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December 13, 1973

To : Prof. Yash Pal, Director, SAC  
From : Y.S. Rajan  
Subject : My biodata and a Profile of my desired future roles.

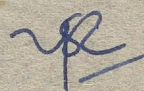
I have tried to blow my trumpet loud enough for you to hear,  
but not yet painful to the ear drum!

As regards the future profile the major intent is in:

- o Leading roles in Advanced Planning and Systems Engineering
- o Direction of and participation in satellite building activities including "buying/selling interface" to other agencies in India/abroad
- o Occasional fire fighting and secretarial roles.

I have slightly elaborated on these points in the text.

In this context, I request you once again, that my promotion  
be considered in retrospect and also with increments.



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BIO-DATA

AND A PROFILE OF DESIRED FUTURE ROLES

1.0 BIO-DATA

- o Uniformly first class academic career.
- o First class in M.Sc. (Physics with Electronics as special subject) from the University of Bombay, June 1964.
- o Research Scholar in Physical Research Laboratory, July 1964 - August 1966.
- o Constructed for balloon experiments:
  - (a) Cosmic Ray payloads - Gieger telescope
  - (b) Solid State FM-FM transmission system
  - (c) Logic circuitry
  - (d) Ground reception systems for balloon data and also ground based Cosmic Ray Instrumentation.
- o Developed Rocket Borne S-Band Radar Transponders during 1966-1969. This effort covered:
  - (i) Overall system design
  - (ii) Hardware design and development, and
  - (iii) Environmental proofing and testing of microwave and antenna components at 2700 - 2900 MHz.
- o Successful launch of this took place in December 1969. Tracked to 200 km. Probably, the FIRST OF ITS KIND IN INDIA.
- o Productionized the design at SSTC.
- o Designed and made detailed Systems Planning for: (during July 1969 - July 1970)
  - (i) Paramps for Radars
  - (ii) Radar transponder required for SLV missions at C-Band and S-Band

- (iii) Tracking and telemetry complexes at SHAR for SLV and Rohini programmes
- (iv) Data link systems for ISRO's SLV and Rohini programmes.
- (v) Microwave and antenna construction facilities for the above.
- o Deputed for the ISRO-MIT Study on INSAT at the Lincoln Laboratory.
- o Made effective contributions to the INSAT Study in the areas:
  - (a) Protection Ratio Calculations
  - (b) Antenna design
  - (c) Communications components design
  - (d) Interferometer
  - (e) Telemetry
  - (f) Link calculations, etc.
- o Posted to work with NASA/Goddard Space Flight Center (ATS Project).
- o Made very effective contributions to the Project from the specification stage (pre-Phase D) to the Testing stages. The areas of work include:
  - (i) Communications subsystems
  - (ii) Telemetry and command subsystem
  - (iii) Interferometer subsystem
  - (iv) Other subsystems from an overall System Engineering view point.

Details are available in many reports by me and also briefly in Appendix-I.

- o Besides the work on ATS-F as a Project personnel - many a time represented the Project in meeting with others - also made many technical inputs for INSAT. Salient ones are:
  - (a) Interpretation of WARC regulations on power flux density

- (b) Protection ratios and isolation required for INSAT-S.
  - (c) Multiple beam antennas for INSAT-S
  - (d) System definition for a classified satellite for India.
  - (e) Other technical inputs relating to the SITE
  - (f) INTELSAT-IV utilisation study.
- o Generated high reliability and screening specifications for components for the ISSP satellite and also gave many technical inputs and systems engineering details for the ISSP.
  - o Presented the ISRO case for Apollo-Soyuz experiment.
  - o Attended many symposia such as:
    - (i) Thor-Delta Users Symposium
    - (ii) ICC
    - (iii) ERTS, etc.
  - o Worked as the ISRO Representative and took care of the ISRO Technical Liaison Unit at USA from January 1973 to October 1973. Had done very effective liaison between ISRO and NASA especially during the troubled period of FEC problems.
  - o Generated:
    - (i) The FIRST Overall Operations plan and schedule for the Total SITE system
    - (ii) The complete spacecraft compatibility test plan for FEC and ESCES equipment.
  - o Attended UN Working Group on Direct Broadcast Satellites as technical assistance to Mr. Vellodi.
  - o Made timely contributions to technical and managerial aspects of the ATS-F GVHRR experiment collaboration and paved way for ISMD personnel in efficiently discussing with the GSFC technical officer.

