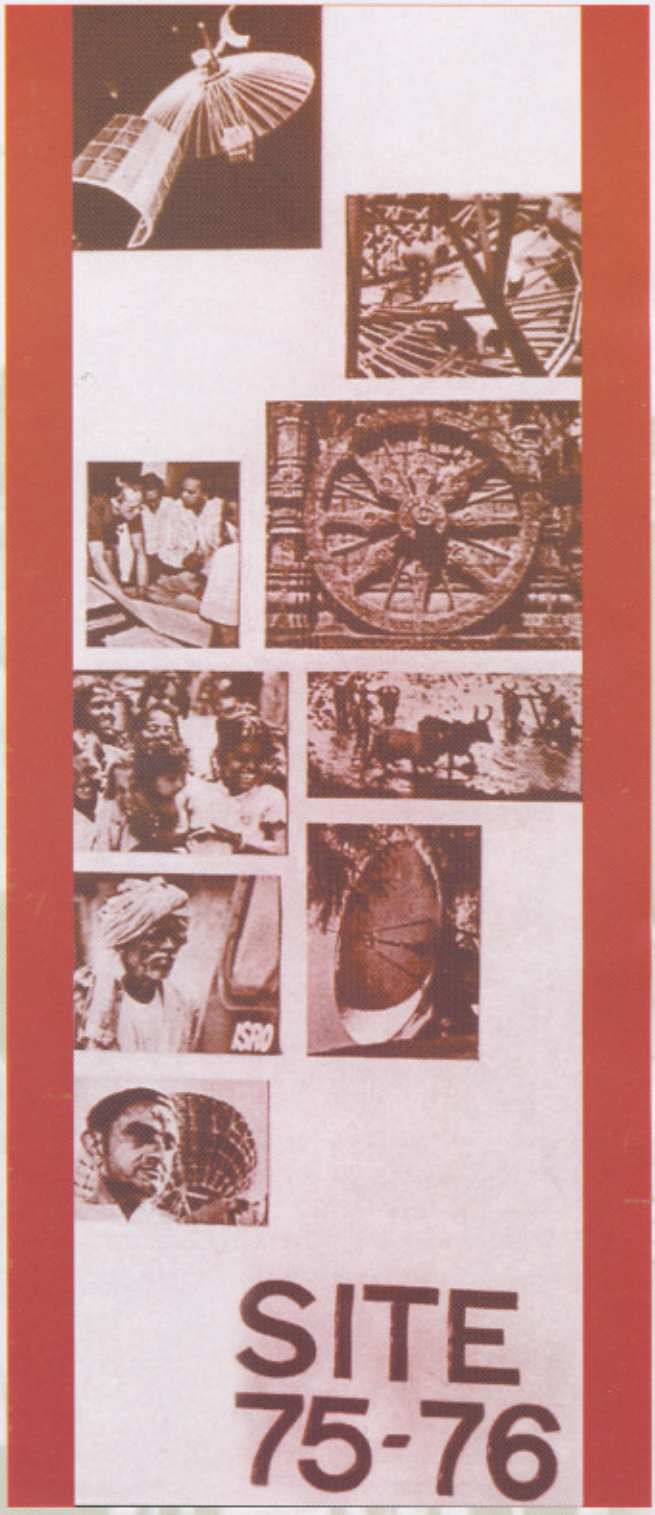


25 Years of Satellite Television In India

India has more than a thousand transmitters and 70 million households having television today. The cable operators in the private sector and the private entrepreneurs have been using the immense potential of television with the result that a number of channels for music, sports, news and current affairs, feature films and enrichment programmes have now become available. The number of channels in regional languages has also grown over the years.

