

omy. But what the numbers cannot show is the fact that in India the space program has had to develop the sophisticated industrial base it required. Whereas in Europe, the United States, or the Soviet Union a sophisticated industrial base had already been built up as a result of defense programs by the time of the postwar period, in India the program was launched in conditions of extremely weak economic infrastructure.

In 1978, the Department of Space took a policy decision that all space projects would make maximum use of Indian industry, but in the initial phase, ISRO was doing everything itself, in house. Gradually, capabilities were developed in industry such that an ISRO-made prototype could be reproduced in quantity on order, with close collaboration from ISRO. In the final phase, now beginning, ISRO will increasingly be giving only functional specifications to industry for a component or subsystem.

Where ISRO has not developed a needed technology itself, it has sought constructive technology transfer agreements. For instance, ISRO entered into an agreement with France to produce transducers where France agreed to give ISRO the technology on condition that the product would be exported to France for a stipulated time period. Now, under the terms of the agreement, the technology will be disseminated to industry and India will possess the capability to export transducers to the world market—not to mention the broader domestic market for control systems where lack of transducers has been a critical bottleneck.

ISRO has built a dynamic interface with Indian industry, which includes systematic technology transfer from ISRO to industry of technologies and systems for both space and non-space applications. So far more than 65 products and processes have been licensed to companies mainly in the areas of chemicals, electro-optics, electronics, and telecommunications, and another 25 are in the pipeline.

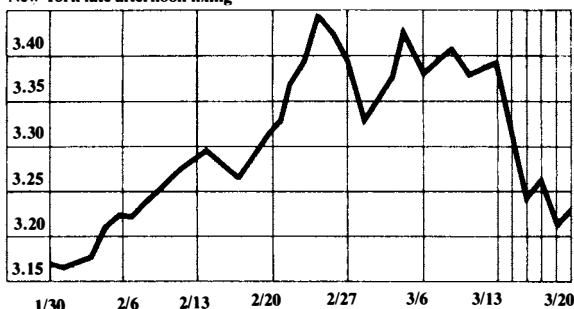
Moreover, within the past two to three years, the program's direct demands on industry have led to establishment of two complete chemical plants and new divisions within a number of private and public sector industrial corporations devoted exclusively to supplying the space program. An estimated 50-60 industries across the country are involved.

This "spinoff" effect will become increasingly visible, just as Dr. Sarabhai foresaw. Dedicating the Equatorial Launching Station in 1968, he emphasized the point: "I might illustrate this from experience which we are gaining in the development of rockets. This requires new disciplines and an understanding of materials and methods; of close tolerances and testing under extremes; the development of guidance and control and the use of advanced information techniques," said Dr. Sarabhai. "Indeed, I often feel that the discipline and the culture of the new world which emerges through the pursuit of activities of this type are among the most important from the standpoint of a developing nation."

## Currency Rates

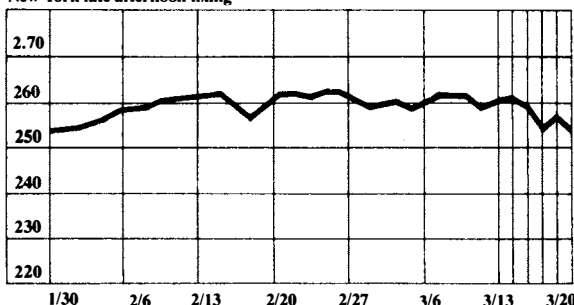
### The dollar in deutschmarks

New York late afternoon fixing



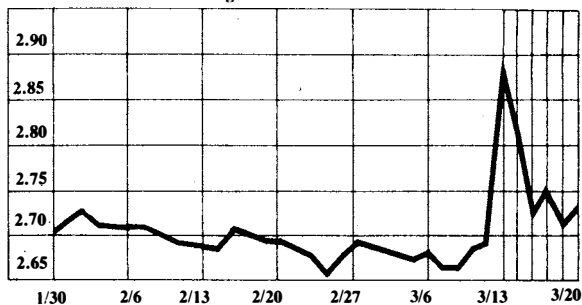
### The dollar in yen

New York late afternoon fixing



### The dollar in Swiss francs

New York late afternoon fixing



### The British pound in dollars

New York late afternoon fixing

