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STATUS OF INTERNATIONAL COOPERATION AND EAST-WEST INFORMATION EXCHANGE

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Abstract

It is proposed that there are certain necessary conditions for sci-tech intellectual transfer to appear in significant, and therefore noticeable, proportions. The two obvious conditions are the existence of a "donor" country (a country which experiences a surplus of intellectual output) and a "recipient" country (one which manages to accommodate foreign intellectual production in its publications). The sci-tech intellectual transfer is likely to occur when the publishing potential of a given country exceeds its intellectual production or when the quality and importance of research performed abroad surpasses internal accomplishments. Patterns of Soviet aerospace science as information donor and recipient have been investigated in a case study. An assessment of two decades of AIAA's (the American Institute of Aeronautics and Astronautics) coverage of the Soviet aerospace and engineering literature in the Aerospace Database demonstrates that the former Soviet Union has been transformed from a recipient of foreign intellectual effort to a donor country. Aspects of utilization/integration of Soviet information are examined, and a survey of the AIAA Journal suggests that Soviet literature entering the U.S. via the alternative channel of distribution (i.e., as a result of international intellectual transfer) is far more likely to be integrated into the mainstream of actively utilized aerospace knowledge. Suggestions for change in this area are presented, with emphasis on ways to reduce language barriers.

Introduction

The American Institute of Aeronautics and Astronautics (AIAA) has a long history of acquisition of international published information for the purpose of encouraging its utilization. International information acquisition began with AIAA's predecessor, the Institute of the Aeronautical Sciences (IAS), when the IAS founded its Library in 1936. By the 1940's IAS began to emphasize awareness of Soviet literature by publishing abstracts of Soviet publications in its monthly journal.

In the early 1960's AIAA's abstracting and indexing activities had expanded and International Aerospace Abstracts (IAA) became a separate publication covering worldwide aerospace literature. NASA's fledgling STI Program, led by Mel Day, was just organizing. Mr. Day, recognizing that AIAA, as the leading professional society for aerospace engineering, was already playing an important role in managing and disseminating aerospace STI, designed a cooperative program which maximized AIAA's strong international exchange program and aided the IAS in expanding its efforts while focusing on published literature.

Over time the potential for and mechanisms of cooperative information exchange have evolved as national and international aerospace programs developed. This paper does not describe AIAA's particular exchange arrangements or acquisition processes, but instead analyzes the patterns of information transfer between nations, as exemplified by the patterns between the former Soviet Union and the United States. Then we will consider ideas

to enhance information utilization between nations which have strong aerospace scientific and engineering programs but different languages and cultures.

The AIAA publication IAA has a database counterpart, the Aerospace Database, the combination of the published literature covered in IAA and the report literature covered by NASA STAR. A unique feature of the structure of the Aerospace Database is the differentiation between the "country of publication" and the "country of origin" in bibliographic citations. As far back as the 1960's, the producers of the Aerospace Database recognized the importance of the separation of the geographic origin of a scientific or technical work (the country of publication) from the intellectual affiliation of the author(s) (the country of affiliation or origin field). Needless to say, these two are not necessarily the same. A work performed by a professor in the former Soviet Union but published in the AIAA Journal would be classified as country of origin = Russia and country of publication = United States. Equipped with this feature for over thirty years, the Aerospace Database has become a potent intelligence tool which allows us to monitor the phenomenon of intellectual transfer on the international level.

Thesis

In this paper we propose that there are certain necessary conditions for sci-tech intellectual transfer to appear in significant, and therefore noticeable, proportions. The two obvious ones are the existence of the "donor" country (i.e. a country which experiences a surplus of intellectual output) and the "recipient" country (i.e. a country which manages to accommodate foreign intellectual production in its publications). The scientific or technical intellectual transfer is likely to occur when the publishing potential of a given country exceeds its intellectual production or when the quality and importance of research performed abroad surpasses internal accomplishments. The comparison of the results of our study with external, non-bibliographic information on the countries involved further suggests that this phenomenon is stimulated when both a solid socio-economic infrastructure and relative prosperity exist in the recipient countries. For under these conditions the likelihood of the consumption of foreign technological and scientific thought dramatically increases.

