JOURNAL OF AEROSPACE SCIENCES AND TECHNOLOGIES

ISSN 0972-950x

Volume 63 Number 3 August 2011

PSLV-C17 Successfully Launched GSAT-12 in Orbit

See Page No. 193

Published by :
The Aeronautical Society of India
13-B, Indraprastha Estate
New Delhi - 110 002, India
Tel: ++91 11 23370516
Fax: ++91 11 23370768
e-mail: aerosoc@bol.net.in

Printer :
Mr. V. Krishnamoorthy, Director
Repromen Offset Printers Pvt Ltd
Bangalore

Publisher : Mr Yatindra Kumar
Secretary(Adm) for the Aeronautical Society of India, New Delhi

Registered with the Registrar of Newspapers for India
No. R. N.4767/57

CONTENTS

Volume 63 **Number 3**

R. C. Mehta:
Numerical Flowfield Visualization over Heat Shield of Satellite Launch Vehicle at Mach 0.8 - 3.0 183

Rakesh Kumar and A. K. Ghosh:
Nonlinear Aerodynamic Modeling of HANSA -3 Aircraft Using Neural-Gauss-Newton Method 194

R. Prabhakaran:
Lightning Strikes on Metal and Composite Aircraft and their Mitigation 208

TECHNICAL NOTES :

S. Thirunavukkarasu, B. P. C. Rao, T. Jayakumar, N. Naryanankutty and P. V. Prabhakaran
Eddy Current Methodology for Nondestructive Assessment of Thickness of Silicon Carbide Coating on Carbon-Carbon Composites 223

D. P. Sudhakar, V. Vinodh Babu, Abhay K. Jha M. Rajmohan and A. E. Muthunayagam:
Optimisation of Vacuum Brazing Conditions for Joining Stainless Steel 321 Sheets by Nickel Based Braze Foil for Regenerative Rocket Nozzle Applications by Taguchi Method 230

ENGINEERING NOTE :

R. K. Mishra, K. S. Jayasimha, A. Iftekar and J. K. K. George:
Fretting Failure of Turbine Blades in a Turbojet Engine : A Case Study 238

TECHNOLOGY APPLICATION NOTE :

R. Guruprasad, Khaiser Nikam and P. Marimuthu:
A Cross-Association Analysis of Scientific Designations (Grades) with the 'Extent of Use of Electronic Information Resources' and the 'Purpose of Use of the Internet' Amongst the Indian Aerospace Scientists and Engineers of Bangalore 243

Address for Correspondence
The Editor
Journal office, 2nd Floor
Aeronautical Society of India
Suranjandas Road
New Thippasandra Post
Bangalore - 560 075, India
Telefax: ++ 91 80 25273851
e-mail: **editoraesi@dataone.in** or **editoraesi@yahoo.com**

Annual Subscription (4 Issues)

Inland	₹ 1000/-
Overseas (Including Airmail Charges)	US $ 200/

Advertisement Tariff (4 Issues)

Back Cover (Multi Colour)	₹ 1,00, 000/- US $ 4,000/-
Inside Full Page (Multi Colour)	₹ 60,000/- US $ 2,000/-
Inside Full Page (Black & White)	₹ 40,000/- US $ 1,200/-

TECHNOLOGY APPLICATION NOTE

A CROSS-ASSOCIATION ANALYSIS OF SCIENTIFIC DESIGNATIONS (GRADES) WITH THE 'EXTENT OF USE OF ELECTRONIC INFORMATION RESOURCES' AND THE 'PURPOSE OF USE OF THE INTERNET' AMONGST THE INDIAN AEROSPACE SCIENTISTS AND ENGINEERS OF BANGALORE

R. Guruprasad
Scientist
CSIR National Aerospace Laboratories
Kodihalli Post
Bangalore - 560 017, India
Email : gprasad@nal.res.in

Khaiser Nikam
Professor
Dept of Studies in Library and Information Science
University of Mysore
Mysore, India
Email : khaiser.nikam6@gmail.com

P. Marimuthu
Associate Professor
National Institute of Mental Health and Neuro Sciences
Bangalore, India
Email : marimuthu@nimhans.kar.nic.in

Abstract

Aerospace is seen as a key technology today owing to its growth in Asia in general and India in particular. Indian aerospace scientists and engineers currently working on strategically important projects depend heavily on rapid collection of information from various electronic information resources. Seeking information through e-resources is an upcoming and an endearing activity. The coming of the Internet has totally transformed the way scientific communication has spread among the scientists and engineers in general across the world and more specifically amongst the aerospace scientists and engineers. Aerospace scientists and engineers greatly depend upon the network and Internet technologies for accessing electronic information resources (most importantly electronic journals) related to aerospace engineering right at their desktops. The Indian aerospace scientists and engineers representing the various aerospace organizations in Bangalore belong to different scientific designations or cadres or grades. These designations represent their scientific hierarchy within the organization. As part of an ongoing research, a questionnaire based survey was undertaken to study the association of scientific designations with the 'Extent of Use of electronic information resources' and 'Purpose of the Use of the Internet'. The study has been restricted to the geographic boundary of the city of Bangalore and the selected 16 aerospace Indian organizations. The present analysis is purely based on the 583 responses that were found suitable for the study out of the 625 questionnaires distributed. The responses from the participants towards the 'extent of use of electronic information resources' and the 'Purpose of Use of the Internet' versus the' association of scientific designations' were graded on a scale of 0 to 4 with 4 representing 'Most Frequently'. The major findings that the authors would like to report in this paper are: (a) The $\chi 2$ test indicates that the different grades (designations) of the aerospace scientists and engineers (Chi-Square = 156.599, P = 0.0438) by the 'Use of Electronic Information Resources' have significant association, and 'Purpose of Use of the Internet' (Chi-Square = 124.452, P = 0.5722) have no significant association.

Paper Code : V63 N3/736-2011. Manuscript received on 25 Nov 2010. Reviewed and accepted as a Technology Application Note on 17 Mar 2011

This implies that percentages of preference for these different grades (designations) of aerospace scientists and engineers by the 'Extent of Use of Electronic Information Resources' are not approximately the same and the 'Purpose of Use of the Internet' are approximately the same. (b) Hence, the authors infer that the 'Extent of Use of Electronic Information Resources' show a dissimilar pattern of use, and the 'Purpose of Use of the Internet' show a similar pattern of use amongst the aerospace scientists and engineers with regard to the different designations/grades of the selected 16 aerospace organizations.

***Key Words**: Aerospace Scientists and Engineers, Electronic Information Resources, Cross-association analysis, Aerospace Organizations, scientific designations, Internet, Scholarly Communication, Search Engines, Scientific Web Sites, Geographic Boundary of Bangalore*

Introduction

Aviation is one of the most significant technological marvels of our time and empowers the nation with strength. It is a major tool for economic development and has a significant role in national security and international relations. India has been fortunate to have started aeronautics related activities as early as 1940, with the establishment of Hindustan Aeronautics Limited (HAL) in Bangalore. The Company was conceived by the visionary and far-sighted industrialist, Sir Walchand Hirachand in Dec 1940 in association with the then Government of Mysore.

Aerospace engineering is the application of advanced science and technology for the design and development of flight vehicles. These include aircraft, spacecraft, missiles and rockets. An aerospace engineer develops new technologies for control, navigation and propulsion that will lead to future milestones in the history of flight. Originally called aeronautical engineering dealing solely with aircraft, the broader term "aerospace engineering" has replaced the former in most usage, as flight technology advanced to include craft operating outside the earth's atmosphere. In analogy with "aeronautical engineering", the branch is sometimes referred to as astronautical engineering, although this term usually only concerns craft which operate in outer space.

