Sixth Meeting

COORDINATING COUNCIL

NASA STI PROGRAM

1991
*** SUMMARY ***

NASA STI PROGRAM COORDINATING COUNCIL MEETING

Who Are Our Key Users?

October 25, 1991
10:00 am - 4:00 pm

Crystal City Gateway 2
Conference Room

Attendees:

AIAA
Barbara Lawrence
David Purdy
Geoff Worton

CASI
Wanda Colquitt
Carl Eberline
Joe Gignac
Dian Marincola

GSFC
Jane Riddle

JTT
Katie Bajis
Xenia Castell
Gladys A. Cotter
Jim Erwin
Jennifer Garland
Linda Hill
Judy Hunter
Karen Kaye
Allan Kuhn
Lucinda Leonard
Georgianna Lira

Elizabeth Nestor
Ann Normyle
Lou Ann Scanlan
Ron Sepic
Patt Sullivan
Ardeth Taber
Teresa Taylor
Phil Thibideau
Dick Tuey
Kay Voglewede
Leslie Wassel
John Wilson

JZ
Roland Ridgeway

LaRC
Thom Pinelli

LMI
Denise Duncan
Cynthia Shockley

MITRE
Kristin Ostergaard
INTRODUCTION

Jim Erwin, JTT, welcomed the attendees, thanked those who had helped with the meeting, and announced that Geoff Worton would be presenting in place of Barbara Lawrence. He then reminded the attendees that this meeting on users followed naturally from the last meeting, on quality of the database.

PRESENTATIONS

Dian Marincola, CASI, presented statistics on "Key Users: Who Uses the System the Most, Who Orders the Most Documents." The statistics are shown in the vu-graphs (attached); a summary follows.

In 1990, the NASA entities that received the most documents from the NASA Scientific and Technical Information (STI) Program in both paper and microfiche were, in order, Goddard, Ames, and Langley. Those that received the most documents in paper copy were, in order, Langley, Lewis, and Goddard. Among non-NASA entities, "other domestic" affiliations (the public, universities, and research institutes) ordered the most, followed by international partners (those with whom NASA has bilateral or tripartite agreements), NASA contractors, government agencies (including entities within government agencies), and other foreign organizations.

The most registered RECON users in 1990 were other domestic affiliations, followed by NASA, international partners, government agencies, NASA contractors, and other foreign. Government agency contractors and domestic partners (NTIS, OSTI, and DTIC) had fewer than 100 users each.

Non-NASA users registered to receive documents on initial distribution were, in order, other domestic, international partners, NASA contractors, government agencies, and other foreign.

Of 25,000 secondary (ad hoc) requests for documents (after automatic distribution), NASA contractors ordered the most, then domestic partners, international partners, other domestic, and other foreign.

Langley executed the greatest number of RECON commands (SELECT, EXPAND, BROWSE or TYPE, ORDER, and PRINT were those counted) of any NASA Center, followed by Lewis and Ames. There is no correlation drawn between the number of commands executed and the amount of time spent using RECON.
Denise Duncan and Cynthia Shockley, LMI, presented their findings from the Gateway Requirements Analysis: "What Do Users Say?" They visited three NASA Centers—Langley, Lewis, and Ames—and found the following information.

Those doing basic and applied research look for information at three major junctures: 1) beginning a project, to find what's already been done on the subject; 2) if their hypotheses seem wrong, to see if they need to change suppositions or to see if new information can get them back on track; and 3) upon publication, to obtain references.

Scientists find their STI in two ways: informally, through peers, their personal libraries, and their division libraries; and more formally, through official STI sources. Younger researchers are more comfortable with electronic media such as database searches and electronic mail. The best searches are conducted cooperatively, with the research librarian (information broker) conducting the search and the scientist at his elbow providing directional guidance to home in on her topic. In the near future it is likely that scientists will uncover sources of information themselves, using electronic networks and specialty electronic bulletin boards. Information brokers will maintain the universe of good sources.

Research scientists want their STI in three basic formats: text documents for basic research concepts and descriptions of entire experiments, numeric data sets for specific pieces of research, and graphic modeling or simulation (physical observation data, graphic images of computational tools; and animated representations, sometimes with color and sound) to represent large data sets, for specific areas of research. To date the graphic formats are available only through peer networking, not through information brokers.

How can this STI be made available to those who want it? The National Space Science Data Center (NSSDC)'s Master Directory is a beginning.

The potential market for the STI Program consists of some 26,000 scientists and engineers who are NASA employees and contractors. Personnel statistics are available for NASA employees (about half this population) but not for contractors. There is little cross-correlation of disciplines and functions among NASA Centers. Ames and Langley have the most research scientists with aerospace or astronautics engineering degrees, and the most development engineers with degrees in electronics or electronic communication. Goddard, Marshall, and Johnson are similar to each other; Kennedy is strong on test and evaluation, installation, operation, and maintenance.

Discussion: Today the scientific community's focus is on advanced and critical technologies. The National Center for Advanced Technologies (NCAT) has produced a validated list of such technologies and is developing a strategic plan for each one. Much of the newest technology is not obtainable through searchable databases; a researcher can only find it via a peer
networking system. There is no one place where all of this information is catalogued.

Geoff Worton, AIAA, talked about "Users: What Do We Know About Them?" His presentation is summarized here.

Users of AIAA's products and services (IAA, the Aerospace Database, and library services and document supply) can be classified into three groups:

1. Librarians, information professionals, information brokers
2. Engineers, scientists, consultants, researchers
3. Teachers, students

AIAA's membership is divided among industry (40%), government agencies (31%), academia (7%), and other (mostly consultants and service companies)(23%). Only 9 percent are foreign, and these are evenly divided among government, industry, and academia.

The subscription renewal rate for IAA is 97 percent. This represents a slight decrease in the past 6 years, but it's still a high rate. One reason is that access to the online database is limited, especially in Europe, and thus users continue to need the print version. The decline in renewals is a result of the availability of many other online databases containing similar information (Inspec, DOE, NTIS, Compendex). The CD-ROM version of the database is too new to yield statistics on use.

Among U.S. users of the Aerospace Database, 71 percent are in industry, 16 percent in government, and 13 percent in academia. In Canada, users split evenly between industry and government with 43 percent each, followed by 13 percent academics. Australian users are all affiliated with the government; in Israel, the split is 67 percent government to 33 percent industry.

The preferred method of searching on DIALOG is by keyword(s) (90%), followed by author (3%).

An analysis of references and articles in the AIAA Journal revealed that more than a third cited material more than 10 years old (33%). This means that much aerospace research (and, therefore, STI) is of basic and lasting value.

Contributors to the Aerospace Database: U.S. 50%, Europe 20%, Russia 15%, other 15%.
### CITATIONS OF LITERATURE

<table>
<thead>
<tr>
<th></th>
<th>AIAA Journal</th>
<th>ZFW (Germany)</th>
<th>Recherches Aerospatiales</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>85%</td>
<td>41%</td>
<td>41%</td>
</tr>
<tr>
<td>Europe</td>
<td>11%</td>
<td>52%</td>
<td>44%</td>
</tr>
<tr>
<td>USSR</td>
<td>01%</td>
<td>01%</td>
<td>01%</td>
</tr>
<tr>
<td>Other</td>
<td>03%</td>
<td>06%</td>
<td>14%</td>
</tr>
</tbody>
</table>

**Discussion:** Before the 1980s, most of the AIAA literature came from the United States. Perhaps peer contact was a factor: known sources are more credible. Now the proportion of foreign literature is increasing as more contacts are made; a third of the attendees at meetings are foreign. The time lag for translation may also contribute to the lower rate of use of foreign sources.

Thom Pinelli, LaRC, next presented some of the results from his NASA/DoD Aerospace Knowledge Diffusion Research Project, on "Potential Key Users."

