



TECHNOLOGY TRANSFER GROUP
INDIAN SPACE RESEARCH ORGANIZATION (ISRO)

Technology Transfer Policy of ISRO

POLICY ON TRANSFERS OF ISRO KNOW-HOW TO INDUSTRY, PRICING OF ISRO'S 'SPIN-OFF' TECHNOLOGIES AND CHOICE OF LICENCEES FOR 'SPIN-OFF' TECHNOLOGIES.

1. SCOPE

This note, sets down ISRO's broad approach to the transfer of technologies developed by its Centres / Units under a policy framework for ISRO-Industry co-operation and elucidates the principles and guidelines adopted by ISRO in pricing its 'Spin-off' technologies and selection of suitable licensees for such technologies.

2. INTRODUCTION

It is recognized (and borne out by the experience of ISRO as well as other R&D/ Licensing organizations in India and abroad) that technology transfer to industry, especially in high-tech areas, is fraught with uncertainties and pitfalls. There is no sure-fire general algorithm or formula for successful technology transfer. While this activity has to be circumscribed by broad organizational policy and guidelines on pricing and selection of licensees and must be progressed in line with ISRO's main objectives in technology transfer of 'Spin-offs', each case is unique in its own way. The actual modalities of transfer, terms and conditions of licensing and choice of industrial partners, will necessarily be situation-specific. Among a host of factors the following are

some important ones that determine the Specifics of each case, the modalities of transfer, choice of licensees, negotiated terms of transfer, etc.

- (i) Development status, scale and maturity of each know-how offered
- (ii) adaptability to industrial operations
- (iii) relevance to the industrial market 'as is' and 'as modified'
- (iv) market potential
- (v) competitiveness & profitability
- (vi) inherent risk
- (vii) level of investment required as well as revenue /investment and margin / investment ratios
- (viii) interest, seriousness and capabilities of potential licensees
- (ix) Whether the ISRO know-how was a sponsored development or primarily motivated by the space programme's internal needs.
- (x) contemporariness and projected life of the know-how at the licensing stage
- (xi) What the 'technology market' can bear and what can be negotiated with genuine licensees.

3. **POLICY FRAMEWORK FOR TRANSFER OF KNOW-HOW FROM NATIONAL R&D ORGANISATIONS TO INDUSTRY.**

S&T organisations of the Government of India including mission oriented ones like DAE, ISRO, DRDO are required to maximize transfer of know-how

developed by them to industry and thereby make their contributions to technological self-reliance, industrial growth and national development. While initiating and continuing support to the growth of high-tech Government R&D organisations, the Government of India recognized the potential for their activities to generate a multiplier effect in terms of returns to industry and the economy from the long term investments made in these growth areas. Based on the historical experience of the advanced countries, it was realized that the 'Spin-off' or 'fall-out' returns and their multiplier effect could be many times the direct returns from investment in mission oriented high-tech programmes such as nuclear and space technology. Unless these programmes disseminate the fruits of their enterprise to various sectors of the economy and generate mechanisms for effective transfer, the returns to the nation as a whole would remain limited; and a synergistic impact would not occur. The primary objective in the transfer and dissemination of government generated know-how to industry and other sectors is the speedy growth of the latter and the consequential momentum to sustained national development. It is therefore incumbent on premier S&T organisations in the country like ISRO to effect maximum technology transfer to Indian Industry, both to meet the space programme needs as well as to disseminate 'spin-offs' for non-space uses. (The direct revenue returns to Government of India from the process of technology transfer, through licence fees, royalties, etc., are relatively minor and of secondary importance).

4. OBJECTIVES OF ISRO'S IN-HOUSE R&D ACTIVITIES

In-house R&D in ISRO, which provides the basic inputs for its TT activities, is entirely motivated, approved and funded to fulfill the goals and targets of the space programme and its projects in telecommunications, remote sensing, etc. The subsequent deployment of such R&D results, for non-space applications ('Spin-offs'), with or without modifications, is naturally a secondary and incidental albeit important activity of the programme.

Except in the case of R&D activities sponsored in ISRO by other agencies, the immediate motivation for initiation and funding of ISRO R&D activities is primarily for space applications and uses within the ambit of the programme – and not for 'non-space' applications. The funds and other resources deployed by ISRO for in-house R&D are therefore justified entirely from the direct relevance of these R&D activities to the targets of the space programme and its projects. (This is an important basis to derive a rationale for the costing and pricing of 'Spin-off' technologies). In other words, the space programme is the main intended 'exploiter' of its own R&D, as is the case with other mission oriented S&T organisations like the nuclear programme. The primary R&D objectives of organisations like CSIR are in direct contrast - their intended technology output is entirely for direct exploitation and commercialization by Indian Industry.

5. NATURE & OBJECTIVES OF ISRO'S TECHNOLOGY TRANSFER ACTIVITIES

5.1 ISRO-INDUSTRY INTERFACE

Technology Transfer (TT) to industry is an act of policy of ISRO and the Department of Space. It is an integral component of ISRO's multi-faceted collaboration with Indian industry comprising (a) Technology Transfer and Consultancy Services to Industry from ISRO (b) Procurement of goods and fabrication services from Industry by ISRO (c) Utilization of industry's own R&D capabilities and infrastructure (technology utilization) by ISRO, and combinations of these cooperative processes.