The city of Bangalore is popularly known as the 'Aerospace Hub' of the country with many key aerospace organizations which have already been established several years ago like

- National Aerospace Laboratories (NAL)
- Hindustan Aeronautics Limited (HAL)
- Aeronautical Development Establishment (ADE)
- Indian Space Research Organization (ISRO)
- Aeronautical Development Agency (ADA)

It also comprises many key Indian Air Force establishments like

- Air Force Systems and Testing Establishment (ASTE)
- Air Force Technical College (AFTC)
- Institute of Aviation Medicine (IAM)

In a nutshell, many of these organizations come under the broad umbrella of

- Council of Scientific and Industrial Research (CSIR)
- Defense Research and Development Organizations (DRDO)
- Indian Air Force (IAF)
- Space Research Organizations
- Educational Institutions like IISc (Department of Aerospace Engineering) and
- Major Public Sector undertakings

All of them in their own way have significantly contributed to a large number of Indian aerospace programmes.

Amongst these aerospace organizations, National Aerospace Laboratories occupies a very special place. NAL is India's premier civil aviation R and D aerospace research organization in the country. The main mandate during its initial years of establishment was the 'Development of aerospace technologies with strong science content and their practical application to the design and construction of flight vehicles'. NAL is also required 'to use its aerospace technology base for general industrial applications'. NAL, today is in its 50th year of existence and over these years has made remarkable contributions to a variety of Indian aerospace programmes. It also has well-established aerospace related collaborative projects with reputed international agencies. NAL is the harbinger of civil aviation design and development activities in India. In the years to come, 'Technology' would be its core engine-driver for the future. NAL is also best known for its main sophisticated aerospace R and D testing facilities which are not only unique for this country but also comparable to similar facilities elsewhere in the world, [36].

Today, every NAL scientist has access to online electronic scholarly information right at their desktops. This has been possible with the help of the National Institute of Science Communication and Information Resources (NISCAIR) through its CSIR e-conglomerate. Access has been provided to almost 6,000 e-journals by tying up with 23 international publishers. This facility enables any CSIR scientist to access, browse, search and download 'full-text' journal articles from any computer system connected to the campus wide network. This clearly indicates that 'Electronic Information Resources', more so in the form or e-Journals are extremely important to an aerospace scientist and engineer to keep pace with global R and D [37].

The present work is a joint initiative with the Department of Studies in Library and Information Science (DOS, LIS), Mysore and the National Aerospace Laboratories, Bangalore [38].

Evolution of Scholarly Communication and Role of Electronic Media

Traditionally scientists and engineers would use print resources; after the emergence of electronic media, the usage of e-resources is on the rise. This can be noticed in studies made by well known authors in the field.

Kling and McKim, [2000], say that the shift towards the use of electronic media in scholarly communication appears to be an inescapable path. They say that the use of electronic media to support scientific communication is one of the major shifts in the practice of science in this era. According to them, electronic communication media can often expedite special kinds of communications between scientists who work across continents and 10-15 time zones while reducing the marginal costs of communication. Today, the Internet is the primary medium of this communication. To substantiate the role of the Internet in increasing scholarly productivity, several studies indicate that the frequent use of the Internet for information retrieval and communication is associated with the increase in publication by scientists Barjak, [2006] and has improved scholarly communication, Brown, Found and McConnell, [2007]; Rowlands and Olivieri, [2006].

According to Kling and McKim [2000], different scientific fields have developed and use distinctly different communicative forums, both in the paper and electronic areas, and these forums play different communicative roles within the field. One thing is clear that we are in the early stages of electronic communication revolution, and it is only a matter of time before other fields converge on a stable set of electronic forums - "sooner or later everyone will catch on" and learn to use the e-media structures in all fields.

According to Odlyzko [2002], traditional journals, even those available electronically, are changing slowly. However, there is rapid evolution in scholarly communication. Usage is moving to electronic formats. In some areas, it appears that electronic versions of papers are being read about as often as the printed journal versions. He mentions that although there are serious difficulties in comparing figures from different media, the growth rates in usage of electronic scholarly information are sufficiently high that if they continue for a few years, there will be no doubt that print versions will be more or less 'eclipsed'. Further, he adds, that much of the electronic information that is accessed is outside the formal scholarly publication process. There is also vigorous growth in the forms of electronic communication that take advantage of the unique capabilities of the web, which simply do not fit into the traditional journal-publishing format. The Internet is growing rapidly. Typical growth rates, whether of bytes of traffic on backbones, or of hosts, are of the order of 100 percent per year. When one looks at usage of scholarly information online, typical growth rates are in the 50 to 100 percent range.

Need for Electronic Information Resources and Services among the Scientists and Engineers

During the late 1980's and early 1990's many new information technologies arose that revolutionized the way in which people searched for and gathered information. More and more publications began to profile the impact that new electronic resources had on different populations. The coming of the Internet itself was the most fundamental shift since Gutenberg's invention of the printing press, Gleeson [2001].

Somewhere between 1994 and 1996 there was a profound shift in electronic resource usage by scientists. The shift could be attributed to the increase in popularity and usability of the Internet itself as well as the resources it contained. Curtis; Weller and Hurd [1997] opine that the increase in the use of the electronic information resources was attributed to the availability of more and better electronic resources, desktop access through networked workstations, and user-friendly interface design. With the coming of the twenty-first century, successful storage and retrieval of the exponentially growing body of scientific information quickly became dependent upon the Internet and World Wide Web.

The way in which scientists seek information to support teaching, research and creative activities is changing as new technologies and information delivery systems emerge, Brown [1999]. Consequently, the traditional model of scientific communication proposed by Garvey and Griffith [1972], which states that information is primarily disseminated through, and subsequently becomes most highly valued when printed in, refereed journals, is being challenged. An early model of electronic communication proposed by Lancaster [1978], and modernized by Hurd [1998], bypasses printed journals, indexes, and abstracting tools and suggests that scientific information dissemination will eventually be purely electronic. In the light of the escalating cost to libraries for purchasing and archiving printed scholarly journals, electronic journals may prove to become the only alternative for maintaining an active platform for scientific scholarly communication, Tenopir and King [1997], Odlyzko [1998] and Walker [1998].

Electronic information services are obviously an upcoming and endearing activity among all the scientists and engineers irrespective of their disciplines and work environment. The on-line access services and the Internet services are the two of the most popular library services in electronic formats today. Several studies conducted reveal that the use of e-resources has improved the quality of research work and inspired new ideas. About 60 percent of the researchers feel that the use of electronic information resources has made it easier to keep up-to-date with the developments in their field, and greatly saved their working time.

Aerospace and Defence Resources (AERADE) Pioneering Initiatives in Promoting the Use of Aerospace Electronic Information Resources

The Aerospace Information Management - UK (AIM-UK) project - found compelling evidence of 'under-utilization' of 'electronic information resources' by the aerospace scientists and engineers. It recommended a number of initiatives to raise awareness and improve access to useful electronic information resources, and to reduce the threat of 'information overload'. In particular, there was a call to establish an Internet gateway and portal to the aerospace and defence community that would act as a "jumping-off-point" for effective exploration and retrieval of information on the World Wide Web. Launched in November, 1999, AERADE is specifically designed to meet this need. It is an initiative developed by the Cranfield University to enable aerospace and defence experts to find relevant information on the Internet. Today, the reports archive is a historical collection of over 10,000 significant technical papers and reports produced by the Aeronautic Research Council (ARC) and the National Advisory Committee for Aeronautics (NACA), Hanley; Harrington and Blagden, [1998].