The thesis of this project is that for scientists and engineers to maintain a position on the cutting edge of technology, they must be able to acquire the information they need in a form that is immediately usable and easily incorporated into their work. This is an active style of information delivery, as opposed to the National Science Foundations's premise that if you create knowledge the world will beat a path to your door (passive delivery).

There are three models for knowledge delivery in the U.S.: the economic model, the appropriability model (NSF view), and the dissemination model.

The dissemination model is an intermediary-based system.

The U.S. Government uses models 2 and 3 to distribute research and development (R&D) results: NASA R&D reports are now distributed using model 2, to institutions; health care and education reports use model 3, distribution to the end user. The discrepancy occurs because health care and education information is seen as critical to the end user.

The long-term goals of Pinelli's project are to describe and analyze the dissemination of aerospace knowledge, specifically within NASA and DoD. To do this he will look at the users, how they interact with each other and with the system; and also look at the interfaces between government and industry and between government and academia.
Then he proposes to compare aerospace scientists and engineers in the U.S. with those in other countries, and look at other systems (Japan, Russia, etc.) from a policy and policy analysis point of view: are they intermediary-based systems? How do they interface? After conceptualizing, describing and analyzing other systems, Pinelli proposes to move into some modeling and predictions from which he’ll derive a marketing strategy for STI.

The Keller Group, in the process of determining whether NASA’s STI Program is viable, asked Pinelli for information about the production and use of STI within NASA, and especially at five Centers: Ames, Goddard, Langley, Lewis, and Marshall. With the mechanism for the Knowledge Diffusion Project already in place, the information was easy to gather using a telephone survey. Of the respondents, 70 percent were engineers; 23 percent, scientists; 4 percent, managers; and 3 percent, technicians.

NASA purports to be a science organization, but in terms of what it does and who does it, it is a technology-driven engineering organization. This colors the entire process of information delivery. Only a quarter of the respondents did their research alone; the others were all members of a team or group. The STAR categories most represented were engineering, aeronautics, and space science. Only 22.1 percent of the respondents had earned a doctorate; 32.6 percent had a masters, and 45.3 percent had a bachelor’s degree or less. The proportion of women was 8.7 percent (there are fewer in AIAA and almost none in SAE). Center Directors and Deputy Directors were excluded from the survey.

<table>
<thead>
<tr>
<th>How important is it... (percent of respondents)</th>
<th>very important</th>
<th>somewhat important</th>
<th>not important</th>
</tr>
</thead>
<tbody>
<tr>
<td>to publish STI?</td>
<td>47.4</td>
<td>28.2</td>
<td>24.3</td>
</tr>
<tr>
<td>... through the STIP?</td>
<td>25.6</td>
<td>33.6</td>
<td>44.8</td>
</tr>
<tr>
<td>to use STI?</td>
<td>80.6</td>
<td>17.5</td>
<td>1.8</td>
</tr>
<tr>
<td>... is STIP to you?</td>
<td>47.5</td>
<td>35.8</td>
<td>16.8</td>
</tr>
</tbody>
</table>

Most of those surveyed, 61.1 percent, said they had no problems with the STI system. Only 9.9 percent experienced problems; of those, 8.6 percent said the process was too time-consuming. This perceived problem could be corrected with better communication between the Centers and the Headquarters publishing operation. Most of the time lag in publishing occurs in the production of the document, and production can be accelerated with author-publisher cooperation throughout the process.
A quarter of the respondents said they used the NASA STI Program once a month, 30 percent used it more often, and the rest said either that research wasn't part of their job or they had their own libraries. A quarter of the respondents, again, experienced problems accessing the system; another 15 percent said it took too much time and effort.

In evaluating the STI Program overall, however, 82 percent gave it either excellent (28.2%) or good (54.4%).

The bottom line result of the survey was that the STI Program is used and is meeting the needs of the majority of those it serves. Perceived problem areas will be addressed using focus groups and discussions.

Jane Riddle, GSFC, discussed "How We Meet the User's Needs" from her perspective as information intermediary in the STI Program. The summary follows.

In 1989 the Goddard library surveyed its users. The survey asked who the users were, what they liked, what they didn't like, and what they would like in terms of library services.

Users of the Goddard library are government employees, contractors, NRC/NAS research associates, co-op students, and a small group of "other": people in private industry, authors, retired scientists, and retired engineers. Civil service grades range from 10 through 16; age levels are 25-55 and getting younger. Goddard encourages its affiliation with local universities and hires many recent graduates.

The heaviest users are engineers, space scientists, and earth scientists. Project scientists and managers are also well represented.

Users come to the library to find a specific reference or fact, to explore a new topic, to update material on a recurring topic, to browse among the new materials, and to seek help in any of these areas.

The research tools the Goddard library users prefer are the databases, RECON (for which they use an intermediary) and ARIN (which they use themselves); the card catalog, now on microfiche but not updated; and do-it-yourself with help from Goddard's brochures—user manuals for the library. Users ask for help with all of the above-mentioned tools. Some specific questions take longer to answer; for example, from 15 to 60 minutes; these tend to be quests for obscure references of for sources that are not bibliographic information. Research questions can encompass an entire research package: printed materials, online, information, and referrals both within and outside of Goddard. The library also has CD-ROMs: Books in Print, the Science Citation Index, Computer Select, GEOREF, and INSPEC.
The tools most liked by the users are ARIN, whose usage is growing, often remote access; and RECON, although the users would prefer a CD-ROM version and find RECON hard to understand. They would like to have ISI access through ARIN.

Medium-use tools are microfiche from CASI and AIAA papers. The least used tools are RECON directly (users find its promotional materials too verbose), SCAN (not dynamic enough; it used to be heavily used), and IAA and STAR in paper versions.

Users would like to have ISI; the breadth of DIALOG; STN spread: physics, chemical abstracts, INSPEC, American Institute of Physics' SPIN; electronic transmission of search results; other electronic tools such as fax and electronic mail; and optical scanning capability.

Discussion: It is not yet possible to access the information "in RECON" through ARIN or NOTIS, because the databases would have to be converted, the cost is too high for the limited demand, and some fields in RECON have no equivalent in NOTIS. Some Goddard users requested coverage of additional journals in the IAA database; Goddard has given a list of these journals to AIAA.

Kristin Ostergaard, MITRE, presented a "STI Council User Requirements Update." The preliminary findings are summarized here.

At the behest of the STI Council, MITRE undertook a two-fold study, of STI usage and of STI users. Its timeframe is from May 1991 through April 1992. The methodology of the study is to 1) gather statistics from CASI for 1990, 2) gather additional statistics from STI staff at Centers, and 3) survey samples of high-volume STI users and of nonusers of STI across all Centers.

Some of the background information for the study comes from CASI (statistics from 1990) and some from the survey of users that LMI performed in 1990.

Preliminary results show that in eight Centers, half of the STI managers or designees could estimate the number of total users of STI, three-quarters could identify the most active users, half could identify the less active users, and 63 percent maintain usage records.

