

# *A decision theory approach to standing order procurement of NASA reports \**

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**Abstract:** *Explains various package deal procurement methods including standing order method for library documents and enumerates different standing order services of NTIS for technical reports. Describes the NASA information system. Discusses and analyses the economy of NASA FS service by applying decision theory approach and considering the various costs as well as saving aspects/advantages. Finally, throws open the non-economic factors to be considered in evaluating such a service. Concludes by suggesting ways of making NASA FS service more beneficial to the library of ISRO Satellite Centre (ISAC).*

**Keywords:** Library acquisition. Standing orders, NASA reports, technical reports, decision theory approach,

## **INTRODUCTION**

Increased prices, inelastic budgets and inflation are resulting in constrained buying power of libraries. Naturally, libraries explore more and more of gratis and exchange modes of acquisition, especially for unconventional grey literature. However, when inevitably they have to resort to purchasing, reading materials are bought directly or through vendors/agents either on credit basis or on advance payment basis. Some conservative suppliers/agencies have instituted deposit account schemes and coupon systems in place of the advance payment system with a favourable edge to the seller. Irrespective of the size of a library, more desirable and possibly least exploited methods of procurement, which can considerably enhance the utility of limited monetary resources, are standing/bulk orders, package deals, combinations, membership orders, orders on domestic rate suppliers, etc.

It is a common practice in many libraries to place standing orders for advances, annual views and other serial titles, including directories and handbooks, to avoid routine ordering work and to make marginal savings. However, certain package deal offers, such as those offered by professional bodies (e.g. IEEE and AIAA) and membership offers (individual, student, associate, institutional membership. e.g. ACM, ISI, BSI, etc.), provide considerable saving in price, procurement time and office work. Combination subscriptions, such as those for SIAM journals,

also result in considerable, saving. It is not difficult for a library to evaluate such package/bulk/standing/membership/combination offers. Apart from monetary considerations of reduced price, the offers extend free postage, handling and quick supply on credit basis. At times, additional copies are made available free or at reduced rate and some documents are available only to members or package deal customers, that too in special 'library edition'. The purpose of this paper is to evaluate one of the standing orders of ISAC Library, namely, NASA FS service offered by NTIS.

## **TECHNICAL REPORTS**

NTIS, the largest grey literature handling agency, offers a series of standing orders which include JPRS, *FBIS*. CIA monographs, NASA-FS and SRIM (which has the additional advantage of saving due to supply in microform). The economies in procurement of technical reports have been dealt with elsewhere while highlighting problems and choices in procurement [1]. Apart from contacting the appropriate source, opting for a suitable standing order enhances the system efficiency. However, changed conditions have to be noted and a trial order needs to be placed, as agents are not much up-to-date and informed and NTIS does not entertain direct enquiries from Indian libraries.

NASA reports are naturally the life blood for a space science and satellite technology library. The relative importance of NASA reports is evident from the results of a recent use study of paper copy reports of ISAC library based on a 20% systematic random sample[2]. Though the overall usage of reports is less, NASA reports, which formed about 27% of sample, were used to the extent of 55% of total use of the entire sample. In other words, NASA reports were the maximum sought after reports in the library. As such, NASA FS standing order service has been availed of by the library since 1982. As NTIS has doubled the price of the service since 1983, it has become necessary to evaluate this trial standing order service.

## **NASA INFORMATION SYSTEM**

It may not be out of context to mention here a few words about the NASA information facility[3] itself. The STIO of NASA collects nearly one lakh documents per year from government organizations, universities, research laboratories, corporations and commercial publishers in USA and from more than 200 foreign countries. The actual acquiring and processing is done by STIF, a contractor - operated NASA installation, TIS of AIAA and ESA, which has exchange agreement with STIO.

NASA keeps most of its collection in microform and bibliographic data in machinable form.

