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Paper Thirty Four

Users and Uses of DoD Technical Reports: A Report From the Field

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USERS AND USES OF DoD TECHNICAL REPORTS: A REPORT FROM THE FIELD*

by

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INTRODUCTION

The *NASA/DoD Aerospace Knowledge Diffusion Research Project* attempts to understand the information environment in which U.S. aerospace engineers and scientists work, the information-seeking behavior of U.S. aerospace engineers and scientists, and the factors that influence the use of scientific and technical information (STI) (Pinelli, Barclay, and Kennedy, 1991). Such an understanding could (1) lead to the development of practical theory, (2) contribute to the design and development of aerospace information systems, and (3) have practical implications for transferring the results of federally funded aerospace research and development (R&D) to the U.S. aerospace community. The *Project* fact sheet is the appendix.

This paper presents data from two information-seeking behavior studies involving U.S. aerospace engineers and scientists that were undertaken as Phase 1 activities of the *NASA/DoD Aerospace Knowledge Diffusion Research Project.* Responses from three groups of respondents - DoD, other government, and industry - are presented for two sets of selected questions. One set focuses on DoD technical reports: their use and importance, reasons for non-use, the factors affecting their use, the sources used to find out about them and the sources used to physically obtain them, and the quality of DoD technical reports. The second set focuses on information sources used in problem solving: the use of U.S. government technical reports in problem solving and the information sources used to find out about U.S. government technical reports.

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BACKGROUND

Derian (1990) has described the U.S. aerospace industry as a "sheltered" (as opposed to an exposed) culture because of the role played by government in the innovation process and because aerospace operates in both government and private sector markets. He points out that, unlike other U.S. industries, aerospace, principally the commercial aviation sector, has been the beneficiary of federally funded R&D for nearly a century. According to Mowery (1985), "The commercial aircraft industry is virtually unique among U.S. manufacturing industries in that a Federal research organization, the National Advisory Committee for Aeronautics (NACA) and subsequently the National Aeronautics and Space Administration (NASA), has for many years conducted and funded research on airframe and propulsion technologies." The commercial aviation sector has also benefitted from considerable investment in terms of research and procurement by the Department of Defense (DoD). "Although not intended to support innovation in any but military airframe and propulsion technologies, [this investment] has, nonetheless, yielded indirect, but very important, technological spillovers to the commercial aircraft industry" (Mowery, 1985).

Derian (1990) states that the aerospace industry is subject to a unique set of *externalities* that result from government intervention which, in turn, change the structure and regulation of the marketplace. Thus, the external environments of sheltered and exposed cultures are distinctive as is the interaction between the two cultures and the external environment. In the case of the U.S. aerospace industry, the interaction with and isolation from the external environment are moderated somewhat by the "supply-push/demand-pull" effect created by the U.S. government's involvement, primarily through NASA and the DoD, in the aerospace innovation process. (See

figure 1.) From a policy perspective, the U.S. government acts as both a performer and a dominant purchaser of aerospace R&D, supports precommercial research in civilian and military aircraft technologies, and plays a major role in diffusing the results of that research throughout the aerospace industry.