Use Patterns of Electronic Information Resources

Several studies on the influence of the use of electronic information resources on scholarly work have indicated that the use of electronic literature has improved their work considerably in several ways.

Today Governments, R and D institutions and Universities invest substantial sums of money for providing scholars with the digital literature they need for their research work with the intention that improved access to electronic information resources will lead to increasing scholarly productivity. The transformation of the physical library to the virtual library probably saves time, since one can access publications from one's desktop. The extent of publications available online combined with easier access has tremendously improved scholars' ability to keep abreast in their field, and perhaps inspired new ideas and ultimately enhanced the quality of their work.

Several studies on the perceived influence of e-resources use on scholarly productivity have indicated that factors like:

- Easier to find material

- Easier to get hold of material
- Extended range of material available electronically
- Easier to keep updated in one's field of research
- Improved quality of work
- Inspired new ideas
- Greatly saved working time
- Reduced time browsing in libraries
- Multi-user access, fast access
- 24 hour access
- Available before print
- Multiple file formats for downloading and storing (PDF, RTF, DOC, HTML etc..)
- Enhanced access and visibility to scientific papers,
- Keeps current about global R and D etc.

have considerably influenced the quality of work of the scholars and inspired new ideas to some extent.

Vakkari [2006, 2008], interalia says that the number of and variety of different sorts of databases ranging from journal databases to reference databases to fact databases are increasingly accessible from scholar's desktops, Borgman [2000]. In his study on the influence of electronic information resources on scholarly work and publication productivity, he mentions that the influence of electronic resources on scholarly productivity can be differentiated in two dimensions: (a) in improved accessibility and availability of literature and (b) the second is more directly related to the content and quality of scholarly work. The perceived improved access is positively associated with the number of international publications produced, among doctoral students in particular. The more direct influence of e-resource use on the content of scholarly work is, however, not associated with publication productivity. The results seem to imply that investments in academic digital libraries are beneficial for the researchers and the Universities.

He studied the perceived influence of e-resource use on scholarly work and productivity. He mentions that, about 60 percent of the researchers are of the opinion that the use of digital resources has also considerably extended the range of material available, made it easier to keep up-to-date with the developments in their field, and saved their working time. The majority of the scholars also felt that the use of e-resources has improved the quality of their work and inspired new ideas. Of the total number of scholars interviewed, 44 percent believe that the use of these resources has improved the quality of their work to some extent; where as 38 percent are of the opinion that the improvement has been considerable. The corresponding figures concerning getting new ideas are 49 percent versus 32 percent. The proportion of those who feel that e-resources have not improved their work at all or who are not able to answer the question is in most dimensions under 10 percent. Thus, the respondents perceive that the use of e-resources has indeed influenced their work, considerably in most cases. He also feels that the perceived availability of digital literature is perhaps the strongest predictor of e-resource use. Therefore, we can expect that it also influences the scholars' perception of the influence of e-resource on their work and on access to information.

The Electronic Journals and the Changing Patterns of Use

It is absolutely clear that traditional print journals, even those available electronically are slowly changing. There is a paradigm shift in their usage and they are moving towards electronic formats. Many studies have revealed that the electronic versions of papers are being read about as often as the printed journal versions. The coming of the World Wide Web has propelled this vigorous growth of the electronic forms of communication which simply do not fit into the traditional publishing format. With the coming of age of the electronic journals, it has totally altered the way scholarly information is disseminated throughout the world. There is no doubt that this particular innovation has changed the information usage of scientists. Invariably, the role of the librarian has dramatically changed to meet the 'vibrant electronic needs' of the scientists and engineers. Electronic journals is greatly affected not only the way information has spread, but also the way in which electronic information is acquired and how scientists, engineers, scholars and researchers seek this needed information.

Many interesting surveys on faculties, students, scientists and researchers conducted over time have shown that journals and journal articles continue to be valued resources. Today's scientists read from a wide variety of sources, including print journals, electronic journals, e-print servers and full text databases, however the amounts for each vary with subject discipline and library collection policies. Scientists greatly value library provided resources and electronic journals that are meant to meet their 'specific discipline needs'. Over the last decade, it is observed that all kinds of journals are available all over the place. According to the Ulrich's Periodicals Directory, close to 80 percent of today's active, peer-reviewed journals are now available in some digital form or the other. A few of these are electronic only with no print equivalent, but more are electronic journals that replicate print journals or add additional information and features to what are available in a print version. So it can be expected that this widespread availability of electronic journals and electronic separate articles will have some effect on the reading and use patterns amongst the scholars. Yes, today's electronic collections are definitely changing the reading patterns over time, Boyce; King and Montgomeri [2004].

Access to electronic journals and articles went through three crucial evolutionary phases Tenopir, King and Boyce [2003]:

- **The Early Systems Phase**: This space spans from 1990-1993 during which electronic journals began to be published in earnest in CD-ROM and online. Libraries were actually struggling with spiraling prices and pressures of physical space and were hoping that the emergence of electronic journals might be the answer to these problems. During this phase, many publishers were not ready to commit to publishing electronic journals, but the emergence of a pre-print archive at Los Alamos National Laboratory (LANL) gained widespread interest. During this systems phase, the emergence of MOSAIC and the World Wide Web seemed to trigger interest in electronic journals. This was followed by
- **The Evolving Systems Phase**: During the late 1990's through the current time, scientists accepted electronic journals as an alternative to print journals. Based on a search on the 2002 online edition of Ulrich's International Periodicals Directory, there were approximately 15,000 active, peer-reviewed titles, of which 12,000 were available electronically. Most of these electronic journals were merely replicas of traditional print journals. During this evolving phase, libraries began to expand their collections of electronic journals in parallel with print or as a replacement to print. This phase also produced alternative forms of journal articles: many pre-print services emerged like the Energy Preprint Network Servers (which served as a gateway to dozens of e-print servers). These e-print servers included preprints of articles submitted to peer-reviewed journals, final versions of published articles (post-prints), and articles never submitted to journals. Also separate electronic articles could be accessed through the author's web site or the author's institutional repositories.
- **The Advanced Systems Phase**: Around mid 1990's the American Astronautical Society (AAS) began developing an advanced system in conjunction with the University of Chicago Press, based on support from National Science Foundation and NASA; Boyce and Dalterio [1996]; Boyce [1997]; Stevens-Rayburn and Bouton [1998]. This system development included collaboration with the NASA-support Astrophysics Data System (ADS), Kurtz, et al. [2000] which simultaneously developed an effective, searchable abstract database and complete, full text back files of the core literature back to the mid 1880s. This complete system included (i) extensive interlinking features, (ii) backward and forward citations, (iii) a searchable abstract database, (iv) published and original numeric data sets (maintained in international astronomical databases) and (v) moving graphics etc.