It does not supply its documents directly to users abroad. We have to buy them through NTIS or SOD (USGPO). The results of NASA sponsored research are recorded in approximately 10,000 technical reports each year. These reports are obtainable through NTIS[4]. As we understand from one of the Indian agents of NTIS, 3500-4500 NASA reports are input into the NTIS system per year. Thus, NTIS lacks more than 50% of current NASA reports.

STAR, a semi-monthly announcement bulletin of NASA, covers about 25,000 citations to unclassified reports, patents, translations and standards per year. LSTAR is a quarterly bulletin of NASA for unclassified but limited distribution and security classified reports acquired by STIF. It covers less than a thousand to a few thousand citations in an year, which are normally not reannounced in STAR when limitations are removed and 90% of these originate from DOD and the remaining ones are NASA inhouse and contractor reports.

All the reports listed in STAR are not available to public. STAR uses # symbol to indicate that a document is available only in microfiche, \* to indicate that the report has originated within NASA or one of its prime contractors and + to indicate unusual problems of reproducibility and the documents being available only in paper copies.

## **NASA - FS STANDING ORDER SERVICE**

The main feature of NASA-FS service of NTIS is that selected unclassified (probably more popular) reports of NASA sponsored research in some selected series in original printed form are regularly (once in a month) mailed from NASA to the customer through NTIS at a flat rate per report, irrespective of its size. NASA-FS service includes supply of reports in popular NASA series, such as CP, CR, RP, SP, TM, TP and a few others. Though it is claimed that the service covers reports in TN and fl series also, we have not received these during the last two years.

The nature of different series of NASA reports covered in the service is worth taking note of. CPs are compilations of scientific and technical papers or transcripts arising from conferences, workshops, symposia, seminars and other professional meetings that NASA elects to publish. CRs contain results of work completed under NASA contracts or grants. The service covers CRs numbered below 50,000 which are printed and considered substantively important. RPs include technical handbooks and manuals, critical tables, monographs and scientific and technical textbooks. SPs include scientific summaries of mission results, scientific photography, atlases and histories and chronologies. In particular, new information resulting from space exploration and significant advances in space science and technology (below 3,000 numbers), handbooks, charts and data compilations on various aspects of science and technology (numbered 3,000s), histories and chronologies (numbered 4,000s), management and evaluation

standards providing significant advances for decision-makers in system and program management, design, development, manufacture and evaluation (numbered 6,000s) and such of the SP reports printed by SOD (USGPO) are also covered under SP series. TMs are in-house reports with classified, preliminary or unconfirmed research results and the service obviously covers such reports which are unclassified and unlimited (numbered above 50,000). The technical publications under TP and a few other series are also included in the service. TNs presented high quality complete technical results but less broad in scope than TRs and TTs, which provide English translations of foreign documents with broad significance for NASA's programs (numbered below 8,000), are supposed to have been covered in this service. One important point to be noted here is that all the reports brought out in these series as per the scope mentioned are not supplied under NASA-FS service and the criteria for inclusion or exclusion of a report are not clear.

In other words, the following series are specifically excluded from NASA-FS service. (i) CRs above 50,000 which contain preliminary, unconfirmed or proprietary information and hence have limits on their distribution, (ii) SPs which fall under technology utilization series (numbered 5,000s) and spacecraft design criteria in four areas of technology — environment, structures, guidance and control and chemical propulsion (numbered 8,000s), (iii) TMs below 50,000 which are not printed but are available only in microfiche and duplicated form, (iv) TRs which are unclassified final reports that provide comprehensive coverage of NASA research project or other information of current and lasting importance to aeronautics or space science, (v) TTs which may have narrower interest and distribution limitations (numbered 8,000s) and are not printed, but are available in microfiche or duplicated form, and (vi) NASA patents.