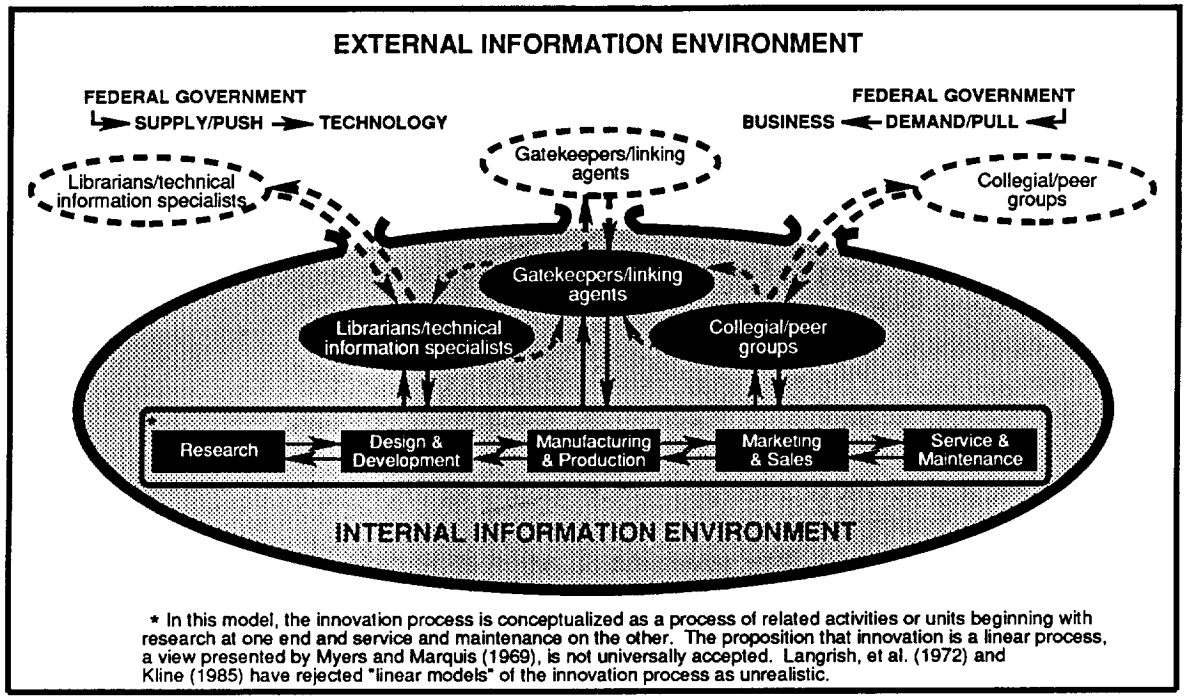

Figure 1. Boundary-Spanning Activities in the U.S. Aerospace Information Environment

Information use by engineers and scientists has been variously studied by information and social scientists, the earliest studies having been undertaken in the late 1960s. The results of these studies have not accumulated to form a significant body of knowledge that can be used to develop a general theory regarding the information-seeking behavior of engineers and scientists. The difficulty in applying the results of these studies has been attributed to the lack of a unifying theory, a standardized methodology, and the common definitions (Rohde, 1986).

Despite the fact that numerous "information use" studies have been conducted, information use by engineers and information use in engineering are neither broadly known nor well understood. There are a number of reasons (Berul, et al., 1965): (1) many of the studies were conducted for narrow or specific purposes in unique environments such as experimental laboratories; (2) many, if not most, of them focused on scientists exclusively or engineers working in a research environment; (3) few studies have concentrated on engineers, especially engineers working in manufacturing and production; (4) from an information use standpoint, some engineering disciplines have yet to be studied; (5) most of the studies have concentrated on the users' use of information in terms of a library and/or specific information packages such as professional journals rather than how users produce, transfer, and use information; and (6) many of the studies, as previously stated, were not methodologically sophisticated and few included testable hypotheses or valid procedures for testing the study's hypotheses.

Further, we know very little about the diffusion of knowledge in specific communities such as defense. In the past 25 years, few studies have been devoted to understanding the information environment in which DoD engineers and scientists work, the information-seeking behavior of DoD engineers and scientists, and the factors that influence the use of DoD STI. Presumably, the results of such studies would have implications for current and future DoD STI systems and for making decisions regarding the DoD STI program. Three studies specifically concerned with DoD include (1) a study of the information needs of DoD personnel engaged in research, development, and test and evaluation (RDT&E) activities (Berul, et al., 1965), (2) a study of the information acquisition patterns of engineers and scientists working in the defense community (Goodman, et al., 1966), and (3) a study undertaken by King Research to describe

the use and value of major information products and services provided by the Defense Technical Information Center (DTIC) (Roderer, Nancy K.; Donald W. King; and Sandra E. Brouard, 1983).

METHODOLOGY

Data were collected through two self-administered (reported) questionnaires. The approximately 34,000 members of the American Institute of Aeronautics and Astronautics (AIAA) served as the sample population. The sample frame consisted of 6,781 AIAA members who reside in the United States (U.S.) and who are employed primarily in academia, government, and industry. Systematic sampling was used to select 3,298 members to participate in the first (green) survey and 1,795 members to participate in the second (yellow) survey. Responses to the first survey numbered 2,016 and to the second survey 975. The adjusted (corrected) response rates for the two surveys were 70 and 63 percent, respectively.

