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Scientific and Technical Information (STI) Policy and the Competitive Position of the U.S. Aerospace Industry

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SCIENTIFIC AND TECHNICAL INFORMATION (STI) POLICY AND THE COMPETITIVE POSITION OF THE U.S. AEROSPACE INDUSTRY

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Abstract

With its contribution to trade, its coupling with national security, and its symbolism of U.S. technological strength, the U.S. aerospace industry holds a unique position in the Nation's industrial structure. Federal science and technology policy and Federal scientific and technical information (STI) policy loom important as strategic contributors to the U.S. aerospace industry's leading competitive position. However, three fundamental policy problems exist. First, the United States lacks a coherent STI policy and a unified approach to the development of such a policy. Second, policymakers fail to understand the relationship of STI to science and technology policy. Third, STI is treated as a part of general information policy, without any recognition of its uniqueness. This paper provides an overview of the Federal information policy structure as it relates to STI and frames the policy issues that require resolution.

Introduction

Information policy, a field encompassing information science and public policy, treats information as both a commodity and a resource to be collected, protected, shared, manipulated, and managed. Although the literature often refers to information policy in the singular, there is no single all encompassing policy. Rather, information **policies** address specific issues and, as a rule, remain fragmented, overlapping, uncoordinated, and contradictory. In fact, from the 95th through the 100th Congresses (1977 through 1988), more than 300 public laws dealing with information policy were enacted.[1] In addition, many authorization and appropriations bills contained provisions that directed agency information policy activities. Furthermore, numerous administrative rules and regulations were proposed and implemented during this time period.

Information policy is defined as a set of interrelated principles, laws, guidelines, rules, regulations, and procedures guiding the oversight and management of the information **life cycle**: the production, collection, distribution and dissemination, retrieval, use and access, and retirement of information. This definition underscores that information resources, like other **commodities**, require planning and management.

The United States has historically adopted a decentralized approach to Federal scientific and technical information (STI) policy, and

> has addressed STI in response to broader policy concerns surrounding the Nation's research and development (R&D) endeavor, access to government information, U.S. national security, and the competitiveness of U.S. industries.[2]

Rosenbaum has characterized the overall STI infrastructure of the United States as being competitive (driven by demands of marketplace), lacking long range planning, and having weak government involvement.[3] Clearly, STI policy in the United States is the stepchild of economic, industrial, science, and technology policies, intermixed with some application of information resources management (IRM). And so, Solomon and Tornatzky point out, "while STI, its transfer and utilization, is crucial to innovation [and competitiveness], linkages between [the] various sectors of the technology infrastructure are weak and/or poorly defined."[4]

Three acts of Congress, one executive order, and one OMB circular have shaped the legislative and regulatory environment for Federal STI policy:

- Stevenson Wydler Technology Innovation Act of 1980 (P.L. 96-480)
- Federal Technology Transfer Act of 1986 (P.L 99-502)
- Japanese Technical Literature Act of 1986 (P.L. 99-382)
- Executive Order 12591, "Facilitating Access to Science and Technology" (April 10, 1987)
- Circular A-130.[5]

Excluding A-130, the intent of these policy instruments is to: (1) develop a predominant position for the United States in international markets by facilitating the transfer of technology from government laboratories to the private sector, and (2) provide the inducements for government engineers and scientists to nurture the transfer process. In addition, some of these instruments provide a mechanism for the collection and dissemination of foreign scientific and technological information in the United States.

The Stevenson-Wydler Act promotes the development of domestic technology and stimulates improved utilization of Federally funded technology by state and local governments and the private sector. The Federal Technology Transfer Act, which amended the above-mentioned act, directs all Federal agencies to authorize their government-owned and operated laboratories to enter into cooperative research and development (R&D) agreements with universities and the private sector. Among its other provisions, the Act mandates agencies to pay at least 15 percent of the royalties from inventions made at the laboratories to the inventor(s).

The Japanese Technical Literature Act underscores the importance of technical reports produced in other countries, especially those that are major competitors of U.S. business and industry. The 1987 Executive Order provides for an exchange program for engineers and scientists between the private sector and Federal laboratories.

Since the implementation of Circular A-130 in 1985, the Office of Management and Budget (OMB) has not distinguished between types of information or information policies. In effect, OMB ruled that Federal STI policy does not exhibit any unique characteristics calling for the development and implementation of a separate policy framework. Like other types of information, STI, according to OMB, conforms to the information life cycle. The circular also focuses on paperwork reduction or controlling aspects of information creation and production, but gives inadequate attention to information dissemination and use, and IRM.