- o Made very good arrangements for the Director SAC for visiting various aerospace companies, GSFC Project Managers and JPL.
- o Visited many aerospace companies/laboratories many times for Design Reviews regarding ATS-F and also for special technical visits.
  - Philco-Ford
  - Lockheed
  - Hughes
  - MIT Lincoln Laboratory
  - RCA (Princeton - Hightsnow)
  - GE Valley Forge
  - JSC, Houston
  - IBM, Huntsville
  - Fairchild
  - COMSAT etc.
- o After arriving in India (in about one month period) have helped the Director SAC in certain special evaluation of certain Projects, preparation of proposals such as Radiometer payload, Satellite Fabrication Facilities etc. Also helping the SITE Management Office (SMO) personnel by debriefing on SITE systems engineering and operations; assisting the Programme Manager in independent technical evaluation, writing the roles of various operational groups, etc.

## 2.0 PROFILE OF DESIRED FUTURE ROLES

The goals and ambitions of a person are dynamic processes which change with the growth of the organisation and society he is in, and also his own growth and the resultant world outlook. Thus a projection over a decade, especially for a person of versatile interests, is a difficult job, which I attempt here, with my crystal-ball.

## 2.1 GENERAL:

My desires, ambitions, and hopes can be broadly termed as below (sort of guiding principles or motivational factors):

- o To (i) shape and (ii) contribute to the technological growth in India. This includes both planning and execution.
- o To play pioneering roles in introduction of new concepts, systems, and applications, to the country.

In my life, I envisage this coming decade (I am 30 now) as a period of rapid growth and acquiring very good maturity, which is needed to occupy high policy making positions beyond. To realise this goal, this coming decade has to be a period of intense activity and productive results.

Besides such active works, in order to have the right environment of growth and maturity, I need to work for, and report to, very effective and big bosses; this gradient between us will stimulate high growth rate and provide a great maturity to my thought processes.

## 2.2 SPECIFIC

A projection of these general desires within the framework of ISRO in about 5 to 10 years would be roughly as under:

- o Leading roles in Advanced Planning and Systems engineering activities.
- o Direction of, and participation in, satellite building activities including "buying/selling" interface to other agencies in India and abroad.
- o Occasional fire fighting and secretarial roles.

In the following paragraphs, I attempt to briefly explain the above mentioned activities.

- o Advanced Planning and Systems Engineering: These could be at the level of major Projects/Centres/ISRO Headquarters.

By Advanced Planning is meant the system level planning of future systems of ISRO's interest by taking into consideration existing developments at various ISRO units, the country and abroad. In this sense, it precedes Systems Engineering, by which I mean, more detailed technical specifications and definition of interfaces.

Both these efforts are closely knit (more so in the Indian context), as their functions are overview and tying of various ISRO activities into one big picture.

This overview helps in:

- (i) avoiding unnecessary duplications (as against necessary)
- (ii) utilisation of developments in non-ISRO units
- (iii) finding out effective ways of managing our resources, and
- (iv) identification of problem areas and new areas of action.

Also these efforts will ensure whether the detailed activities fit the total picture and goals of ISRO.

The above activities could be in the form of monitoring, detailed studies and/or laboratory experimentation; the latter would be needed more in future to conceive and plan specially Indian systems. A judicious mixture of these different facets of activities (i.e. monitoring, analyses and laboratory work) would enhance the effectiveness of such Planning and Systems Engineering Group (s). It is envisaged that this activity will go on in close liaison with other Groups/Units doing various detailed activities but this Group will be independent of them, e.g. at a Centre level it will be independent of its divisions, at a Project level independent of sub-units and at Headquarter level

independent of Centres. To repeat again by independence, no isolation is implied.

Necessarily, Advanced Planning and Systems Engineering work requires a general understanding of all activities of interest to ISRO. But specifically my area of concentration would be in:

- (i) Satellite buying/building and all related technologies
- (ii) Applications like communication, remote sensing, navigation, other special needs, etc.

o Direction of, and participation in construction/buying satellites and major space borne payloads:

This is an area of technology development and management. Similar to the ISSP efforts, I envisage that in near future, ISRO would be having few collaborative/indigenous satellite building efforts; some of these could be in the form of buying and selling too: We may buy subsystems or sell subsystems to agencies like INTELSAT, or Indian agencies. Thus these building/buying/selling can be broadly categorised as:

- (a) Collaborative programmes
- (b) Global bids, and
- (c) Special Indian needs.