It should be noted that the data reported in this paper reflect the responses of DoD engineers and scientists belonging to the AIAA. The data may not be generalizable to DoD engineers and scientists who are not members of professional societies or who may belong to other professional societies. Because the sample came from the AIAA, the responses may not necessarily be generalizable to the population of all DoD engineers and scientists.

PRESENTATION OF THE DATA

Demographic data regarding survey participants appear in table 1. Data concerning DoD technical reports are presented first followed by data concerning the information sources used in problem solving, the use of U.S. government technical reports in problem solving, and the information sources used to find out about U.S. government technical reports.

Table 1. Demographics
[N = 2,016; N = 975]

Demographics	DoD		Other Government		Industry	
	Survey 1 (n = 202)	Survey 2 (n = 103)	Survey 1 (n = 251)	Survey 2 (n = 106)	Survey 1 (n=1042)	Survey 2 (n =472)
Education:						
Undergraduate Degree Or Less	34.7	35.0	29.9	26.2	33.5	33.5
Graduate Degree	65.3	65.0	70.1	73.8	66.5	66.5
Educated As:						
Engineer	86.9	91.3	79.4	77.4	86.4	87.9
Scientist	8.6	7.8	15.9	16.0	10.2	6.8
Other	4.5	0.9	4.7	6.6	3.4	5.3
Works As:						
Engineer	68.7	79.6	65.3	67.7	72.0	70.0
Scientist	7.5	6.8	12.1	14.7	5.3	4.7
Other	23.8	13.6	22.6	17.6	22.7	25.3
Years of Professional Work Experience:						
Mean ($\bar{X}$)	17.1	17.2	20.0	18.6	22.0	22.6
Primary Professional Duty:						
Academic/Teaching	1.0	1.0	0.4	0.9	0.1	0.2
Research	20.3	14.6	34.3	42.5	11.2	7.4
Administration/Management	6.4	2.0	5.6	5.7	6.4	7.8
Technical Management	41.6	40.8	37.1	28.3	34.8	38.4
Design/Development	23.3	34.0	18.3	17.9	39.2	37.6
Manufacturing/Production	0.5	0.0	0.4	0.0	1.7	1.7
Marketing/Sales/Service	0.5	1.9	0.8	0.0	3.6	3.6
Other	6.4	5.9	3.2	4.7	3.1	3.4

The demographic characteristics are about equal between and among the two surveys and the three groups. Regardless of affiliation - DoD, other government, and industry - most of the respondents held a graduate degree; were educated as engineers; and work as engineers in technical management, research, and design/development. Industry respondents had the highest (mean) number of years of professional work experience. DoD respondents were more likely

than other government respondents to report their primary professional duties as technical management and design/development. Most "other government" respondents are predominantly employed by NASA.

Use and Importance of Technical Information Products

Of the six technical information products, DoD technical reports were used more frequently by DoD respondents (84%) and industry respondents (67.9%) (table 2). NASA

Table 2. Use of Technical Information Products
by U.S. Aerospace Engineers and Scientists

Information Products	Percentage Of Respondents Using Product In --		
	DoD	Other Government	Industry
Conference/Meeting Papers	**69.0**	**90.4**	**87.4**
Journal Articles	**75.0**	**90.1**	**86.8**
Technical Translations	29.0	37.6	22.6
AGARD Technical Reports	42.1	47.8	31.1
DoD Technical Reports	**84.0**	51.1	67.9
NASA Technical Reports	66.0	**93.1**	**74.6**

technical reports were used more frequently by other government respondents (93.1%) and industry respondents (74.6%). Conference/meeting papers and journal articles were used most often by other government respondents (90.4%, 90.1%) followed by industry (87.4%, 86.8%) and DoD respondents (69.0%, 75.0%). Technical translations were the least used information products. Of the three groups, technical translations were used most frequently by other government respondents (37.6%). AGARD technical reports were used most frequently by other government respondents (47.8%), followed by DoD respondents (42.1%) and industry respondents (31.1%).

