Defence is the most important task of the union government and, therefore, always tops the list of priorities in the planning process. The welfare of the people, their social and cultural development, industrial growth, and economic stability all depend mainly on the safety and security of the nation, which is the main task of Defence. The very aim of the Defence is to safeguard the nation from foreign aggression and preserve and promote peace within the country. Therefore, there is every need to maintain well-trained, well-equipped and well-informed Defence Services -- Army, Navy and Air Force -- to meet all the challenges efficiently and successfully.

Such a need is more for a country like India, which has a vast territory, with many countries surrounding it. Further, it has a long coastline to protect and preserve in a democratic set-up. Besides, the technological revolution which has taken place in the post-war period, has drastically changed man’s strategic skills and maneuvering capacity of machines in the field of Defence in the modern world.

In keeping with the current trends, Government of India has been taking every step and making every endeavor to keep the Defence forces in proper form by formulating new plans and programmes, developing and acquiring new techniques and machines and supporting Defence Research and Development (R & D) and related activities through liberal budgets, grants and concessions.

The Defence Research and Development Organisation (DRDO), as it exists today, was formed in 1958 by integrating and consolidating various scientific and technical organisations then existing under the Defence Science Organisation. The mandate of the organisation was also focused more sharply to concentrate exclusively on problems related to Research and Development in the Defence sector.
1. STATEMENT OF THE PROBLEM

The problem chosen by the investigator aims at (a) ascertaining the information needs of defence scientists in India, (b) surveying the information gathering habits of defence scientists, and (c) suggesting ways to improve the avenues for making the needed information available to them. By knowing the information needs and problems being faced by the defence scientists while gathering the information needed, the investigator proposes to suggest some methods and means so that the right information reaches the right person at the right time. Figure 1.1 illustrates the investigation.

2. NEED AND PURPOSE FOR THE STUDY

To serve the users effectively, an essential pre-requisite is to study the patterns of information usage by them. One form of such study is to evaluate the extent and mode of use of certain library services and tools by users; their information collecting habits; and their awareness about the information services available in the field. Guha (1978), emphasizing the need to study information users, says: “It has often been complained that the documentalists had, for a long time, neglected one of the most important components of science communication system, namely, the user. They were more concerned with the documents and their bibliographical organisation to satisfy the information needs of the users. But very little was known about the exact nature of this need. How exactly the user behaved when he was looking for information; what type of document was used in which situation; how the information was used when obtained, all these were not very clearly known to documentalists”.

Menzel (1966), while reviewing the studies on information needs and uses in science and technology, remarks: “The way in which the scientists and engineers make use of the information systems at their disposal, the demands that they put to them, the satisfaction achieved by their efforts, and the resultant impact on their further work, are among the items of knowledge which are necessary for the wise planning of science information system and policy”. It follows that the need for improvement of the existing library and information services in India and their future planning in
Fig. 1.1: The Investigation: An Overview
conformity with the nation's educational, social and economic needs have made users' study a must. The present study is a modest attempt in this direction so far as the information users in the Defence in India are concerned.

3. REVIEW OF EXISTING LITERATURE

User studies originated with the perception that by understanding users and their information needs one could design an effective information system. Although many reviewers did question the validity of user studies as guides to improving information services, studies in the subject continued to grow in numbers. A number of reviews and bibliographies cover user studies conducted prior to 1972. The significant works are those by Menzel (1960), Davis and Bailey (1964), Barnes (1965), DeWeese (1967), Paisley (1968), Coover (1969), Elman (1971) and Wood (1971).

Crawford (1978) estimated that 1000 user studies had been published. An online search for this thesis using terms such as user needs, user satisfaction and user studies turned up 2000 documents in one database alone. The literature on science user studies is composed of a large body of data that cannot be correlated, due to differing objectives, methodologies, scales and definitions used in the studies. Each study stands in isolation, with no obvious links that enable it to be compared with other studies.

The topic of information needs and use has been discussed in India from 1962 onwards. “Users and library and information service” formed one of the topics at the Second IASLIC Seminar (1965) held in 1962. This was followed by S. R. Ranganathan’s (1970) annotation on users’ surveys. From 1968 onwards, users and their problems in different fields of Science and Technology (S&T) began to be considered for study and analysis. The aspects covered include classes of information in specific fields, evaluation of specific services or systems, channels or media of communication used, pattern of information use and flow, and users' behaviour (Krishan Kumar, 1984).