It all began 25 years ago when satellite television was introduced with the launch of Satellite Instructional Television Experiment (SITE) in August 1975 by ISRO, which was described as one of the biggest socio-technological experiment in the world. Though television was introduced on an experimental basis in and around Delhi in 1959, it grew at a very slow pace till 1975, confined to the metropolitan cities, till SITE enabled remote and backward regions of the country to receive television. It was indeed a thrilling moment when, at 6.20 pm on August 1, 1975, about 2,400 TV sets came alive in as many small villages receiving programmes directly from a high power geo-synchronous satellite located at 36,000 km over Kenya. It was the realization of the dream of Dr Vikram Sarabhai, the father of Indian space program, for using advanced technologies to solve the problems of the nation.

SITE, conducted using USA's Application Technology Satellite (ATS-6), demonstrated the potential of satellite technology as an effective mass communication media for a developing country like India. It provided valuable experience in the development, testing and management of a satellite-based instructional television system, particularly, in rural areas.



SITE had the following objectives:

- Gain experience in the development, testing and management of satellite-based instructional television system, particularly, in rural areas and to determine optimal system parameters.
- Demonstrate the potential of satellite technology in the rapid development of effective mass communications in developing countries.
- Demonstrate the potential of satellite TV broadcast in the practical instruction of village inhabitants.
- Stimulate national development in India, with important managerial, economic, technological and social implications.

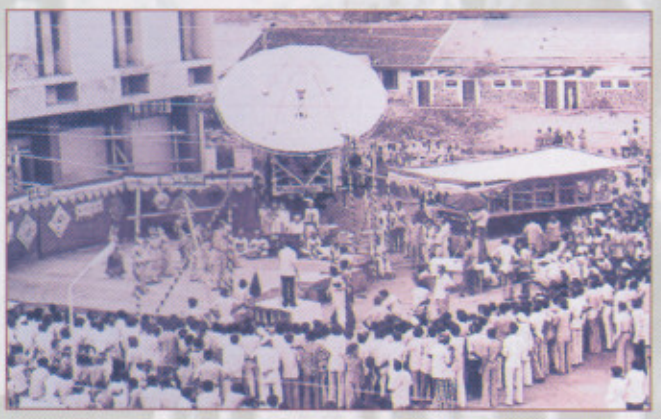
Under SITE, TV sets, augmented with 10 feet diameter parabolic antenna and front-end converters, had been placed in isolated villages in parts of six states of India Rajasthan, Bihar, Orissa, Madhya Pradesh, Karnataka and Andhra Pradesh. A TV transmitter was also set up in Pij village in Gujarat, which provided programmes in local language along with common programmes from Delhi via satellite; this was the first rural transmitter. TV sets in and around Delhi and Amritsar also received programmes beamed from Ahmedabad via satellite in addition to those telecast locally.

While most community sets were deployed in villages, which had electricity, about 150 battery-operated sets were also deployed in villages, which did not have electricity. In addition to the Direct Reception Sets (DRS), some conventional transmitters were employed to rebroadcast the satellite programmes. An elaborate system was required to deploy, maintain and operate the community sets.

The programmes were broadcast for four hours every day, $1^1/_2$ hour in the morning for school children and $2^1/_2$ hours in the evening, for community viewing, from earth stations in Ahmedabad and Delhi. The programmes were produced in four studios set-up especially for SITE. Villagers in each state received programmes made especially for them in their own language besides a 30-minute common programmes meant for all viewers.

Many organizations played a role in SITE. ISRO had the overall management responsibility besides realising the hardware elements and production of science education programmes for children. The responsibility for programmes production was taken by Doordarshan (at that time part of All India Radio). The ministry of education took the responsibility for follow up of the school programmes and for organizing teacher-training programmes. Several extension agencies played a major role in SITE beside the state when the programmes were telecast.

