



# The Indian Society of Remote Sensing

## Ahmedabad Chapter

### NEWS LETTER

**VOL. 2 No, 2**

**April 1, 1988**

**Dear Member,**

The seventeenth of March 1988 is a golden day in the history of Indian Remote Sensing Programme. IRS-1A- the first of a series of operational remote sensing satellites was launched successfully on this day. We feel elated to have witnessed this grand event and fortunate enough to be a part of the excitement. Elsewhere in the newsletter we bring you more details on the satellite.

We also have something new to offer in this issue. We are now going to bring to you the views and ideas (on various topics) of different people in a feature entitled INTERVIEW. We plan to discuss and interview selected persons on topics of interest-remote sensing, problems of Gujarat etc. For this issue, we had an hour long discussion with Dr. Baldev Sahai, President of our Society, on a wide range of topics-the society's activities, the chapter activities, future of remote sensing etc. Dr. Sahai has some strong views on the society's future, role of chapters and this news letter. Turn over to the INTERVIEW section and read on for more details. We have a few more interesting personalities for the future issues. We hope you will find this feature interesting and also that this mode of exchange of views and ideas will be rewarding.

Geographical Information System (G.I.S.) is an emerging technological tool for solving different problems of natural resource management. Suppose there were problems which went like this calculate by density, age group, disabled people and movement ease the population at risk from drought in any district of Gujarat or calculate the area (total and land use wise) that would be inundated if the height of Narmada dam was raised/lowered. NO PROBLEM, one would say, provided one has a handy GIS package. We bring to you a note on GIS in this issue. We will follow it up with more details in the forthcoming issues.

Apart from these, we have a write-up on a very useful instrument for visual interpretation of satellite data. This instrument-the High Magnification Enlarger (HME) will soon be available in the market. You will find the details of the instrument useful.

How did you find the second/third issue? We haven't heard from any of you on these lines. We earnestly look forward to your comments/suggestions, and even criticisms, if there are any. A successful newsletter not only needs a good editorial staff but also a good amount of participation by the readers and this is what we are looking for. Just a line from you will give us a lot of encouragement and will enable us to bring out a better news letter.

- Editor



# INTERVIEW

Dr. Baldev Sahai is the president of ISRS (from 1987) and has been a very leading and active member of the society. It was because of his initiative that the Ahmedabad chapter was set up (in 1984) and has grown to such a stature today. Dr. Sahai is the Group Director, Remote Sensing Applications Group (RSAG) at Space Applications Centre (SAC) and also Associate Director for the IRS Utilisation Programme (IRS-UP). All these responsibilities keep him very busy. However, when we talked to him about this interview for the news letter, he readily agreed to give us time in spite of his busy schedule. We had gone prepared for conducting the interview (a set of questions which we had rehearsed before, a tape recorder, note-pads, pencils etc.) but we wonder if Dr. Sahai needed any such preparations, for he soon set things rolling and even before we knew it the interview had started.....

## SOCIETY AND CHAPTER ACTIVITIES

- Q. Dr. Sahai let us start with the society first and later we shall discuss other topics- the Chapter, remote sensing technology etc. According to you what is the present standing of the society and what are its future plans ?
- A. The society has been very active for the last 6-7 years-say since the SWAR symposium. The society has been concentrating on a concerted membership drive to have more members, setting up of local chapters - now chapters are already set up at Ahmedabad, Hyderabad, Delhi, Lucknow, Bhubaneswar and Dehradun and a few more are to be set up soon at Jaipur, Bombay and Bangalore. We also hope to have about 1000 members shortly because of the membership drive.
- Q. Presently, how many members are there in the society ?
- A. The membership achieved upto end of 1987 was 600 - i.e those who had paid the dues, but if the members who have not paid dues are also included then it would be around 1000. This essentially means that people who paid dues in 1987 are 600. As far as the society activities are concerned we have organised one national symposium every year, since SWAR.
- Q. What do you think is the impact that the society has on RS technology ?
- A. Right now the major activity of the society, apart from organising national symposia, is the Journal of the society-JOURNAL OF INDIAN SOCIETY OF REMOTE SENSING (PHOTONIRVACHAK). This activity is a major one at the national level. Through this, the society is trying to disseminate information on RS technology. Apart from this, the Chapters have been organising, at the local level, lectures, film shows, topical discussions etc. This is another way of disseminating information to the members about the RS technology. All this does have an impact.
- Q. Since you have taken over as President (from 1987) what have been your plans, apart from the membership drive and the journal, to further the growth of the society ?
- A. The first decision that has been taken, since I took over, was to increase the frequency of the journal. Previously it was two issues a year but with effect from 1988 we have