The foregoing discussion of the scope of NASA-FS service gives an idea of the types of NASA reports expected in the standing order service. Looking at the quantum of reports and the financial implications of the service, we see that NASA-FS service carried 425 reports in 1981 and about 371 (estimated) in 1982. The number during 1983 and 1984 (estimated) was 382 and 417 respectively. This service has undergone several changes during last few years and as a result the total number of reports is believed to have come down drastically. NTIS, as a commercial organization, might be discouraging this service, as is evident from the fact that the flat rate of \$10 per report in 1982 has been doubled since 1 January 1983 and it is this aspect that has prompted this analysis.

On the other hand, SRIM service, which is also a standing order service, is for microfiche copies of reports falling under specified subject groups or those originating from a specified organization (e.g. NASA) supplied at a flat rate of \$ 2 in 1983 and \$ 2.20 in 1984 per report. But reports supplied in SRIM service are not necessarily current reports. There is a considerable

time lag in the supply of NASA reports under SRIM service compared to NASA-FS service. About 4,000 NASA reports per year are expected under SRIM if all NASA reports are specified. Most of the reports available under NASA-FS service are not made available in SRIM service. For example, in the month of May 1982, only one report became common between NASA-FS service and SRIM service for NASA reports.

## **ECONOMIC ASPECTS OF THE DECISION**

In order to facilitate taking the decision whether to continue to NASA-FS standing order service or not we examined the actual reports supplied for about six months during 1983 in different series. Our assessment has shown that about 59% of reports are fairly relevant to ISAC library and the library would have otherwise also acquired in case announcement lists were scanned regularly. The breakup of this relevance among different series, is presented in Table 1, which also incorporates the percentage of supply in different series and average size/price (with code) for different series for buying the reports individually. Hence, this model has been based on estimated percentage of relevant reports and estimated average price for each series.

*Table 1*  
(Decision Model 1)  
*Probable cost of relevant NASA reports based on probability of occurrence of a series and its average cost*

Series	Supplies in 1983		% of relevant reports	Average size/Price		Cost of relevant reports in \$, i.e. (2) x (4) x (6)
	No.	%		Code	1983 price in \$	
1	2	3	4	5	6	7
CP	36	9.4	80	A18	62	1786
CR	93	24.3	52	A09	35	1693
RP	17	4.4	83	A06	26	367
SP	10	2.6	83	A09	35	291
TM	79	20.7	62	A07	29	1420
TP	146	38.2	46	A05	23	1545
Others	1	0.3	100	A04	20	20
Total	382	99.9	57	-	-	7122

It is seen from Table 1 that it would have cost US \$7,122 to buy individually the 218 relevant reports out of a total of 382 reports supplied through NASA-FS standing order service. On the other hand, the standing order (for 1983) has cost US \$ 7,640 at the rate of \$ 20 per report (for 382 reports). In both cases, the mandatory air freight charges are excluded. Thus,

there is a marginal loss of \$ 518 ( $\$ 7,640 - 7,121$ ) towards the remaining 164 less relevant and irrelevant reports. Another dimension of the cost not indicated in this analysis is the cost of processing and storing irrelevant reports. However, if the procedure permits, the library can avoid this cost by not taking irrelevant reports to the stock but to give them away to other libraries for which they are potentially useful, either as gift or at a reduced price, and recover a substantial part of the expenditure on NASA-FS service. Hence, as per Decision Model 1, it is still not clearly beneficial to ISAC library to continue with NASA-FS service unless the cost of less relevant and irrelevant reports is recovered. It is but natural that the savings and advantages of the service would have been enormous had the service continued at the 1982 price of \$10 or even at a marginal increase in price per report instead of \$ 20. While the price of a report for individual purchase has been marginally increased by \$ 2 per report, irrespective of size, the price per report in NASA-FS service has been increased by \$ 10 per report in 1983.

An alternative decision model is presented in Table 2, which is based on probability of price group of actual supply of reports if the same have to be bought separately. This model emphasizes the price distribution of actual supplies and not the distribution of relevance percentage among reports of different series of the previous model.

