Large foreign debt and a deteriorating balance of payments situation has significantly curbed India's options to borrow commercially. India's credit rating has been downgraded from BBB− (long-term) and A2 (short-term) to BB+ (long-term) and B (short-term) by Standard & Poors; from A2 (long-term) and P1 (short-term) to Ba2 (long-term) and non-prime (short-term) by Moody's; and from A+ (long-term) to BBB (long-term) by the Japanese Bond Research Institute during FY 1990-91 and FY 1991-92. While the credit-rating downgrading can in part be attributed to the unstable political situation in India during this period, there is little doubt that the negative impact on foreign exchange earnings of the Gulf crisis and the uneasiness over the Indian situation as expressed by the NRIs through withdrawal of vast sums of deposits have been major factors in enhancing India's risk status. It is also clear that the three Indian governments that were in power during the 1989-91 period failed to alleviate the fears of foreign lenders because of their unwillingness to deal with the growing balance of payments problems.

The new government—a minority government led by the Congress Party that came to power following its success in the 1991 general elections—was left with little choice when it took over the reins last June but to seek loans from the IMF and garner as much bilateral assistance as possible to tide over the difficult foreign exchange problems. In order to enhance confidence among lenders, the new government has announced a major reform program with the purpose of getting the Indian economy out of the rut it is now in.

India's foreign exchange crisis is not going to affect the developmental programs in a direct way (India's Seventh Five Year Plan has 6.2% financial input from abroad.) But the Indian economy requires crucial state-of-the-art technological inputs in the form of high-technology components and capital goods. This is most explicit in the inputs required for capital goods manufacturing and the defense industry. Due to the foreign exchange crunch, these crucial inputs have been affected at least temporarily.

On the other hand, India's large domestic debt has seriously imbalanced India's budgets over the years. In the process, resources earlier earmarked for development have been increasingly channeled to meet interest payment obligations on current expenses. To offset this imbalance, India has taken recourse to large monetary expansions, which, however, due to the inadequate infrastructure sector, have proven to be double-edged at best. Because of the poor performance of the industrial sector, particularly the public sector units, and a growing overhead in the form of huge bureaucracy to oversee regulations and myriads of laws and by-laws, the "pump-priming" has failed to provide the expected boost. As a result, India is now experiencing double-digit inflation which, if allowed to continue for long, will scuttle the hopes generated by the government's new reform measures. Indian Finance Minister Dr. Manmahan Singh recently assured the country that inflation will be brought down to a single-digit rate before the year is over.

Space Technology

ESA releases first Earth radar images

by Philippe Jamet

When it comes to new technologies, especially experimenting with new types of instrumentation, the European Space Agency (ESA) has reached a high point, with its remote sensing and environmental research satellite ERS-1. The satellite was launched in the night of July 16-17 and placed into a Sun synchronous orbit.

In distinction from the "classical" remote sensing satellites such as Spot or Landsat, which use instruments that make their observations in the visible wavelengths, ERS-1 uses a whole battery of radar instruments and transmitters which use ultra-shortwaves (1,000-30,000 MHz) and microwaves. We especially want to underline the two components of what is called AMI (Active Microwave Instrument), that is, the Synthetic Aperture Radar (SAR) and SCATT radar, developed by the Franco-British company Matra Marconi Space. Thanks to SAR—which operates outside the optical wavelength range and therefore "laughs at both the day and the night"—ERS-1 is able, by means of waves which are transmitted and received after being echoed from the "object" under study, to supply extremely precise information 24 hours a day. ERS-1 could very well be considered as the first real radar satellite worthy of the name: It goes far beyond its American precursor Seasat which functioned for about three months in 1978.

The first images

ERS-1 is in fact a veritable union of sophisticated new technologies, whose aims include studying the topography of the ocean floor, which is revealed by surface irregularities on the oceans themselves; the analysis of interactions between warm and cold currents; icebergs; and more generally, the ocean-atmosphere interactions which may allow more reliable and coherent models of climatic change and evolution. It will be, for example, possible to detect, in advance, cataclysmic processes in formation, which would apparently make it easier to understand their causes and take preventive measures.

Every radar-photo from ERS-1, whether of land or ocean, in itself practically flawlessly reveals a stage in the processes

Courtesy European Space Agency

This radar image, received from ERS-1 on July 27, clearly shows the potential of the Synthetic Aperture Radar. On the lower right the farmland of western Friesland in the northwest of the Netherlands and the variations of the water surface are visible. The light tones on the North Sea show the movements of waves and ocean currents. The dark parts, on the other hand, show where the sea surface is completely free of currents, and wave height is negligible. The white line along the Friesland coast is an immense breakwater which protects the polders against high tides.

being studied, and for this reason, the first images taken by ERS-1 were awaited impatiently by specialists. Even if, at present, the instruments of this huge, 2.4 ton satellite are just now coming into operation, the first results appear absolutely breathtaking! For example, on one of the first radar images put out by the agency, which represents a northwest part of the Netherlands including the islands of western Friesland showed by the SAR, the details of the coastal lands and the movements of the sea currents are so clear that one could believe oneself in the presence of an actual relief photo. In another image, received at the Kiruna Salmkjarvi station in Sweden and depicting the Spitsbergen region, the glaciers and icebergs floating in the sea appear, in contrast to their environment, almost better than in photos taken in the visible spectrum, and the crevices and unevenness of the mountains can almost be "optically felt." That's not all. Practically every day, the agency publishes new radar images confirming the excellence of the early results, and states: "Whatever the radar altimeter, the infrared radiometer, the wind diffusionometer, or the ultra-shortwave radar transmitter, all of them have results which allow the ESA to envisage the future of the mission with great optimism."

Unexpected dividends

There have been a few glitches, which can always be expected in an experimental program of this sort. Paradoxically, while all the remote sensing instruments are functioning marvelously and in some cases better than expected, the operations control specialists at the ESA are experiencing the worst difficulties in locating the exact position of their satellite down to several inches. In fact, after mid-August, and for a reason not yet explained, the Precise Range and Range Rate Equipment, which normally allows the ground stations to follow the satellite in an extremely precise manner, has failed.

To fix this problem, the agency plans to use laser retroreflectors, which were prudently placed on board the satellite, and to couple them to a system of the same type for the transmission and reception with ground stations. This unexpected problem does not seem so far to have dampened the confidence of the ESA mission specialists in their program nor their determination for future projects. In fact, it is known that the ERS-1's results will be integrated in 1992 into the framework of the World Ocean Currents Experiment (WOCE) program and that a second satellite of the same type, called ERS-2, is currently under development. Of course, that is just awaiting by the end of the century, the future polar platform of the Columbus program.

Philippe Jamet is a free-lance science journalist in France. His article originally appeared in the weekly Nouvelle Solidarité *of Sept. 27.*