The programmes telecast under SITE provided information on agriculture, animal husbandry, dairy, poultry, health and hygiene, family planning, education, national integration, teachers training and other development related issues in addition to entertainment. These capsules, in four languages — Hindi, Kannada, Oriya and Telegu were of 22.5 minutes. Preference was given to familiar folk formats. The drama



Video Shooting in progress for SITE

Landmarks in Television Broadcasting in India

1959 - Experimental Television Transmission from Delhi

1961 - School Television for Delhi students

1965 - Regular Television Broadcast with a daily news bulletin in Hindi

1967 - Krishi Darshan - programmes for farmers initiated

1972 - TV Transmission started in Bombay (now Mumbai)

1975 - Satellite Instructional Television Experiment launched

1978 First live telecast of cricket match from Pakistan

1982 - National Programme; Colour transmission and networking through satellite, live telecast of Asian Games from New Delhi

- Expansion of Television through Low Power Transmitters (LPT)

1983 - Launch of INSAT-1B (August 30, 1983)

1984 - Country-Wide Classroom of University Grants Commission (UGC) started

1986 - First regional satellite network started in Maharashtra

1987 - Morning transmission of Doordarshan started

1988 - INSAT-1C launched (July 21, 1988)

1989 - Afternoon transmission of Doordarshan started

1990 - INSAT-1D launched (June 12, 1990)

1991 - Private channel (Star TV) beamed for India on a large scale

1992 - INSAT-2A, first ISRO satellite under INSAT-2 series launched (July 10, 1992)

- Launch of first Hindi channel (Zee TV)

1993 - Metro Channel with satellite networking introduced

- Exclusive Satellite Channels

- Regional Language Satellite Channels by DD

- Regional Language Satellite Channel by Sun TV followed by others

- INSAT-2B launched (July 23, 1993)

1994 - Training and Development Communication Channel (TDCC) launched

1995 - INSAT-2C launched (December 7, 1995)

1997 - Prasar Bharati - Autonomous Broadcasting Corporation of India formed

1998 - INSAT System augmented with INSAT-2DT

1999 - INSAT-2E launched (April)

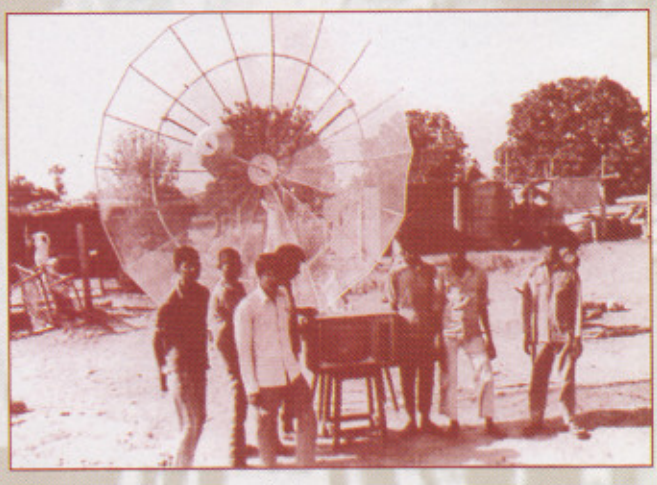
2000 - INSAT-3B launched (February)

- Gyan Darshan Channel inaugurated

format was adopted as the most effective means for message transfer while instructional information content was kept light. Recapitulation with stills and important points at the end of instructional programmes also proved to be useful.

Several programmes were produced with the objective of helping children to learn community living skills, instilling habits of hygiene and healthy living, promoting aesthetic sensitivity and making children aware of the modernization of life and society around. Science education with

Rural audience watching the SITE programme



Chickenmesh antenna being set up to receive TV signals

A scene from another popular programme Hun Haan

programmes were conceived to make children understand their immediate environment and to emphasize the learning of the scientific methods. An important feature of the SITE Science Education Programme was the inclusion of behavioral scientists/ developmental scientists in the production team to do formative research.

A multi-media package for training primary school teachers in science was specifically developed under SITE to train a large number of teachers efficiently and economically. About 24,000 teachers were trained and 10 teachers each were sent to 2400 SITE villages. The multi-media training package covered pedagogic, motivational and enrichment aspects. The components included television programmes, radio programmes, and enrichment material and teacher monitor tutorials.