Discussion: Heavy users such as General Electric or Hughes Aircraft could be sources of additional revenue for the STI Program. Their usage pattern differs from that of the Centers in that they get tapes from CASI and generate their own documents from them. In addition, they use the tapes for internal-use searches and have subscription services; thus they have little need for further products or services from CASI. The STI Council wants to
see the user as a customer rather than as a potential market. The NASA Charter is vague—it's not clear whether it mandates NASA to disseminate STI throughout NASA (only) or to anyone who wants it. Nonetheless, it should be kept on mind that technology transfer and technology utilization are also parts of the NASA STI Program.
KEY USERS —

Who Uses the System the Most,

Who Orders the Most Documents
A Brief Review of the Data

- 1990 data profiled
- Data organized by CASI registration affiliation types
- Data extracted from RPCS, document order files, and RECON usage files
- Data are data.
### Active Addresses on RPCS in 1990

<table>
<thead>
<tr>
<th>Address Type</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>NASA</td>
<td>1,600</td>
</tr>
<tr>
<td>NASA Contractors</td>
<td>340</td>
</tr>
<tr>
<td>Gov't Agencies</td>
<td>540</td>
</tr>
<tr>
<td>Gov't Agency Contractors</td>
<td>80</td>
</tr>
<tr>
<td>Domestic Partners</td>
<td>30</td>
</tr>
<tr>
<td>International Partners</td>
<td>740</td>
</tr>
<tr>
<td>Other Domestic</td>
<td>2,500</td>
</tr>
<tr>
<td>Other Foreign</td>
<td>160</td>
</tr>
</tbody>
</table>

Estimates
Documents Distributed to NASA Entities in 1990

Paper and Microfiche

In thousands
High Volume Document Requesters

- NASA CONTRACTORS
  721 Hughes Aircraft Co, CA
  357 Rockwell International Corp, CA
  287 NERAC, Inc, CT

- GOVERNMENT AGENCIES
  29 Wright-Patterson AF Base, OH
  26 Arnold AF Station, TN
  16 Naval Ship R&D Ctr, MD

- GOVERNMENT AGENCY CONTRACTORS
  42 Teledyne Ryan Aeronautical, CA
  32 Rockwell Int'l Corp/NAAO, CA
  13 Rockwell Int'l Corp/SSED, CA

- DOMESTIC PARTNERS
  781 NTIS, VA
  160 OSTI, TN

- INTERNATIONAL PARTNERS
  172 ONERA, France
  103 Nat'l Aerospace Lab, The Netherlands
  97 Nat'l Aerospace Lab S&T Agency, Japan

- OTHER DOMESTIC
  152 General Dynamics Corp, TX
  26 Ithaco, Inc, NY
  13 AVCO Corp, MA

- OTHER FOREIGN
  125 Indian Space Research Organization, India
  31 Instituto de Pesquisas Espaciais, Brazil
RECON Commands Executed in 1990

In thousands
RECON Commands Executed by Non-NASA Entities

Heavy Users?

- NASA CONTRACTORS
  44,644  Rockwell Int'l Corp/STSD, CA
  44,543  WESRAC, CA

- GOV'T AGENCY
  18,088  Arnold AF Station, TN
  9,026   Wright-Patterson AF Base, OH

- GOV'T AGENCY CONTRACTOR
  9,101   Rockwell Int'l Corp/SSED, CA
  6,837   Sandia Labs, NM

- Other Domestic
  14,198  Research Triangle Institute, NC
  11,949  Fairchild Space Co, MD

Volumes based on a single RECON ID
STI PROGRAM COORDINATING COUNCIL MEETING

25 October 1991

"WHAT DO OUR USERS SAY?:
An LMI [Limited] Perspective"

Presentation by:
Denise R. Duncan
Cynthia W. Shockley
FINDINGS FROM GATEWAY REQUIREMENTS ANALYSIS

MAJOR FINDING: Key Function Supported is Research
[Research in several contexts: basic research, applied research
during design, etc. through lifecycle of NASA work]

- Events which trigger an STI search
  .. Project initiation, recheck if/when hypothesis not supported, at publication

- How do users do the STI search
  .. First stage – personal resources – own library, peer library, ask peers
  .. Second stage – official STI resources

- Management of research requires both STI and administrative information
FINDINGS FROM GATEWAY REQUIREMENTS ANALYSIS

MAJOR FINDING: NASA Research Population is Changing

[Distribution of employee age and years of experience is changing
as well as increasing numbers of contract support staff]

- Bimodal age distribution
  - Corporate memory will be retiring over next 10 years
  - Peer contacts will be leaving NASA
  - Younger staff may be versatile in using online resources
  - Younger staff may have higher expectations of STI delivery system

- Between 1989 and 1991, NASA lost more than half of its GS/GM 13-15 scientists and engineers. Overall there was a net gain of 237 with new hires.

- NASA's work force declined from 31,000 in 1970 to 23,500 in 1990 whereas the support-service contractor population increased from 29,000 to 41,000
FINDINGS FROM GATEWAY REQUIREMENTS ANALYSIS

MAJOR FINDING: User Community for STI Program are NASA Researchers and Information Brokers who Directly Support Them

(We understand that the charter includes dissemination to the general aerospace community, but if STIP satisfies the more technically demanding NASA users, the external users should be satisfied.)

- Researchers form the primary market for STI – these are NASA scientists and engineers, TPMs, contract scientists and engineers, university researchers – in support of NASA projects.

- Information brokers supporting these people are part of the primary market as substitutes for the researcher in the STI search and retrieval process – these are Center librarians, CASI, IACs, TUOs, and university librarians.

- The major difference between these two groups is in their patterns of STI search, sources used, and expertise in location and retrieval of STI.
FINDINGS FROM GATEWAY REQUIREMENTS ANALYSIS

MAJOR FINDING: User Community for STI Program are NASA Researchers and Information Brokers who Directly Support Them

(continued)

- Researchers use peers and local resources first and "official" STI resources (library, RECON) second. Information brokers use STI program resources first and are far more likely to make systematic use of online resources.

- Disconnect between researcher and information provider
  .. A researcher will discover unique sources
  .. Sources used are not communicated to information brokers by researchers
FINDINGS FROM GATEWAY REQUIREMENTS ANALYSIS

MAJOR FINDING: Peers are an Important Part of the STI Research Process

• Members of a group with similar research interests assist one another with locating sources of STI, whether those sources are other researchers, professional groups, discipline-specific bulletin boards, etc.

• The Internet is a major channel of communication among peers.
Users Have Identified Types of STI, Needed Formats, and Probable Sources of Required STI as Follows:

**Needed format**
- Text
- Photographs
- Drawings
- Graphs
- Legends
- Tables
- Formulae
- Diagrams

**Located via**
- NTIS
- RECON
- Peers
- Center library, branch, division, or special library
- DTIC
- NLM
- NIST
- Commercial databases
- SAE

**Probable sources**
- NACA reports
- NASA reports
- Pre-published reports and papers
- Publications of other research organizations
- Professional journals
- Proceedings of conferences and symposia

*Notes:* NTIS = National Technical Information Service, NLM = National Library of Medicine, NIST = National Institute of Standards and Technology, SAE = Society of Automotive Engineers, NACA = National Advisory Committee for Aeronautics

**FIG. 5-3. TEXT IN DOCUMENT FORM**
**FIG. 5-4. OBSERVATION DATA**

**Notes**: NOAA = National Oceanographic and Atmospheric Administration; DoE = Department of Energy; JPL = Jet Propulsion Laboratory; GSFC = Goddard Space Flight Center; ESA = European Space Agency

**FIG. 5-5. GRAPHIC IMAGES**
LMI VIEW OF KEY NASA STI USERS
Internal Factors Which Contribute to STIP Challenge

- Potential users of STI in support of NASA mission (NASA and NASA contractors) is about 26,000
  - There are between 10,000 to 13,000 scientists and engineers in NASA
  - There are 13,000 NASA contractors (figure was 6500 in 1987)
  - Limited insight into the contractor user population which may be 50% of users

- Each Center tends to be insular and compete with others for research dollars

- Each NASA Center is unique in its user population composition and consequently STI profile
  - Distribution within research, engineering, development, T&E functions at each Center different from other Centers
  - No clear categorization across Centers by discipline
LMI VIEW OF KEY NASA STI USERS

External Influences

- Impact of Space Exploration Initiative (SEI)

- Impact of other Agency programs
  - DoD spends twice as much as NASA on space research and development
  - Overlap between agencies
Present and future technologies required for the Space Exploration Initiative