Others have used similar bibliometric measures of author affiliation and publication origin to analyze the boundaries that scientists create around "islands" of scientific literature.[1] In 1987 we presented a paper which analyzed the barriers to information transfer in the aerospace and defense community[2] , because we believe with the US National Academy of Engineering that, "Technological isolation will surely undermine the future of our industries and educational institutions."[3]

Patterns of Soviet AerospaceScience as Information Donor and Recipient

Our study of two decades of the AIAA's coverage of the Soviet aerospace and engineering literature in the Aerospace Database demonstrates that the former Soviet Union has transformed from a recipient of foreign intellectual effort to a donor country. (See Figure 1). During the 1970's, the Soviet publishing potential seemed well capable of accommodating the results of the Soviet scientific and technical research. Moreover, from 1972 through to 1979 Soviet scientific publications featured a significant number of studies attributable to foreign authorship, mainly American and Central European. This observation led us to believe that in the context of international sci-tech intellectual transfer, the Soviet Union of the 1970's was a prime example of the recipient country. The relative political stability of the Soviet state, the uninterrupted state financing for aerospace-related research, and the brief détente

culminating in the Soyuz-Apollo Project undoubtedly contributed to this situation. The fact that the majority of the non-Soviet aerospace material published in the Soviet Union during that period appeared in Soviet serials is in itself testimony of the Soviet publishing industry's ability to disseminate foreign scientific effort quickly and efficiently.

Beginning in 1980, however, the Soviet publishing potential was gradually diminishing. After a brief three-year period of relative equilibrium between the Soviet intellectual production and the country's publishing output, there has been a steady increase in the volume of Soviet research published outside of the Soviet Union. More importantly, as the Soviet economy came to a standstill in the second half of the 1980's, we have noticed a considerable decline in the total number of Soviet-produced publications. (See Figure 2). This process is clearly visible in the dramatic drop of Soviet material accessioned into the Aerospace Database during the last decade. The 1992 figures, for instance, stand at half of the 1977 (post Soyuz-Apollo) level. Therefore, we are prompted to conclude that within the context of international intellectual transfer, the Soviet Union of the 1980's was gradually becoming a donor of intellectual effort in the aerospace and engineering fields. Consequently, the Soviet publishing industry's inability to accommodate the surplus of submitted scientific and technical literature may have had a decisive impact on the Soviet author's resolve to seek publishing opportunities abroad.

Remarkably, the Soviet sci-tech intellectual transfer of the 1980's might have had a truly spontaneous character. Our experience indicates that the process was unlikely to have been orchestrated at the official level. Instead, it was most probably initiated by the authors themselves. Our hypothesis assumes that if a typically Soviet degree of official control over the publishing policies had still been exercised in the second half of the 1980's, the Soviet intellectual surplus would have found its way into the scientific and technical literatures of the U.S.S.R.'s Eastern European satellites, rather than into the West. East Germany and Czechoslovakia, the two publishing giants of Soviet-controlled Eastern Europe, would have been the most logical candidates for assimilating the surplus of scientific and technological thought originating in the Soviet Union.

That apparently was not the case. Although both East Germany and Czechoslovakia were actively assimilating Soviet intellectual surplus, their combined total of 200 titles constitutes only approximately 2 percent of the nearly nine thousand Soviet attributable publications featured in serials and monographs worldwide in the last decade. At the same time, Western nations, and particularly the United States, were vigorously absorbing the Soviet intellectual surplus, with the U.S. alone accommodating as much as 58 percent of all Soviet-originated publications. With the currency of information delivery conceived of as a prerequisite of success in the American information industry of the 1980's and the 1990's, it is hardly surprising that journal articles were by far the most common means of disseminating the surplus of Soviet technological thought among the members of the American aerospace and engineering communities.

Table 1 (see attached) shows which nations imported intellectual surplus from the former Soviet Union between 1984 and 1992. This surplus consisted of some 9,000 documents accessioned in the International Aerospace Abstracts.

Thus, in the last two decades, the Soviet sci-tech literature was being channeled into the U.S. in two ways. The majority of Soviet technological thought entered the American market in the traditional manner - as Soviet-published documents. However, a substantial number of Soviet-originated manuscripts appeared in American publications as a result of the alternative

process which we have defined here as "international intellectual transfer." Both channels have been actively utilized by the producers of the Aerospace Database who have introduced the American scientific and technical community to literally hundreds of thousands of Soviet research papers, articles, and monographs.

Utilization/Integration of Soviet Information

Nevertheless, it is our understanding that success in the process of integration of foreign information in the scientific and technical community cannot be expressed simply as the total number of documents which crossed international borders. That portion of the total which is actually utilized to foster locally-performed research seems to us far more consequential. With this notion in mind, we attempted to determine the degree of utilization of Soviet-attributable literature by American authors. We have elected to concentrate our search on the AIAA Journal, the Institute's premier monthly which for years has successfully reflected the best of international aerospace research and development.