ISRO evaluated the SITE in terms of both technical performance and social impact. The latter was carried out by a team of social scientists who not only did summative evaluation but also provided inputs to programmes producers through pre-testing of programmes, generation of audience profiles and assessment and feedback after transmissions. Some of the findings were:

- Overall gain in health and hygiene was significant and the gains by females were higher. Gains by illiterate females were maximum.
- There was a significant change in the concept of the ideal family size; there was a significant shift in favour of three or less children.
- There were significant gains in the field of animal husbandry.
- There were significant gains in the field of overall modernity; this was more in the case of illiterate males compared to literate males.
- There was significant gain in the area of political orientation.
- Before SITE there were about 30 percent males and 60 percent females who had never been exposed to any mass media. After SITE, in the TV villages, the figure reduced to 10 percent and 35 percent respectively.

In the field of agriculture, the overall results did not show any statistically significant gains.

SITE established that extension of communications infrastructure to remote areas was not only feasible, but it could also contribute concretely to promoting national development. It was possible to deploy, operate and maintain community TV sets and DRS even in remote areas of a country and the service availability was as high as 80-90 percent and the average audience size was 80-100.

SITE was indeed a great learning experience to design, produce and telecast educational and developmental programmes to widely spread areas with diverse problems and languages using, on a time-sharing mode, a single broadcast channel. The viewers of SITE programmes were first generation mass participants, most of them illiterate and came from the poorer

(L to R) Mr, Arun Jaitely, Minister of Information and Broadcasting, Smt. Mirnalni Sarabhai wife of late Dr. Vikram Sarabhai, Shri B.S. Bhatia, Director DECU at the inauguration of the seminar "Satellite Broadcasting - Retrospect and Prospect" organised at Ahmedabad. Dr. K. Kasturirangan Chairman, ISRO is delivering the Welcome address.

sections of rural society. SITE was more effective than all other media in attracting female audience.

SITE also brought a large number of scientists, engineers, sociologists and programmers close to the rural reality. It provided a practical example of how a number of agencies with different basic disciplines could work in a close partnership. SITE also gave a rural orientation to Indian satellite TV broadcasting. Thus, SITE was a successful experiment and achieved both its social and technical objectives, paving the way for a satellite based television system for India.

Since SITE, satellite broadcasting has seen several landmarks. In 1982, Doordarshan launched a massive expansion program. The commissioning of INSAT system in 1983 with the launch of INSAT-1B, enabled Doordarshan to telecast nation-wide live programmes. The transmission of Asian Games in colour was a historic event.

Andhra Pradesh to Use INSAT - 3B for Developmental Communication

ISRO and the Department of Information Technology and Communications (IT&C) of Andhra Pradesh signed a Memorandum of Understanding on July 8, 2000 for establishing a satellite-based communication network in Andhra Pradesh using the Ku-band capacity of INSAT system. Andhra Pradesh will use the Ku-band capacity of INSAT for promoting satellite-based communication, specifically, in the areas of distance education, telemedicine and agricultural extension. Following closely the inauguration of Vidya Vahini Yojana in Orissa on May 24, 2000 by the Prime Minister, the MOU with Andhra Pradesh marks yet another milestone in the implementation of a countrywide satellite network for grassroots level development.

To mark the Silver Jubilee of the commencement of SITE, a seminar "Satellite Broadcasting - Retrospect and Prospect" was organized at Ahmedabad on August 12, 2000. Inaugurated by Mr Arun Jaitley, Minister of State for Information and Broadcasting, the seminar had participation by experts in mass media, educational communication and satellite broadcasting technology.