Importance was measured on a 1 to 5 point scale with "1" being the lowest possible importance and "5" being the highest possible importance. Overall, survey participants accorded a higher importance rating to the information products they used the most (table 3). Of the six technical information products, DoD technical reports were used more frequently by DoD respondents. Of the same six technical information products, DoD respondents considered DoD technical reports to be the most important technical information product. Other government respondents and industry respondents accorded DoD technical reports low importance ratings: 23.1% and 40.3%, respectively. The use and importance of DoD technical reports is influenced by the classified and/or restricted distribution nature of many of these reports.

Table 3. Importance of Technical Information Products to U.S. Aerospace Engineers and Scientists

Information Products	Combined "4" and "5" Percentage Of Respondents In[a] --		
	DoD	Other Government	Industry
Conference/Meeting Papers	**46.6**	**64.1**	**51.9**
Journal Articles	42.4	**61.9**	**48.8**
Technical Translations	10.6	12.7	4.9
AGARD Technical Reports	23.1	20.0	11.9
DoD Technical Reports	**69.7**	23.1	40.3
NASA Technical Reports	**50.0**	**66.7**	**41.5**

[a]A 1 to 5 point scale was used to measure importance with "1" being the lowest possible importance and "5" being the highest possible importance. Hence, the higher the percentage, the greater the importance of the product.

NASA technical reports were used most often by other government respondents. They were also considered to be the most important technical information product by other government respondents (66.7%), followed by conference/meeting papers (64.1%) and journal articles (61.9%). Conference/meeting papers and journal articles were used most often by industry

respondents. They were also considered to be most important: 51.9% and 48.8%, respectively. Data on in-house technical reports are not presented here but previous analysis of the green survey data indicates that in-house technical reports are used most often and are rated highest by industry respondents.

Of the six technical information products, technical translations received the lowest importance ratings: DoD (10.6%), other government (12.7%), and industry (4.9%). AGARD technical reports received marginally higher importance ratings: DoD (23.1%), other government (20.0%), and industry (11.9%).

Reasons for Non-Use of DoD Technical Reports

Survey participants were asked their reasons for non-use of DoD technical reports. (See table 4). Among DoD participants who did not use DoD technical reports, "not relevant to my

Table 4. Reasons for Non-Use of DoD Technical Reports

Reasons	Percentage Of Respondents Not Using DoD Technical Reports In --		
	DoD	Other Government	Industry
Not Available/Accessible	38.5	**36.8**	**47.1**
Not Relevant To My Research	**92.9**	**82.2**	**66.2**
Not Used In My Discipline	**69.2**	35.3	40.5
Not Reliable/Technically Inaccurate	0.0	6.9	4.6
Not Timely/Current	0.0	16.7	19.8

research" (92.9%) and "not used in my discipline" (69.2%) were the reasons most frequently selected. For other government and industry respondents who did not use them, "not relevant to my research" and "not available/accessible" were the most frequently selected reasons: (82.2% and 36.8%) and (66.2% and 47.1%), respectively.

Factors Affecting Use of DoD Technical Reports

Survey participants who used DoD technical reports were asked to indicate the extent to which seven factors affected report use (table 5). Overall, **accessibility** and **relevance** appear as the factors exerting the greatest influence on use for all three groups of respondents. Among DoD respondents, accessibility, relevance, and technical quality or reliability appear as the factors exerting the greatest influence on use. For other government respondents, relevance, accessibility, and familiarity or experience were the factors exerting the greatest influence on use. Accessibility, relevance, and familiarity or experience were also the factors exerting the greatest influence on use of DoD technical reports by industry respondents.

Table 5. Factors Affecting the Use of DoD Technical Reports

Factors	Combined "4" and "5" Percentage Of Respondents In[a] --		
	DoD	Other Government	Industry
Accessibility	**84.5**	**61.6**	**71.2**
Ease Of Use	61.9	53.9	53.9
Expense	28.6	30.0	30.0
Familiarity Or Experience	67.6	**60.0**	**62.5**
Technical Quality Or Reliability	**68.4**	50.0	48.8
Comprehensiveness	50.0	52.5	47.6
Relevance	**81.6**	**70.0**	**68.8**

[a]A 1 to 5 point scale was used to measure influence with "1" being the lowest possible influence and "5" being the highest possible influence. Hence, the higher the percentage, the greater the influence of the factor on the use of DoD technical reports.