During our study, we surveyed five annual volumes of the AIAA Journal, beginning with the January 1988 issue. The choice of the last five years as the subject of our study was by no means accidental. With the Soviet Union of the early and mid-1980's gradually becoming a donor country in the context of the international intellectual transfer, we were hoping to determine the impact of the Soviet intellectual surplus on the American aerospace community. Thus, each issue of the journal was analyzed in terms of the number of articles, the total number of cited bibliographic references, and the percentage of Soviet-attributable citations. We have discovered that the AIAA Journal, typically featured 340 well-researched papers annually. On average, the American contributors to the journal referenced 15 citations in each of the contributed papers. Sadly however, Soviet-attributable references constituted less than 1 percent of all works cited. (See Table 2.)

Significantly, our findings based on the contributions to the American AIAA Journal, seem characteristic for research patterns prevailing in the Western aerospace community as a whole. An analysis of bibliographic citations found in the 1990 volumes of the German bimonthly, Zeitschrift fur Flugwissenschaften und Weltraumforschung and the French, Recherche Aerospatiale confirms that Western aerospace scientists and engineers tend to reference their work to locally performed research. Thus, sixty percent of references found in the German and French serials were attributable to European authorship. In the case of the AIAA Journal, as many as seventy-five percent of all bibliographic citations were of American origin. Yet given the U.S.S.R.'s enormous contributions to the advancement of the aerospace sciences, it seems inconceivable to us that Western European and American researchers are willingly ignoring the wealth of knowledge which originated in the former Soviet Union. In fact, our study indicates that under certain conditions the information utilization can be improved.

During our survey of the AIAA Journal, we were able to ascertain that two-thirds of the 150 Soviet-attributable references found in the papers contributed by American authors were originally published outside of the Soviet Union, mainly in the United States. Clearly, the mechanism which prompts American scientists and engineers to reach out to familiar serial titles when referencing their research was at work here. With the language barrier removed and with information arriving promptly, Soviet research became as accessible and valuable to U.S. scientists as the works of their American colleagues. Thus, Soviet literature entering the United States via the alternative channel of distribution (i.e. as a result of the international intellectual transfer) is far more likely to be integrated

into the mainstream of actively utilized aerospace knowledge.

Discussion

Barriers to information transfer can be categorized as cultural, economic, linguistic political and technological. It seems that the language barrier may be the highest, as we have seen radical changes in the other areas for the former Soviet Union, without a subsequent improvement in aerospace information utilization by the U.S. scientists and engineers.

Suggestions for Change

M. Hlava has developed expertise in and appreciation for the art of acquiring newly available former Soviet Union information sources from an environment which is quite alien to American business.[4] However, if the information is to be used, we must undertake some additional activities.

In recent years, the Office of Naval Research funded the AIAA Journal's publication of additional pages for abstracts of former Soviet literature acquired for IAA. However, as we have seen, this apparently did not have a major impact on the readers and writers of the AIAA Journal.

Several organizations created special databases for Russian and Japanese Scientific and Technical Information (STI). These did not survive, as researchers did not really want to go an extra step to retrieve literature by national origin, but preferred to use the major subject-based databases.

Ever persistent, and believing that information service adds value to the aerospace scientific and engineering process, AIAA is trying once again. We are now launching a new series, AEROSPACE RESEARCH AND TECHNOLOGY IN TRANSLATION. The intent is to offer rapid publication of translations completed in the originating nation (mostly Russia), with minimal editing. The basis is to make the information accessible in English in hopes that information transfer will indeed occur.

Other ways to stimulate the transfer of information between nations may be to:

- publish abstracts in several languages, even though the article is in one language only,

- continue to develop machine-aided translation or other multilingual tools for rapid, if inelegant, information access,

- continue to support personal interactions, such as visiting professorships and international symposia, to develop confidence in "foreign" information quality and awareness of more information sources.

Conclusion

If we as information scientists and information managers are to aid the scientific and engineering community in using the wealth of information developed world-wide, our effort to overcome the language barrier, including multilingual tools, must be enhanced. In the movie, "Field of Dreams", the notion about the baseball field was, IF YOU BUILD IT, THEY WILL COME. It seems that for information assimilation, ACQUIRE IT AND THEY WILL USE IT, is not sufficient. ACQUIRE IT, MOVE IT OVER THE BARRIERS, AND THEN PROMOTE ITS VALUE - maybe then we will truly have effective international information transfer which facilitates international cooperation.