What trend do the Scientists' information seeking patterns and use patterns of electronic journals indicate: According to Tenopir and King [2001], use of electronic journals saw a big jump in the last half of the 1990s and is continuing to escalate. On an average, one-half to nearly 100 percent of scientists in a field use electronic journals at least part of the time. In their study which spanned almost over three decades, it was found that information in journals serve many purposes for scientists in both university and non-university settings. These scientists reported that journal articles are highly important to their work, more so than any other information resource. Scientists are willing to pay a high price in their time as they spend many hours reading scientific literature. Many more scientists read than write, although university scientists tend to both read and write more journal articles than do scientists outside the university setting. The convenience of desktop access to journal articles allows all scientists to read more, from a wider variety of sources, although there is an upper limit on the time they can devote to reading. This limit is reached whether the articles carry a fee or are freely available. Finally, the information that scientists get from refereed journals results in improved performance, as evidenced by the awards and accomplishments of scientists who read more.

Evidence suggests that amount of reading and time spent on reading by scientists have been relatively stable over the past 20 years, there have been some changes in the ways in which scientists identify the articles they read and there are appreciable differences in the sources of these articles. Surveys from 1993 to 1998 show that scientists identify articles they read by browsing through journal issues or bound volumes, 62 percent of readings are identified in this way, by automated searches accounts for 12 percent, by having other person tell them about the articles amounts to 11 percent, by using citations found in other articles, books etc. adds up to 9 percent, or by other means such as current awareness services, printed indexes, and so on fills the remaining 6 percent. The same study indicates that during the period 1993 to 1998, the scientists surveyed averaged about 120 readings of scholarly articles per year, Tenopir and King [2001]. In general, reading has shifted from personal subscriptions to library-provided journals, due in large part to a decline in the number of personal subscriptions and to better library services. Recent studies indicate they spend about 150 hours of readings of scholarly articles per year.

There are a number of factors that influence information-seeking and reading patterns, Tenopir and King [2001]. Variation among scientists' communication patterns is partially attributable to personal characteristics such as one's discipline, level of education and experience, and general communication capabilities. There are also situational factors as well, such as size of the organization, level of research funding, amount of funds available for information services, and availability and access to library services.

These authors in an interesting study find that, scientists read at least one article from an average of 18 scholarly journals. However, they tend to read only a few of these journals extensively and most of them sparsely. For example, across all journals read by scientists only five percent of them are read more than 25 times by a scientist (on average) and about 80 percent are read less than 10 times. The amount of reading of a journal has a major bearing on whether it should be purchased, depending, of course, on the price compared with the cost of using alternative sources of the article. In the past, libraries have been the principal alternative to purchasing journals.

What do the trends reflect? Since their birth in the 17th century, 'Scientific scholarly journals have become the most used type of publication and, for most fields of science, the most inevitable, and the single most channel of communication', Tenopir and King [2001].

Over the last 40 years, numerous studies have indicated that journals are extensively read; the information they contain is extremely useful for research, teaching and life-long learning; and the information is valuable in terms of the favourable outcomes from its use. All of these factors have remained stable over the years.

Internet and Scholarly Scientific Communication

Julie Hallmark [1995] interlaia quotes Larry Star, Astrophysicist by saying that "The Internet has been undoubtedly the most fundamental shift since Gutenberg's invention of the printing press. The Net is basically a space and time destroyer. It shrinks distance and time to zero. It's as if all the world's scientists were in one room, available at one computer. Needless to say, this is having a profound impact on the way science is done". John Gage [1982, 2009], goes one more step in mentioning that "The Internet is not a thing, a place, a single technology, or a mode of governance. It is an agreement".

The coming of the Internet has totally transformed the way scientific communication has spread among the scientists and engineers in general across the world and more specifically amongst the aerospace scientific community. The Net has totally transformed the way scientists look for their information, the various means by which they get their required information from the Internet and most importantly how much they depend on the Internet for their scientific scholarly pursuits.

In this information explosion age, it is practically impossible for an aerospace scientist or engineer to carry out his research work without embracing the network and Internet technologies. They greatly depend upon these electronic innovation tools for accessing electronic information resources in the form of e-journals related to aerospace engineering right at their desktops. In fact, many of the scientists in today's R and D organizations have the unique privilege of downloading full-text e-journals right at their desktops through their Organization's E-Conglomerate.

It is absolutely clear that the use of electronic media to support scientific communication has undoubtedly been one of the paradigm shifts in the practice of science in this era. For a research scientist today, with access to the Internet, working across continents in different time zones and keeping in touch with his peers has indeed become a reality due to the exponential growth of the telecommunication infrastructure that the world has witnessed. Most surprisingly, all this happens with very marginal costs of communication.

According to King and Callahan [2003], 'Scholarly communication can take place via a number of documentary genres (as well as conversational genres) including letters, memos, conference papers technical reports, dissertations, primary articles, review essays, monographs, and edited books. However, the primary scholarly literature is composed of articles (usually published journals or disseminated at conferences) and books'. The vast majority of practical projects to use the Internet in enhancing the communication of this primary research literature have focused on articles. In addition, most of the research about scholar's behavior with electronic media has also emphasized articles, especially those packaged as peer-reviewed e-journals.

Many visible enthusiasts for e-journals, such as Okerson [1991; 2000] and Odlyzko [1995; 2002] rely upon a Standard Model of e-journals and portray the transition of journals from paper to electronic media as a relatively easy process. The Internet is seen as a medium that will be able to solve many of the difficulties associated with traditional publishing.

With the coming of e-journals, there has been a significant transformation by which scholarly information is disseminated throughout the world. In fact, the arrival of e-journals has greatly affected the way a scientist or an engineer seeks this information, acquires it and then uses it effectively.

Today, scientists and engineers have adopted electronic journals because of quick, easy access, and convenience. Also, very little effort is required to retrieve information from these e-journals.

Scholarly communication is very rapidly evolving. The usage trend is leaning more and more towards electronic formats. In many of the scientific areas, it is also observed that the electronic version of scientific publications is being read almost as often as the printed journals. If this trend continues, many authors feel that in the years to come the print versions of scientific publications will more or less disappear. It is very clear that the World Wide Web has very largely facilitated and propelled the emergence of these electronic journals. In fact, with the arrival of the electronic platform, some of the research studies show that the range of scientific journals read by scientists has also increased rapidly. It has also been observed in some major studies that a large number of scientists make use of electronic journals at least part of their time. During a research interview by Tenopir and King [2001], many of the scientists have revealed that 'electronic journals' are highly important to their work, more than any other information resources. Today, scientists are even willing to pay a high price for their time to spend many hours reading electronic scientific literature. Their study also revealed that the quality of information that a scientist gets from refereed journals has greatly resulted in their improved performance.

It is important to note that the scientists and engineers in aerospace organizations are currently working on projects, which are of strategic importance to this country. These scientists largely depend on rapid collection of information from various 'electronic information resources'.

Objectives of this Study

- To ascertain whether the percentage of preference of scientific designations (grades, cadres) of the aerospace scientists and engineers by the 'Extent of Use of Electronic Information resources' and the 'Purpose of Use of the Internet' are approximately the same.
- To study whether the different designations (grades, cadres) of the aerospace scientists show similar patterns of use with regard to the 'Extent of Use of Electronic Information Resources' and the 'Purpose of Use of the Internet'.

Sample Selection

The present study is restricted to the selected 16 prominent aerospace organizations in Bangalore. A total number of 650 survey questionnaires were distributed amongst the aerospace scientists and engineers belonging to these organizations which were found suitable for the study. A total number of 612 questionnaires were received back finally 583 (89.7%) were selected for the study.