5.2 ISRO TT CATEGORIES

Technology transfer cases themselves fall under three categories, as follows with

examples, in the order of reducing direct stake of ISRO:

- (i) Primarily for ISRO buy-back (UDMH, HTPB, ISROSIL, 1.5 AH sealed Ag-Zn Cells)
- (ii) Primarily for development of Space systems utilization and Space applications (S-band DRS, satellite telecom/TV/Met ground systems, remote sensing utilization and ground-truth equipment)
- (iii) Primarily for development of 'Spin-offs' or non-Space applications (Dry powder, ISRO Polyols, Pressure and & Thrust transducers,

IR thermometer, 'FEAST' Software package).

Though there are many commonalities in licensing approach and procedure, there are also significant differences in emphasis and approach between these three categories.

Cases in the first category call for technology transfer, productionisation and buy back type of contracts. Product pricing is extremely important here to ISRO. ISRO may be the only market for the product and in many cases ISRO will have to underwrite the risks of the licensee by way of investment sharing, guaranteed buy-back with firm off take schedules and penalty clauses, price escalation clauses and (depending on the quantum of ISRO requirements and economies of scale)- in practice there may be only one licensee per technology in most cases. Except for the TT part such ISRO contacts and the relationship with the industries concerned are very similar to special fabrication contracts that we enter into. Even in the TT part technology pricing (down payment & royalty) is avoided or kept low since the product is meant for buy-back. Provision for royalty from sales to third parties, if any, is however kept.

In the second category, the main market for the licensed products would be organisations utilizing the space systems promoted by ISRO/DOS - Doordarshan, AIR, DOT, IMD, NNRMS community, etc. Volume of

requirements would be generally higher than in the first category and multiple licensees for each know-how may be practical and highly desirable. ISRO should retain a hold on product price fixation through the licence agreement so that the sister government agencies promoting the space systems and the user community are served optimally. ISRO can directly and indirectly 'control' or shape the market growth with the cooperation of user departments.

In the last category, 'spin-offs for non-space applications', the case to case variability is high with reference to the nature of know-how, market potential, licensee profile, etc. ISRO can exercise very little influence on market growth and it would be impractical to exercise control on product price through the licence agreement. Monopolistic market exploitation can however be prevented by ISRO through careful multiple licensing wherever feasible.

5.3 CATEGORY-WISE TT MOTIVATIONS & OBJECTIVES

ISRO's specific objectives in category (i) & (ii) technology transfers derive pre-dominantly from the specific tasks and explicit applications goals of the Space programme itself. These transfers are effected to facilitate the performance of the organisations main tasks, to develop practical space applications and service the growing needs of user organisations. Further, TT in these cases enables ISRO to concentrate on its major project and R&D tasks, without getting diverted and bogged down by the problems of manufacture and routine industrial operations. TT here merely subserves as a tool to carry out the

main mandate of the programme.

In the case of spin-offs however, ISRO's TT motivations are more complex and qualitative. These have so far never been explicitly stated. However some of the important ones are as follows:

- (a) To contribute its share in the development of indigenous technology, industrial and national development in various areas, promoting globally competitive products and service capability of Indian industries.
- (b) To extract the maximum benefit from mainstream R&D efforts by deploying the same or very similar know-how for non-space applications as well.
- (c) Organisational prestige
- (d) To remain abreast of and participate actively in technological and industrial developments in other related sectors, especially in high-tech. areas
- (e) To provide testing grounds and outlets for its R&D talent and make inroads relevant for future organisational diversification.

5.4 HIERARCHY OF SPECIFIC TT OBJECTIVES IN 'SPIN-OFFS'

It follows that the specific ISRO TT aims, objectives and approach to 'Spin-offs' would be quite different as compared to non-spin-off cases. A

hierarchically ordered -set of aims for 'spin-offs' is suggested as follows:

- (i) Winning acceptance for ISRO know-how and effecting successful and speedy transfer
- (ii) Optimal scale of utilization in relation to potential market size
- (iii) Lastly, recovery of the marginal cost of TT and if possible, a surplus financial return to ISRO. (Very roughly, the marginal costs, of TT are recovered at the stage of licensing as part of the negotiated licence fee, documentation charges, etc. The 'surplus' accrues usually by way of the negotiated royalty rate).

6. PRICING & LICENCEE(S) SELECTION FOR SPIN -OFFS

6.1 Pricing of Spin-off technologies and criteria for selection of their licensees should sub-serve the above objectives. A significant policy cum managerial study on pricing of ISRO spin-offs was conducted by the IIM, Bangalore and the guidelines evolved by this study have been followed by the ISRO TT system.