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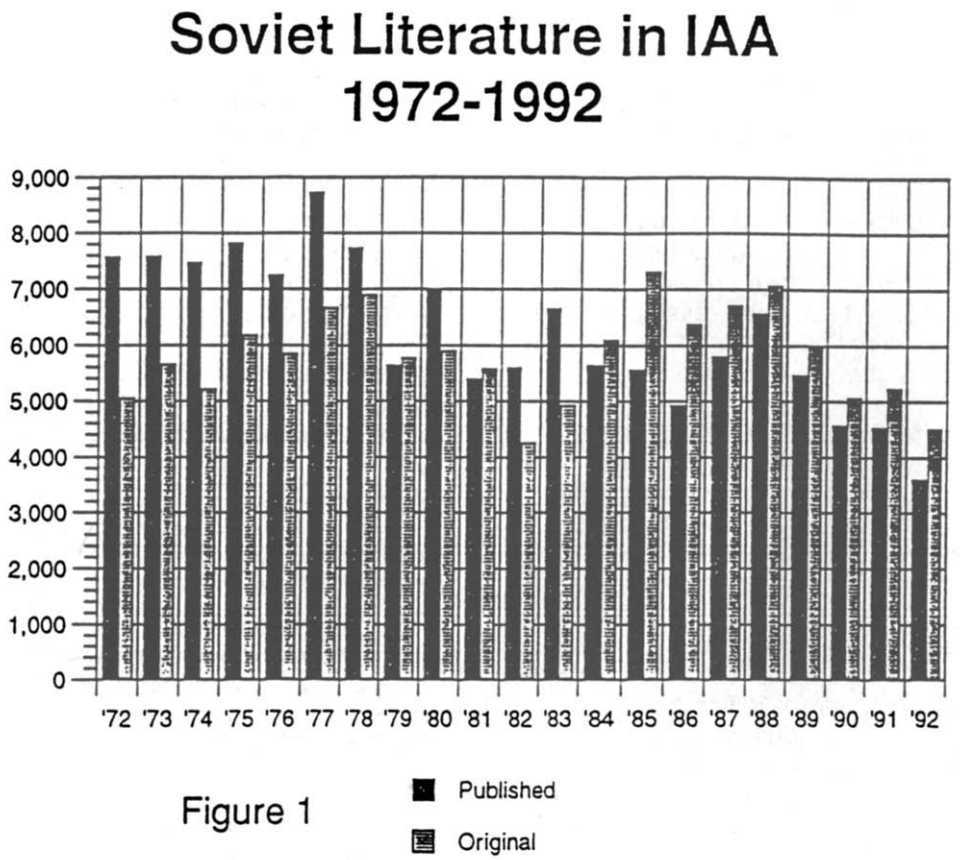

Figure 1

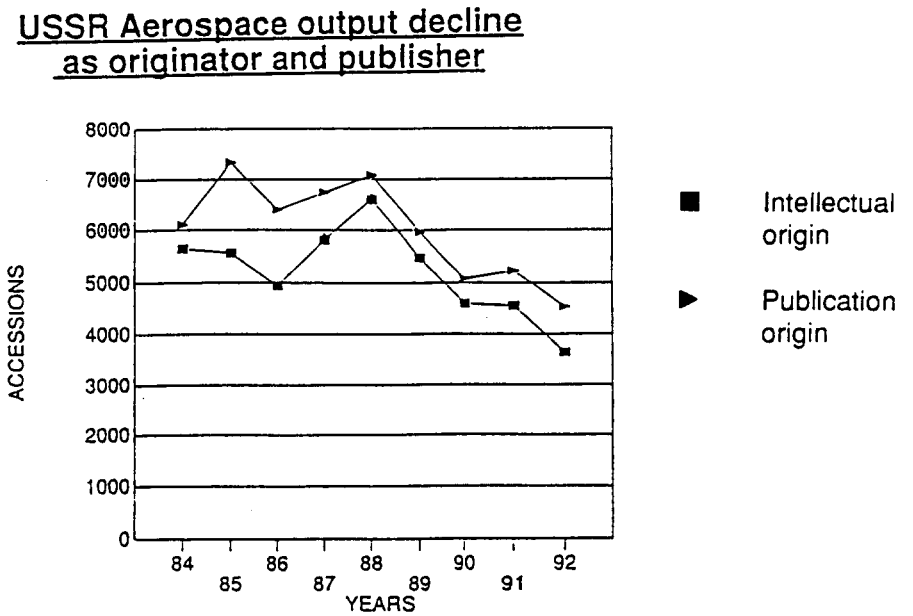

Figure 2 IAF - Oct 1993
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Table 1
IMPORTERS OF FORMER SOVIET AEROSPACE INTELLECTUAL SURPLUS, 1984-1992

COUNTRY	PERCENT
US	59
UK	15
Netherlands	11
Germany, Federal Republic	3.7
International Organizations	2.2
Czechoslovakia	1.1
France	1.1
Germany, East	0.9
Other	6.1

Table 2

US UTILIZATION OF SOVIET-ORIGINATED INFORMATION IS POOR

Year	#References	#Soviet-origin	%Soviet-origin
1988	3355	28	0.83
1989	4664	18	0.39
1990	5263	28	0.53
1991	4424	26	0.59
1992	7391	50	0.68
average	5020	30	0.6