Krishi Darshan

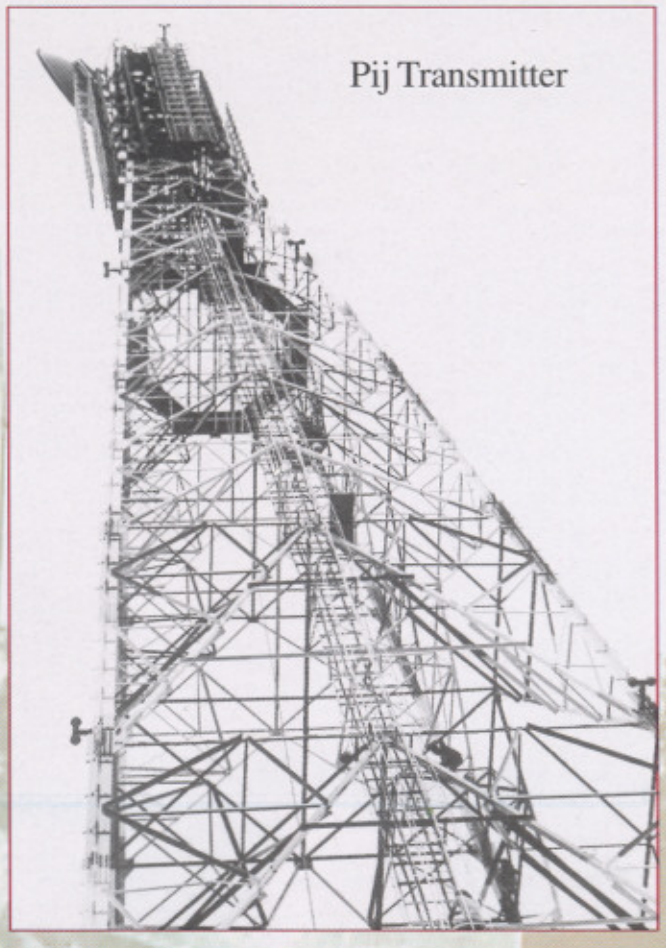
Krishi Darshan was an important programmes conducted as a pretest for SITE. It was initiated in 1967 to get experience in production of rural and development programmes and to study their impact. Under Krishi Darshan, eighty TV sets were installed in villages around Delhi and the functioning of the system was studied and the impact measured.

Kheda Communications Project

While SITE and direct broadcasting enabled TV programmes to be taken to remote and inaccessible villages with most exciting consequences for development, there were apprehensions about the centralization inherent in the technology of direct broadcasting. Looking for technological options that could meaningfully complement this centralization, the idea of "limited rebroadcast" was also pursued; the result was Kheda Communication Project (KCP). Under KCP a low-power TV transmitter was set up in Pij village (about 60 km south of Ahmedabad), which was linked to a studio and earth station complex at Ahmedabad, so that it could relay local programmes (originated from the studio) or the "central" satellite programmes received at the earth station.

Though Pij covered some urban population in Kheda, the focus was on the villagers. With assistance from the state government and local cooperative organizations, 550 community TV sets were installed in public places in 400 villages of the Kheda district where the audience gathered during the transmission time. The transmissions consisted of 90 minutes of local programmes of which, half was produced by ISRO. Doordarshan, the national TV organization, produced the other half. ISRO programmes were developmental and education oriented, while Doordarshan programmes covered news, topical issues and general entertainment. About 100 villagers - primarily small farmers, labourers and children formed the typical audience at a community TV set. Kheda TV had the specific purpose of promoting rural development and social change.

In the larger context, the efforts had been not only to evolve and demonstrate new approaches



Pij Transmitter

to the use of television for development and education, especially in rural areas, but also to chart out a more meaningful direction for Indian TV.

All the ideas for the programmes emerged from the needs of the rural audience - generally on the basis of studies by ISRO social scientists, or by the assessment of the concerned field agencies. programmes proposals were discussed in a large group that examined objectives, relevance, target audience, approach, format, extent of utilization/field support required, etc.

KCP was a participatory mission having two-way communication approach. Communication research formed important core activities of the project. It included

Prime Minister's "Tete-a-tete" With Panchayat Chiefs

In another significant use of INSAT for direct contact with the grassroots level society, the Prime Minister, Mr Atal Behari Vajpayee, had a virtual "tete-a-tete" with the chiefs of Panchayat Raj institutions on August 01, 2000. In an hour-long video-conferencing via 14 video-studio link centres spread across Uttar Pradesh, Gujarat and Karnataka, the Prime Minister could get first-hand assessment of the nitty-gritty of the local problems. Problems faced by Panchayat institutions like education, water shortage, and irrigation were among the issues discussed. The need for construction of cold storage to preserve food was also pointed out since 40 per cent of food grains and vegetables go waste.