Economic Competitiveness Versus Restricting Scientific Communication

"Discussions of U.S. competitiveness typically are dominated by the international economic dimension"[6] and "by increasing innovative capacity," or "bringing the benefits of new technology more quickly and broadly to ... [the Nation's] manufacturing firms."[7] Other nations have assumed more of a leadership position in the development of standards among third world countries in the belief that their capital investment will expand trade and economic opportunities. Economic competitiveness, therefore, underscores the necessity of having a supportive infrastructure, one that has not yet emerged within the United States.

As U.S. high technology industries have lost world market shares, trade deficits have increased. The Congress and the various administrations have sought ways to increase the competitive position of the country. President Reagan, for example, established a commission on industrial competitiveness. Congress, for example, has pursued economic competitiveness through the Omnibus Trade and Competitiveness Act of 1988 (P.L. 100-418). Two purposes of competitiveness for Congress are to "ensure that the government sponsors research that industry can use" and "that industry does use that research."[8]

As the ability of the United States to compete in international markets declined, American business "pressed for relief from [the adoption of] stringent export controls."[9] The dramatic and historical changes taking place in the Soviet Union and Eastern Europe have resulted in some softening of regulatory power as exercised through national security and export controls. As seen in discussions over reauthorization of the Export Administrative bill (S. 320), there is bipartisan support in Congress to limit enforcement to "the most sensitive high tech exports,"[10] or those relating to the production, transportation, and use of chemical and biological weapons; the release of trade secrets; or the advancement of terrorism.

Quantity, Quality, Use, and Impact of Information

Nobody knows how many publications and other information resources the Federal government produces annually. Clues as to the amount produced come from the fact that from 1981 through 1990, the Government Printing Office (GPO) distributed over 500,000 titles to depository libraries, a sizable percentage of which, according to GPO claims, comprise STI. NTIS collects over 45,000 titles annually, many of which are government supported information resources. The National Aeronautics and Space Administration (NASA), as well as other R&D agencies, generates additional publications, not all of which are unclassified and publicly available. These agencies release (or could do so) vast amounts of data and information in CD-ROM and electronic format.

"Over 200,000 new technical documents are generated each year as a result of Federal R&D, adding to the base of an estimated 4 million documents." Furthermore, "satellite data and imagery are contributing to an STI explosion in the space and earth sciences."[11] Clearly, "the sheer volume of Federal STI, along with the balancing of free flow and limitations on the use of Federal STI, ... set it apart from other types of Federal information."[12] That volume, especially the portion produced in electronic form, underscores the importance of electronic technologies to the practice of information resources management and to the creation and maintenance of mechanisms for the dissemination of STI.

The production and availability of data and information do not necessarily result in their use, or guarantee an improved competitive position for the United States. This information varies significantly in technical quality, completeness, utility, presentation, and accessibility. Information providers and intermediaries serving different missions, goals, and clientele, facilitate the transfer of this information. Currently however, these segments overlap and provide services of varying quality, completeness, and utility.

Because engineers and scientists might already be "drowning" in too much information and data,[13] they might not negotiate the information environment (information providers and intermediaries) to select high quality and useful information. Most likely if they need information not readily available to them and if they do not suffer from the "not invented here" syndrome, they turn to an interpersonal source (e.g., a colleague) while attempting to avoid an **information overload** (for a given information need, too much information is available and at their immediate disposal).

As this paper suggests, some government agencies and policy instruments are beginning to focus more on dissemination than on production; however, the relationship of use and impact to dissemination is not fully understood and reflected in policy instruments. Despite this shift, economic issues, including cost containment, may be the driving force behind dissemination activities. In some instances, agencies view dissemination as a means for generating revenue. Some view dissemination as an after thought.

Government policy tends not to address the issue of information quality. Quality is more of a user issue, one which affects where people turn for information, what they expect, and what they are willing to accept and pay. With increased attention to dissemination, use and impact become more important policy concerns, ones that may ultimately be measured in terms of cost-effectiveness and cost-benefit.