<table>
<thead>
<tr>
<th>Functional requirement</th>
<th>System characteristics</th>
<th>System options</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Propulsion</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surface to low earth orbit</td>
<td>High thrust, 150-250-metric-ton capacity</td>
<td>Advanced chemical-fuel rockets (cryogenic liquids, non-cryogenic liquids, solids)</td>
</tr>
<tr>
<td>Transfer orbit to the moon and Mars</td>
<td>Restartable motors: stable, storable propellants; for Mars, very high specific impulse</td>
<td>For the moon, current propellants and systems; for Mars, nuclear thermal rockets, nuclear electric propulsion</td>
</tr>
<tr>
<td>Insertion into planetary orbit and descent to surface</td>
<td>Throttleable; high reliability required; long-term cryogenic storage</td>
<td>Not demonstrated by present systems</td>
</tr>
<tr>
<td><strong>Electric power</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moon mission spacecraft</td>
<td>Manned: up to 30 kW for week(s); unmanned cargo: up to 5 kW for week(s)</td>
<td>Nuclear: presently 7 W/kg with radioactive thermoelectric generators</td>
</tr>
<tr>
<td>Mars mission spacecraft</td>
<td>Manned: up to 20 kW for year(s); unmanned cargo: up to 5 kW for year(s)</td>
<td>Fuel cells: presently 250 Wh/kg</td>
</tr>
<tr>
<td>Moon and Mars mission surface activities</td>
<td>Habitat/laboratory: 30-100 kW; base: 100-1000 kW; rovers: 100-4800 kWh per trip</td>
<td>Batteries: presently 20 Wh/kg</td>
</tr>
<tr>
<td><strong>Extravehicular activities</strong></td>
<td>All systems reliability must be greater than 99 percent, with minimal support for continuous operation</td>
<td>Photovoltaic: presently 21 Wh/kg at earth</td>
</tr>
<tr>
<td><strong>Life support systems</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waste management</td>
<td>Technology largely driven by closure of food cycle (recycling human and plant waste)</td>
<td>Key research areas: plant growth techniques, food production, waste processing, contaminant control, and systems integration and control</td>
</tr>
<tr>
<td>Water recovery</td>
<td>Organic and inorganic waste removal from multiple sources; must provide drinkable water</td>
<td>Distillation systems; thermoelectric integrated membrane evaporation, vapor compression, bioregenerative (plant-growth-based) systems</td>
</tr>
<tr>
<td>Air revitalization</td>
<td>Carbon dioxide reduction and removal; oxygen generation; trace-contaminant control</td>
<td>Molecular sieves, chemical reactors (Bosch or Sabatier); direct carbon dioxide electrolysis</td>
</tr>
<tr>
<td><strong>Planetary surface systems</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Habitats</td>
<td>Moon: six persons for week(s) to 18 for year(s); Mars: six for month(s) to 18 for year(s)</td>
<td>Inflatable and rigid structures</td>
</tr>
<tr>
<td>Rovers and walkers</td>
<td>Radiation protection, simple maintenance essential</td>
<td>Sensors, software</td>
</tr>
<tr>
<td>Robots</td>
<td>25-100-km radius for several-day missions</td>
<td>Very high-definition stereo television (10 000-line TV)</td>
</tr>
<tr>
<td><strong>Site characterization</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stereo visual imaging</td>
<td>Local maps with 1-meter resolution; global maps with 10-100-meter resolution</td>
<td>Achieved with present technology</td>
</tr>
<tr>
<td>Resource characterization</td>
<td>Multispectral imaging, chemical, and evolved gas analyses</td>
<td>Spectrometers, electromagnetic sounders, gas chromatography, surface penetrators</td>
</tr>
<tr>
<td><strong>Spacecraft</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low-earth-orbit personnel shuttle and heavy lifter</td>
<td>Spacecraft designs limited by materials properties and fabrication methods</td>
<td>Current spacecraft designs based on aluminum and titanium</td>
</tr>
<tr>
<td>Moon and Mars transfer vehicles, cargo transfer vehicles, landers</td>
<td>Minimal on-orbit assembly, maximum crew safety, radiation protection</td>
<td>Light alloys, metals, ceramics, polymer matrix composites need development; radiation shielding possibilities include water, magnetic, and electrostatic</td>
</tr>
<tr>
<td><strong>Communications, control, navigation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mission control, science data return, radiometric support for navigation</td>
<td>Moon: downlink 350 Mb/s, uplink 250 Mb/s; Mars: downlink 20 Mb/s, uplink 10 Mb/s; Navigation: 10 meters accuracy Driven by imagery data rates</td>
<td>Present interplanetary navigation systems cannot adequately support real-time Mars navigational requirements; options include optical bands, phased-array antennas, millimeter-wave integrated circuitry, expert systems, neural networks, data compression techniques</td>
</tr>
</tbody>
</table>

### Agencies and their missions in the U.S. space program

<table>
<thead>
<tr>
<th>Agency</th>
<th>Initial budget for space, millions of US dollars (year)</th>
<th>1990 budget for space, millions of US dollars</th>
<th>Space activities and missions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Department of Defense</td>
<td>489.5 (1959)</td>
<td>19.382</td>
<td>Develops the National Launch System heavy lift booster jointly with the National Aeronautics and Space Administration (NASA); researches and develops the Strategic Defense Initiative (SDI); and operates the Defense Satellite Communications System (DSCS) and the Defense Meteorological Satellite Program (DMSP).</td>
</tr>
<tr>
<td>National Aeronautics and Space Administration</td>
<td>261.0 (1959)</td>
<td>11.393</td>
<td>Researches, develops, and operates technology for the space shuttle, space station, interplanetary probes and orbiting astronomical observatories, space and earth sciences and their applications, and manned and unmanned space exploration; encourages commercial space programs; technology transfer to universities and industries.</td>
</tr>
<tr>
<td>Department of Commerce</td>
<td>50.7 (1962)</td>
<td>243</td>
<td>Oversees both polar-orbiting and geostationary operational weather satellites; administers the land remote-sensing program (which is conducted by Earth Observation Satellite Co., Lanham, Md.) and helps develop telecommunications policy for the use of geostationary orbits.</td>
</tr>
<tr>
<td>Department of Energy</td>
<td>34.3 (1959)</td>
<td>190</td>
<td>Develops nuclear electric power reactors for U.S. earth-orbiting and interplanetary spacecraft; and provides instrumentation for space-based monitoring of nuclear weapons test ban.</td>
</tr>
<tr>
<td>Department of Agriculture</td>
<td>0.5 (1968)</td>
<td>23.4</td>
<td>Conducts applications research on space-based systems for monitoring, assessing, and managing agricultural and forest resources, and impact analyses on droughts and floods.</td>
</tr>
<tr>
<td>Department of the Interior</td>
<td>0.2 (1968)</td>
<td>15.5</td>
<td>Maintains remote-sensing resource data archive; uses remote-sensing data to inventory, monitor, and manage natural resources; assists various countries in remote sensing and geographic information systems; and has helped develop interplanetary spacecraft sensors and produced maps of planets and satellites.</td>
</tr>
<tr>
<td>Department of Transportation</td>
<td>0.5 (1987)</td>
<td>3.5</td>
<td>Through the Office of Commercial Space Transportation, oversees and coordinates the U.S. commercial space transportation industry by issuing launch licenses, establishing insurance requirements, and researching policy issues.</td>
</tr>
<tr>
<td>Arms Control and Disarmament Agency</td>
<td>-</td>
<td>-</td>
<td>Represents the United States in arms control negotiations, including those of space weapons systems.</td>
</tr>
<tr>
<td>Department of State</td>
<td>-</td>
<td>-</td>
<td>Advises the President on international space matters; is responsible for evaluating and advancing U.S. foreign policy interests in the context of space activity, and represents the United States in international negotiations concerning space issues.</td>
</tr>
<tr>
<td>Environmental Protection Agency</td>
<td>-</td>
<td>-</td>
<td>Conducts research and technical support using satellite remote sensing as part of an overall environmental monitoring program.</td>
</tr>
<tr>
<td>National Science Foundation</td>
<td>-</td>
<td>-</td>
<td>Supports academic research in atmospheric sciences and ground-based astronomy.</td>
</tr>
<tr>
<td>Smithsonian Institution</td>
<td>-</td>
<td>-</td>
<td>Conducts basic research and public education on astron- omics and space-related topics.</td>
</tr>
<tr>
<td>U.S. Information Agency</td>
<td>-</td>
<td>-</td>
<td>Disseminates information about U.S. achievements in space to other countries.</td>
</tr>
</tbody>
</table>

Source: Aeronautics and Space Report of the President 1989 Activities NASA 1990
USERS: WHAT DO WE KNOW ABOUT THEM?