increased it to four issues. Another thing which I am trying to see is to have more local chapters. When I took over there was only the Ahmedabad Chapter but now there are many. We are now trying to have more interaction of the members at the Chapter level where the members can meet more frequently. We feel that this way the members need not have to travel long distances to participate in the society activities.

Q. While the Chapters would take up their own regular activities, does the main society have any plans for assigning particular tasks of national/regional importance to the chapters? Say, the society could plan out an annual programme of activities and ask the chapters to implement it.

A. It is very difficult to give any guidelines on particular tasks or activities to the local chapters as one has to think of the local conditions and problems, the type of membership etc. It is the chapters that have to evolve plans and policies at the local level which, in turn, should aid the dissemination of RS technology in the country. But the important thing is for the members to have more frequent interaction and come out with innovative ideas. We must always remember that it is the part that constitutes the whole and not the other way.

Q. In this connection, could we think that in the coming years the society would be similar to other international societies like ACRS, ASPRS etc. and that we could have other activities (other than symposium and chapter level interaction)- say publishing books and journals, making good slide-sets, conducting tours, undertaking consultancy work etc. ?

A. Primarily, the major activities of most of the societies is bringing out journals/newsletter, organising symposium etc. In fact beyond this, any other task becomes essentially a localised one and that is why we feel the chapters have to take the lead in organising local level activities, because presently, it is also not feasible to organise more than one national level symposium per year. But chapters must take up from here and even try to organise regional level meetings where the regional problems could be discussed.

Q. For this, would it not be proper that the executive council decides on certain regional topics and then asks the chapters to take lead as some of the chapters may not be in a position to take up activities on their own.

A. I personally feel that one should not give directives and that the local people must come up with ideas and evolve programmes as they are better in touch with the problems of that region and can feel the pulse of the people/problems better. This way the programmes would then be tailored to these regional needs. And, if one always thinks of the executive council providing guidelines, then many of these problems could be glossed over. Further, it is very difficult for members to attend frequent national level activities because of travel and fund constraints. One must keep these problems in mind before activities are taken up. Thus, I feel chapters should take up activities which involves minimum travel expense so that the interaction could be more frequent than what could be achieved at the national level. Say, for organising a lecture not much of funds are required. Similarly, screening of video programmes/film shows by contacting agencies like USIS, British Council etc. would not require much of funds. Such programmes could be held more frequently than an annual symposium.

Q. Yes, these activities which you have mentioned do not require much funds but why can't we think of one day workshops, seminars or any such activity which the chapter could



organise? Such activities would be organised by the chapters, say 3-4 times in a year and this could be apart from the national symposium. In such a case, the funds are a constraint and.....

A. Why should funds be a constraint? Why should Chapter unnecessarily have ambitions of doing things in a big way. Say, why should the chapters think of bringing out proceedings? One should have an open mind and have discussions at such meetings and the chapters need not worry about funds for bringing out the proceedings. The problem comes only in such cases. I feel the chapters should have programmes which do not require funds or require minimal possible funds. For example, I am associated with the Indian Physics Association since 1979 and there are few chapters in Gujarat and they get together and hold symposia and do not worry about finding funds. Members travel on their own and they have no ambitions to distribute bags etc. and thus minimal possible funds are sufficient. I strongly feel, and reiterate here again, that the chapters should organise programmes which require minimal or no funds.