The fields covered in this connection include science and technology, nuclear science and technology, physics, chemistry, biology, food science and technology, leather technology, electrical engineering, electronics, armament technology, etc.
Exhaustive surveys have been conducted in the areas of electronics (Raizada, 1967), chemistry (Krishan Kumar, 1968), physics (Dhakar, 1971), food science and technology (Sangameswaram et al., 1976), electrical engineering (Haravu and Nagaraja, 1979) and again food sciences (Ramana and Gopinathan, 1982). Studies in chemistry and electronics were carried out in the late sixties and some of the finding may not be relevant today.

Until now, the strongest complaint against user studies has been the use of defective methodology. Menzel (1966) and Herners (1967), have expressed concern over the field's failure to adopt sound methods of its own. Inconclusive studies are conducted to fill gaps left by previous inconclusive studies. Information needs have been studied using methods developed for social sciences studies. Basically there are three main methods of collecting data either explicitly or implicitly related to users' information needs: viz., questioning, observation, and analysis of documentary sources (Ford, 1977). The most commonly used ones are the survey techniques of questionnaires and face-to-face or telephone interviews (Brittain, 1982; Crawford, 1978; Faibisoff and Ely, 1976; Lipetz, 1970; Paisley, 1968; Wood, 1971) because they provide the most easily quantifiable data. Among the other methods used are those based on observation, experiments, simulations, and analysis of various records or documents, such as circulation records, statistical records, diaries, solution development records, and publications in various formats (Crawford, 1978; Faibisoff and Ely, 1976; Ford, 1977; Herner and Herner, 1967; and Skelton, 1973). The two main techniques used in analysing these records or documents are citation analysis and content analysis. Each method has its weaknesses and biases. So, in some studies more refined techniques have been used like using the critical incident approach in questionnaires or interviews. Some workers have used combinations of different techniques, e.g., questionnaires and interviews, to provide internal checks against bias (Crawford, 1978; Faibisoff and Ely, 1976; Ford 1977; Herner and Herner 1967; Line, 1971a; Paisley, 1968; and Skelton, 1973).

Another example of a not-quite-conventional method is Parker's (1967) combination of a secondary analysis of previously collected questionnaire data (Libbey and Zaltman, 1967) with tape-recorded depth interviews of essentially the same population. Some years ago, tape-recorded diaries were collected by the Aslib
Research Department (Line, 1974) from scientists and technologists engaged individually in attacking particular problems of research or development.

Hodges and Angalet (1968) prepared a report based on data collected for the Department of Defense User-Needs Study. The data were collected from interviews with 1500 scientists and engineers selected from among the 1,20,000 persons engaged in work for the Department. It appears that in most of the studies, the sample is selected randomly. However, in some, for example, in the studies of Hogg and Smith (1958) and Herner (1954), the random sample was stratified by status grades.

Since no systematic survey of information needs of defence scientists in India has been carried out so far, the present study is of value as an attempt to fill up this gap. A recent DIALOG online search by the investigator also confirms that to-date no such survey has been attempted even abroad.

4. OBJECTIVES OF THE STUDY

Information needs of scientists cannot be understood properly without having a clear understanding of their information gathering habits. Literature reviewed in the preceding pages revealed that no systematic study has been made so far in India and abroad to assess the information needs of defence scientists working in different laboratories/establishments (labs/estts). The present investigation thus represents the first attempt at studying the subject at a comprehensive scale, and as such is a significant contribution to the existing knowledge. The present study aims at filling this gap. The objectives of this study are ten-fold:

1. to study the organisational structure of Defence in India;
2. to survey the genesis, status and working environment of defence scientists in India;
3. to survey the information resources and services of Defence Scientific Information and Documentation Centre (DESIDOC);
4. to survey the existing library and information services being provided by different defence libraries in India;
5. to investigate the information needs of different categories of defence scientists;
6. to investigate the level of awareness of defence scientists about the existing library & information services and centres;
7. to study the information gathering habits of defence scientists;
8. to study the problems faced by defence scientists while gathering information;
9. to examine if any relationship exists between information gathering habits of defence scientists and their age, experience, languages known, etc. and;
10. to suggest ways and means whereby the information needs of all categories of defence scientists can be met to their satisfaction.

It is hoped that the recommendations made by the investigator in various chapters and summarized in the last chapter would provide necessary guidelines for evolving frameworks for satisfying information needs of DRDO scientists in India on scientific lines. Additionally, they will make the scientists aware of various information centres/systems/services available to them for satisfying their information needs. The recommendations may also benefit other special libraries, especially non-DRDO defence libraries in India, to some extent.