Considering both non-users and users of DoD technical reports, relevance appears to be a stronger predictor of DoD technical report use than does accessibility. The influence of accessibility is perhaps best explained by the classified and/or restricted distribution nature of DoD technical reports.

Awareness of and Physical Access to DoD Technical Reports

From respective lists of 11 and 7 sources, survey participants who used them were asked to indicate how often they find out about (become aware of) and physically obtain DoD technical reports (tables 6 and 7). Survey participants appear to find out about DoD technical reports

Table 6. Sources Used by U.S. Aerospace Engineers and Scientists to Find Out About DoD Technical Reports

Source	Combined "1" and "2" Percentage Of Respondents In[a] --		
	DoD	Other Government	Industry
Data Base Search	60.0	**72.5**	58.9
Announcement Journal	25.4	55.0	39.1
Current Awareness Publication	16.0	47.8	22.4
Cited In Report/Journal/Paper	**64.5**	**71.8**	**81.8**
Referred By Colleague	**82.9**	56.1	**69.0**
Referred By Librarian/Technical Information Specialist	44.0	25.7	32.9
Routed By Librarian/Technical Information Specialist	30.7	17.9	21.1
Intentional Search of Library	**64.8**	**67.5**	**60.4**
Accident/Browsing	37.0	39.4	40.5
DoD Sends Them	45.9	46.2	33.4
Author Sends Them	37.0	30.8	21.1

[a]A 1 to 4 point scale was used to measure use with "1" being frequently and "4" being never. Hence, the higher the percentage, the greater the use of the source to find out about DoD technical reports.

through colleagues; citations in reports, journal articles, and conference/meeting papers; and intentional search of the library. For DoD respondents, the three most frequently used sources include colleagues (82.9%); intentional search of the library (64.8%); and citations in reports, journal articles, and conference/meeting papers (64.5%). For other government respondents, the sources include data base searches (72.5%); citations in reports, journal articles, and conference/meeting papers (71.8%); and intentional search of the library (67.5%). The sources

most frequently used by industry respondents to find out about DoD technical reports were citations in reports, journal articles, and conference/meeting papers (81.8%); colleagues (69.0%); and intentional search of the library (60.4%).

Overall, participants physically obtained DoD technical reports from the library, from a colleague, and directly from DoD (table 7). This pattern was consistent for all three groups.

Table 7. Sources Used by U.S. Aerospace Engineers and Scientists to Physically Obtain DoD Technical Reports

Source	Combined "1" and "2" Percentage Of Respondents In[a] --		
	DoD	Other Government	Industry
DoD Sends Them To Me	**41.6**	**43.9**	**36.2**
Author Sends Them To Me	37.7	31.7	20.1
I Request Them From Author	28.6	35.9	27.0
I Order Them From Library	**67.6**	**77.5**	**76.0**
I Order Them From NTIS	35.6	21.1	42.9
I Get Them From A Colleague	**69.7**	**61.0**	**59.7**
Library Routes Them To Me	29.3	13.5	18.7

[a]A 1 to 4 point scale was used to measure use with "1" being frequently and "4" being never. Hence, the higher the percentage, the greater the use of the source to physically obtain DoD technical reports.

Quality of DoD Technical Reports

Survey participants who used DoD technical reports were asked to rate DoD technical reports on six aspects (table 8). Overall, survey participants accorded DoD technical reports the highest rating for precision/accuracy of data. DoD respondents rated DoD technical reports highest for quality of information (89.6%), followed by precision/accuracy of data (84.4%), followed by adequacy of data/documentation (75.3%).

Other government participants rated DoD technical reports highest for precision/accuracy of data (78.1%), followed by quality of information (65.8%), and advancing "the state of the art"

(61.5%). Industry respondents rated DoD technical reports highest for quality of information (78.1%), followed by precision/accuracy of data (73.3%), and organization/format (57.5%).