Q. Just like the Centre-State relationship is a big bone of contention, it is now coming out that the HQ-Chapter relationship needs to be well defined because we find the chapter always complains of lack of funds and the HQs feels that funds should not be a constraint as the chapters should go in for activities involving minimum funds. What do you have to say about this?

A. So, if this ambition of the chapter of spending more money is cut then the problem does not come. Today, whatever aberration has come is because of the ambition of the Ahmedabad chapter to have lot of funds and spend lot of money which, we feel, at the local level should not be required. Now, if the chapter tailors its programme then funds are not a constraint at all. Then the problem with the HQ would not come up. The underlying factor is that the chapter wants more money from the HQ or a greater share of funds to be kept back with it. On the other hand, the HQ requires funds as the activities that it has taken up at the national level - specially the publication of the journal - does require lot of funds. So, the chapters must keep their ambitions to the local level of activities.

Q. But, sir, on the other hand there are certain things we should look at. The Chapter's activities, whatever they are-for example even the Ahmedabad Chapter's activities cannot be handled or even be taken up by the main society at all. And so.....

A. That is why the chapters are set up. The chapters are part and parcel of the society. They collectively constitute the whole. Now, if the chapters are getting unnecessarily into those sort of activities..... for example there is no reason why the chapter should have ambitions at the national level of holding symposia. By doing that, the chapter is unnecessarily getting into conflict at the national level. I will tell you the situation that would arise. For example, somebody comes to the Ahmedabad Chapter's symposium from Guwahati. He cannot travel more than once a year or more frequently and thus may not be in a position to later attend the society's national symposium/activities. That is why, I feel that the chapters should confine themselves to localised activities, thus making the members' interaction more frequent and effective which, in a way, is not possible at the national level because of the travel constraints that I just mentioned.

Q. Could we then put it this way that chapters should largely interact at the level of members, by frequent activities, and the main society would interact at the larger level



by organising national symposia etc.

- A. Yes, but the symposia are also attended by the members and what I feel is that the chapters should interact at the local level rather than at the members' level or non-members' level. Ultimately, both the chapter and the main society aim for the interaction of members since the society is of the members. But, we should be clear of one thing it is possible for 150 members of the Ahmedabad Chapter to gather at Ahmedabad but it is highly unlikely that all the 150 would be able to attend the national symposium/meeting which could be held somewhere else. In this context, the chapter should concentrate on the interaction of these 150 members rather than worrying about HQ level or chapter level etc.
- Q. As we are already on the chapters, what is your opinion on the Ahmedabad chapter activities and do you have suggestions, keeping in mind the larger interests of the society.
- A. From what I have been observing for the last 2 years, travel again, seems to be a constraint because I find that if the Ahmedabad Chapter organises something at the University, the members find it difficult to travel. So you see the problem. In organising activities, one must keep this constraint in mind that people find it difficult to travel. The activities must be organised in such a way that members do not find it difficult to attend. At no time have I seen more than one third of the members of Ahmedabad Chapter attending any of the chapter activities. So how can one expect that members from all over the state would attend the chapter activities? This I am mentioning because the Ahmedabad Chapter has been raising the point of state level jurisdiction. My suggestion is that the chapter should primarily organise lectures, on topics of general public interest, which could be well advertised so that they could be attended by all. For example, if the chapter organises a lecture on IRS, immediately after its launch, it will make a good impact on the public.
- Q. Sir, now let's go over to another topic which is in relation to what you have been saying. It is about this newsletter. Don't you think the newsletter would serve as a better medium for such a local level interaction and information exchange considering that it reaches the members. And then, what is your opinion on this newsletter-now that we have come out with the first issue at least.
- A. The newsletter should aim at keeping the members informed of all the developments, particularly at the local level, and the selection of material should be such that the members would find it useful. For example, there is no use of reporting on International symposia/events etc. because those members who are interested in them would have other accesses to the information. Things like Wasteland mapping activities, drinking water mission etc. particularly in Gujarat - should be well covered so that the members are informed on the utility of remote sensing at large. The Chapter newsletter should aim at focussing such local issues.
- Q. One of the issues that needs to be considered is whether the newsletter must be a glossy, colourful, attractive and a well brought one or should it be simple and brought out with minimal expenses.
- A. I feel that it should be least expensive and it should not unnecessarily tax the resources of the Chapter. Otherwise, the Chapter starts facing difficulty in arranging funds and then the issue of funds again becomes a bone of contention. The newsletter need not be a very simple affair. Without any high ambition we should go for minimal cost and minimum delay as most of the efforts in printing causes the delay in bringing out the issues. To my