Within this context, Lawrence H. Thompson of the General Accounting Office raised the question of whether the public is receiving its "money's worth from the Federal government" and, by extension, its publicly generated information. He encouraged agencies to define **service quality** as "meeting the public's expectations." The challenge, as Thompson noted, "is to meet the rising demands for public services in the environment of continual revenue shortages." In effect, he advocated the adoption of performance measures as a means for holding agencies accountable.[14]

<u>Actors Within Government</u>

According to Senator Gore, information providers and safety nets, or the actors within government, will have to shift even more attention more to dissemination and use. The reason is that

> our current national information policy resembles the worst aspects of our old agricultural policy, which left grain rotting in thousands of storage silos while people were starving. We have warehouses of unused information 'rotting', while critical questions are left unanswered and critical problems are left unsolved. For example, the Landsat satellite is capable of taking a complete photograph of the entire earth's surface every two weeks. It has been operating for nearly 20 years. Yet more than 95 percent of those images, which might be invaluable to farmers, environmental scientists, geologists, educators, city planners and business, have never been seen by human eyes.[15]

His solution to the problem is the use of supercomputers to search these silos and get the grain (or information) to those in need. Presumably the supercomputers will have to separate quantity of information on a topic from quality of information. A further presumption is that end users can understand, process, and correctly interpret the information provided to them.

Analogous to the silos are the numerous information safety nets and providers operating within and outside government. For example, there are different clearinghouses, information analysis centers, laboratories, agency reading rooms, and depository library programs. The National Technical Information Service (NTIS), a clearinghouse operated by the Department of Commerce, fulfills an important role. Hampering its effectiveness, however, is a lack of awareness within the agency about the information needs and information seeking behavior of potential clientele. NTIS responds, more than anticipates, information needs. For these and other reasons, NTIS remains a secondary actor in the broader dissemination of STI throughout the Nation. The GPO, with its sales and depository library programs, also performs an important but limited role.

The Office of Science and Technology Policy (OSTP) within the White House has abdicated a leadership role concerning the nation's science and technology infrastructure.[16] The National Science Foundation

(NSF), although supporting some important studies, has not filled the leadership void. Perhaps with enactment and funding of the National Research and Education Network (NREN), the NSF might become a more active participant in STI policy formulation and review. At present, OMB is the predominant player because it sets general policies having governmentwide implications.

Aerospace Industry

Although the U.S. aerospace industry continues to be the leading positive contributor to the balance of trade among all merchandise industries, it is experiencing significant changes whose implications may not be well understood.[17] Increasing U.S. collaboration with foreign producers is creating in a more international manufacturing environment, altering the current structure of the aerospace industry. International alliances will result in a more rapid diffusion of technology and place increased pressure on U.S. aerospace companies to push forward with new technological developments and to incorporate them into the R&D process.

To remain a world leader in aerospace, the United States must improve and maintain the professional competency of U.S. aerospace engineers and scientists, enhance innovation and productivity, and maximize the inclusion of new technological developments into R&D. How well these objective are met, and at what cost, depends on a variety of factors, but largely on the ability of U.S. aerospace engineers and scientists to acquire and process the results of NASA and Department of Defense (DoD) funded R&D.

The ability of aerospace engineers and scientists to identify, acquire, and utilize scientific and technical information is of paramount importance to the efficiency of the R&D process. Testimony to the central role of STI in the R&D process is found in numerous studies, which show, among other things, that aerospace engineers and scientists devote more time, on the average, to the communication of technical information than to any other scientific or technical activity.[18] A number of studies have found strong relationships between the communication of STI and technical performance at both the individual[19] and group levels.[20] Clearly, effectively communicating STI is central to the success of the innovation process and the management of R&D activities.[21]

Linking STI and Technology Policy in the Aerospace Industry

According to Mowery and Rosenberg,

> judged against almost any criterion of performance – growth in output, exports, productivity, or innovation – the U.S. aerospace industry, in particular the commercial aviation sector, must be considered a star performer in the American economy.[22]

"Total factor productivity in this [the commercial aviation sector of the] industry has grown more rapidly than in virtually any other U.S. industry during the postwar period."[23] In 1991, the U.S. aerospace industry continues to be the leading positive contributor to the balance of trade among all merchandise industries.[24] Along with its performance record, this industry, in particular the commercial aviation sector, presents important anomalies in structure and conduct that make it worthy of investigation from the standpoint of enhancing innovation and productivity and of understanding the innovation process. These anomalies include the factors that influence the rate and direction of innovation, the diffusion of Federally funded aerospace R&D, and Federal involvement in supporting civilian R&D.