If ISAC library has to buy all 1983 NASA reports obtained through NASA-FS service on individual price basis, as per Table 2, it would have cost \$9,788. Hence, there is a saving of \$2,148 (i.e.  $\$ 9,788 - 7,640$ ), provided all the 382 reports are relevant and useful. Since only 59% (i.e. 218) of them are found relevant and useful, the proportional cost has to be worked out and examined.

Table 2 shows \$ 50 as the median cost of a report and based on this the total cost of 218 relevant reports would have been \$10,900, which shows a saving of \$ 3,260 (i.e.  $\$ 3,260 - 7,640$ ). Another version of Model 2 can also be worked out based on the mode cost of \$ 17 per report. According to this, the relevant reports would cost only \$3,706, showing a loss of \$ 3,934 (i.e.  $\$ 7,640 - 3,706$ ) towards less relevant and irrelevant reports.

Table 2 also reveals the weighted average price of a report as \$ 25.5. A recent study[5] has shown that the average report from NTIS through Indian agents has cost about \$23 (excluding mandatory air freight charges). Thus, it establishes, incidentally, a fact which otherwise would have led to suspicion that the supplier might push less costly reports in a standing order deal like NASA-FS service.

The third version of the model based on the (weighted average/mean shows that \$5,559 would have been sufficient to buy all relevant reports. This leads to a loss of \$2,081 (i.e.  $\$ 7,640 - 5,559$ ).

7,640—5,559) due to 164 less relevant and irrelevant reports. The third version of the model based on mean is statistically more dependable than versions 1 and 2.

**Table 2**  
(Decision Model 2)  
*Probable cost of relevant NASA reports based on probability of occurrence of a price group of actual supply*

1983				Expected cost per report, i.e. (2) x (4)	Total cost of reports in \$, i.e. (2) x (3)
Price code	Price in \$	Supplies No.	Probability		
1	2	3	4	5	6
A02	14	75	0.196	2.74	1050
A03	17	83	0.217	3.69	1411
A04	20	55	0.144	2.88	1100
A05	23	39	0.102	2.35	897
A06	26	28	0.072	1.87	728
A07	29	11	0.029	0.84	319
A08	32	18	0.047	1.50	576
A09	35	12	0.031	1.09	420
A10	38	10	0.026	0.99	380
A11	41	7	0.018	0.74	287
A12	44	4	0.010	0.44	176
A13	47	7	0.018	0.85	329
A14	50	2	0.010	0.50	200
A15	43	2	0.005	0.27	106
A16	56	5	0.013	0.73	280
A17	59	6	0.016	0.94	354
A18	62	2	0.005	0.31	124
A19	64	3	0.008	0.52	195
A20	68	3	0.008	0.54	204
A21	71	1	0.003	0.21	71
A22	74	0	0.000	0.00	00
A23	77	2	0.005	0.39	154
A24	00	0	0.000	0.00	00
A25	83	1	0.003	0.25	83
A26	86	4	0.010	0.86	344
Total	-	382	0.996	25.50	9788

A consolidation of the results of both the model is presented in Table 3. Ignoring version 2 and 3 of Model 2, the choice is between Model1 and version 3 of Model 2. Since Model 1 is based on probability of a series and the average cost of a report in a given series, whereas Model 2 is based on probability of individual purchase cost of a given report, the first model is

aggressive and the second one is conservative.

By either model, the NASA-FS service is not cost efficient or economically justifiable and the library incurs a loss of \$ 518/2081 towards less relevant and irrelevant reports. We may note here that the errors in the estimates, including the estimate of relevant reports, are not taken into account in the analysis and a combination of Decision Models 1 and 2 could not be developed, as data were not available.

