

AD 669837

**FINAL SCIENTIFIC REPORT:
AEROSPACE POWER AND BEHAVIORAL KNOWLEDGE**

CONTRACT AF 49(638)1344

with the

**DIVISION OF BEHAVIORAL SCIENCES
AIR FORCE OFFICE OF SCIENTIFIC RESEARCH**

**Albert D. Biderman
Principal Investigator**

March 29, 1968

**BUREAU OF SOCIAL SCIENCE RESEARCH, INC.
1200 Seventeenth Street, N. W.
Washington, D. C. 20036**

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1. Background

The present project was originally undertaken because of an interest in how the knowledge and techniques developed by the social sciences could inform the use of military power as a means of persuasion in support of the international objectives of the nation. At the time the original proposal for the research was made, a number of evaluations had identified serious deficiencies in the adequacy and utility for the Air Force of existing scientific knowledge as it bears upon the control and exploitation of military power to persuade and dissuade. Originally, the effort envisioned identifying key ways in which the substance of scientific knowledge bearing on this problem might be improved, as well as examining factors that affected the ability of the Air Force to take account and exploit such knowledge. During the course of the study, the work was broadened to encompass the utility of behavioral science knowledge to concerns of the Air Force beyond those in the area of persuasion in the international politico-military arena. This latter remained an important focus of the study, as is represented in one of its major products--Crawford and Biderman (1968). As is also represented by this product, however, the project became increasingly oriented to questions of the uses of behavioral science knowledge, rather than its substance. Stated somewhat more accurately, it was concluded early that the major deficiencies in behavioral theory and research were those that made for the lack of adequate scientific means for understanding how scientific knowledge informs policy and action and how it might do so more extensively and effectively. A main task of the project thereupon became work toward a "social science of social science" with particular regard to the organizational and institutional structures that influence

what behavioral knowledge gets produced and, thereupon, what influences this knowledge comes to have on policy and action.

II. Approaches

The project has used a variety of approaches to these topics.

These have included:

A. Documentary analysis: (1) of research products; documents relating to research administration; (2) of discussions of research by social scientists and research users; (3) of statistical series on research expenditures and personnel in research endeavors; (4) of curricula and student products of service educational institutions.

B. Quantitative content analysis of published research.

C. Participant observation in two areas of research application.

D. Interviews of research users and producers.

E. Direct observation of research implementation in a training program.

III. Products

The primary products of this project have been its metasocial-scientific analyses--that is knowledge about the social sciences and their uses for policy, planning and operations, and suggested approaches toward such study. In the course of developing such knowledge, the project has also produced, as by-products, substantive knowledge relating to a number of Air Force concerns. These by-products have dealt with such problems as the broad complex of problems involving American military personnel in hostile custody and the related problems of survival training; officer education, both in service schools and pre-entry higher education;

innovational selection procedures for a complex Air Force personnel specialty; and problems in the international security area.

The bibliography section of this report lists books, journal articles, research monographs, and annotated bibliographies representing both primary and secondary published products of the project. The special concerns of this study with the organization and uses of the social sciences also made participation in scientific meetings and conferences of special importance to developing data for the project as well as for a medium for presentation of its findings and gaining critical comment on them. In addition, the special nature of the present project led to some of its results being communicated by incorporation into government issued reports and documents; panel and symposia reports; in the form of research planning documents; and, in one instance, as a procedural system in the personnel field.

IV. Primary Products

The project has sought to contribute at several levels to its primary purpose of developing knowledge of how social and behavioral sciences inform policy and action.

Perhaps the most important result of the project has been to develop a basically new conceptual orientation that may permit approaching questions of the uses of research in a more objective and scientific manner than has been usual. The proposed orientation also directs attention to key processes and determinants that heretofore have either been neglected or not systematically entered into thinking and research on utilization. These broad conceptual orientations to the functions of knowledge were developed through the following steps. A comprehensive review was carried

out of all identifiable writings on the uses of knowledge. More detailed consideration was given to those discussions which dealt with knowledge pertinent to military and international affairs. To afford a synthesizing and objective perspective for considering these disparate writings, we initially adopted theoretical perspectives of the sociology of science and the sociology of knowledge. As broad conceptual orientations, traditional approaches to these "sociologies" were found useful but wanting in several respects. First of all, the special preoccupation with knowledge appeared to us to reinforce the inherent difficulty scholars have in gaining a detached view of their own activities. This was manifest in a general failure of writings in the sociology of knowledge or the sociology of science to apply behavioral concepts and principles either of universal applicability to individual and social behavior or to broader classes of phenomena of which knowledge activities are a subset. It was concluded that, as a consequence, a large part of the accumulated power of the social sciences was not being utilized in approaching the study of knowledge. Secondly, it was concluded that the sociology of knowledge and sociology of science tended to overly-isolate the knowledge product and knowledge producing activities from the larger social systems which determine their form. Lastly, primarily because of the relative paucity of scientific attempts toward integrated consideration of the economic bases of social science activities and their content and form, a basic orientation was desired to which these relationships were readily assimilable. The broad conceptual orientation evolved by this study is discussed most comprehensively in Crawford and Biderman (1968: Chapter 1).

