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NEWS

Cryogenic rocket engine contract between ISRO and Glavkosmos: PM's statement in Parliament

In the Rajya Sabha on 18 August 1993, in response to his attention being called to the present situation with regard to the cryogenic rocket engine deal with Russia, the Prime Minister stated as follows:

I am aware of the great concern felt by Hon'ble Members on the reports about the difficulty that has arisen in implementing the commitment of the Government of Russian Federation regarding the transfer of technology and production equipment under the Agreement on cryogenic stages and technology transfer signed in January 1991. I would like to take the House into confidence on this most important issue.

The primary goal of the Indian space programme from its very inception has been to use the immense potential of the space science and technology for national development, particularly in the vital areas of communication, meteorology and remote sensing of natural resources. The utilization of Indian remote sensing satellites (IRS-1A & 1B) and INSAT system of satellites stand testimony to this.

In order to achieve full potential of our space programme it was necessary that along with application projects and satellite segments, we acquire capability to have our own operational launch vehicles. Self-reliance in launch vehicles is most essential in providing continuity in operational space services.

While the solid and liquid propulsion technologies developed by ISRO have enabled our space scientists to proceed with the launch vehicles programme, the need for launching 2.5 ton class of satellites in geo-synchronous transfer orbits by Geosynchronous Satellite Launch Vehicle requires the more efficient cryogenic propulsion system. The cryogenic technology is highly sophisticated and has taken over 10 years for development even in advanced nations. Glavkosmos of the then USSR offered the technology transfer and cryogenic stages at most competitive rates. Other countries under consideration as a source of this technology were France and the US. Government decided to accept the Glavkosmos offer. An agreement was signed in January 1991 with Glavkosmos at a cost of Rs 235 crores for technology transfer along with supply of two units of cryogenic stages in a period of about six years. This contract has been making normal progress.

In May 1992 USA imposed embargo on ISRO and Glavkosmos for two years citing that the Agreement violates MTCR. Both the sides have consistently pointed out that this Agreement does not come under the purview of MTCR since the intended use of this cryogenic upper stage as a part of GSLV is only for launching geo-synchronous satellites for peaceful uses towards national development. There is also provision in the contract against transfer of this technology to any third country.

As a part of routine periodical consultations between Glavkosmos and Indian Space Research Organization, Secretary, Department of Space and a team of officers from the Department visited Moscow in the early part of July 1993.

The Indian side during the course of their discussions reiterated:

- the long standing relation between the two countries in space
- MTCR concern is not relevant to cryogenic technology
- the technology transfer is the heart of the Agreement
- the provision in the Agreement on the non-transfer of technology to a third country.

Subsequently, the Chief of the Directorate of International Scientific and Technical Cooperation of the Russian Minister of Foreign Affairs handed over a nonpaper to the Indian Ambassador in Moscow on the 16 July in which it has been stated, that in the context of unforeseen circumstances, Glavkosmos finds itself in a situation of not being able to fulfil further its obligations regarding the transfer of technology and production equipment under the Agreement of January 1991. The paper given to the Indian Ambassador invokes the force majeure clause of the January 1991 Agreement as the basis of Glavkosmos resiling from its contractual obligations. No other communication regarding the agreement has been received. The Russian side, however, has expressed its readiness to hold further consultations with India in this matter.

The Government firmly believes in self-reliance in our launch vehicle programme and development of cryogenic technology is an essential part of it. Our space engineers have been simultaneously working to develop technologies for our

own design of cryogenic engine. If the Agreement cannot be implemented, we are quite confident of our space scientists and engineers who would be able to develop our own technology.

We have had fruitful cooperation in peaceful application of space technology with several countries including the erstwhile Soviet Union, France and United States and now Russia. We would like to continue such cooperation for mutual benefit where feasible. In any event I want to assure this House that we are committed to achieving self-reliance in high technology particularly in areas like space which have a major bearing on our economic and social development.

Intensive course on inverse problems in Science and Engineering

The Technology Advisory Board (TAB) for Physical and Earth Sciences of CSIR recommended that an intensive course on inverse problems and a panel discussion on CSIR Initiatives in Tomography should be held to acquaint scientists with current developments in inverse problems in general and tomography in particular. The CSIR Centre for Mathematical Modelling and Computer Simulation (C-MMACS) organized this course at NAL, Bangalore during Feb. 15–20, 1993. Participation of over fifty scientists from twenty institutions indicates a growing recognition of the importance of these approaches to a wide variety of problems in Science and Engineering. The course was inaugurated by B. V. Srikantan, Scientist Emeritus, IISc and Chairman, TAB with a welcome by R. Narasimha, introduction by K. S. Yajnik and a keynote address by V. K. Gaur.

The core faculty comprised of V. K. Gaur, C-MMACS; P. Bhimasankaram, ISI; G. V. Anand, IISc; Sri Niwas and P. K. Gupta, University of Roorkee; P. S. Moharir and R. N. Singh, NGRI. The course covered several topics such as generalized inverses, singular value decomposition, resolution and spread of inverse solutions, Backus-Gilbert technique and nonlinear and nongaussian inversion. An important feature of the course was the intensive hands-on exercises programme and introduction to available public domain software for inversion (available at C-MMACS). A diskette containing several public domain packages was also given to participants to enable them to apply the techniques learned by them during the course. The last two days of the programme involved lectures by scientists on applications of the techniques to research problems. S. S. Rai, NGRI outlined applications in seismic tomography; S. A. Ahmed, NGRI described applications in hydrogeology; Phoolan Prasad, IISc talked on inverse scattering; N. K. Indira, C-MMACS spoke on time series modelling; G. V. Anand, IISc on ocean acoustic tomography; B. B. Bhattacharya, ISM, Dhanbad on VES tomography and P. S. Naidu, IISc on diffraction tomography.

The panel discussion on the status and future of tomography was chaired by V. K. Gaur and featured the faculty members of the course and P. S. Naidu. One of the recommendations made at this meeting was the constitution of a think-tank comprising of several active researchers in the field by C-MMACS. It was widely felt that the think-tank would be an effective means of stimulating and advancing creativeness of tomographic techniques in system definition at various scales ranging from the large earth, atmosphere, ocean systems to smaller scale engineering systems. The discussion also identified several possible areas of collaborative research.

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OPINION

Science in India – Some basic questions

The current debate on 'Science in India' in *Current Science* has been of considerable interest to the scientific community of India. Most of the articles have been written by eminent scientist-bureaucrats who, having derived immense benefits from the scientific system of the country, are now critical of the same system. Through these columns, I would like to voice my opinion on the threshold of a scientific career in India.

While various viewpoints have been expressed about science, scientists and 'scientific temper', one crucial point has been missed out by most authors: the human element in the scientist. Why is science considered so different from other professions or jobs? The scientist is as much a human as a doctor, engineer, lawyer or bureaucrat. Why is a scientist expected to be selfless, devoted to the 'welfare of society' and have his salary weighed against his achievements? At the risk of being branded a materialist or worse, a nihilist, I would humbly state that in our country, where bureaucracy is God and there is a permanent rush for jobs, a candidate often applies for jobs in diverse fields which may or may not be