mind a local level newsletter could even be cyclostyled. The chapter should not end up with a major expenditure on the newsletter as this would defeat the very purpose of having the chapter.

## REMOTE SENSING TECHNOLOGY

- Q. Sir, now let's come over to the field of remote sensing. There is one thing which we hear nowadays very frequently - OPERATIONALISATION OF REMOTE SENSING. To different people it has different connotation. But what, according to you, is the concept of operationalisation of remote sensing?
- A. My concept of OPERATIONALISATION is that-when a user agency adopts remote sensing techniques as a routine technique for his information gathering activities, only then is the technology operationalised.
- Q. But then are we not making a dividing line between a user and the developer of the technology. Is it proper to make such a dividing line, particularly in remote sensing?
- A. I think it is an unnecessary controversy. I can give you an analogy. The case of a car. The car is developed by somebody but the user just uses the car routinely and does not bother who developed it as long as the car runs. To the user the car is a matter of convenience - a mode of conveyance. A dividing line will always be there between the developers of the technology and the users. At some point of time the car becomes operational but that doesn't mean the car manufacturers now should stop improving the models. The developers will always be improving the technology but they should take care to pass on to the users whatever is ready for use at a given time. For example, one activity that has really brought remote sensing to the user's domain or has reached the maximum number of people today is the remote sensing for groundwater exploration, through the Drinking Water Mission. The district level officials and the engineering personnel are now aware of remote sensing. I don't think there has been any other application which has reached that proportions. Even the Wasteland mapping, in that way, has not reached the common man. Because of the Drinking Water Mission more people have heard of remote sensing for ground water. While most of the applications are still limited to the organisational or agency level, the ground water exploration has gone to the execution stage.
- Q. But then, is it not because of the government's resolve, to solve the immediate problem of drinking water by finding out potential resources through quick and fast means, that remote sensing techniques got sufficient boost and now these techniques are widely known. Maybe, if such a pressure is there for other application from the government, then they too would be at the same level as the ground water application is now today.
- A. After all, what is government? The government is for the people and whatever technology is able to give the maximum benefit to the people, the government has to support that. So, today if drinking water is a problem then the government has to make all efforts to make water available to the people. And So, the pressure - as you say - on any other field will depend on the needs of the people and the government policies will always be dictated by these needs. I feel that we should be happy that the technology has reached such a level at least in this application. For that matter, I can't think of any other application that would reach such a level in the near future.
- Q. One thing needs to be considered here, Sir. Is such a policy of operationalisation correct, or, should we allow for the technology to percolate down to the society on its own, rather than going for such a forced operationalisation?



A. In no society does the technology just percolate.....

Q. For example in the US condition.....

A. No. The efficacy of the technology in the given application is what makes it acceptable to people. Today, whatever we have achieved in ground water - no doubt there was support because of the mission - but it is really the needs of the people that has driven the technology to such a level. If one is able to meet those needs, then the technology would be certainly acceptable to people. Say, for example, if we can give better estimates of crops than what the present techniques give then the remote sensing techniques for crop estimation would automatically get accepted. The fact remains that we are not at that level yet. So, to make the remote sensing technology operational in any application area, one must prove its efficacy. I don't think any technology will find resistance in getting accepted if it proves its efficacy. Why, even the common man buys a thing in the market only if it works and will not like to invest money on things that only promise to work. So, I think the operationalisation solely depends on the efficacy of the technology.

## **FUTURISTICS OF REMOTE SENSING**

Q. Now let us go over to the futuristics of remote sensing. We would like to know from you, in the world context, where is remote sensing now leading to? We have the Landsat and SPOT series which are providing data operationally - but where is the technology leading towards or where is it going to end?