Methodology

The present study was spread over 16 aerospace organizations in Bangalore, through a questionnaire based survey as a part of an ongoing doctoral research work at the University of Mysore on studying the 'patterns of use of electronic information resources' amongst the aerospace scientists and Engineers, Guruprasad, R. and Nikam, K. [2001]. In the present study, the authors have tried to study the 'Association of Scientific Designations (Cadres, Grades)' with the 'Extent of Use of Electronic Information Resources' and the 'Purpose of the Use of the Internet'.

Scores were assigned for the responses of the questionnaire. The score ranges from 0-4, indicating that the score of 0 means 'Do Not Use', 1 means 'Uncertain', 2 means 'Less Frequently', 3 means 'Frequently' and finally the score of 4 means 'Most Frequently'.

Table-1 shows the format of the questionnaire on a scale of 0 to 4 with regard to the 'Frequency of Usage of Electronic Information Resources'. Similarly, Table-2 shows the main purpose of the 'Use of the Internet' by the Aerospace Scientists and Engineers.

Broad Classification of Occupation Categories of the Aerospace Scientists and Engineers

When all the 625 questionnaire responses related to the research survey were received (out of which 583 were found fit for the study), the responses were updated using the SPSS package spreadsheet. During this stage, the different types of designations of the aerospace scientists and engineers were broadly classified into 4 major categories, namely: (a) Scientific and R and D, (b) Armed Forces, (c) Teaching and (d) Managerial. The details of the various grades, cadres coming under these 4 main categories were further classified based on the nature of occupation. Table-3 gives the details of the broad occupational categories.

Table-1 : Frequency of Usage of Electronic Information Resources

1	E-Journals	4	3	2	1	0
2	E-Databases	4	3	2	1	0
3	E-Books	4	3	2	1	0
4	E-Technical Reports	4	3	2	1	0
5	E-Conference/ Meeting Proceedings	4	3	2	1	0
6	E-Drawings	4	3	2	1	0
7	E-Specifications	4	3	2	1	0
8	E-Computer Programs	4	3	2	1	0

4 - Most Frequently; 3 - Frequently;
2 - Less Frequently; 1 - Uncertain; 0 - Do Not Use

Table-2 : To What Purpose Do you Use the Internet

1	For sending and receiving E-Mail	4	3	2	1	0
2	For entertainment	4	3	2	1	0
3	For collecting general information	4	3	2	1	0
4	For accessing electronic information resources like (E-Journals, E-Books, E-Databases, etc.)	4	3	2	1	0
5	For writing research proposals/projects	4	3	2	1	0
6	To download software for scientific research	4	3	2	1	0
7	For collaborative research work	4	3	2	1	0
8	To access audio/visual materials	4	3	2	1	0
9	To access OPAC (Online public access catalog)	4	3	2	1	0
10	For participating in discussion forums	4	3	2	1	0
11	For participating in news groups	4	3	2	1	0

4 - Most Frequently; 3 - Frequently;
2 - Less Frequently; 1 - Uncertain; 0 - Do Not Use

Association of Designations (Grades) of Aerospace Scientists and Engineers with 'Extent of Use of Electronic Information Resources' and the 'Purpose of the Use of the Internet'

This section compares the association of the various grades of the aerospace scientists and engineers with the 'Extent of Electronic Information Resources'. Table-4 highlights the association of the various grades (designations) of the aerospace scientists and engineers by the 'Extent of Use of Electronic Information Resources', viz.,

- e-Books
- e-Journals
- e-Databases
- e-Technical Reports

Table-3 : Broad Classification of Occupational Categories of Aerospace Scientists and Engineers

Sl. No.	Broad Occupational Categories	Details of Grades/Designations Coming under the Various Occupational Categories
1	Scientific and R and D Category	Scientist B, Scientist C, Scientist D, Scientist E, Scientist E1, Scientist E2, Scientist F, Scientist G, Scientist A1, Scientist B1, Scientist C1, Deputy Secretary Grade, Junior Technical Assistant, Scientists - Managerial Cadre (Inter-Organizational Collaborative Projects)
2	Armed Forces Category	Doctor, Squadron Leader, Wing Commander, Group Captain, Captain, Lieutenant Colonel, Flight Lieutenant, Major
3	Teaching Category	Professors, Associate Professors, Assistant Professors, Principal Research Scientist, Senior Scientific Officers, Research Scholars
4	Manager Category	Dy. General Manager-Grade 7, Chief Manager-Grade 6, Senior Manager-Grade 5, Manager-Grade 4, Dy. Manager-Grade 3, Engineer-Grade 2, Assistant Engineer-Grade 1

Table-4 : Association of Grades (Designations) Versus Extent Use of Electronic Information Resources

Grade Wise Distribution	Grade (Designation) Versus Extent of Use of Electronic Information Resources					Total
	Do not Use	Uncertain	Less Frequently	Frequently	Most Frequently	
Sc A1	0 (0.0)	1 (16.7)	2 (33.3)	3 (50.0)	0 (0.0)	6 (100.0)
Sc B1	0 (0.0)	0 (0.0)	0 (0.0)	1 (100.0)	0 (0.0)	1 (100.0)
Sc B	6 (6.2)	7 (7.2)	35 (36.1)	37 (38.1)	12 (12.4)	97 (100.0)
Sc C	1 (1.6)	8 (12.5)	27 (42.2)	19 (29.7)	9 (14.1)	64 (100.0)
Sc D	0 (0.0)	0 (0.0)	7 (38.9)	9 (50.0)	2 (11.1)	18 (100.0)
Sc E	3 (15.0)	1 (5.0)	4 (20.0)	10 (50.0)	2 (10.0)	20 (100.0)
Sc E1	2 (7.1)	3 (10.7)	14 (50.0)	7 (25.0)	2 (7.1)	28 (100.0)
Sc E2	0 (0.0)	1 (7.1)	10 (71.4)	2 (14.3)	1 (7.1)	14 (100.0)
Sc F	1 (1.9)	7 (13.2)	22 (41.5)	17 (321.1)	6 (11.3)	53 (100.0)
Sc G	0 (0.0)	4 (17.4)	8 (34.8)	10 (43.5)	1 (4.3)	23 (100.0)
Dy. Secy	0 (0.0)	0 (0.0)	0 (0.0)	1 (100.0)	0 (0.0)	1 (100.0)
Flight Lt.	0 (0.0)	1 (12.5)	6 (75.0)	1 (12.5)	0 (0.0)	8 (100.0)
Sqn. Ldr.	1 (5.6)	4 (22.2)	8 (44.4)	4 (22.2)	1 (5.6)	18 (100.0)
Wg. Cdr	1 (3.1)	2 (6.2)	14 (43.8)	12 (37.5)	3 (9.4)	32 (100.0)
Gp. Capt	1 (14.3)	3 (42.9)	3 (42.9)	0 (0.0)	0 (0.0)	7 (100.0)
Capt	0 (0.0)	1 (33.3)	2 (66.7)	0 (0.0)	0 (0.0)	3 (100.0)
Major	0 (0.0)	0 (0.0)	4 (80.0)	1 (20.0)	0 (0.0)	5 (100.0)
Lt. Col	0 (0.0)	0 (0.0)	0 (0.0)	2 (100.0)	0 (0.0)	2 (100.0)
Doctor	0 (0.0)	0 (0.0)	4 (66.7)	2 (33.3)	0 (0.0)	6 (100.0)
Res. Scholar	0 (0.0)	1 (5.0)	6 (30.0)	8 (40.0)	5 (25.0)	20 (100.0)

