

**MEMORANDUM OF UNDERSTANDING¹ BETWEEN
THE GOVERNMENT OF INDIA AND THE
GOVERNMENT OF THE UNION OF SOVIET
SOCIALIST REPUBLICS ON COLLABORATION
IN ROCKET SOUNDING OF THE ATMOSPHERE
BY SOVIET METEOROLOGICAL
ROCKETS AT THUMBA
Moscow, 14 May 1970**

1. The Hydrometeorological Service (HMS) of the USSR and the Department of Atomic Energy (DAE) of the Government of India express their desire to collaborate in conducting systematic investigations of the upper atmosphere from the International Thumba Equatorial Rocket Launching Station (TERLS) using Soviet meteorological rockets.
2. The scientific objectives of the meteorological rocket investigations are to study the properties and processes which characterize the physical state of the stratosphere and mesosphere.

As a first step, the study of the thermodynamical parameters and winds will be undertaken. In order to carry out these investigations, about 50 to 70 meteorological rockets will be launched annually from Thumba during the initial period of 1971-72.

The sounding rocket programme will be continued further and it will include experiments for the study of ion composition, the influence of the corpuscular solar radiation and low energy particles of the atmosphere, the distribution of atomic oxygen and water vapour and some other questions. The programme will be reviewed annually taking into account how the Indian side could take progressively more responsibilities such as payload construction and instrumentation. The Agreement provides that Indian scientists would be able to put in their own meteorological payloads of the Soviet rockets to be launched from Thumba.

1. Came into force on 14 May 1970.

3. The results of the collaborative experiments would be made freely available to the world scientific community, in the standard form, thorough the World Data Centres A (USA) and B (USSR). However, detailed results of these investigations will belong to the participating scientists of the two countries.

In order to preserve the priority of the participating countries the results of the investigations will be published only by mutual consent of Indian and Soviet scientists.

The Soviet side will as soon as possible make available to the Indian participants data collected from other Soviet stations on the meridional cross section for the purpose of fuller appreciation of the processes which characterize the state of the stratosphere and mesosphere over the Indian region, and effective use in weather forecasting.

4. The shipment of the equipment to Thumba will be carried out in the second half of 1970 so that at the end of this year or at the beginning of the next year it would be possible to start the regular operations.
5. For implementing the joint programme at TERLS by means of Soviet meteorological rockets, HMS and DAE agree to the following, division of responsibilities between the two agencies :

HMS will use its best efforts to make available the following :

- (a) rockets type M-100, with solid fuel charges and pyrotechnics;
- (b) rocket-borne scientific instrumentations (payload) and radio-technical devices, including complete telemetry, tracking systems and power supplies;
- (c) launcher for M-100 rockets;
- (d) trailer for transportation and charging of rockets;
- (e) special installations for calibrating, testing and controlling, designed for preparation and launching of rockets;
- (f) radar stations;
- (g) telemetry stations;
- (h) equipment for initial processing of sounding rocket data;
- (i) transportation of all items of equipment to be supplied by the HMS, from USSR to the Indian port of Cochin.

DAE will use its best efforts to make available the following :

- (a) launching pad;
 - (b) block house;
 - (c) accommodation for the following :
 - (i) building space for storage of propellant charges, pyrotechnics and rocket motor hardware,
 - (ii) building space for charging, assembling rocket motors,
 - (iii) building space for payload assembly, testing and calibration,
 - (iv) building space for telemetry station,
 - (v) pad for radar station,
 - (d) necessary internal communication lines;
 - (e) computer facility (Minsk II);
 - (f) existing radar station (Cotal LV) for tracking chaff cloud;
 - (g) existing transport facilities;
 - (h) power supply;
 - (i) necessary auxiliary equipment and instruments;
 - (j) necessary meteorological and aerological data;
 - (k) clearance of frequencies;
 - (l) unloading, clearance and transportation of the USSR equipment from the port of Cochin to TERLS.
6. For assembling and commissioning the equipment for rocket launching from TERLS, the Soviet side will send the necessary number of specialists to India for this initial work.
- The Technical staff for the installation of rocket facilities, launching rockets and processing measurement results, will be provided by the Indian side.
7. The Indian side will ensure the range safety measures during rocket launching and in the places of storing rockets and charges to them.
8. In the process of systematic work of the range at TERLS, scientists of both sides will be present there for general scientific collaboration.

9. For implementing the collaborative programme from TERLS, Soviet specialists will visit Thumba and Indian scientists will participate in meridional section observation from the Soviet ships and other stations.
10. Each side will provide the necessary finance for the work it has to do to implement the programme, and pay all the necessary living expenses and travel costs of its specialists. No exchange of funds is envisaged.
11. Each side will nominate a project manager and a scientific co-ordinator for mutual consultations and the follow up actions required for the successful completion of the programme. The Indian Project Manager will be responsible for the conduct of the campaign at TERLS according to the plan of operation. Copies of all correspondence and reports generated by the Project Managers and the Scientific Co-ordinators will be furnished to the Indian Space Research Organisation (ISRO) of the DAE and to the HMS of the USSR.
12. The HMS of the USSR and the DAE agree that the equipment (such as, radar and telemetry station) to be supplied by the HMS of the USSR will be made available when it is possible to other countries, if required for sounding rocket experiments in exploration of the upper atmosphere for peaceful purposes.

The Memorandum is done in two languages: Russian and English. Both language versions are equally authentic and valid.

The Memorandum of Understanding shall enter into force on the date of signature.

DONE at Moscow on 14th day of May, 1970.

Sd/-

VIKRAM A. SARABHAI
Chairman of the Atomic
Energy Commission of India and
Secretary to the Government
of India.

Sd/-

E.K. FEDOROV
Chief of the Hydrometeorological
Service of the USSR.