A. The way things look at present, one of the major areas where the technology should find acceptance - by proving its efficacy is in the field of agriculture. This means that the methodology must be developed to an extent where automatically people will find its efficacy to be better vis-a-vis the conventional techniques. Even in the world context, it has not yet been proven that remote sensing technology can provide better crop estimates in time and in that sense, it is still at a developing or R&D stage.

Q. What about ocean applications? There are many satellites present and planned mainly for ocean applications.

A. Yes, there is a lot of stress on ocean applications as it is very difficult to get data of the ocean, conventionally. For example, the ship measurements are all spot measurements but they cannot cover the full ocean area. It is only satellites which make it possible to get the complete picture for a global measurement of the oceans. And that's why, the stress on ocean application is well placed and we should see a lot of good coming out from the remote sensing applications in ocean and the related meteorological problems.

Q. There is one more area which is now a days picking up and is discussed a lot in various forums. It is the integration of remotely sensed data and non-remotely sensed data and their combined analysis. What have you to say for this sort of an analysis approach?

A. Yes, a lot of effort is needed here. The Geographical Information Systems (GIS) are being developed which are easily understandable and usable by resource scientists/managers and planners. This sort of an approach to analysis is now a days picking up. But I feel that the system should be such that scientists can make use of it and generate information which, in turn, can be used for decision making. Once such systems are fully developed and available then the integration of data could take place easily.



Q. In the Indian context, you mentioned about ground water exploration as having reached an operational level. Any other application you feel will be operational may be in the near future.

A. If we go by the concept of operationalisation, i. e. the user departments taking up remote sensing application routinely for information generation, I think it will still take some time for other applications although Forest Survey of India has adopted remote sensing technology for monitoring vegetation cover in the country.

Q. But then there is the GSI which has taken up remote sensing application for geology routinely.....

A. No, I am afraid one can't say that GSI is using it routinely because there are still many geologists in GSI who are yet to get familiarised with remote sensing. Even today, GSI has Photogeology and Remote Sensing Division/Wings rather than adopting this as a routine technique for gathering information. To my thinking, the day these separate division/wings are not required and every geologist in GSI becomes familiar with remote sensing technology and starts his exploration/mapping activity using remotely sensed data then that would be the day when it could be considered operational.

Q. You mean, just like the hammer and haversack are a part of the geologist's kit, the Landsat data must also become a part of his kit.

A. Yes. He should not think of going to another person for information from remote sensing. I would say that the analogy that you have given of remotely sensed data becoming a part of a geologist's kit, along with the hammer and haversack, is perfect and that is how it should be. Only then could it be considered fully operational.

## **PRESIDENT'S MESSAGE**

Q. Well, Dr. Sahai, we have asked you all that we wanted to. We must thank you for answering all the questions so patiently and also for readily agreeing to this interview, in spite of your busy schedule. Lastly, as President of the society, we would like you to say something special to our members - may be as a message.

A. Basically, I feel that we should all strive to make remote sensing an acceptable technology because this would then give a proper status to the remote sensing community. My wish is that the members should strive to make the technology acceptable by proving its efficacy so that people would automatically give due status to the technology and hence to the remote sensing community.



# SATELLITE UPDATE

## IRS-1A LAUNCHED

It is with a great sense of pleasure that we are announcing the launch of IRS 1-A, the first operational Indian Remote Sensing Satellite. IRS-1A lifted off from the Baikanour Cosmodrome in USSR, onboard a Vostok rocket, exactly at 12:13:30 PM (IST) on the 17th March, 1988. Just 22 hours later one of the sensors - LISS-I - was switched on. Soon, Shadnagar (where the data reception terminal is located) started receiving the first scene from the satellite. Since then, a large number of frames have been collected from the LISS-I camera. The LISS-II camera was switched on on the 28th March, 1988 and data was successfully received at Shadnagar.