Unique Characteristics

The U.S. aerospace industry exhibits certain characteristics that make it unique among other industries. First, the U.S. aerospace sector leads all other industries in R&D expenditures. Total R&D expenditures on U.S. aerospace projects reached $25 billion in 1988.[25] Second, the U.S. aerospace industry has benefited as a technological "borrower" from developments in industries such as metallurgy, materials, chemicals, and petroleum.[26] Third, the aerospace industry, in particular the commercial aviation sector, has a high degree of systematic complexity embodied in its products. Consequently, a substantial element of technological and marketplace uncertainty exists in the design and development of each product. Aerospace companies have thus pursued production and design strategies aimed at insulating themselves from the adverse consequences of such uncertainty.[27]

Finally, the U.S. aerospace industry has been the beneficiary of Federally funded R&D for nearly a century. According to Mowery,

> 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 aviation sector research on airframe and propulsion technologies.[28]

The commercial aviation sector has also benefited from considerable investment, in terms of research and procurement, by the Department of Defense. Mowery further states that:

> 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.[29]

Implications for Federally Funded Civilian R&D

By and large, the Federal government's attempts to intervene in the innovation process have been unsuccessful, for example, initiatives such as the Cooperative Automative Research Program (CARP)[30]. Numerous reasons have been advanced for the failures of civilian technology programs. Averch suggests that the failure of these initiatives lies with the application of an "engineering strategy" approach to the solution of broad economic and social problems, such as declining productivity.[31] Logsdon maintains that the failure of such programs is due to government's "direct involvement" in the marketplace. The implication is that direct government involvement in economic affairs should be minimal.[32] Mowery believes that the failure of these programs is attributable to the application of an inappropriate theoretical economic framework, one that ignores or does not account for the effective transmission and utilization of complex research results and technological information.[33] In particular, these programs ignored the abilities and limitations of organizations engaged in innovation to exploit extramural research, thus ignoring the relationship among knowledge production, transfer, and utilization; these are three equally important components of the innovation process. Mowery further states:

> This theoretical [economic] framework focuses primarily on the putative undersupply of research and bases its recommendations for policy on this market failure. However, for policy purposes, the distribution and utilization of the results of research and development are crucial. An exclusive focus on the R&D support policies of the Federal government, without some cognizance of the substantial diffusion support component of the policy structure, yields conclusions that differ substantially from those of an analysis that attempts to incorporate both the technology supply and technology adoption incentives operating within the overall policy framework.[34]

What reasons account for the apparent success of the Federal government's attempts to intervene in aerospace R&D? Scholars have cited both the NACA and NASA as models for Federal involvement in civilian R&D and precommercial research cooperation between industry and government.[35] According to Mowery, "government policy in the aircraft industry not only supported precommercial research in civilian and military aircraft technologies, but it also has played a major role in supporting the diffusion of the results of that research."[36] A retrospective look indicates that the government has played a significant role in both the "supply-push" and the "demand-pull" side of the aerospace knowledge diffusion process.[37]

Supply-Push

The use of Federal policy to supply and push aerospace knowledge began with the creation of the NACA. Throughout its history, the agency has been described as

> arguably the most important and productive aeronautical research establishment in the world. Between its creation in 1915 and its demise in 1958, the NACA published more than 16,000 technical reports which were sought after and exploited by aeronautical engineers [and scientists] throughout the U.S. and abroad.[38]

Many of these reports are classics in the field of aerodynamics and aeronautics and are still used and referenced; the data contained in these reports are essential to understanding the fundamentals of aeronautical research and design.[39] Additionally, the NACA maintained an "intelligence" office in Paris for the specific purpose of collecting, evaluating, translating, and disseminating the results of foreign aeronautical research to U.S. academic, government, and industry users.

The DoD has aided the use of Federal policy to supply and push aeronautics knowledge. Research supported by the department has yielded indirect, but very important, innovative spillovers to the commercial aircraft sector of the U.S. aerospace industry, most notably in the areas of airframe development, aircraft propulsion, avionics, and flight control systems. The demands of the military for performance pushed the development and early application of many technologies. The military supported jet engine development, provided continued support for the development of specific military engines whose cores were adapted for commercial use, and provided the test-beds for the technological development of early commercial jet aircraft.[40]

Demand-Pull

Federal regulatory policy also affects the demand for knowledge by the commercial aviation industry.

Passage of the Kelly Air Mail Act of 1925 (43 Stat. 805) transferred responsibility for airmail transport from the Post Office to private contractors. The contractors, who were paid on a weight basis, bid on the various routes. Between 1925 and 1930, Congress also reduced airmail rates, creating a substantial increase in airmail volume. Reflecting the growth of the airmail market, the commercial aircraft industry responded by producing aircraft, such as the Boeing 40, that were designed for long-haul cargo transport.