Table-4 : Association of Grades (Designations) Versus Extent Use of Electronic Information Resources (Contd)

Grade Wise Distribution	Grade (Designation) Versus Extent of Use of Electronic Information Resources					Total
	Do not Use	Uncertain	Less Frequently	Frequently	Most Frequently	
Sr. Sc. Offcrs	0 (0.0)	0 (0.0)	1 (33.3)	2 (66.7)	0 (0.0)	3 (100.0)
Principal Research Sc.	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (100.0)	1 (100.0)
Assoc. Prof	0 (0.0)	1 (20.0)	3 (60.0)	1 (20.0)	0 (0.0)	5 (100.0)
Prof.	0 (0.0)	2 (25.0)	3 (37.5)	2 (25.0)	1 (12.5)	8 (100.0)
AE Gr.1 (Mgr. Gr.1)	1 (50.0)	0 (0.0)	1 (50.0)	0 (0.0)	0 (0.0)	2 (100.0)
Engr Gr.2 (Mgr Gr.2)	9 (11.8)	10 (13.2)	31 (40.8)	23 (30.3)	3 (3.9)	76 (100.0)
Dy Mgr Gr.3	3 (23.1)	1 (7.7)	4 (30.8)	1 (7.7)	4 (30.8)	13 (100.0)
Mgr Gr.4	1 (4.0)	7 (28.0)	11 (44.0)	4 (16.0)	2 (8.0)	25 (100.0)
SM-Gr.5	0 (0.0)	2 (25.0)	4 (50.0)	2 (25.0)	0 (0.0)	8 (100.0)
Ch. Mgr Gr.6	0 (0.0)	1 (10.0)	6 (60.0)	2 (20.0)	1 (10.0)	10 (100.0)
DGM-Gr.7	0 (0.0)	0 (0.0)	2 (50.0)	1 (25.0)	1 (25.0)	4 (100.0)
Jr. Tech.Asst	0 (0.0)	0 (0.0)	1 (100.0)	0 (0.0)	0 (0.0)	1 (100.0)
Trainee	0 (0.0)	1 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (100.0)
Total Percentage	30 (5.1)	69 (11.8)	243 (41.7)	184 (31.6)	57 (9.8)	583 (100.0)
Ch-Square and P Value	$\chi2$ = 156.599, P Value = 0.0438					

Key1 : Extent of Use of Electronic Information Resources :
1 : e-Books , 2 : e-Journals, 3 : e-Databases, 4 : e-Technical Reports, 5 : e-Conference Proceedings,
6 : e-Drawings, 7 : e-Specifications, 8 : Computer Programs
Key2 : Figures in Brackets indicate Percentages

- e-Conference / Meeting Proceedings
- e-Drawings
- e-Specifications and
- e-Computer programs

The detailed percentage wise distribution with respective $\chi2$ values and P values are indicated in the table. Similarly, Table-5 highlights the association of the various grades (designations) of the Aerospace Scientists and Engineers by the 'Purpose of Use of the Internet' , viz.,

- For sending and receiving e-mail
- For entertainment
- For collecting general information
- For accessing Electronic Information Resources like (e-Journals, e-Books, e-Databases, etc.)
- For writing research proposals / projects
- To download software for scientific research
- For collaborative research work
- To access audio / visual materials
- To access OPAC (Online Public Access Catalog)
- For participating in discussion forums, and
- For participating in News Groups

Null Hypothesis: At the beginning of the research survey, a 'null hypothesis' was proposed stating that, there is no association between the various grades (designations) of

Table-5 : Association of Grades (Designations) Versus Purpose of Use of the Internet

Grade Wise Distribution	Grade (Designation) Versus Purpose of Use of the Internet					Total
	Do not Use	Uncertain	Less Frequently	Frequently	Most Frequently	
Sc A1	0 (0.0)	0 (0.0)	2 (33.3)	3 (50.0)	1 (16.7)	6 (100.0)
Sc B1	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (100.0)	1 (100.0)
Sc B	3 (3.1)	28 (28.9)	57 (58.8)	9 (9.3)	0 (0.0)	97 (100.0)
Sc C	1 (1.6)	5 (7.8)	25 (39.1)	27 (42.2)	6 (9.4)	64 (100.0)
Sc D	0 (0.0)	0 (0.0)	9 (50.0)	7 (38.9)	2 (11.1)	18 (100.0)
Sc E	0 (0.0)	3 (15.0)	7 (35.0)	8 (40.0)	2 (10.0)	20 (100.0)
Sc E1	0 (0.0)	3 (10.7)	14 (50.0)	11 (39.3)	0 (0.0)	28 (100.0)
Sc E2	0 (0.0)	0 (0.0)	9 (64.3)	4 (28.6)	1 (7.1)	14 (100.0)
Sc F	5 (9.4)	24 (45.3)	23 (43.4)	1 (1.9)	0 (0.0)	53 (100.0)
Sc G	0 (0.0)	1 (4.3)	13 (56.5)	9 (39.1)	0 (0.0)	23 (100.0)
Dy. Secy	0 (0.0)	0 (0.0)	0 (0.0)	1 (100.0)	0 (0.0)	1 (100.0)
Flight Lt.	0 (0.0)	0 (0.0)	3 (37.5)	4 (50.0)	1 (12.5)	8 (100.0)
Sqn. Ldr.	0 (0.0)	2 (11.1)	8 (44.4)	7 (38.9)	1 (5.6)	18 (100.0)
Wg. Cdr	0 (0.0)	2 (6.2)	10 (31.3)	17 (53.1)	3 (9.4)	32 (100.0)
Gp. Capt	0 (0.0)	0 (0.0)	4 (57.1)	3 (42.9)	0 (0.0)	7 (100.0)
Capt	0 (0.0)	0 (0.0)	2 (66.7)	1 (33.3)	0 (0.0)	3 (100.0)
Major	0 (0.0)	0 (0.0)	2 (40.0)	3 (60.0)	0 (0.0)	5 (100.0)
Lt. Col	0 (0.0)	0 (0.0)	1 (50.0)	1 (50.0)	0 (0.0)	2 (100.0)
Doctor	0 (0.0)	0 (0.0)	2 (33.3)	4 (66.7)	0 (0.0)	6 (100.0)
Res. Scholar	0 (0.0)	0 (0.0)	3 (15.0)	15 (75.0)	2 (10.0)	20 (100.0)
Sr. Sc. Offcrs	0 (0.0)	0 (0.0)	1 (33.3)	2 (66.7)	0 (0.0)	3 (100.0)
Principal Research Sc.	0 (0.0)	0 (0.0)	0 (0.0)	1 (100.0)	0 (0.0)	1 (100.0)
Assoc. Prof	0 (0.0)	0 (0.0)	2 (40.0)	3 (60.0)	0 (0.0)	5 (100.0)
Prof.	0 (0.0)	0 (0.0)	3 (37.5)	4 (50.0)	1 (12.5)	8 (100.0)
AE Gr.1 (Mgr. Gr.1)	0 (0.0)	1 (50.0)	1 (50.0)	0 (0.0)	0 (0.0)	2 (100.0)
Engr Gr.2 (Mgr Gr.2)	1 (1.3)	13 (17.1)	32 (42.1)	26 (34.2)	4 (5.3)	76 (100.0)
Dy Mgr Gr.3	0 (0.0)	3 (23.1)	4 (30.8)	5 (38.5)	1 (7.7)	13 (100.0)
Mgr Gr.4	1 (4.0)	4 (16.0)	9 (36.0)	8 (32.0)	3 (12.0)	25 (100.0)
SM-Gr.5	0 (0.0)	1 (12.5)	4 (50.0)	3 (37.5)	0 (0.0)	8 (100.0)
Ch. Mgr Gr.6	0 (0.0)	3 (30.0)	4 (40.0)	3 (30.0)	0 (0.0)	10 (100.0)
DGM-Gr.7	0 (0.0)	0 (0.0)	1 (25.0)	3 (75.0)	0 (0.0)	4 (100.0)