The first few data sets from LISS-I prove it to be a big success. 'FOREGET MSS AND TM', was one of the cryptic comment made by a member of our chapter who was at Hyderabad and had the chance of having a good look at the first few images. The LISS-II data is also of very good quality and sufficient details can be seen. Details of the satellite and the sensors are given in the table.

The success of IRS-1A is yet another "milestone achieved" under the Indian Remote Sensing Programme. We must recognise that there is still a long way to go in the overall pursuit of operationalisation. But as of now, THERE IS NO LOOKING BACK.

We congratulate all those who have been associated with the IRS-1A programme and wish that all these efforts will lay a strong foundation for the future years to come. We look forward to a successful utilisation of the various applications - thus justifying the Indian remote sensing programme on the whole.

**TABLE : DETAILS OF IRS-1A**

### SATELLITE

|                      |  |
|----------------------|--|
| Type                 | : Body stabilised remote sensing satellite |
| Orbit                | : Sun-synchronous, 904 km. orbit           |
| Equat. crossing time | : 10.25 AM, descending node                |
| Mission life         | : Three years                              |
| Weight               | : Approx. 975 kg.                          |
| Launcher             | : Vostok from Baikanour in USSR            |

### PAYLOADS

|                                |  |
|--------------------------------|--|
| Type                           | : Linear Imaging Self Scanning (LISS) system with 2048 element CCD linear array  |
| No of cameras                  | : Three - one of LISS-I and two of LISS-II   |
| Spectral bands                 | : 0.45 - 0.52 microns (Band - 1)<br>0.52 - 0.59 microns (Band - 2)<br>0.62 - 0.68 microns (Band - 3)<br>0.77 - 0.89 microns (Band - 4) |
| IFOV (micro-rad)               | : 80.2 for LISS-I                      40.1 for LISS-II  |
| Spatial resolution (in meters) | : 72.5 for LISS-I                      36.25 for LISS-II   |
| Swath                          | : 148.48 km for LISS-I<br>74 km. (approx) for LISS-II (combined swath is 146.98km.)  |
| Repeat cycle                   | : 307 orbits/22 days   |
| No. of bits                    | : 7 bits (128 levels)  |

### PRODUCTS

|                     |  |
|---------------------|--|
| Type                | : Standard, Precision and Special products. Both images (B/W and colour) and CCT |
| Scale               | : 1:1,000,000 for LISS-I      1:500,000 for LISS-II                              |
| Standard image size | : 240 mm X 240 mm  |



## REMOTE SENSING FOR THE MEDIA

EOSAT, the commercial agency responsible for marketing Landsat data, is conducting a market survey to determine the need for five-meter resolution remotely sensed data. This survey will determine whether EOSAT should proceed with a dedicated programme to fly a high resolution sensor on a Landsat satellite in the 1990s.

If the plans materialise then EOSAT will be able to market :

- \* three band, 5 meter resolution data for any location in the world
- \* coverage of any part of the world on a daily basis, and
- \* data delivery within hours of its collection.

The programme, Satellite Tracking and Reporting (STAR,) is mainly designed to "rope-in" the media and is visualised as a next step for news-reporting - a satellite reporter that can "see" a story up close from space. The programme would combine satellite, sensor, communications and data processing technologies in innovative ways to implement a new information gathering capability. The STAR data would be delivered in standard format-reception would be no different than a "live-feed" from a field unit. With the 5 meter pixels - trucks, buses and vehicles would easily be visible in full colour and would be available within hours of acquisition for manipulation.

## HIGH MAGNIFICATION ENLARGER

Space Applications Centre has developed a High Magnification Enlarger (HME) for projecting a part of a 24-cm format satellite imagery at a continuously varying magnification of 3.5X to 45X. The equipment provides low distortion sharp images of high luminance throughout the magnification range and helps in the comparison of image details with conventional data available in the form of topographic or thematic maps. It could also be used in presentation on a chosen scale.

The main subsystem of the HME is a projection head which houses a light source, heat filter, condenser package, film holder and interchangeable projection lenses. The image is projected on a table top. The film holder is mounted on a carriage which can be moved in X and Y directions. All the movements have manual as well as motorized option.