These activities involve not merely satellite building but also developing an infrastructure within the country, as our goal is final indigenisation or "basic self-reliance." I would like to plan out and execute these possibilities, by having major roles. I feel confident in both Project management and developmental roles.

- o Occasional fire fighting and secretarial roles: On a long term basis, I would like to have a base and leading position in the activities mentioned above

specifically; but I do not envisage it as a congealed //  
activity pattern. I am willing to take short term  
"sorties" for my bosses, including some "administrative" /  
secretarial roles.

December 13, 1973.

  
Y. Sundara Rajan

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APPENDIX-I

The following are the salient points of works/contribution of Y.S. Rajen at the ATS-F Project at GSFC:

1. Joined the Project 3 months before the signing of final contract with the Fairchild. Hence had many inputs to the negotiation and review of specifications mainly communications subsystem, telemetry and command, interferometer and systems specifications.
2. Some specific instances are addition of Multipactor specification to communication system, sidelobe specifications, isolation of VHF diplexer in launch configuration, and so on.
3. Pointed out the transient as well as failure mode in which the solar array will deliver about twice the power and hence "burn up" shunt regulator; this caused major design changes (around November 1970) to shunt regulator design and heat pipes below it.
4. Played a major role in selection of ETV frequencies within the time constraints and technical constraints.
5. Pointed out the existence of simultaneous downlink of 890 MHz "beacon" if C-Band beacon is turned on. This caused some major rethinking in tracking philosophy.
6. Review of many specification revisions in the period February 1971 to April 1971.
7. Contributed system engineering backup and communications, telemetry, interferometer expertise to GSFC, during many design reviews of the ATS-F spacecraft with the Prime and sub-contractors.
8. Reviewed many test plans:
  - (i) Systems test plans
  - (ii) Subsystem test plans, etc. for the ATS-F project.

9. For a period of about 2 years had been a very effective Assistant to the Electrical Systems Manager, Mr. Trudell. In fact, used to be the Project "all-rounder", to provide technical input when some subsystems engineers were absent or out of station.

For about a year, I was the shadow "T & C subsystem engineer." Had reviewed in detail many component test procedures, attended failure review meetings, etc.

10. Have worked closely with the Project Systems Engineer, Dr. W. Redisch, and Launch Vehicle Manager, Mr. R. Mattson to provide a system engineering look to many problems like telemetry omnilink coverage percentage, monopulse system etc.
11. Taken care of certain important management functions such as pointing out faults in Thermal number calculations, Mass properties Report, etc.
12. Have pointed out the single point failure mode between the Prime Focus Feed and Earth Coverage Horn at C-Band reception for the SITE, ETV, etc. experiments and been instrumental in providing a redundant relay.
13. Have made many answers to periodic Reliability Review Committee questions and have represented the Project in defending telemetry link, coverage etc.
14. Have provided effective technical interface between experts and the Project for investigating various multipactor problems that occurred in the ATS-F.
15. Played a major role in characterization tests of engineering model transponder (ATS-F) at the Philco-Ford. This brought out the problems of small signal compression in UHF and S-Band power amplifiers and more importantly the emitted noise in Radio Astronomy band which was later solved by an output filter.

16. Contributed to the review of redesign of Prime Focus Feed form. //
17. Served as a member on a Group to analyse the Monopulse design problems.
18. Calculated near field electromagnetic fields of ATS-F transmitters, required for EMIC tests and also for clearances in the Launch Pad.
19. Contributed to the evolution of all-up EMIC tests on ATS-F and configuration of Anechoic chamber. //
20. For the SITE experiment provided many technical inputs periodically, such as the analysis of reduction of antenna gain etc. and produced the FIRST Overall Operations Plan, and spacecraft compatibility test plans.
21. For other Project requirements, mainly for ISSP and GVHRR, had many detailed technical discussions with GSFC persons and have sent detailed reports to India. The areas are in Reliability, GVHRR design, Grounding Philosophies, multiple antenna designs, etc.
22. Have been very effective ISRO Representative at GSFC for SITE, Apollo-Soyuz etc. The technical and managerial liaison during FEC problems have been the most challenging one. Had played an important role in the technical management of the ISRO Technical Liaison Unit including the negotiations with the ISM, HP, etc. //
23. Made many popular talks at GSFC for the educators/students regarding ATS-F and SITE experiment; this is arranged by the Goddard Special Programs Office. //

For brevity, I stop here. //

  
Y.S. Rajan