GEOFF WORTON
AMERICAN INSTITUTE OF AERONAUTICS AND ASTRONAUTICS

NASA STIP COORDINATING COUNCIL

OCTOBER 25, 1991
USERS: WHAT DO WE KNOW ABOUT THEM?

User Services

- International Aerospace Abstracts
- Aerospace Database
- Library/Document Supply

User Types

- Clearly defined market

Usage Characteristics

- Aerospace Literature shelf life
- U.S. vs. Foreign Source Material
Who are STIP’s Users?

Librarians
Information Professionals
Information Brokers

Engineers
Scientists
Consultants
Researchers

Teachers
Students

Where are STIP Users?

Academia
Government/Government Agencies
Industry
American Institute of Aeronautics and Astronautics

Professional Members

30%  Government/Government Agencies
40%  Industry
7%   Academia
23%  Other

91%  U.S.
9%   Foreign
## International Aerospace Abstracts

Print resource, available since 1961

<table>
<thead>
<tr>
<th>User Type</th>
<th>U.S.</th>
<th>Foreign</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government</td>
<td>21%</td>
<td>31%</td>
</tr>
<tr>
<td>Industry</td>
<td>32%</td>
<td>35%</td>
</tr>
<tr>
<td>Academia</td>
<td>47%</td>
<td>34%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Subscriber Base</th>
<th>U.S.</th>
<th>Foreign</th>
</tr>
</thead>
<tbody>
<tr>
<td>1987</td>
<td>66%</td>
<td>34%</td>
</tr>
<tr>
<td>1991</td>
<td>59%</td>
<td>41%</td>
</tr>
</tbody>
</table>
International Aerospace Abstracts

Subscription Renewal Rate

96%  U.S.
98%  Foreign

Geographic Breakdown of Foreign Subscribers

16%  Pacific Rim
17%  U.K.
38%  Western Europe/Scandinavia
 7%  Eastern Europe
International Aerospace Abstracts

Overall subscriptions declining, but

IAA experience better than other print A & I

Closer to core

Restricted availability of online in foreign markets

Why a decline?

Online availability

- Quicker
- Cost effective
- Space saving

Improved global access to online

Alternative sources weaken exclusivity
Aerospace Database

Online via DIALOG Information Services since 1985

Availability

<table>
<thead>
<tr>
<th>User Types</th>
<th>U.S.</th>
<th>Australia</th>
<th>Canada</th>
<th>Israel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academia</td>
<td>13%</td>
<td>-----</td>
<td>14%</td>
<td>-----</td>
</tr>
<tr>
<td>Industry</td>
<td>71%</td>
<td>-----</td>
<td>43%</td>
<td>33%</td>
</tr>
<tr>
<td>Government</td>
<td>16%</td>
<td>100%</td>
<td>43%</td>
<td>67%</td>
</tr>
</tbody>
</table>
## Library Document/Supply

### INTERLIBRARY LOANS

<table>
<thead>
<tr>
<th>Location</th>
<th>Periodicals</th>
<th>Reports</th>
<th>Books</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Langley</td>
<td>8</td>
<td>5</td>
<td>24</td>
<td>37</td>
</tr>
<tr>
<td>Johnson</td>
<td>2</td>
<td>2</td>
<td>10</td>
<td>14</td>
</tr>
<tr>
<td>Lewis</td>
<td>13</td>
<td>5</td>
<td>7</td>
<td>25</td>
</tr>
<tr>
<td>Stennis</td>
<td>10</td>
<td>---</td>
<td>4</td>
<td>14</td>
</tr>
<tr>
<td>CASI</td>
<td>1</td>
<td>1</td>
<td>---</td>
<td>2</td>
</tr>
<tr>
<td>HQ</td>
<td>6</td>
<td>3</td>
<td>6</td>
<td>15</td>
</tr>
<tr>
<td>SSFPO</td>
<td>3</td>
<td>---</td>
<td>---</td>
<td>3</td>
</tr>
<tr>
<td>Kennedy</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Ames/Moffett</td>
<td>---</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Goddard</td>
<td>---</td>
<td>---</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Ames/Dryden</td>
<td>---</td>
<td>1</td>
<td>---</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>45</strong></td>
<td><strong>21</strong></td>
<td><strong>58</strong></td>
<td><strong>124</strong></td>
</tr>
</tbody>
</table>
NATURE OF THE LITERATURE

LONG LIFETIME

CITATION AGE

<table>
<thead>
<tr>
<th></th>
<th>5 YRS</th>
<th>6-10 YRS</th>
<th>&gt;10 YRS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value</td>
<td>43%</td>
<td>24%</td>
<td>33%</td>
</tr>
</tbody>
</table>
## Aerospace Literature Distribution vs. Utilization

<table>
<thead>
<tr>
<th>Literature Distribution</th>
<th>(%)</th>
<th>U.S.</th>
<th>Europe</th>
<th>USSR</th>
<th>OTHER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Literature Use - % Citations</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AIAA J</td>
<td>85</td>
<td>11</td>
<td>1</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>ZFW</td>
<td>41</td>
<td>52</td>
<td>1</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>RECHERCHE AEROSPATIALE</td>
<td>41</td>
<td>44</td>
<td>1</td>
<td>14</td>
<td></td>
</tr>
</tbody>
</table>
"To understand the process by which the results of NASA / DoD aerospace research diffuses into the aerospace R&D process"
NASA / DoD Aerospace Knowledge Diffusion Research Project

Assumptions

- Knowledge production, transfer, and utilization are equally important components of the aerospace R&D process

- Diffusion of knowledge resulting from NASA / DoD aerospace R&D is indispensable in maintaining the vitality and competitiveness of the U.S. aerospace industry

- The professional competency of U.S. aerospace engineers and scientists and their ability to be innovative and productive depends on a number of factors, but largely on their ability to acquire and process the results of NASA / DoD funded aerospace R&D
NASA / DoD Aerospace Knowledge Diffusion Research Project

4 Phase Project

1. Information seeking behavior of U.S. aerospace engineers and scientists
   - Self administered mail surveys
   - Members of the American Institute of Aeronautics and Astronautics (AIAA) and the Society of Automotive Engineers (SAE)

2. Industry and government: the information intermediary interface
   - Self administered mail surveys
   - Aeronautics, aerospace, and engineering libraries in government and industry with DoD and NASA technical report collections and U.S. government depository (state) libraries receiving NASA technical reports
NASA / DoD Aerospace Knowledge Diffusion Research Project

4 Phase Project

3. Academia and government: the academia faculty, students, and information intermediary interface
   - Self administered mail surveys
   - U.S. colleges and universities with University Space Research Association (USRA) capstone courses in aerospace departments

4. Information seeking behavior of non-U.S. aerospace engineers and scientists
   - Self administered mail surveys
   - Pilot studies in selected non-U.S. countries
U.S. Aerospace Knowledge Diffusion Process

Informal (Collateral)

Users
- Aerospace engineers
- Scientists and students

Information Intermediaries
- Librarians
- Gatekeepers
- Linking agents

Knowledge brokers

Producers
- DoD
- NASA
- DoD/NASA contractors & grantees

Surrogates
- DITC
- CAB
- DROLS
- CASI
- STAR
- RECON
- NTS
- GRA & I
- NTIS file

Formal
Project Status

The relative status of the four phases comprising the initial thrust of the project appears below. Status is stated in terms of definition, development, implementation, and analysis.