The first prototype of the HME was developed at SAC in June 1986 and since then it has been extensively used for various IRS UP projects, wasteland mapping project, drinking water mission, remote sensing applications mission etc. The experience from this unit has gone into the development of an improved prototype which incorporates various modifications in functional and operational aspects. In view of the large demand of the remote sensing user community of the country, technology transfer to an industry for commercial production has been initiated.

For more details, please contact Shri R. P. Dubey, R. S. A., Space Applications Centre, Ahmedabad-380 053.

## CONGRATULATIONS, DR. GEORGE JOSEPH !!!

We once again congratulate Dr. George Joseph, Deputy Director (Remote Sensing) at the Space Applications Centre on his receiving another prestigious award. Dr. George Joseph has been selected for the Shri Om Prakash Bhasin Foundation for Science and Technology Award 1987 in the discipline of SPACE AND AEROSPACE technology. The award carries a sum of Rs. 50,000/-, a memento and a citation. Congratulations, Dr. George Joseph!!!



# GEOGRAPHICAL INFORMATION SYSTEM (GIS) - AN OVERVIEW

Natural resource planners need regular information on resources availability for the purpose of planning the future utilisation in an optimum way. Some of the typical examples of queries which are frequently asked and need to be answered are :

- how much is the land converted from agriculture to urban use during a specified period
- which land could be suitable for future urbanisation
- what is the least cost route for logging service between a cutting area and existing high way considering slope, ground cover, drainage etc.
- where could the recreation spots be located and developed considering a strip of requisite size in the vicinity and avoiding particular land uses
- what could be the potential areas for mineral exploration

Apart from the involvement of resource experts who perform the criterion based analysis on basic thematic data, the major task involved in replying to these queries is the handling of spatial and non-spatial data. Traditionally this has been done in map form and all the manipulations (required to reply to the queries) used to be carried out manually by using various techniques for measurement, comparison and summarisation of maps. However, the amount of input data to be handled is so large and diverse that the techniques other than manual needs serious consideration. This becomes even more necessary due to the vast potential of repetitive availability of thematic data (in spatial form) from remote sensing.

The emergence of Geographical Information Systems (GIS) technology has raised hopes of providing an efficient tool for handling of spatial and non-spatial data in an integrated manner so as to be able to manipulate the basic data and generate information required in desired format and level of detail for natural resources planning.

The essential components of a GIS can be divided into 4 major categories :-

- Data capture/editing, including the features for transfer of analog maps or digitized maps (remote sensing based) into system specific form
- Data management functions dealing with optimum storage of the locational and non-locational data and handling of user queries
- Analysis and manipulation modules which provides a set of primitive commands for performing complex analysis tasks in spatial context
- Output and display features for presenting the analysed results in desired form (maps or tables)

Present day GIS technology provides ample scope for facilitating the information generation pertaining to various resource planning areas. Notable among them are :

- Forest management, agriculture, ecology, watershed management, mineral targetting etc.
- Urban and regional planning, landuse planning and management, environmental impact studies
- Route selection (highways/pipelines), utility facilities management
- Census and related statistical mapping, cadastral records management

Scientists at Space Applications Centre (SAC) have been following the technological developments in this field for quite sometime. During the past few years, the developments in this area have reached a stage where the resource planners or information managers can hope to get a commercial software/hardware package which they could use as a tool for implementing the information systems as per their needs. Recently, a technical survey was carried out on the commercial availability of such packages. The aim was to identify and short list



the packages which could help implement the natural resources information systems required for different disciplines.

Using a classroom training GIS package (called MAPS), an initial attempt was also made to implement a sample Mineral Exploration Information System (MEIS). This work was carried out jointly with DGM-Gujarat. A more comprehensive package is under procurement which is envisaged to be used for implementing information systems in the other areas like crop inventory, watershed management, urban and regional planning and coastal environment monitoring.

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Article contributed by Shri R. K. Goel, RSA, Space Applications Centre, Ahmedabad-380 053.

### BOOK-POST

To,

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LRD

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