5. HYPOTHESES

During the course of the study, the investigator attempted to test the veracity of the following commonly held views:

1. DESIDOC has adequate number of information resources to cater the information needs of all categories of defence scientists in India.
2. Advance information technologies are available at DESIDOC and are being utilised for information processing and retrieval.
3. Majority of the DRDO libraries/Technical Information Centres (libs/TICs) have sufficient money but the library staff available is inadequate.
4. An overwhelming majority of the DRDO libs/TICs have photocopying services.
5. Information bulletins like, accession lists, CAS, indexing services, abstracting services, SDI, etc. are not brought out by majority of the DRDO libs/TICs.
6. Foreign language knowledge among the defence scientists is meagre.
7. Defence scientists, by and large, are not aware of different information centres and services available in India and abroad and the awareness level increases with the status of the scientists.
8. A lot of important information is communicated among the defence
scientists by various informal means, such as, meetings, telephone conversations, correspondence, etc.

9. Average time spent in laboratory, for literature search and reading, decreases with the status of the defence scientist, whereas, the time spent on conferences and discussions increases with their status.

10. Majority of the defence scientists have not attended any conference/seminar/workshop at national or international levels.

11. An overwhelming majority of the defence scientists are not member of any professional society/association.

12. Majority of the defence scientists consult the lib/TIC less frequently and for lesser period.

13. Female scientists spend more time in the library than their male counterparts.

14. Majority of the defence scientists visit their respective libs/TICs to consult current periodicals only.

15. Majority of scientist 'Bs', 'Cs' and 'Ds' are not able to understand the shelf arrangement of documents in their libs/TICs.

16. Majority of the DRDO scientists do not subscribe to current periodicals individually.

17. Current periodicals published in U.S.A and U.K are read/consulted by Indian defence scientists more often than those published in other countries.

18. Out of various foreign defence related publications, “International Defense Review” and “Janes Defence Weekly” are most frequently consulted by the Indian defence scientists.

19. Senior defence scientists get the photocopying services more promptly while those in junior positions get it considerably late - even after a week's time.

20. There is a significant time delay in getting the required document on inter library loan by the defence scientists through their libs/TICs.

21. A majority of the defence scientists feel the need for personalised in-house current awareness service.

22. The frequency of translation problems faced by the defence scientists increases with the status.

23. Majority of the defence scientists do not consult the library staff for retrieving the required information.

24. Defence scientists feel that there is a significant time delay between publication of an information and its retrieval.

25. An overwhelming majority of the defence scientists feel a strong need for using new information technology for information processing and dissemination.
6. UNIVERSE OF THE STUDY

All categories of scientists serving in various labs/estts of DRDO have been covered in the study. The list of DRDO labs/estts and the fields covered by them is illustrated in Fig. 1.2. Currently, about 25,000 scientists are working in DRDO labs/estts in India. These scientists have varied and extensive information needs. The users of defence libs/TICs can be broadly classified into two categories, namely, (i) actual users, and (ii) potential users. Both actual and potential library users have been investigated for this study.

7. SAMPLING

The data was collected personally by visiting different DRDO labs/estts. First of all, the investigator secured the latest list of scientists working in each lab/estt. The total number of scientists serving in various DRDO labs/estts is 25,000. Stratified random sampling was followed for collecting the data. The investigator used the statistical tables given by Taro Yamane (1967) for deducing the optimum size of the sample, which comes to 610, i.e. 2.44% of the total population. As such, every 41st name on the list was tick-marked and selected for administering questionnaire and interviewing. Every possible effort was made to contact the selected incumbents either within their labs/estts or at their residences, even if the investigator had to make more than one attempts. Those who could not be contacted despite repeated attempts, due to their being indifferent, on leave or otherwise, were ultimately left out. Thus, 598 scientists in all were surveyed out of 610 tick-marked. The investigator personally visited DRDO labs/estts located in different parts of India for collection of data by contacting the respondents and also personally observing resources and services of DRDO libs/TICs.

Great care was taken in the design of the questionnaire which was pilot-tested. In all, the questionnaire schedule passed through five different forms during the design stage before the final version was produced. After pre-testing the questionnaire and making a few alterations, the final questionnaire cum interview schedule was adopted for this study, as per Appendix- “A”.
Fig. 1.2: Location of DRDO Labs and sites in India
The respondents were mainly asked either to tick mark their choice or to answer in 'usually', 'occasionally' or 'never'. By 'usually' was meant 'everyday', whereas 'occasionally' implied 'once a week'. A few questions were of open type. Personal contacts facilitated informal discussions with scientists and provided an opportunity to the investigator to understand their information gathering habits. Every care has been taken to ensure that a fair representation was provided.

8. TOOLS AND TECHNIQUES

The data for assessing the information needs, habits, awareness level and problems of defence scientists were mainly collected through a questionnaire cum interview schedule (Appendix-'A'). The data about the resources and services of various DRDO libs/TICs was collected through another questionnaire which is given as Appendix-'B'. The questionnaire and interview schedule were formulated in consultation with the supervisor and also keeping in view the tools used in other similar studies in India and abroad.