- **Planning**  Task is stated in terms of objectives to be accomplished and measurable outcomes; study group and sample frame identified; and feasibility and relative cost/difficulty established.

- **Development**  Task is planned and documented; questions formulated, reviewed, and pretested; questionnaires printed and transmittal letters prepared; samples selected and verified; and data collection and analysis established.

- **Implementation**  Task is undertaken; questionnaires are mailed, returned, and processed; and data are input, adjusted, and reduced.

- **Analysis**  Task is completed; data are analyzed, documented, and presented.
An Initial Investigation into the Production and Use of Scientific and Technical Information (STI) at Five NASA Centers: Results of a Telephone Survey

by

Nanci A. Glassman
and
Thomas E. Pinelli, Ph.D.

presented at the
NASA Johnson Space Center
Houston, Texas
Monday, October 21, 1991
Purpose

- To provide NASA management with an "initial" look at the production and use of scientific and technical information (STI)

- To provide NASA management with a "gross" assessment of the NASA STI system from the perspective of 5 NASA centers
Methodology

- Telephone interviews (surveys)

- 23 interrogatives
  - 3 open ended
  - 20 closed ended

- Survey pretested using NASA Langley personnel

- Sample frame (list) provided by STI contacts at 5 NASA centers

- Weighted sample drawn from each center’s list

- Only CS employees interviewed
Methodology

Sampling Variability Estimates

- With a total sample size of 550, we are 95 percent certain that any percentages in the report would be within ±4.05 percentage points (assuming a dichotomous question).

- Sampling error estimates for the five individual centers are as follows:

<table>
<thead>
<tr>
<th>Center</th>
<th>Population</th>
<th>Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ames Research Center</td>
<td>1186</td>
<td>±8.90%</td>
</tr>
<tr>
<td>Goddard Space Flight Center</td>
<td>2181</td>
<td>±9.10%</td>
</tr>
<tr>
<td>Langley Research Center</td>
<td>1414</td>
<td>±8.97%</td>
</tr>
<tr>
<td>Lewis Research Center</td>
<td>1583</td>
<td>±9.00%</td>
</tr>
<tr>
<td>Marshall Space Flight Center</td>
<td>2504</td>
<td>±9.15%</td>
</tr>
</tbody>
</table>
Methodology

Results of Phone Calls

1865 phone numbers were used in the process of obtaining 550 interviews. Most numbers were contacted 2 to 4 times.

Contacted / unusable numbers:

- 7 were disconnected phone lines
- 39 were wrong numbers
- 1 involved a language barrier
- 5 were no longer employed at that facility
- 36 were on vacation / travel
- 20 refused to participate
- 125 were contractors or clerical employees
- 550 completed interviews

783 contacted

Never contacted:

- 217 were unanswered phones each time we called
- 51 had busy signals each time we called
- 658 had voice mail / answering machines
- 156 could have been called at a later date / in meetings
- 1082 not contacted
### Methodology

**NASA Centers**

<table>
<thead>
<tr>
<th>Center</th>
<th>Weighted Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ames Research Center (California)</td>
<td>13.4%</td>
</tr>
<tr>
<td>Goddard Space Flight Center (Maryland)</td>
<td>24.6%</td>
</tr>
<tr>
<td>Langley Research Center (Virginia)</td>
<td>16.0%</td>
</tr>
<tr>
<td>Lewis Research Center (Ohio)</td>
<td>17.8%</td>
</tr>
<tr>
<td>Marshall Space Flight Center (Alabama)</td>
<td>28.2%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>

*(n = 550)*

Note: Originally, 110 people from each center were interviewed. As detailed in the methodology, this sample was balanced to raise each center's AST population to its correct proportion.
If you were to define what you do at work, would you say you are an engineer, a scientist, or something else?

<table>
<thead>
<tr>
<th>Role</th>
<th>Weighted Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineer</td>
<td>70.1%</td>
</tr>
<tr>
<td>Scientist</td>
<td>23.1%</td>
</tr>
<tr>
<td>Manager</td>
<td>3.8%</td>
</tr>
<tr>
<td>Technician</td>
<td>3.0%</td>
</tr>
</tbody>
</table>

100.0%

(n = 550)
Which of these categories best describes what you do at work?

<table>
<thead>
<tr>
<th>Role</th>
<th>Weighted Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>An individual researcher</td>
<td>25.7%</td>
</tr>
<tr>
<td>A member of a project team or group</td>
<td>37.1%</td>
</tr>
<tr>
<td>A technical manager or supervisor</td>
<td>20.1%</td>
</tr>
<tr>
<td>Engineering or research support staff</td>
<td>15.1%</td>
</tr>
<tr>
<td>Administrative support staff</td>
<td>1.9%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>

(n = 550)
If you could use only one term to characterize your area of work or the application of your work, would it be:

<table>
<thead>
<tr>
<th>Field</th>
<th>Weighted Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aeronautics</td>
<td>29.0%</td>
</tr>
<tr>
<td>Astronautics</td>
<td>8.0%</td>
</tr>
<tr>
<td>Engineering</td>
<td>30.8%</td>
</tr>
<tr>
<td>Space Sciences</td>
<td>20.8%</td>
</tr>
<tr>
<td>Chemistry and Materials</td>
<td>0.5%</td>
</tr>
<tr>
<td>Geosciences</td>
<td>3.1%</td>
</tr>
<tr>
<td>Mathematical and Computer Sciences</td>
<td>4.2%</td>
</tr>
<tr>
<td>Physics</td>
<td>1.7%</td>
</tr>
<tr>
<td>Social Sciences</td>
<td>1.7%</td>
</tr>
<tr>
<td>Life Sciences</td>
<td>0.4%</td>
</tr>
</tbody>
</table>

100.0%  
(n = 550)
What is the highest level of education you have completed?

<table>
<thead>
<tr>
<th>Degree Level</th>
<th>Weighted Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bachelors degree (or less)</td>
<td>45.3%</td>
</tr>
<tr>
<td>Masters degree</td>
<td>32.6%</td>
</tr>
<tr>
<td>Doctorate</td>
<td>22.1%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>

(n = 550)
<table>
<thead>
<tr>
<th>Gender</th>
<th>Weighted Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>91.3%</td>
</tr>
<tr>
<td>Female</td>
<td>8.7%</td>
</tr>
</tbody>
</table>

100.0%

(n = 550)
### How many total years of professional work experience (in aerospace) have you had?

<table>
<thead>
<tr>
<th>Work Experience</th>
<th>Total Years Work Experience</th>
<th>Weighted Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zero</td>
<td>0.0%</td>
<td></td>
</tr>
<tr>
<td>1 to 5 years</td>
<td>16.3%</td>
<td>21.0%</td>
</tr>
<tr>
<td>6 to 10 years</td>
<td>17.6%</td>
<td>18.7%</td>
</tr>
<tr>
<td>11 to 15 years</td>
<td>13.2%</td>
<td>9.5%</td>
</tr>
<tr>
<td>16 to 20 years</td>
<td>6.4%</td>
<td>5.3%</td>
</tr>
<tr>
<td>21 to 25 years</td>
<td>9.5%</td>
<td>7.6%</td>
</tr>
<tr>
<td>26 to 30 years</td>
<td>21.6%</td>
<td>21.8%</td>
</tr>
<tr>
<td>Over 30 years</td>
<td>15.4%</td>
<td>10.1%</td>
</tr>
<tr>
<td></td>
<td>100.0%</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

\( n = 550 \)
In your job, how important is it for you to publish scientific and technical information?