The McNary-Watres Act of 1930 (46 Stat. 259) changed the method of payment for carrying airmail from a weight basis to a space-mile (seat) basis. Carriers, therefore, could derive a greater portion of their revenues from passenger transportation. Additionally, this Act authorized incentive payments for carriers which used multi-engine aircraft, radios, and other navigational aids. The Act, which had the effect of developing a small number of financially strong transcontinental carriers, coincided with the rapid growth of air passenger traffic. The commercial aircraft industry responded with the design of long-haul passenger transports.

Congress created the Civil Aeronautics Board (CAB) in 1938, giving it the power to issue operating certificates, oversee airline fares, control pricing policies, and determine entry to and exit from commercial air transportation. Multiple carriers, operating in a market where entry was controlled and price competition was prohibited, gave rise to a high level of service-quality competition. Acting on the belief that the rapid introduction of state-of-the-art aircraft was an effective marketing strategy, the major air carriers quickly adopted new aircraft designs. The drive to be the first with a new design motivated the major airlines to make early purchase commitments to airframe manufacturers as a means of obtaining the earliest possible delivery. Service-quality competition, thus, fostered rapid diffusion and adoption of innovations that drew upon Federally funded research results. This same situation initiated fierce competition among airframe manufacturers, especially for aircraft that would capture the largest single markets, the transcontinental and transatlantic routes. Little or no attention was paid to the development of aircraft for short-range and low-density routes.[41]

Recent Federal regulatory policy, in the form of domestic airline deregulation, has disrupted the supply-push and demand-pull knowledge production, transfer, and utilization equation by fundamentally shifting the primary axis of competition from service and quality to price. Price competition has had the net effect of pressuring both the airlines and the airframe manufacturers to cut costs; it has also lessened the need for and the adoption of innovations. As a result, many airlines have postponed or delayed purchase decisions and continue using existing aircraft.[42]

Airline deregulation has also affected route structure and subsequently altered fleet needs. Deregulation has replaced a point-to-point emphasis with a hub-to-spoke strategy that promotes short-range and low-density routes. Deregulation has also produced a mismatch between the existing fleets of larger, wide-body aircraft and the need for smaller commuter aircraft. CAB policies, which emphasized long-haul, point-to-point service, restricted the need for short-haul aircraft and, hence, their production by U.S. manufacturers. Their development was confined largely to Europe and Canada. One outcome of domestic airline deregulation has been the creation of a commuter airline market and the need for commuter aircraft. The rapid growth of this market has benefited European, Canadian, and other foreign producers of these aircraft.[43]

Government Influence on Information Processing

The government has become both a performer and a dominant purchaser of aerospace R&D. From a policy perspective, the aerospace industry is a main performer of Federal R&D and the academic community is a main performer of basic research. The government's support of R&D involves contractual relationships among the Federal government, the aerospace industry, and academe.[44]

These relationships, in and of themselves, contribute to the transmission and utilization of knowledge resulting from Federally funded aerospace R&D. The transfer of knowledge is also aided by cooperative projects between government and industry, the exchange of personnel, jointly sponsored workshops and conferences, and the use of government facilities by academe and industry. Additionally, both NASA and DoD maintain scientific and technical information systems for acquiring, processing, announcing, publishing, and transferring the results of government-performed and government-sponsored research. Within both the NASA and DoD STI systems, the U.S. government technical report is the primary means of transferring the research results to the aerospace community.[45]

Policy Framework Undergoing Change

Since 1989, Congress and the White House have failed to agree on reauthorization of the Paperwork Reduction Act, which was first enacted in 1980 (P.L. 96-511). If new legislation is not enacted, Congress should consider the information dissemination provisions as separate legislation; the provisions might offer a clearer definition of a government publication as a subset of electronic information. Congress might distinguish between products and services, or else give agencies greater discretion to decide which services to include within GPO's depository library program. Clearly, cost will be a significant determinant for what electronic services libraries receive and for what the GPO can afford to distribute. As an alternative to reauthorization of the Paperwork Reduction Act and passage of information dissemination legislation, Congress might let Circular A-130, in its present or altered form, remain as the de facto governmentwide information policy.

