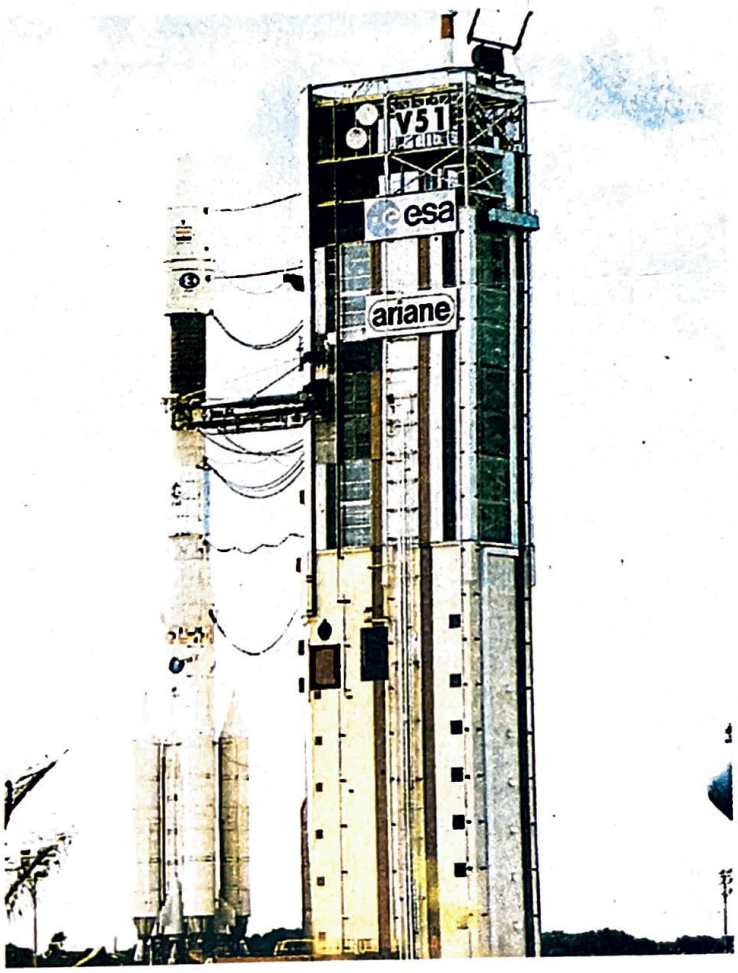
SATELLITES
FACING PARKING PROBLEMS

With more and more satellites being launched to facilitate modern systems of communication, the space is in real danger of becoming crowded. Finding proper parking place for them will be an important task in the future. ■ ***by D. P. Sabharwal***

The twentieth century has brought many epoch-making changes in the lives of human beings. It started with the first flight of man-made aeroplane in 1903. Now the aeroplane has brought people of different continents closer by making vast distances shrink. Then came the era of talking-movies in 1924 which exposed the people of the world to the customs and thoughts of other races and countries.

The invention of the laser in 1940 proved to be a boon to mankind, as far as control of fatal diseases is concerned.

However, the single invention that has changed styles the most is the invention and development of rockets during the 1940s and thereafter. It is through these rockets that satellites are positioned in space; the satellites that provide the common thread amongst the various diverse facets of modern lives — the telephone, television, E-mail, flood and drought monitoring and cyclone warnings, to name just a few.



It is through rockets that satellites are positioned in space.

Literally, a satellite is a natural body in space, revolving around a planet. The moon, for example, is a satellite of the earth. This definition, however, has undergone a change during the last 50 years or so.

Today, a satellite means a man-made device launched by rocket into space and put into the orbit to travel around the earth.

While doing so, a satellite continuously sends data and messages to the earth.

There are basically 2 types of satellites performing different and distinct roles. These are discussed in subsequent paragraphs.

Low earth orbiting satellite: These satellites orbit the earth at lower heights, generally 800-1,200 km above the surface of the earth. These satellites go round the earth once in 100-150 minutes, depending on their orbiting altitude. These satellites have the latest cameras which continuously take images/ pictures of the earth.

This data is transmitted to the earth and is interpreted for various purposes such as drought monitoring, agricultural crop estimation, forest resources survey, wasteland management, urban planning etc. These are remote-sensing satellites and India has a few such satellites (IRS-1B, IRS-1C, IRS-P3) in operation.

Geo-stationary satellites: These satellites orbit the earth at a distance of slightly more than 36,000 km above

its surface. At this altitude, the satellite matches the speed of rotation of the earth, thus appearing to be fixed over a specific region on the surface of the earth. This is called a geo-stationary orbit.

Present status

Such a satellite can receive signals sent from a point on the earth and transmit it back over a much larger area. Thus, these satellites are used for radio/television signals, telephone calls, data transmission and weather forecasting. Indian National Satellites (INSATs) belong to this category.

40 years ago, there were just 2 satellites in the geo-stationary orbit. Today, there are already more than 160 hovering in their allotted parkingslots. Well, that definitely does not appear to be too large a number, considering the vastness of space. Yes, physical proximity is not a problem at all. Nor is there any risk of these satellites bumping into each other.

That possibility just does not exist because one degree arc on geo-stationary orbit equals almost 700 km. Thus even when 2 satellites are placed at 68.1 and 68.2 degree positions, they are still 70 km apart, a very safe distance physically, of course. But this is not so with regard to electronic signals.

When placed closer, 2 satellites can disrupt each other's signals through electro-magnetic inferference, which can disturb reception at the receiving station. The signal beams, emitted by neighbouring satellites, can overlap, thus disrupting/distorting earth-bound signals. India's INSAT satellites already face this problem.