<table>
<thead>
<tr>
<th>Importance</th>
<th>Weighted Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very important</td>
<td>47.4%</td>
</tr>
<tr>
<td>Somewhat important</td>
<td>28.2%</td>
</tr>
<tr>
<td>Not important</td>
<td>24.3%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>

(n = 550)
When you need to obtain scientific or technical information, are you more likely to look first to people and resources within your center or to people and resources outside of your center?

<table>
<thead>
<tr>
<th></th>
<th>Weighted Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Within center</td>
<td>88.2%</td>
</tr>
<tr>
<td>Outside center</td>
<td>11.8%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>

*(n = 550)*
In your job, how important is it for you to use scientific and technical information?

<table>
<thead>
<tr>
<th>Importance Level</th>
<th>Weighted Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very important</td>
<td>80.6%</td>
</tr>
<tr>
<td>Somewhat important</td>
<td>17.5%</td>
</tr>
<tr>
<td>Not important</td>
<td>1.8%</td>
</tr>
</tbody>
</table>

100.0%

(n = 550)
In your job, how important is it for you to publish your work through the NASA STI system?

<table>
<thead>
<tr>
<th>Importance</th>
<th>Weighted Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very important</td>
<td>21.6%</td>
</tr>
<tr>
<td>Somewhat important</td>
<td>33.6%</td>
</tr>
<tr>
<td>Not important</td>
<td>44.8%</td>
</tr>
<tr>
<td></td>
<td>100.0%</td>
</tr>
</tbody>
</table>

(n = 550)
Have you encountered any problems using the NASA STI system services when you publish?

<table>
<thead>
<tr>
<th>Response</th>
<th>Weighted Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>9.9%</td>
</tr>
<tr>
<td>No</td>
<td>61.9%</td>
</tr>
<tr>
<td>I don’t know / never used</td>
<td>28.1%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>

(n = 550)
What problems have you experienced when using the NASA STI system services when you publish?

<table>
<thead>
<tr>
<th>Issue</th>
<th>Weighted Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Encountered no problems</td>
<td>90.0%</td>
</tr>
<tr>
<td>Process too time consuming</td>
<td>8.6%</td>
</tr>
<tr>
<td>Other</td>
<td>1.4%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>

(n = 550)
How would you evaluate the overall NASA STI system in terms of supporting you when you publish your work?

<table>
<thead>
<tr>
<th>Rating</th>
<th>Weighted Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellent</td>
<td>24.6%</td>
</tr>
<tr>
<td>Good</td>
<td>37.6%</td>
</tr>
<tr>
<td>Fair</td>
<td>8.2%</td>
</tr>
<tr>
<td>Poor</td>
<td>2.0%</td>
</tr>
<tr>
<td>I don’t know / never used</td>
<td>27.6%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>

*(n = 550)*
To perform your job, how important is it for you to use the NASA STI system?

<table>
<thead>
<tr>
<th>Importance</th>
<th>Weighted Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very important</td>
<td>36.6%</td>
</tr>
<tr>
<td>Somewhat important</td>
<td>42.5%</td>
</tr>
<tr>
<td>Not important</td>
<td>20.9%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100.0%</strong></td>
</tr>
<tr>
<td><em>(n = 550)</em></td>
<td></td>
</tr>
</tbody>
</table>
How many total times per month do you use any product or service included in the NASA STI system?

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Weighted Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all</td>
<td>16.3%</td>
</tr>
<tr>
<td>Less than once a month</td>
<td>8.8%</td>
</tr>
<tr>
<td>Once a month</td>
<td>25.6%</td>
</tr>
<tr>
<td>Twice a month</td>
<td>14.9%</td>
</tr>
<tr>
<td>Three to four times a month</td>
<td>15.8%</td>
</tr>
<tr>
<td>Five to ten times a month</td>
<td>13.9%</td>
</tr>
<tr>
<td>Over ten times a month</td>
<td>4.7%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>

(n = 550)

Mean = 3.1 times / month

Median = 1.0 time / month
I noticed that you're not a frequent user of the NASA STI system products and services. Why is that?

<table>
<thead>
<tr>
<th>Reason</th>
<th>Weighted Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not part of my job responsibilities</td>
<td>33.4%</td>
</tr>
<tr>
<td>Had no need to use the NASA STI system</td>
<td>23.9%</td>
</tr>
<tr>
<td>Information I need is in my office</td>
<td>13.2%</td>
</tr>
<tr>
<td>Not familiar with the system</td>
<td>6.3%</td>
</tr>
<tr>
<td>Do my own typing, graphics, etc.</td>
<td>5.0%</td>
</tr>
<tr>
<td>Use my own computer for searches</td>
<td>4.4%</td>
</tr>
<tr>
<td>Prefer outside sources</td>
<td>3.2%</td>
</tr>
<tr>
<td>Other</td>
<td>8.6%</td>
</tr>
<tr>
<td></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>

(n = 279, rather than 550)
Have you encountered problems using the NASA STI system when you need to access information?

<table>
<thead>
<tr>
<th></th>
<th>Weighted Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>24.6%</td>
</tr>
<tr>
<td>No</td>
<td>68.5%</td>
</tr>
<tr>
<td>I don’t know / don’t use</td>
<td>6.9%</td>
</tr>
</tbody>
</table>

100.0%

(n = 550)
<table>
<thead>
<tr>
<th>Issue</th>
<th>Weighted Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Encountered no problems</td>
<td>75.0%</td>
</tr>
<tr>
<td>Too much time and effort to locate</td>
<td>8.0%</td>
</tr>
<tr>
<td>Too much time and effort to obtain</td>
<td>6.4%</td>
</tr>
<tr>
<td>System not accurate / precise / reliable</td>
<td>4.1%</td>
</tr>
<tr>
<td>Information not available through system</td>
<td>2.4%</td>
</tr>
<tr>
<td>Database not extensive enough</td>
<td>2.1%</td>
</tr>
<tr>
<td>Information too hard to read / use</td>
<td>2.0%</td>
</tr>
<tr>
<td>Abstracts / key word bad</td>
<td>1.7%</td>
</tr>
<tr>
<td>Other</td>
<td>0.4%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100.0%</strong></td>
</tr>
<tr>
<td><em>(n = 550)</em></td>
<td></td>
</tr>
</tbody>
</table>
Overall, how important is this NASA STI system (I just described) to you?

<table>
<thead>
<tr>
<th>Importance</th>
<th>Weighted Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very important</td>
<td>47.5%</td>
</tr>
<tr>
<td>Somewhat important</td>
<td>35.8%</td>
</tr>
<tr>
<td>Not important</td>
<td>16.8%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>

\( n = 550 \)
How would you evaluate the overall NASA STI system in terms of meeting your information needs?

<table>
<thead>
<tr>
<th>Rating</th>
<th>Weighted Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellent</td>
<td>28.2%</td>
</tr>
<tr>
<td>Good</td>
<td>54.4%</td>
</tr>
<tr>
<td>Fair</td>
<td>9.1%</td>
</tr>
<tr>
<td>Poor</td>
<td>1.6%</td>
</tr>
<tr>
<td>I don’t know / don’t use</td>
<td>6.7%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100.0%</strong></td>
</tr>
<tr>
<td><em>(n = 550)</em></td>
<td></td>
</tr>
</tbody>
</table>
Conclusions

- The NASA STI system is used and is important
- The NASA STI system meets the users' information needs
- Problems - production
  - 90% encountered no problems
  - Process is too time consuming (9.0%)
- Problems - access
  - 75% encountered no problems
  - Too much time/effort to locate/obtain information (14.4%)
- Interesting difference between the 5 NASA centers and certain demographics
This year's combined Reference Transactions, Literature Searches, and Collaborations highlight interests in the following areas:

**Earth & Space Sciences**
- Upper Atmosphere
- Meteorology and Climate
- Geophysics & Geodesy
- Crustal Dynamics
- Biospheric Sciences
- Hydrology
- Astronomy & Astrophysics
- Solar Physics
- Planetary Systems
- Stellar & Galactic Media

**Engineering**
- Sensor Development
- Instrumentation
- Standards & Calibration
- Reliability/Assurance
- Payload Engineering
- Electromechanics
- Robotics
- Mission Operations
- Cryogenics
- Materials

**Management**
- TQM
- Participative Management
- Team Building
- End-to-End Project Management
- The Individual in the Organization
- Cross-generational and Intergender Communication
- Demographics and the Workplace

**Data Operations & Information Management Series**
- Data Archiving
- Information Systems
- Software Engineering
- Systems Engineering
THE KEY USERS AND THE GODDARD LIBRARY SERVICES

WHO ARE THE USERS?