V. General Theoretical Models

From this broad conceptual orientation, several theoretical models were developed in this study for more specific application to studying the relations of behavioral knowledge to policy and action. Particularly important use was made of the following:

The first was a 6-dimensional model adaptable to studying (a) the way in which problems are presented to social scientists, (b) the ways in which social scientists address themselves to problems, or (c) the products of behavioral research. On inferential bases, an empirical clustering of phenomena along these dimensions suggested heuristic reduction of this model into a typology for use in a functional analysis. This typology groups the functions of behavioral knowledge into "engineering," "intelligence," and "enlightenment" categories. It is applied by Crawford and Biderman (1968) to the analysis of conceptions of the uses of research that figure in the literature of research in the international and military affairs fields. The typology was particularly useful in directing attention to "enlightenment" functions which are much neglected both in attempts at examining the impacts research has had on practical affairs and as a model of research utility for application to planning, allocations and the conduct of research.

The same theoretical perspectives led to what were regarded as important conceptual distinctions between "manipulative" and "adaptational" strategies. These distinctions were advanced as a possible mode of clarifying some major issues relating to the relations of research endeavor to the political process.

Another set of models that was used extensively for the project was useful for linking the modes of economic support of behavioral research to its form, its substance and its relations to the world of practical affairs. One such model was derived from consideration of the public-good, non-distributive character of behavioral research and from an historical analysis of the ways in which the economic sustenance of research has been provided. This model, set forth and applied in Biderman and Crawford (1968), involves six modes by which economic allocations to the production of knowledge are legitimated.

The thrust of the work in the present project was empirical. A deliberate effort was made to avoid diverting this effort to the ethical and epistemological issues that have preoccupied most other attempts to deal with the relations of research to policy and action. Nonetheless, a few of the propositions which the results suggest do have fairly direct implications of an epistemological character. These have been given attention in reports and publications of the study, however, only where it was felt to be essential to clarify distinctive suppositions underlying the empirical presentation. An illustration of this is an examination of the conditions under which scientific intervention with a system under scientific study leads to spurious self-confirmation and when it does not (Biderman, 1968).

VI. Broad Applications

The general orientations and theoretical models discussed were applied to efforts of the project to provide general understandings of the present relations of particular social sciences to governmental policy and action. This was done most exhaustively for sociology by Biderman and

Crawford (1968), using a primarily economic orientation. These authors have in progress a book extending this analysis to the behavioral and social sciences in their entirety. A review by the project of anthropology is presented by Raghavan (1967). Historical analyses of the development of the relationships between the social sciences and government, analyses of current problems of these relationships, and some attempts toward projecting future resolutions of problems as well as ones likely to be emergent were also made. These analyses were directed toward providing comprehensive and coherent background for examinations of the more concrete problems of Air Force concern discussed below.

VII. Specific Applications

The most extensive consideration of the policy relevance of behavioral knowledge by this project was in the area that had been the original focus of the study, namely that of international affairs. A comprehensive review of the literature of this field was conducted at the beginning of the study. An overview of this literature is given by Crawford (1965) in her introduction to an annotated bibliography of the field. This bibliography was brought up-to-date through 1967 and the extended version is being published in the book edited by Crawford and Biderman (1968).

The project attempted to identify all previous efforts to provide either scientific conceptualizations or systematic empirical information on the role that behavioral knowledge has played (or may play) in informing military or international policy. The book edited by Crawford and Biderman (1968) brings together an anthology of particularly pertinent and representative examples of such writings, synthesizing discussions of this literature, some original writings to cover notable gaps in the existing

literature, and essays directed toward suggesting theories and approaches for further exploration of this field.