The video conferencing centres had been established at Bakshi ka Talab, Gaurabaug, Sarojini Nagar, Nishatganj and Cantonment Park Road in Lucknow district (UP), Himmat Nagar, Mehsana, Nadiad, Palanpur and Gandhinagar in Gujarat and at Mangalore, Dharwar, Raichur and Tumkur in Karnataka.

various communication research steps for formative, process and summative research both for policy planners as well as programmes producers. These steps made all communication efforts need antenna based, relevant and useful. Outcome of the regular system of feedback from the village audience was given to all the producers, so that their programmes could be tuned to audience needs, tastes and reactions. In addition, occasional summative evaluations were done to determine the impact of specific series or programmes.

An interesting spin-off of the agricultural programmes. Tuner KCP was problem solving. Whenever some problem of a village came to the notice of the medium, it was recorded and carried to the decision-making authorities. The reaction of the decision-making authorities was recorded and transmitted repeatedly till the problem was solved.

Programmes on agriculture, animal husbandry, health and employment formed a regular, vital and substantial part of the Kheda transmission. Most of these programmes were produced in the field. Solutions to the real problems of the audience were sought. For example, veterinary doctors had been trained in programmes production in animal husbandry. Some of the important titles produced under KCP that made an impact were: No More Toleration of Sins, My Labour - My Earnings, Children more Empowered than Elders, Woman - you are Powerful, Window, Trijunction or Cross-roads, Life is on fire, Justice - Injustice, Uncle's Courtyard, Efforts at Organising Village Youth, Problem Solving Tactics by Bhala and Bhusa, Dahima Says and, The Writer's Mirror.

(Excerpts from "Yatra - The Journey" published by Development and Educational Communication Unit - August 2000.)

IRS-1D Completes Three Years in Orbit

The Indian Remote Sensing Satellite, IRS-1D, has successfully completed its designed life of three years and continues to function well. India's Polar Satellite Launch Vehicle, PSLV-C1, launched the satellite into orbit on September 29, 1997 from Sriharikota.

IRS-1D carries a combination of three cameras i) a Panchromatic camera (PAN) with a spatial resolution of 5.8 m, ii) Linear Imaging Self Scanner (LISS-III) operating in four spectral bands with spatial resolution of 23.5 m in visible and near infrared bands and 70.5 m in short wave infrared band and iii) a Wide Field Sensor (WIFS) with a ground resolution of 188 m. During the last three years, these cameras have been operated more than 9711 times during the satellite's 15,700 orbits around the earth. Availability of high resolution data from IRS-1D and its predecessor IRS-1C have enabled newer remote sensing applications to be taken up, especially, in the areas of urban sprawl, infrastructure planning and other large-scale thematic mapping.

It may be recalled that, due to a slight under performance of PSLV fourth stage, IRS-1D was injected with a velocity that was 130 m/sec less than the required 7446 m/sec. This minor shortfall in the injection velocity resulted in IRS-1D being injected into a polar orbit with an apogee of 822 km and a perigee of 301 km instead of the intended 817 km circular orbit. But, ISRO scientists, monitoring and controlling the satellite from ISRO Telemetry, Tracking and Command Network (ISTRAC) executed meticulously planned orbit maneuvers to successfully put IRS-1D into a functional sun-synchronous orbit of 737 km perigee and 821 km apogee. The scientists also ensured that the propellant on board the satellite was used optimally while carrying out the orbital maneuvers to assure the minimum designed life of three years for the satellite mission. It is in this context that the completion of three years of IRS-1D assumes significance.