In March 1991, OMB announced its plans to issue a replacement circular for A-130 covering electronic information dissemination. To date, OMB has not released a draft of that replacement. Circular A-130 is exceedingly important now that more government agencies and officials are focusing on dissemination issues. For example, for the Environmental Protection Agency, the placement of government data into the public's hands has become a major senior management concern.[46]

One important question is "To what extent does a general policy on information dissemination, i.e., A-130 or its replacement, serve as a substitute for the creation of an overall strategy on the dissemination of STI?" After all, dissemination is more than merely "physical distribution;" it

> includes mass marketing and targeting of specific audiences, often through value-added processes, e.g., abstracting and indexing. It, therefore, appears that governmental commitment to a policy forbidding adding value to Federal information products denies one of the major tenets of IRM and of governmental function. This conflict must be explored and debated as fundamental to public information policy.[47]

It would appear that there is an urgent need to demonstrate the uniqueness of STI and to develop a strategy for getting to engineers, scientists, and others the data and information needed to advance science and to bolster the Nation's competitive position.

The "American Technology Preeminence Act of 1991" (S. 1034), which was introduced on May 9, 1991, addresses economic competitiveness. That bill calls for NTIS to coordinate a governmentwide locator system for managing government information resources, in particular databases. It remains to be seen if NTIS should assume such a role or if the National Archives and Records Administration, or some other agency, (e.g., GPO, GSA, Library of Congress) would be a better lead agency. Clearly, there has been discussion of a locator system for years, but key issues remain unresolved.

Conclusion

Given the present environment, answers to the following questions may become more important as agencies increase their information dissemination responsibilities and roles:

- What are the attributes of information, an information provider, and information intermediary, preferred and sought by engineers and scientists?
- How do these attributes affect information gathering behavior?
- What types and formats of government information does the scientific community, including the aerospace community, need and use?
- Where do they go for access to this information? How effective are these providers and intermediaries?
- What government information at present would they like to get that they do not receive at present?
- What role does and should the Federal government play in making government information more accessible and available?
- What types of fees will or should the scientific community, including the aerospace community, pay in order to gain access to government information? Under what circumstances should or would they be willing to pay?
- With the report card for the Nation's science and mathematics education reflecting grades of mediocrity to failure, are agencies, and others, creating and maintaining cost-effective systems understandable and usable by more than a few? What benefits would result from cost-benefit analysis? How will all this impact the national computer networks envisioned by many people?

The answers to such questions must be translated into a policy context which makes systems responsive to the actual information needs and information gathering behavior of target audiences.[48] This responsiveness is especially important given the networked information environment proposed and emerging within the United States.

Despite the presence of numerous laws, regulations, and other policy instruments that affect the creation, distribution, use, and dissemination of STI, Federal STI policy is sketchy and uncoordinated. There is neither an overall STI strategy nor a focal point to develop one. Furthermore, "there is no focal point for coordination [of STI] issue identification and resolution."[49] Therefore, it is important that a strong and effective policy framework for STI emerge. Given present day information policy practices and beliefs, that framework will probably treat information resources as a commodity but encourage greater attention to dissemination, use, and impact. Central to the creation of that framework will be the conduct of research and modeling studies, and the development of an infrastructure that is currently nonexistent.

The types of issues discussed in this paper (see Table 1) have direct implications for the Nation's aerospace industry. Those within the aerospace community must see that their views are heard and incorporated into a revised A-130, which may guide policy formulation, review, and practice into the next century. OMB must be educated that STI lacks a life cycle and that there are important differences among general information policy, STI, science and technology policy, and industry policy.

Table 1. Current STI Issues Mentioned in Paper.

1. Effectiveness of dissemination programs in meeting user needs.
2. Identification, acquisition, processing, and utility of all STI produced domestically and worldwide. For the latter, what is the need for STI produced in non-English languages? What translation services are there, and are they cost-effective?
3. IRM for STI, with greater inclusion of user perspectives.
4. Intellectual property rights, e.g., ownership and diffusion.
5. Jigsaw puzzle of policy instruments – no general policy coordination (excepting OMB). A key challenge is to maintain and and improve agencies' ability to carry out their information responsibilities within a decentralized environment that increasingly depends on technology.
6. Lack of leadership within government – piecemeal approach; by default, OMB fills void.
7. Protection of, and access to, STI.
8. Relationship of STI to A-130 and other OMB policies supporting the Paperwork Reduction Act.
9. Relationship between public and private sectors over dissemination.
10. Relationship among R&D, science and technology policy, and STI.

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