EMPLOYMENT STATUS -
Government
Contractors
NRC/NAS Research Associates
Co-Op Students
Other

GRADE DISTRIBUTION -
GS-10 to 16

AGE CLUSTER -
25 - 55

PROFESSIONAL CATEGORY -
Scientists
Engineers
Managers

RANGE OF DISCIPLINES -
Earth & Space Sciences
Engineering
Data Operations & Information Management
Institutional and Project Management
WHY THEY USE THE LIBRARY -

To locate a specific reference or fact
To explore a topic
To update information on a recurring topic
To browse new materials
To seek help in any of the above

PREFERRED METHOD OF SEEKING INFORMATION -

Computer Data Bases
"Old card catalog" style - microfiche or book KWOC format
Browse "Topical Neighborhoods" in the stacks
Solicit aid in any of the above

WHAT THEY WANT THAT WE PROVIDE -

Long Questions - 15 to 60 minutes
Obscure References
Source rather than bibliographic information

Research Questions
Project Assistance
Conference Support
Information Package

In Print
On Line
Referral Services
orientation to Library Services and Public OnLine Catalogs
CD-ROM Data Bases
WHAT THEY LIKE MOST -

ARIN

250+ registrants for remote access

Book & Journal Collection

CD-ROM Data Bases

CASI Microfiche

AIAA Papers

WHAT THEY USE LEAST -

Literature Search Update

SCAN

WHAT USERS WANT THAT WE DON'T PROVIDE -

Journal article location through ARIN

ISI

Easy RECON on CD-ROM

A more comprehensive RECON

Electronic Transmission of Search Results

Optical scanning capability
The STI Council User Studies
Preliminary Findings

K. Ostergaard
25 October 1991
The STI Council User Studies

Outline

- Background
- Preliminary Findings
- Preliminary Conclusions
Background
The STI Council User Studies

Objectives

- At a gross level, develop a statistical profile of STI Program use (STI Products and Services Usage Evaluation)
- On an individual basis, collect up-to-date information on current and potential users and their STI needs (STI User Requirements Update)
The STI Council User Studies

Approach

- Develop a usage baseline starting with 1990 CASI statistics
- Supplement this baseline with user and usage information provided by the Center STI Staff and, if possible, the Center Personnel Offices
- Survey a sample of the baseline representing the proportional use of the STI Program across all Centers and emphasizing "high-volume" users
- Also, survey potential/non-users at each Center
Preliminary Findings
The STI Council User Studies

Preliminary findings are based on:

- A 15 September '91 CASI statistical report for 1990 that is currently undergoing expansion and enhancement
- A recent poll of STI Managers and their staff at each of the Centers
1990 Summary Statistics
Hardcopy and Microfiche
Distributed

<table>
<thead>
<tr>
<th>Agency</th>
<th>Hardcopy</th>
<th>Microfiche</th>
</tr>
</thead>
<tbody>
<tr>
<td>GSFC</td>
<td>16%</td>
<td></td>
</tr>
<tr>
<td>ARC</td>
<td>15%</td>
<td></td>
</tr>
<tr>
<td>LaRC</td>
<td>14%</td>
<td></td>
</tr>
<tr>
<td>HQS</td>
<td>12%</td>
<td></td>
</tr>
<tr>
<td>LeRC</td>
<td>10%</td>
<td></td>
</tr>
<tr>
<td>MSFC</td>
<td>9%</td>
<td></td>
</tr>
<tr>
<td>JSC</td>
<td>8%</td>
<td></td>
</tr>
<tr>
<td>JPL</td>
<td>8%</td>
<td></td>
</tr>
<tr>
<td>KSC</td>
<td>7%</td>
<td></td>
</tr>
<tr>
<td>SSC</td>
<td>2%</td>
<td></td>
</tr>
</tbody>
</table>
1990 Summary Statistics
RECON Commands Executed

<table>
<thead>
<tr>
<th>Institution</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>LaRC</td>
<td>20%</td>
</tr>
<tr>
<td>LeRC</td>
<td>16%</td>
</tr>
<tr>
<td>ARC</td>
<td>16%</td>
</tr>
<tr>
<td>JSC</td>
<td>13%</td>
</tr>
<tr>
<td>MSFC</td>
<td>11%</td>
</tr>
<tr>
<td>GSFC</td>
<td>9%</td>
</tr>
<tr>
<td>HQS</td>
<td>7%</td>
</tr>
<tr>
<td>JPL</td>
<td>4%</td>
</tr>
<tr>
<td>SSC</td>
<td>3%</td>
</tr>
<tr>
<td>KSC</td>
<td>1%</td>
</tr>
</tbody>
</table>
1990 Summary Statistics
Breakdown of RECON "Browse" Commands

- ARC: 37%
- JSC: 15%
- LaRC: 11%
- LeRC: 10%
- SSC: 9%
- MSFC: 7%
- HQS: 5%
- GSFC: 5%
- KSC: 1%
- JPL: 0%
1990 Summary Statistics
Breakdown of RECON "Expand" Commands

![Graph showing percentage distribution of RECON commands by institution.]

- LeRC: 37%
- LaRC: 15%
- JSC: 10%
- MSFC: 7%
- GSFC: 11%
- ARC: 9%
- JPL: 5%
- HQS: 5%
- KSC: 1%
- SSC: 0%
1990 Summary Statistics
Breakdown of RECON "Select" Commands

The bar chart shows the percentage of "Select" commands from different locations:
- LaRC: 25%
- LeRC: 17%
- MSFC: 12%
- JSC: 10%
- ARC: 10%
- GSFC: 9%
- HQS: 8%
- JPL: 5%
- KSC: 1%
- SSC: 1%
1990 Summary Statistics
Breakdown of RECON "Order" Commands

- LeRC: 26%
- LaRC: 16%
- JSC: 12%
- MSFC: 9%
- GSFC: 9%
- HQS: 9%
- ARC: 8%
- SSC: 7%
- JPL: 1%
- KSC: 1%
1990 Summary Statistics
Breakdown of RECON
"Browse" Commands*

* Normalized ARC "Browse" Statistics
1990 Summary Statistics
RECON Commands Executed*

* Normalized ARC "Browse" Statistics
The 1990 Usage Baseline

Caveats on Interpretation

- Totals include initial distribution
- Offsite NASA contractor use is not reflected
- Use of CASI support is uneven across the Centers, e.g., some Centers do their own photocopy and microfiche blowback while others solicit CASI support
- RECON IDs are routinely reassigned and statistics prior to the reassignment are not included in totals
The Center STI Staff Poll

Summary of Results

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No/ Not Sure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimate total users?</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>Identify most active users?</td>
<td>75%</td>
<td>25%</td>
</tr>
<tr>
<td>Identify less active users?</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>Maintain usage records?</td>
<td>63%</td>
<td>37%</td>
</tr>
</tbody>
</table>

A total of 8 Centers are represented
Preliminary Conclusions
The STI Council User Studies

Preliminary Conclusions

- Representative sampling based on usage patterns is not feasible given our current state of knowledge
- Statistical information on the provision of Center specific products and services is needed to augment the current baseline
- Descriptive information on Center specific STI policies, search and service modes is needed to refine our interpretation of the baseline
- The Program needs to establish a methodology for monitoring our total user population over time