Besides National Remote Sensing Agency, Hyderabad, several ground stations in North America (Norman in Oklahoma and Fairbanks in Alaska), Germany (Neustrelitz), Dubai, Equador, Abu Dhabi, Saudi Arabia, Japan, South Korea, Australia, Taiwan and Thailand receive data from IRS satellites under commercial agreements. Brazil, Argentina, Gabon and Malaysia, are also expected to receive the IRS data in the near future. India today operates a constellation of five remote sensing satellites, IRS-1B, IRS-1C, IRS-1D, IRS-P3 and IRS-P4 (OCEANSAT).

The launch of IRS-1D in September 1997, assumed great significance, since for the first time, India launched an operational satellite of the IRS-1D class using its own launch vehicle, PSLV. Subsequently IRS-P4 (OCEANSAT) was launched by PSLV along with Korean and German satellites on May 26, 1999.

India has planned to launch the follow-on satellites, RESOURCESAT (IRS-P6) and CARTOSAT-1 (IRS-P5) in the coming years. Another satellite CARTOSAT-2 mission has also been approved. Thus, ISRO will continue to enhance its remote sensing services.

Three Indian Boys Selected for "Red Rover Goes to Mars" Training Mission

Three Indian boys are among the 9 student scientists selected by the Planetary Society, USA, from over 10,000 entrants worldwide to serve on the Planetary Society's Red Rover Goes to Mars Training Mission. The boys are:

- 15 year old Shaleen Rajendra Hartalka, from Udaipur, Rajasthan in the Senior group
- 13 year old Tanmay Sanjay Khirwadkar, of Nagpur, Maharashtra, in the junior group and
- 10-year-old Vikas Sarangadhara of Bangalore in the Sophomore group.

The other 6 winners are: 15 year old Zsofia Bodo and 14 year old Bernadett Gaal of Hungary, 13 year old Kimberly De Rose of USA, 12 year old Luri Jasper of Brazil, 11 year old Hsin-Liu Kao of Taiwan and 10 year old Wojciech Lukasik of Poland. The nine students were chosen from a field of 80 semi-finalist representing sixteen nations. In all, 44 nations participated in the contest.

The idea of student participation in a real Planetary Exploration Mission was mooted by Planetary Society, USA with funding from LEGO Company and other sponsors and in cooperation with NASA, Jet Propulsion Laboratory and Milan Space Science Systems. The student-scientists will participate in an upcoming Mars Lander Mission. The training to be imparted to the students in this connection has been named 'Red Rover Goes to Mars Training Mission'. The student-scientists will work with actual data from Mars Global Surveyor (MGS) that is already in orbit around Mars and control the Mars Orbiter Camera aboard the spacecraft. They will also pick a launching site for a sample return mission to Mars. In early 2001, they will travel to Milan Space Science Systems in San Diego, California. There, they will take pictures of their site on Mars

Mars surveyor 2001 lander-rover mock-up

National finalists selected for Red Rover Goes to Mars Training Mission.

MGS Orbiter Camera. The imaging will be carried out under the supervision of Michael Malin and Ken Edgett, whose recent announcement of evidence for seepage of Martian groundwater stunned the world. ISRO was the national coordinator for selecting the student essays from India.

The initial selection of the student-scientists from India was carried out by 16 identified regional centres through a preliminary essay contest. The regional centres were Science City at Chennai, Nehru Planetarium of New Delhi, Visvesvaraya Industrial & Technological Museum at Bangalore, Raman Science Centre at Nagpur,

The Mars Global Surveyor

The Mars Global Surveyor (MGS) mission was launched on November 7, 1996 and began mapping the surface of Mars from orbit on April 1, 1999. MGS has instruments on board designed to return data about Mars' surface features, atmosphere and magnetic properties. MGS has already completed more than 6,000 orbits around Mars, and it's only halfway through its primary mapping mission. The Surveyor's camera, Mars Orbiter Camera (MOC), is producing the largest volume of data. MOC images include high-resolution pictures that can see Martian rocks as small as 1.4 metre for detailed geological studies and wide-angle pictures for global monitoring of dust storms, cloud formations, the polar ice caps, and surface features blown by wind. Data from Mars Global Surveyor will be used in the comparison of Mars and Earth - two planets that shared similar conditions billions of years ago, but are much different today. MGS data will also be used in planning future missions to Mars. MOC pictures provide important information in the selection of landing sites for future Mars landers.