Table 8. How U.S. Aerospace Engineers and Scientists Rate DoD Technical Reports

Factor	Combined "1" and "2" Percentage Of Respondents In[a] --		
	DoD	Other Government	Industry
Quality of Information	**89.6**	**65.8**	**78.1**
Precision/Accuracy Of Data	**84.4**	**78.1**	**73.3**
Adequacy Of Data/Documentation	**75.3**	50.0	55.1
Organization/Format	64.5	53.6	**57.5**
Quality Of Graphics	57.2	53.7	43.7
Timeliness/Currency	54.6	58.6	53.4
Advancing "The State Of The Art"	63.6	**61.5**	47.4

[a]A 1 to 5 point scale was used to rate DoD technical reports, with "1" being excellent and "5" being no opinion. Hence, the higher the percentage, the higher the rating for each characteristic.

Information Use and Problem Solving

From a list of eight choices, survey participants were asked to categorize the most important technical project, task, or problem they had worked on in the past 6 months (table 9). Overall, survey participants selected the category "research" as the modal response. DoD participants chose the following three categories: research (33.7%), development (24.2%), and management (19.5%). Other government respondents selected research (44.4%), followed by management (17.7%) and design (15.2%). Industry respondents selected development (27.7%), followed by design (25.9%) and research (22.1%) as the categories for the most important technical project, task, or problem they had worked on in the past 6 months.

Survey participants were asked to identify the sources they used to obtain the information they had used to complete their most important technical project, task, or problem in the past 6

Table 9. Type of Most Important Technical Project, Task, or Problem

Type	Percentage Of Respondents In --		
	DoD	Other Government	Industry
Educational	4.7	1.6	2.1
Research	**33.7**	**44.4**	**22.1**
Design	12.6	**15.2**	**25.9**
Development	**24.2**	13.2	**27.7**
Manufacturing	0.0	0.0	1.5
Production	3.2	1.2	2.3
Management	**19.5**	**17.7**	12.7
Computer Applications	2.1	6.6	5.7

months (table 10). Overall, survey participants relied on their personal stores of information, followed by coworkers in their organization and a search of the library. Following these three sources, survey participants used colleagues outside of the organization, followed by a data base search and a librarian in their organization. DoD respondents were a little more likely to do a library search than were other government or industry respondents.

Table 10. Sources Used by U.S. Aerospace Engineers and Scientists in Completing Most Important Technical Project, Task, or Problem

Source	Percentage Of Respondents In --		
	DoD	Other Government	Industry
Personal Store Of Information	77.7	77.8	74.4
Coworker In My Organization	74.8	70.6	69.5
Library Search	62.9	57.1	56.1
Colleague Outside My Organization	56.4	52.0	46.6
Data Base Search	48.0	46.4	45.4
Librarian In My Organization	33.2	32.5	31.7

Survey participants were asked if they had used U.S. government technical reports in completing the most important technical project, task, or problem they had worked on in the past 6 months (table 11). Overall, a majority of survey participants used U.S. government technical

Table 11. Use of U.S. Government Technical Reports in Completing Most Important Technical Project, Task, or Problem

Use	Percentage Of Respondents Using U.S. Government Technical Reports In --		
	DoD	Other Government	Industry
Yes	80.2	72.6	59.5
No	19.8	27.4	40.5

reports. About 80% of the DoD respondents had used U.S. government technical reports, followed by 72.6% of the other government respondents and 59.5% of the industry respondents. Survey participants who used them were asked at what stage - near beginning; near middle; near end; or throughout the entire project, task, or problem - they had used these reports (table 12). Overall, the majority of survey participants used U.S. government technical reports through the entire project, task, or problem, followed by near the beginning and middle.

Table 12. Stage at Which U.S. Government Technical Reports Used to Complete Most Important Technical Project, Task, or Problem

Stage Of Work	Percentage Of Respondents Using U.S. Government Technical Reports In --		
	DoD	Other Government	Industry
Near Beginning	37.3	39.7	43.3
Near Middle	19.6	22.3	21.8
Near End	15.2	20.7	11.6
Throughout Entire Project, Task, Or Problem	**75.3**	**77.1**	**62.9**

Survey participants were asked to identify the sources they had used to find out about the U.S. government technical reports used in completing their most important technical project, task, or problem (table 13). Overall, survey participants relied on their personal stores of information, followed by coworkers in their organization and a search of the library. Following these three

sources, survey participants used colleagues outside of the organization, followed by a data base search and a librarian in their organization.