*Table 3: Cost of less relevant and irrelevant reports*

	Model 1 (based on probability of a series and its average cost)	Model 2 (based on probability of price of a report)		
		Version 1 (Median)	Version 2 (Mode)	Version 3 (Mean)
Cost of relevant reports by direct purchase (\$)	7122	10900	3706	5559
Cost of standing order (\$)	7640	7640	7640	7640
Cost of less relevant and irrelevant reports (\$)	- 518	+3260	- 3934	- 2081

Another question is: At what percentage of relevance (i.e. relevant reports supplied) is the NASA-FS standing order service economically justifiable as per Model 2 and 'breaks even' the cost of individual purchase of relevant reports? To answer this question we have to find out what percentage of \$ 9,788 is \$ 7,640 and the answer is 78%.

## **NON-ECONOMIC ASPECTS OF THE DECISION**

The economic considerations have revealed that NASA-FS service at the revised price of \$ 20 per report is not justifiable, unless the percentage of relevant reports is not less than 78 or the less relevant and irrelevant reports can be resold to recover a part of the expenditure. However, the analysis, has not considered the cost of selecting, order processing and reminding in the case of individual purchase of relevant reports. Finally, the non-economic considerations also have to be examined before accepting the above decision.

Firstly, NASA-FS service brings reports within a month or two of their production directly from NASA unlike scanning announcement bulletins of NASA and NTIS, which take not less than six months to come. When individual orders are placed, as per a recent case study [6], just 60% of reports are supplied within six months from the date of placing order. Thus, a total delay of supply of the same NASA reports to users could be 1-2 years. On the other hand, NASA-FS



service, partially fulfilling the requirement of a current awareness service, brings the reports much earlier than any announcement bulletin.

Secondly, all NASA reports under NASA-FS service are original, neatly printed, attractive, legible and readable. Against this, most of the reports supplied by NTIS against individual orders are poor quality reproductions on one side of loose sheets from microfiche originals. As such, diagrams and photographs are not legible. Though NTIS claims that one in every five reports supplied is normally original printed report and "Approximately 15% of NASA –generated scientific and technical information is printed...i7j. The experience at ISAC library is that printed reports are supplied against stray orders only rarely.

Lastly, the one-sided loose copies of reports supplied by NTIS against individual orders invariably need immediate binding before they are released for use, involving additional delay and cost.

## **CONCLUSION**

Before taking a final decision, the results and observations involving all the above economic and non-economic considerations were presented before a user representative committee. The committee decided not to cancel the NASA-FS service at least for another six months (i.e. up to April 1985) due to the special occasion of the 25th anniversary of NASA, which is expected to bring several useful and interesting conference publications. Many users have felt that some of the reports under this service are invaluable sources of information. It has also been decided to review and assess the matter after the above event before a final decision, is taken.

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### ***Abbreviations and acronyms used***

ACM	Association for Computing Machinery (USA)
AIAA	American Institute of Aeronautics & Astronautics
BSI	British Standards Institution
CIA	Central intelligence Agency (USA)
CP	Conference Publications
CR	Contractor Reports
DOD	Department of Defense (USA)
ESA	European Space Agency
FBIS	Foreign Broadcast Information Service
FS	Formal Service
IEEE	Institute for Electrical & Electronics Engineers
ISAC	ISRO Satellite Centre
ISI	Indian Standards Institute
ISRO	Indian Space Research Organisation
JPRS	Joint Publications Research Service (USA)
LSTAR	Limited Scientific and Technical Aerospace Reports
NASA	National Aeronautics and Space Administration (USA)
NTIS	National Technical Information Service (USA)
RP	Reference Publications
SIAM	Society for Industrial & Applied Mathematics (USA)
SOD	Superintendent of Documents (USAFO)
SP	Special Publications
SRIM	Selected Research in Microfiche
STAR	Scientific & Technical Aerospace Reports
STIF	Scientific & Technical Information Facility (USA)
STIO	Scientific & Technical Information Office
TIS	Technical Information Service (USA)
TM	Technical Memorandums
TN	Technical Notes
TP	Technical Publications
TR	Technical Reports
TT	Technical Translations
USGPO	United States Government Printing Office (USA)

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### **About the Author**

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