Table-5 : Association of Grades (Designations) Versus Purpose of Use of the Internet (Contd)

Grade Wise Distribution	Grade (Designation) Versus Purpose of Use of the Internet					Total
	Do not Use	Uncertain	Less Frequently	Frequently	Most Frequently	
Jr Tech Asst	0 (0.0)	0 (0.0)	1 (100.0)	0 (0.0)	0 (0.0)	1 (100.0)
Trainee	0 (0.0)	0 (0.0)	1 (100.0)	0 (0.0)	0 (0.0)	1 (100.0)
Total Percent	11 (1.8)	93 (15.9)	257 (44.1)	193 (33.1)	29 (4.9)	583 (100.0)
Chi-Square and P Value	$\chi 2$ = 124.452, P Value = 0.5722					

Key1 : Purpose of Use of the Internet :
1 : For sending and receiving e-mail, 2 : For entertainment, 3 : For collecting general information
4 : For accessing Electronic Information Resources like (e-Journals, e-Books, e-Databases, etc),
5 : For writing research proposals/projects, 6 : To download software for scientific research,
7 : For collaborative research work, 8 : To access audio/visual materials, 9 : To access OPAC (Online Public Access Catalog), 10 : For participating in discussion forums, and 11 : For participating in News Groups
Key2 : Figures in Brackets indicate Percentages

the Aerospace Scientists and Engineers, with the 'Extent Use of Electronic Information Resources' and the 'Purpose of the Use of the Internet'.

Conclusions

The main conclusions that the authors would like to draw from this study are:

- The $\chi 2$ test indicates that the different grades (designations) of the aerospace scientists and engineers (Chi-Square = 156.599, P = 0.0438) by the 'Use of Electronic Information Resources' have significant association, and 'Purpose of Use of the Internet' (Chi-Square = 124.452, P = 0.5722) have no significant association. This implies that percentages of preference for these different grades (designations) of aerospace scientists and engineers by the 'Extent of Use of Electronic Information Resources' are not approximately the same and the 'Purpose of Use of the Internet' are approximately the same .

- Hence, the authors infer that the 'Extent of Use of Electronic Information Resources' show a dissimilar pattern of use, and the 'Purpose of Use of the Internet' show a similar pattern of use amongst the aerospace scientists and engineers with regard to the different designations/grades of the selected 16 aerospace organizations.

Key:

ADA = Aeronautical Development Agency
AFTC = Air Force Technical College
ADE = Aeronautical Development Establishment
ASTE = Aircraft Systems Testing Establishment
CABS = Centre for Airborne Systems
CEMILAC = Centre for Military Airworthiness and Certification
C-MMACS= Centre for Mathematical Modeling and Computer Simulation
DARE = Defense Avionics Research Establishment
LRDE = Electronics and Radar Development Establishment
GTRE = Gas Turbine Research Establishment
HAL = Hindustan Aeronautics Limited
IAM = Institute of Aerospace Medicine
ISRO/ ISTRAC = Indian Space Research Organization
IISc = Indian Institute of Science
JNCASR = Jawaharlal Nehru Centre for Advanced Scientific Research
NAL = National Aerospace Laboratories

Acknowledgements

The authors would like to sincerely express their deep gratitude and thankfulness to Dr. A. R. Upadhya, Director, National Aerospace Laboratories (NAL), Bangalore for his constant emphasis on electronic scholarly publishing and for according his kind permission to publish this paper. The overwhelming support extended by Dr. Ranjan Moodithaya, Head, Knowledge and Technology Management Division (KTMD), NAL, Bangalore is graciously acknowledged.

References

1. Kling, R. and McKim, G., "Not just a Matter of Time: Field Differences and the Shaping of Electronic Media in Supporting Scientific Communication", Journal of the American Society for Information Science, 51(14), 2000, pp.1306-1320.

2. Barjak, F., "The role of Internet in Informal Scholarly Communication", Journal of the American for Information Science and Technology, V57(10), 2006, pp.1350-1367.

3. Brown, B. Found, C. and McConnell, M., "Federal Science E-Library Pilot: Seamless, Equitable Desktop Access for Canadian Govt. Researchers", Electronic Library, V25(1), 2007, pp.8-17.

4. Rowland, I. and Olivieri, R., "Journals and Scientific Productivity: A Case Study in Immunology and Microbiology", Publishing Research Consortium Summary Papers 1, Retrieved May 15, 2007, http://www.publishing.ucl.ac.k/papers/2006/Rowlands_etal.pdf.

5. Odlyzko, A., "The Rapid Evolution of Scholarly Communication, AT and T Labs - Research", Learned Publishing, 15(1), 2002, pp.7-19.

6. Gleeson, A.C., "Information Seeking Behavior of Scientists and their Adaption to Electronic Journals", Masters Paper for the M.S. in Library Science Degree, School of Information and Library Science, University of North Carolina, Chapel Hill, 2001.

7. Curtis, K. L., Weller, A.C. and Hurd, J. M., "Information Seeking Behavior of Health Sciences Faculty: The Impact of New Information Technologies", Bulletin of the Medical Library Association, 85(4), 1997, pp.402-410.

8. Brown, C.M., "Information-seeking Behaviour of Scientists in the Electronic Information Age: Astronomers, Chemists, Mathematicians, and Physicists", Journal of the American Society for Information Science, 50(10), 1999, pp.929-943.

9. Garvey, W.D. and Griffith, B.C., "Communication and Information Processing within Scientific Disciplines: Empirical Findings for Psychology", Information Retrieval and Storage, 8, 1972, pp.123-136.

10. Lancaster, F.W., "Toward Paperless Information Systems", New York Academy Press Inc, 1978.

11. Hurd, J.M., "Information Technology : Catalyst for Change in Scientific Communication Network", IATUL Proceedings (New Series), V.6, 1998, CD-ROM Full Text Database [URL:http://www.iatul.org/].

12. Tenopir, C. and King, D.W., "Managing Scientific Journals in the Digital Era", Information Outlook, V1(2), 1997, pp.14-17.

13. Tenopir, C. and King, D.W., "Trends in Scientific Scholarly Journal Publishing in the United States", Journal of Scholarly Publishing, 1997, pp.135-170.

14. Odlyzko, A., "The Economics of Electronic Journals", First Monday, 2(8), 1998, http://www.firstmonday.dk/.

15. Walker, T.J., "Free Internet Access to Traditional Journals", American Scientist, 1998, pp.463-471, http://www.amsciorg/amsci/articls/98articles/walker.html, http://www.amsci.org/amsci/atricles/98articles/walkerweb.html.

16. Hanley, K., Harrington, J. and Blagden, J., "Aerospace Information Management (AIM-UK)", Final Report, Cranfield University Press, Cranfield, 1998.