Table 13. Sources Used by U.S. Aerospace Engineers and Scientists to Find Out About U.S. Government Technical Reports

Source	Percentage Of Respondents Using U.S. Government Technical Reports In --		
	DoD	Other Government	Industry
Personal Store Of Information	89.9	87.1	80.0
Coworker In My Organization	67.3	68.5	58.8
Library Search	48.4	53.4	46.4
Colleague Outside My Organization	50.9	51.1	47.4
Data Base Search	41.3	43.8	42.1
Librarian In My Organization	30.8	33.7	29.0

Finally, we compared the sources used by survey respondents to complete their most important technical project, task, or problem in the past 6 months with the sources they had used to find out about the U.S. government technical reports used to complete the same technical project, task, or problem (table 14). Although the percentages differed slightly, the sources used to complete the most important technical project, task, or problem they had worked on in the past 6 months compared with the sources they had used to find out about the U.S. government technical reports used to complete the same technical project, task, or problem were the same.

Whether searching for information or seeking U.S. government technical reports, the survey participants' search patterns are the same. All three groups relied on their personal stores of information, followed by coworkers in their own organization and library search. If these sources did not prove sufficient, survey participants consulted colleagues outside the organization, a data base search, and a librarian.

Table 14. Sources Used by U.S. Aerospace Engineers and Scientists to Solve Technical Problems and to Find Out About U.S. Government Technical Reports

Source	Percentage Of Respondents In --					
	DoD		Other Government		Industry	
	Problem Solving	U.S. Government Technical Reports	Problem Solving	U.S. Government Technical Reports	Problem Solving	U.S. Government Technical Reports
Personal Store Of Information	77.7	89.9	77.8	87.1	74.4	80.0
Coworker In My Organization	74.8	67.3	70.6	68.5	69.5	58.8
Library Search	62.9	48.4	57.1	53.4	56.1	46.4
Colleague Outside My Organization	56.4	50.9	52.0	51.1	46.6	47.4
Data Base Search	48.0	41.3	46.4	43.8	45.4	42.1
Librarian In My Organization	33.2	30.8	32.5	33.7	31.7	29.0

FINDINGS

1. Conference/meeting papers, journal articles, and DoD technical reports were the information products used most frequently by DoD respondents; conference/meeting papers, journal articles, and NASA technical reports were the information products used most frequently by other government and industry respondents.

2. Conference/meeting papers, DoD technical reports, and NASA technical reports received the highest importance rating among DoD respondents; conference/meeting papers, journal articles, and NASA technical reports received the highest importance rating among other government and industry respondents.

3. The reasons most frequently cited for non-use of DoD technical reports by DoD respondents were "not relevant to my research" and "not used in my discipline"; the reasons most frequently cited for non-use of DoD technical reports by other government and industry respondents were "not available/accessible" and "not relevant to my research."

4. The factors affecting the use of DoD technical reports were accessibility and relevance among all three groups of users. Technical quality or reliability was also cited as a factor by DoD respondents; familiarity or experience was also cited by other government respondents and by industry respondents.

5. All three groups of respondents used citations in a report/journal/paper to find out about DoD technical reports; a reference by a colleague and intentional search of the library were also frequently used by DoD and industry respondents. Data base searches and intentional search of the library were frequently used by other government respondents.

6. The sources used most frequently by all three groups of respondents to physically obtain DoD technical reports include "I get them from a colleague"; "I order them from the library"; and "DoD sends them to me."

7. Quality of information and precision/accuracy of data were cited as the highest factors of excellence in DoD technical reports by all three groups of respondents. Adequacy of data/documentation was also cited as among the highest factors of excellence by DoD respondents. Advancing the "state of the art" was cited as among the highest factors of excellence by other government respondents. Organization/format was cited as among the highest factors of excellence by industry respondents.

8. The sources used to obtain the information needed to complete the most important technical project, task, or problem were the same for all three groups of respondents. DoD respondents made the greatest use of U.S. government technical reports in completing their most important technical project, task, or problem; other government and industry respondents used U.S. government technical reports to a lesser extent.

9. U.S. government technical reports were used throughout the entire project, task, or problem by all three groups of respondents who indicated use of reports to complete technical projects, tasks, or problems.