Earlier, the distance between 2 satellites used to be about 5 degrees (3,500 km) of an arc along the geo-stationary orbit. It is already down to almost 2 degrees. It is bound to be reduced further when more satellites are put into orbit.

Almost 20-25 satellites are now being added each year to this orbit over the world. There could thus be about 300 satellites by the end of the century.

The problem is really acute in the Asia Pacific region. There are many countries here and each one has huge demands for telecommunication and television services. There are already 19 working satellites over India in geo-stationary orbits. These include 4 of India's, namely, INSATs 1D, 2A, 2B and 2C launched between June 1990 and December 1995.

India wants to add about a dozen more satel

MY PET PEEVE



My grouse is against those political leaders who quarrel in Parliament and denigrate our democracy. They waste the valuable time of Parliament and then face the cameramen and news reporters with pride. Such political leaders cannot give India a bright future.

— Jadhav Kishor P.

My grouse is against those politicians who nominate their wife or son as heir when they are faced with public ire. This is a very dangerous trend that might endanger democracy in the country. All right-thinking people need to protest actively against it.

— P.V. Srikantiah.

I feel strongly about the manner in which the peons of Income Tax Department conduct themselves while delivering the income tax refund vouchers.

They ask for an exorbitant sum of money as "bakshish" for services rendered, when in fact the refund amount is your rightful due.

— Dr Ashwani K. Malhotra.

I hate it when visitors to a hospital, who are there to meet someone who has taken ill, bore and worry patients and their families with tales of similar or worse fates which had befallen them or their acquaintances.

— Sangeeta Segal.

My grouse is against those media reporters who depict only the bad side of a situation before the entire nation, and close their eyes to the goodness around them. While the North-East is in dire need of Indianisation, not assimilation, these so-called, news reporters prevent the people of that region from entering the Indian mainstream.

— Lallianzama.

My grouse is against those interviewrs who put silly questions to the interviewee, like "How many steps does this building have" and "Actress Vaishnavi (or any third generation actress) has a grandmother who was also an actress. What is her name?", instead of asking them to check their subject knowledge. Is there any benefit in knowing answers to these questions?

D. — Lover.

My peeve is against those leaders who do practically nothing for the country or the people but try to attain immortality by changing names of cities.

— Krishna Kanta Mukherjee.

My peeve is against not only those who ask for dowry but also against those who give it when demanded. Can a boy who marries for money ever make a good husband?

— Pushpa Rani Malik.

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more satellites by 2010. So do many other countries. The writing on the wall is thus bold and clear. Parking of satellites in geo-stationary orbits is going to be as difficult as parking a car in Connaught Place during rush hour.

A controlling agency

The International Telecommunication Union (ITU) based in Geneva, allots parking space to satellites. Presently, there are almost 1,700 satellite networks all over the world. These include 90 Indian networks, that are in various stages of negotiations with ITU asking for parking slots. If all these applications are cleared, the geo-stationary orbit will fill up immediately!

An orbit slot is given by ITU on a first-come-first-served basis. It is rather strange that it can be booked 6 years before the construction of the satellite has even begun. The ITU circulates the booking information every week to all members of the union.

Countries likely to be affected by the satellite's location are consulted. Broadcasting frequencies are so fixed that no two satellites interfere with each other. An exact location is thereafter provided after international coordination.

The present slot booking system faces a Catch-22 situation. Launching a geo-stationary satellite is a long-drawn one and costly proposition. It can take 4-10 years and can cost Rs 50-80 crore. Thus no one would like to take the risk of building a satellite and then having no place to park it. Hence the advance booking and that too at times even before the satellite has been put on the drawing board!

On the other hand, an agency could book a slot and hang on to it without really meaning to launch a satellite into the allotted slot! To overcome this problem with parking slots, the ITU is already thinking of changing its policies.

All satellites launched successfully into geo-stationary orbit do not operate lifelong. Many of them fail after launch, like INSAT-1D, due to some technical problems. Others like INSAT-1B finish their operational life which could be 5 to 15 years. Have you ever thought of what happens to them? Well, they still orbit around the earth and, in all probability will continue doing so for thousands of years. Presently, such satellites do not clutter up space because there are not too many satellites in this category.



Low earth orbiting satellites are basically remote sensing ones.

Things, however, could be different in the future when parking-slots become difficult to get. Then, the question of shifting such satellites from their geo-stationary orbits could come up.

The likely ways out

New geo-stationary satellites would continue to be launched. As regards the parking problems envisaged today, a few options are already available:

- Satellites could be parked closer together, but then these must operate on narrower and more focused beams that will not interfere with the beam of neighbouring satellite.
- Satellites could be placed in lower orbits where, of course, they would not remain stationary over the intended region. A continuous signal in such a case could be obtained by putting a number of satellites up instead of just one. This arrangement is likely to work out to be more cost-effective.
- We could remove abandoned satellites from their geo-stationary orbits. One way is to push them up higher in their orbits just before their lives are going to end. Retrieval of these satellites, which still have very costly equipment on board, could be yet another option.

"Of the future, we certainly know nothing; yet we may form conjectures from the past," said Johnson. Well, that should solve the present dilemma of parking problems for geo-stationary satellites!

No problem till date has ever remained a problem in the field of space technology. Solutions have come up sooner or later. So will it be in the case of communication satellites. Wherever they may be parked and with whatever scientific gadgetry, one thing is certain: we will continue getting news, entertainment programmes, telephone calls and E-mail in future as well.

And if the past is any indication, we will get them with even better reception and clarity! ■