17. Vakkari, P., "Trends in the Use of Digital Libraries by Scientists in 2000-2005: A Case Study of FinELib", Frove, A.(Ed.), Proceedings of the 69th Annual Meeting of the American Society for Information Science and Technology (ASIST), V(43), 2006, http://eprints.relis.org/archive/00008278/

18. Vakkari, P., "Perceived Influence of the Use of Electronic Information Resources on Scholarly Work and Publication Productivity", Journal of the American Society for Information Science and Technology (ASIST), V59(4), 2008, pp.602-612.

19. Borgman, C. L., "From Gutenberg to the Global Information Infrastructure", Cambridge, MA, MIT Press, 2000.

20. Boyce, P., King, D.W. and Montgomeri, C. et al.,"How Electronic Journals are Changing Patterns of Use", Serials Librarian, V46(1-2), 2004, pp.121-141.

21. Tenopir, C., King, D.W. and Boyce, P., "Patterns of Journal Use by Scientists Through Three Evolutionary Phases, D-Lib Magazine, 9(5), 2003.

22. Boyce, P. and Dalterio, H., "Electronic Publishing of Scientific Journals", Physics Today, 49, 1996, p.42 [Online]. Retrieved June 18, 2002, http://www.aas.org/~pboyce/epubs/pt-art.htm.

23. Boyce, P. B., "The ASS Program of Electronic Publication", Heck, A., Ed. Electronic Publishing for Physics and Astronomy, Astrophysics and Space Science Library, 1997, pp.224-55.

24. Stevens-Rayburn, S. and Bouton, E., "If it's not on the Web, it doesn't exist at all, Electronic Information Resources - Myth and Reality", Library and Information Services in Astronomy III, ASP Conference Series, V.153, 1998, Editors: Grothkopf, H. and Andernach, H., Stevens-Rayburn, S. and Gomez, M. Available at: http://www.stsci.edu/stsci/meetings/lisa3/stevens-rayburns.html.

25. Kurtz, M. J. and Accomazzi, G. et al., "The NASA Astrophysics Data System - Overview", Astronomy and Astrophysics Supplement, 143, 2000, pp.41-59.

26. Tenopir, C. and King D.W., "Use and Value of Scientific Journals - Past, Present and Future", Serials, V14(2), 2001, pp.113-120.

27. Hallmark, J., "The Effects of Technology on the Information-seeking Behaviour of Scientists", in B. E. Haner and J.O' Donnell (Eds.)., "Changing Gateways - the Impact of Technology on Geoscience Information Exchange", Proceedings of the 29th meeting of the Geoscience Information Society, Alexandria, Va :Geoscience Information Society Seattle, Washington, October 24-27, 1995, pp.51-56.

28. John, G., "WWW-VL: History: Internet and W3", 1982, 2009, http://vlib.iue.it/history/internet/, http://en.wikibooks.org/wiki/The_Information_Age/The_Digital_and_ICT_Revolutions, http://www.vlib.us/web/worldwideweb3d.html.

29. Kling, R. and Callahan, E., "Electronic Journals, the Internet and Scholarly Communication", Annual Review of Information Sciences and Technology (ARIST), Vol. 37, 2003, pp.127-177.

30. Okerson, A., "The Electronic Journal: What, whence, and when?", The Public-Access Computer Systems Review, 2, 1991, Retrieved April 2, 2002, from http://www.library.yale.edu/~okerson/pacs.html.

31. Okerson, A., "Are We There Yet?, Online E-Resources Ten Years After", Library Trends, Vol.48, 2000, pp.671-694.

32. Odlyzko, A. M., "Tragic Loss or Good Riddance - the Impending Demise of Traditional Scholarly Journals", International Journal of Human-Computer Studies, Vol. 42, 1995, pp.71-122.

33. Odlyzko, A., "The Rapid Evolution of Scholarly Communication", Learned Publishing, Vol. 15, 2002, pp.7-19.

34. Tenopir, C. and King, D.W., "The Use and Value of Scientific Journals - Past, Present and Future", Serials, Vol. 14 No.2, 2001, pp.113-120.

35. Guruprasad, R. and Nikam, K., "Use Patterns of Electronic Information Resources by Aerospace Scientists and Engineers in Bangalore - A Study", Ph.D Thesis, University of Mysore, May 2010.

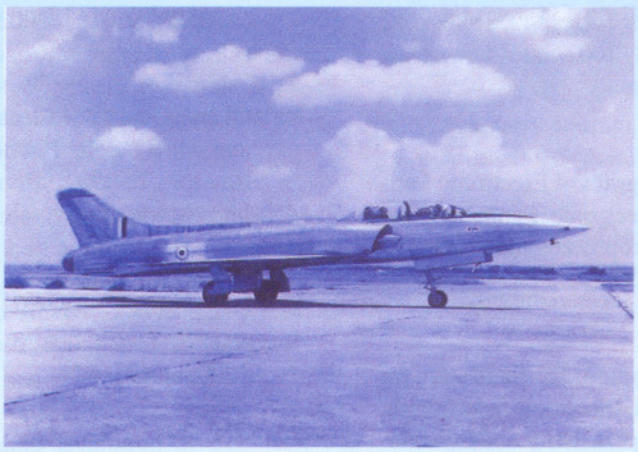
36. www.nal.res.in

37. www.niscair.res.in

38. www.uni-mysore.ac.in

39. Guruprasad, R., Nikam, K., Marimuthu, P. and Mudkavi, V.Y., "Impact of Internet on Scholarly Communications : A Survey of Aerospace Scientists and Engineers in Bangalore", J. Information Studies, Vol.17 (2), Print ISSN : 0971-6726, Online ISSN : 0976-1934.

Golden Jubilee Celebration of HF-24 (Marut)



HF-24, rechristened as the Marut was designed by a well known Focke Wolf Designer, Prof Kurt Tank. It was a sight to behold a treat for the eyes. On 17 Jun 1961, with Gp Capt Suranjan Das at the controls, the HF-24 Tail number BR 462 took to the air. The first official flight of the Marut was on 24 Jun 1961. On 10 May 1964 the first Maruts were handed over to the IAF. HAL built 129 single seaters and 18 trainers from 1964 to 1977. The first Marut squadron was formed on 01 Apr 1967 at Jamnagar when No 10 Sqn, was formed with Wg Cdr VK Murthy as the first Marut Boss. In early 1969 it moved to Pune. The pilots, who flew it then, fondly remember it as a stable and wonderful weapons platform. In Dec 1970 the squadrons moved to Jodhpur which became the Marut hub. By mid 1971, with upheaval in the neighbourhood, the squadrons were tasked to operate six aircraft detachments from Uttarlai. The squadrons received four Vir Chakras and a Mention in Despatches. The third and last Marut squadron was 31 Squadron that converted in Mar 1974 and then moved to Jodhpur. All three squadrons remained there till the very end. Interestingly, Flt Lt Sudhir Batra also recalls that on 22 Sep 1979, he ejected from a Marut Trainer, while on a ferry and also became the first Marut squadron pilot to clock 1,000 hours on type that day. The meltdown started from Jun 1980. The last sortie of the aircraft was flown on 08 Oct 1984 on the Air Force Day by Wg Cdr Vikram Pethia. A beautiful and versatile aircraft retired gracefully. She now rests, in all her majesty, on display at the Air Force Academy, Dundigal. The aircraft has completed Golden Jubilee from the day of inception.

Marut was the **"Wind Spirit"** - the men involved with her were the heart of that spirit.