Because statistical validity was a pre-requisite, interviews were conducted in a formal, conversational manner. At the outset of each interview, the respondent was told that the interview guide and questionnaire was only the starting point and that he/she could add any information considered useful. In this way, an easy rapport was established, which resulted in a high yield of critical ideas regarding information needs, awareness level and information gathering habits of defence scientists in India and the problems faced by them in this respect.

9. VARIABLES

The data collected during the present study were first analysed according to identificational variables, such as age, sex, status, qualifications, experience, etc. Thereafter, the factors indicating information needs, awareness level, information gathering habits and problems faced by the DRDO scientists were analysed. For this purpose, the independent variables are: age, sex, status, qualifications, experience, time devoted for various activities, membership of professional societies/associations,
attending professional seminar/conference/workshop, etc. The rating of various sources/services/habits of the respondents has been taken as ‘dependent’ variable.

10. FIELD WORK EXPERIENCES

During the present investigation, the investigator had to go to different DRDO labs/estts to interview the scientists in order to ascertain the information needs, awareness levels and information gathering habits of scientists and the problems faced by them. During these visits, the investigator came across a number of problems and had to face a variety of situations.

The interviews conducted as part of this study gave a qualitative view of the situation. They were conducted by the investigator and varied from 20 minutes to two hours in length, depending on the information that could be extracted from the interviewee. The questions and the following discussions were adjusted to the level of people interviewed. Some interviewees were more knowledgeable on general matters, while others were more prone to exploration of particular topics.

The cooperation received from the respondents was, in general, of a very high order. A large number of respondents were cooperative for the reason that the investigator was one of them (The investigator is working in DRDO as a Scientist). Very few respondents expressed reluctance towards being interviewed. Where reservations were expressed on the ground of pressure of work, it was rather notable that reluctance at this stage was usually followed by a longer than average interview. The interview time ranged from 20 to 120 minutes (average 40 minutes). Since the respondents were spread over a wide geographical area, the interviewing process was very time-consuming, requiring several days’ stay in a few localities and often involving long journeys. On 14 occasions, the subjects were not available for interview at the agreed time because of unforeseen problems but in all but one case alternative arrangements were made.

It was found that scientist ‘Cs’, ‘Ds’ and ‘Es’, especially those who were long-time employees, were quite open and vocal about their information gathering problems. Many volunteered information about personal files that they had maintained and, in some cases, outlined the information seeking problems and described
what they thought to be the causes of these problems. Some directed the interviewer to other individuals who had also encountered problems in information gathering.

At some labs/cstts, the respondents were keen to participate in the survey, answering all the questions carefully and sincerely to the best of their information level and capability. At other places, the respondents had to be coaxed into cooperating with the investigator. At yet other labs/cstts they remained indifferent, since they believed that no good would come out of the survey.

In a few cases, the respondents had to be contacted at their residence, after office hours, which was a difficult job. To find out the respondents' residential addresses, to reach there and to persuade them to cooperate was the most challenging part of the survey.

11. DESIGN OF THE CHAPTERS

The present work has been divided into nine chapters. Chapter-1 includes the introduction, objectives, hypotheses, and research methodology. The status of the Defence set-up in India, and categories of defence scientists in India have been traced in Chapter-2, which also enumerates their pay scales, nomenclature and promotional opportunities. Chapter-3 surveys the objectives, activities, support services and resources of DESIDOC -- which is the nodal point for providing information services to DRDO scientists. Chapter-4 deals with resources and services of DRDO libs/TICs. It enumerates the total number of books, periodicals, standards, reports, etc. in various DRDO libs/TICs on the basis of the questionnaire. Chapter-5 reflects the information needs of defence scientists in India.

Chapter-6 deals with the awareness level of the respondents about existence of various library and information resources/services. It also enumerates the phenomenon of “invisible colleges”, especially within the DRDO. It highlights that DRDO scientists are more dependent on informal sources of information than the formal ones. Bearing of various identificational variables on information needs, awareness, habits and problems of defence scientists has been discussed in Chapter-7. Various dependent and independent variables have also been correlated in the same chapter to bring out the factors affecting the information needs of Defence.
scientists. Chapter-8 analyses the problems faced by DRDO scientists while gathering information and suggests some solutions in this regard. Chapter-9 includes the summary, conclusions drawn and reflections arising from the present study.

Two appendices have been annexed at the end. A comprehensive bibliography listing alphabetically, about 230 references from books and periodical articles, has been provided at the end. These sources have been consulted by the investigator of this study. This bibliography can be useful for further studies on the subject. Care has been taken to maintain uniformly throughout the listing of the bibliography.