- (i) Use the 'marginal cost-based' price as the starting point and adjust it upward or downward depending on the relevance and significance of other factors and on the specifics of each case.
- (ii) Work out various 'equivalent combinations of down payment and royalty payments where all combinations are equal to the 'marginal cost-based' price above. (In practice, this recommendation is unworkable because of

the high uncertainty in forecasting sales, and hence royalty payments of industrial licensees who take up the new ISRO technologies. It can be followed if we charge down payment plus annual charges.

(iii) The 'base price is to be adjusted to take account of the following economic and non-economic factors:

(a) Sensitivity of acceptance to price after trying the various down payments - royalty combinations with the potential client

(b) Distribution of gains from exploiting the technology - i.e. if the manufacturer or a particular group of consumers are likely to gain considerably, ISRO may want to appropriate a part by pricing above the base price. Alternately if it can lead to cheaper production of a key intermediate good, resulting in cost reduction across a wide range of products with widespread (distributional) benefits, ISRO may consider pricing even below cost.

(c) Cases resulting in 'Global Market Entry' deserve concessional terms to induce exploitation wherever 'free trade' regimes do not apply, such as in high technology areas and where technology development efforts is essentially subsidized by the Government, elsewhere in the world. Similar considerations apply in cases where potential licensee prefers imported technology, but may accept indigenous know-how if it is priced sufficiently low. Similarly, in cases where considerable

social benefits can arise, this approach is adoptable.

- (d) In certain cases, because of small potential market and / or economies of scale, 'Auction' pricing may be used to regulate the scale of exploitation, with formal or informal assurances that ISRO will *limit* the number of licensees. (This was attempted for the first time successfully in India before the IIM study was *commissioned* in the case of 'ISRO Dry Powder').

6.2 GENERAL GUIDELINES IN LICENCING AND PRICING

Winning the Indian markets acceptance and maximum exploitation of ISRO know-how is the over-riding consideration in the entire approach to technology transfer of ISRO spin-offs. This does not mean that TT pricing is unimportant. In fact under priced or free offers are likely to be undervalued by the market or result in a flood of applicants, many of whom are half-interested or non-serious or more interested in buying the product and not the know-how.

In addition to the above, important considerations, pricing of ISRO TT is dependant on what the market can bear-based on negotiations with the potential licensees. Care is taken to see that subsequent licensees of the same technology do not get more favourable terms than the first licensee (who often bears the maximum risk, helps ISRO in shaping the technology better and contours the market. Finally, one of the most important 'rules' followed rigidly in ISRO TT is non-exclusive licensing. Among other things it enables experience-based pricing of TT to subsequent licensees.

7. CRITERIA FOR SELECTION OF LICENCEES FOR ISRO TT

The following are the important factors in selection of licensees of ISRO Technologies:

- (a) Whether technology is suitable for general or limited transfer
- (b) Market assessment and number of licensees most appropriate (via media between over licensing and inadequate consideration to licensee casualty rates)
- (c) Geographical distribution needs of the TT
- (d) Negotiation of financial and other terms and conditions
- (e) Keeness and genuine interest of party (often parties try to acquire and lock up indigenous know-how to bolster their case for pre-decided technology import).
- (f) Previous/current ISRO / DOS experience, if any, with party
- (g) Modifications/ Adaptations/Consultancy effort required, *if any*, for party
- (h) Training needs for each party in ISRO/DOS facilities
- (i) Assessment of party's track record, technical and managerial strengths and weaknesses
- (j) Financial soundness assessment
- (k) Adequacy of party's existing production, testing, marketing, maintenance, products servicing infrastructure and plans
- (l) Ease of transfer by ISRO
- (m) Judgements on party's speed of productionisation and marketing
- (n) Changes that may be required from standard terms and conditions
- (o) Development status of the know-how and party's willingness and

ability to put in the productionisation effort and applications development R&D effort, as required.

(p) Judgment on reliableness of party

(q) Judgements on party's on market assessments for the product

(r) Whether additional licensing needs to be permitted for exploitation for export only (in cases like 'Dry Powder' where internal market is fully met by existing licensees)

8. LICENCEE SELECTION & FINANCIAL TERMS GOVERNMENTAL PROCEDURE:

Wide publicity is given to announce the potential items available for TT in trade journals / news media and interest exploration notes, providing specifications and applications of technologies are sent to potential licensees. Potential licensees are long-listed and short-listed by a procedure akin to recruitment, and negotiations are held with them by centre-level committees with the concerned IFA. Often Chairman, TTG, Manager, TTG and other ISRO HQ focal points are involved in these discussions as necessary. Subsequently the proposals of the centres on licensee(s) choice and negotiated terms are vetted by TTG and processed with modifications for Chairman's approval. The financial terms are finalized in consultation with Member (Finance), ISRO Council, as per the ISRO order on TT.

9. INTELLECTUAL PROPERTY RIGHTS

ISRO has set up a mechanism for continuous review of patent applications in India and elsewhere in the field relevant to its areas of research and send advisories to scientists in ISRO / Patent office as appropriate. ISRO

also set up mechanisms to obtain IPRs in case of technologies developed by it and to protect interests of its licensees in commercial use of its inventions.