During the later periods of the study, the problems of the relations of social and behavioral sciences to governmental, and, particularly, military plans and policies, came to be matters of extensive public discussion and official concern. Certain of the early products of the study became inputs to executive and legislative considerations of these problems (see Crawford, 1966; Crawford and Lyons, 1966). The latter of these two papers, along with the report, Youth and Leadership in the Developing Nations (1967), are instances in which coincidence between the objectives of the project and those of federal agencies other than the Air Force led to a cooperative enterprise.

The identification of "enlightenment" functions of behavioral knowledge as a particularly neglected field of investigation led the project to develop a number of relevant research approaches. One planned investigation was an investigation of indirect modes of the transmission of behavioral concepts and findings to policy personnel through formal educational systems as well as broad-audience media. Organizational arrangements for pursuing this investigation could not be completed. The general approach is suggested in Crawford and Biderman (1968). Crawford (1967a) pursued some of the objectives of this approach through an analysis of documentary materials on lecturers and reading material at selected war colleges. She is preparing a more extensive discussion of these analysis than that available in her 1967 paper.

At a much more specific level of inquiry, the project examined the impacts of knowledge on the complex of Air Force problems involving the hostile custody of military personnel. This part of the project was carried

out in close relationship with Air Force policy and training offices. The area was regarded as an especially useful case for study for a number of reasons. Many aspects of the behavioral and social sciences have been brought to bear on these problems--studies ranging in level from considerations of physiological subsystems to those dealing with broad questions of international relations. It is a field with which investigators associated with the project had extensive familiarity. It was also one in which many of the ordinary barriers separating research from policy and action were absent, thus permitting greater attention to questions of the substantive applicability of behavioral knowledge. Lastly, it was one regarded as of considerable service to the sponsoring department and hence one in which substantively useful by-products of the basic research investigations might have high utility.

The investigations in this area identified certain problems which led to less than full and consistent realization of the practical implications of research findings, despite their general acceptance in the formulation of policy. One set of difficulties confronting implementation of research-based policies was organizational in nature. The highest levels of decision, in general, had effective exposure to, and familiarity with, applied translations of important research bearing on the problem. The same was true of low level units with specialized training or operational responsibilities for this set of problems, although, military personnel rotation and the loss of civil servants seriously attenuated the continuity and degree of expertise available in these organizations. Problems arose with regard to those aspects of policies which, following clear research implications, recognized that broad areas of discretion would have to be

allowed at the unit level and, indeed, allowed individuals in hostile environments for decisions appropriate to varying and changing contexts. Intermediate levels in the organizational system which had little exposure to the research-based knowledge were often inclined to vitiate this aspect of policy by imposing overly-specific prescriptions upon lower organizational levels.

In examining the utilization of behavioral knowledge in the custody area, the study made observations at every level of implementation in the department from the secretarial level down to the experiences of the individual as a trainee or, in the case of repatriated Air Force personnel, in actual criterion situations. The exceedingly broad involvements of Air Force agencies and individual personnel with these problems served to emphasize the importance where such problems are concerned of the transmission of behavioral knowledge through educational and informational media of the Air Force--that is through "enlightenment" mechanisms--rather than in the form of technical reports or engineering applications. These and other implications for research utilization are discussed in Biderman (1963b; 1964) and Schein (1963).

Another area in which the research proceeded by close participation with an operational activity was that examining personnel selection applications. At the invitation of the commander of a highly specialized Air Force activity in August 1965, the project undertook to examine the problems confronting the organization for selecting and assessing officers who were being assigned to critical and sensitive responsibilities in foreign areas. Dr. David Saunders of the University of Colorado undertook adaptations of a standard intelligence scale and of clinical diagnostic procedures for trial with an experimental group of 68 officers. With the assistance of

the project, the Air Force unit has initiated a validation study currently in progress to determine whether the program can be adopted for routine use. The requirements of this unit were instructive in that they posed the frequent problems of adapting the highly generalizing tendencies of relevant behavioral knowledge to uses where varied and specific decisions must be made--in this case, varying specific assignments of personnel requiring different clusters of valued attributes. A computer program was developed to deal with these combinatorial problems.

VIII. Implications for the Air Force

Given the broad scope and the disparate topics dealing with research utilization of the present project, the implications they have for the Air Force are best presented within the context of the various interim scientific reports of the project and in the documents in which recommendations have been made directly to the responsible officers.