Inter University Centre for Astronomy & Astrophysics (IUCAA) at Pune, Nehru Science Centre in Mumbai, Birla Industrial & Technological Museum of Calcutta, Kerala Academy of Sciences at Thiruvananthapuram, Kurukshetra Panorama & Science Centre, Vikram Sarabhai Community Science Centre at Ahmedabad and Regional Science Centres at Bhopal, Calicut, Lucknow, Bhubaneshwar and Guwahati. About 10,000 students participated in the preliminary contest. Of these, about 2000 students were selected who were required to write 1500 word essay defining the mission of the Marie Curie Rover and the Lander Robotic Arm on the Mars Surveyor Mission. Of these, 200 essays were selected by the regional centres and forwarded to ISRO.

Shaleen Rajendra Hartalka

Tanmay Sanjay Khirwadkar

ISRO scrutinized the 200 essays, based on the guidelines provided by the Planetary Society, USA and short-listed 37 students. On August 22, 2000, these 37 students in three age groups — Sophomore group (born between January 30, 1989 and January 31, 1991), Juniors (born between January 30, 1987 and January 31, 1989) and Seniors (born between January 31, 1984 and January 31, 1987) delivered lectures based on their essays at ISRO Satellite Centre, Bangalore.

Vikas Sarangadhara

A panel of judges drawn from Physical Research Laboratory, Ahmedabad, Inter University Centre for Astronomy, Pune, Indian Institute of Astro Physics, Bangalore, Jawaharalal Nehru Planetarium,Bangalore and Raman Research Institute, Bangalore besides ISRO, evaluated the students and selected 12 students whose essays were forwarded to Planetary Society, USA.

Subsequent to submission of the essays from these selected 12 students, the Planetary Society interviewed and selected three students.

The Mars Surveyor Mission

The Mars Surveyor 2001 lander mission was scheduled for launch on April 10, 2001 and land on Mars on January 22, 2002. In addition to the Marie Curie rover and the lander robotic arm, the 2001 lander was slated to have instruments that would perform technology experiments crucial to future human missions to Mars. Hardware on the lander was designed to demonstrate rocket propellant production using gases in the Martian atmosphere. Other equipment was for characterizing Martian soil properties and surface radiation. Although the Mars Surveyor 2001 lander mission has now been cancelled due to a reorganization of the Mars exploration programmes, the hardware and experiments will fly on upcoming lander missions. The Red Rover Goes to Mars Training Mission takes full advantage of the progress of the Mars Surveyor 2001 mission, before its cancellation, as the educational foundation for student participation in an upcoming lander mission.

Postage Stamps *On* Indian Space Programme

India's Department of Posts issued four postage stamps commemorating the achievements under the Indian space program. Of these, two stamps are on OCEANSAT-1 and INSAT-3B satellites that represent India's latest achievements in satellite technology. The other stamps in setenant format carries a painting by S Praveen, a student of Chennai, that won the first prize in the senior category Stamp Design Competition for Children held by the Department of Posts in 1999. The painting, 'India in Space-2025' is indicative of the fascination of the young mind for space exploration and the quest for knowledge about the unknown. It also brings out the yearning of the new generation to see India excelling in this advanced field of science.

The first day cover is another painting made for Stamp Design Competition for Children held in1999 on the theme 'India in Space - 2025' by Miss Parishi Minish Yagnik, a student now studying architecture in Ahmedabad.

The postage stamps were released at a simple function at ISRO Satellite Centre, Bangalore on September 29, 2000.


भारत INDIA
अन्तरिक्ष में भारत
INDIA IN SPACE
3.00