10. The sources used to obtain the information needed to complete the most important technical project, task, or problem and to find out about the U.S. government technical reports used to complete the most important project, task, or problem were the same for all three groups of respondents.

CLOSING REMARKS

We have yet to achieve a thorough understanding of how knowledge diffuses within the defense community or how DoD STI diffuses throughout the U.S. aerospace community. Political, technological, and social changes coupled with the passage of 25+ years have

undoubtedly altered the relevance/application of the findings of the original DoD user studies for making decisions about the DoD STI program and for designing STI systems. The STI dissemination model, used by DoD and NASA, is limited by its passivity: it does not take users into consideration except when they enter the system and request assistance. User requirements are rarely known or considered in the design of information products or services and the one-way, source-to-user transfer procedures of this model are seldom responsive in the user context. A knowledge diffusion model, grounded in theory and practice associated with problem solving and the diffusion of innovation, would better meet the information needs of engineers and scientists working in the post Cold War era. Knowledge diffusion emphasizes active intervention as opposed to dissemination and access, uses proactive information intermediaries to enhance both formal and informal communication, and encourages the development of user-oriented STI products and services.

What are the implications of the findings presented in this paper? These findings support the assumption that members of a community such as DoD rely on the established body of knowledge residing within their community. The further away an information resource resides from the DoD community, the less the likelihood of its use, despite its quality or potential relevance for DoD users. This statement is also true for industry respondents. For example, survey respondents make little use of AGARD technical reports and less use of technical translations. Conversely, the availability/accessibility of DoD technical reports influences the extent of their use within other communities. Communities not withstanding however, relevance appears to be the single most influential factor in determining DoD technical report use.

The burden of identification and acquisition falls on the user of DoD technical reports rather than on the librarian/technical information specialist; thus the successful diffusion of knowledge diffusion currently depends on the proactivity of the user. Although the librarian/technical information specialist plays an important linking role in diffusing knowledge, this role remains essentially passive for a variety of reasons. Implementing a knowledge diffusion model will require an increased proactive role for the librarian/technical information specialist. The ultimate success of the knowledge diffusion model may lie in effectively linking the formal and informal elements of the knowledge production, transfer, and use process. Effective linkage could be provided by the librarian/technical information specialist furnishing users with the "right" kind and the "right" amount of information at the "right" time.

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APPENDIX

NASA/DoD AEROSPACE KNOWLEDGE DIFFUSION RESEARCH PROJECT

Fact Sheet

A research study is investigating the production, transfer, and use of scientific and technical information (STI) in aerospace, a community which is becoming more interdisciplinary in nature and more international in scope. Sponsored by the National Aeronautics and Space Administration, the Aerospace Knowledge Diffusion Research Project is being conducted by the Indiana University Center for Survey Research, the NASA Langley Research Center, and RPI with the cooperation of the AGARD and AIAA technical information panels.

This 4-phase project will provide descriptive and analytical data regarding the flow of STI at the individual, organizational, national, and international levels. It will examine both the channels used to communicate STI and the social system of the aerospace knowledge diffusion process. The results of the Project should provide useful information to R&D managers, information managers, and others concerned with improving access to and utilization of STI. Phases 1 and 4 investigate the information-seeking habits and practices of U.S. and non-U.S. aerospace engineers and scientists and place particular emphasis on their use of government funded aerospace STI. Phase 2 examines the industry-government interface and places particular emphasis on the role of the information intermediary in the knowledge diffusion process. Phase 3 concerns the academic-government interface and places particular emphasis on the information intermediary-faculty-student interface.

Empirically, little is known about the production, transfer, and use of aerospace STI in general and about the information-seeking behavior of aerospace engineers and scientists in particular. Less is known about the effectiveness of information intermediaries and the role(s) they play in knowledge diffusion. It is generally assumed that information intermediaries play a significant role in the aerospace knowledge diffusion process. However, a strong methodological base for measuring or assessing their effectiveness is lacking.

The ability of aerospace engineers and scientists to identify, acquire, and utilize STI is of paramount importance to the efficiency of the R&D process. An understanding of the process by which aerospace STI is communicated through certain channels over time among members of the social system would contribute to increasing productivity, stimulating innovation, and improving and maintaining the professional competence of aerospace engineers and scientists.

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