There is one pervasive problem confronting the adequate articulation of behavioral research to the manner in which results of research are, and can be, best used in the Air Force that we feel should be singled out for emphasis in this report, however. We have already alluded to this problem here in reference to the discussion by Crawford and Biderman (1968) of "enlightenment" research functions. The most extensive and important way in which the products of research can inform Air Force policy and operations is through the wide communication to Air Force personnel of the substantive knowledge such research produces. Providing members of the Air Force with the sensitizations to particular aspects of nature and with conceptual tools for dealing with them is also important. Transmitting these fruits of research takes place most coherently and comprehensively through formal

and informal educational processes. The development of knowledge and imparting it are closely tied functions in civil society. Those who teach have coherent conceptions of gaps and inconsistencies in the body of knowledge with which they deal. These recognized inadequacies become reflected in their research interests and activities. They in turn assimilate the results of research into systematic curriculum content.

There is no equivalent system for reflecting the substantive needs for knowledge of the educational and informational activities of the Air Force in allocations to research efforts. There is somewhat greater, although highly inadequate means for systematic inputs of the fruits of research into educational and informational systems of the service. Such requirements for research as do flow from the knowledge-imparting activities of the Air Force almost exclusively deal with mechanics of the process-- such as selection of personnel and methods of training--rather than with its substance. Perhaps the most comprehensive recommendation that can be made regarding mechanisms that might increase the usefulness of behavioral knowledge to the Air Force is relatively greater emphasis on research directed toward meeting the needs for knowledge content of Air Force education, training and information activities. This implies closer integration of research functions with these activities (Crawford and Biderman, 1968).

Another central problem affecting the utility of behavioral science to the Air Force is one that became so increasingly pronounced during the course of the present project as to lead to our giving it continually greater emphasis in orienting the work of the study. This problem is the disinclination of ever greater numbers of scholars in these

fields--and more particularly, many of the most prestigious figures among them--to engage in work for the military establishment or in work supported by it. Of even longer standing has been a neglect of warfare and of military institutions as fields of objective scholarly interest. These fields have not received scholarly attention commensurate with their importance among the realities with which social and behavioral sciences deal. The recognitions led the project to devote considerable effort toward clarifying factors affecting the allocation of the energies of the scholarly community to various interests and pursuits.

IX. Secondary Products

The last mentioned task in VI, above, was one of several of the activities of the project undertaken in close association with practical concerns. In such cases, by-products with specific applied relevance were produced. More frequently, however, the secondary products of the project were scientific discussions of substantive questions or research designs or research planning statements in the fields in which research uses were being studied. The former were principally papers dealing with prisoner-of-war and internee problems, e.g.: Biderman (1964; 1966); Biderman and Gavilan (1963); Lewis (1963). Illustrative of the latter is a preliminary examination of knowledge relating to pre-entry education of future Air Force officers. The bibliographic review and research design activity were incorporated into a project undertaken by the Inter-University Seminar on Armed Forces and Society.

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UNCLASSIFIED

Security Classification

DOCUMENT CONTROL DATA - R&D

(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)

1. ORIGINATING ACTIVITY (Corporate author) Bureau of Social Science Research, Inc. 1200 17th Street, N. W. Washington, D. C. 20036		2a. REPORT SECURITY CLASSIFICATION Unclassified	
		2b. GROUP	
3. REPORT TITLE AEROSPACE POWER AND BEHAVIORAL KNOWLEDGE			
4. DESCRIPTIVE NOTES (Type of report and inclusive dates) Scientific Final			
5. AUTHOR(S) (Last name, first name, initial) Albert D. Biderman			
6. REPORT DATE 29 March 1968	7a. TOTAL NO. OF PAGES 15	7b. NO. OF REFS 20	
8a. CONTRACT OR GRANT NO. AF 49(638)1344		8a. ORIGINATOR'S REPORT NUMBER(S)	
A. PROJECT NO. 9779-02			
c. 6144501F		8b. OTHER REPORT NO(S) (Any other numbers that may be assigned this report)	
d. 681313		AFOSR 68-0631	
10. AVAILABILITY/LIMITATION NOTICES 1. This document has been approved for public release and sale; its distribution is unlimited.			
11. SUPPLEMENTARY NOTES TECH, OTHER		12. SPONSORING MILITARY ACTIVITY Air Force Office of Scientific Research 1400 Wilson Boulevard (SRLB) Arlington, Virginia 22209	
13. ABSTRACT A variety of approaches were used to examine ways in which the social and behavioral sciences may be of use to policy, plans and operations of the Air Force. These approaches included documentary analyses, participant observation, interviews of research users and producers, and observations of use in a training program. Special attention was given to the utilization of social science research for dealing with international affairs, the problems of personnel in hostile custody, the selection and assessment of officers for responsible and sensitive roles, and the education of officers. ()			

Security Classification

14. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
Behavioral sciences Social sciences						

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