UNCLASSIFIED

APPLICATION OF SOCIAL SCIENCE TO DEFENCE PROBLEMS (U)

by

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and
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REPORT NO. DRAE R42

DRAE

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ABSTRACT

Since World War II the types of demand for operational research in Canadian defence have gradually changed. Formerly the demand was almost entirely confined to the selection of weapons and their tactical application. Later, interest broadened into analytical studies of logistics and manpower. Then activity was extended to include international strategic studies, and at present there is a developing interest in research on the effects of defence activities in general, internationally, and also on the Canadian economy and on Canadian society. In order to meet these new demands the Defence Research Analysis Establishment (DRAE) has had to expand its field of academic competence to include not only the traditional "hard sciences" but also political science, economics and other "social sciences".

This report contains brief resumes of some of the projects in DRAE related to these new fields, and a list of the more relevant unclassified DRAE publications.

SOMMAIRE

L'orientation de la recherche opérationnelle de la défense canadienne a beaucoup évolué depuis la dernière guerre mondiale. En effet, il fut un temps où l'on se préoccupait d'avantage du choix des armes et de leur application tactique. On s'est intéressé par la suite aux études analytiques de logistique et d'effectifs humains. Il y a quelques années, on a élargi le champ des études stratégiques à l'échelle internationale. A l'heure actuelle, on s'attache de plus en plus à la recherche sur les effects des opérations de défense en général, et sur le plan international, mais aussi sur leurs répercussions sur l'économie et la société canadienne. Afin de satisfaire aux nouvelles exigences, le Centre d'analyse pour la défense s'est vu dans l'obligation d'élargir sa formation théorique en incluant aux sciences "pures" traditionnelles, l'étude des sciences politiques, économiques et autres sciences "sociales".

Le présent rapport contient un bref résumé de certains des projets du Centre d'analyse concernant les nouvelles applications des recherches sur la défense. Vous trouverez également une liste des document non-classifiés que vous pouvez vous procurer.

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APPLICATION OF SOCIAL SCIENCE TO DEFENCE PROBLEMS

During World War II, the Cold War, and into the 1960's, it was not necessary to ask what Defence Research was, or to engage in introspection about its objectives. We all knew that defence was concerned with the deterrence or defeat of a foreign enemy, who would use military force if it suited his purposes. Defence research concerned itself with the invention, development, and design of the weapons needed by our armed forces, together with other equipment needed to support the forces. Operational research in particular was concerned with the selection of weapons and with improvement of procedures and tactics for the employment of the weapons.

The sciences needed for defence research were mostly of the laboratory and equipment type, perhaps fairly characterized as "physical sciences". A typical defence research symposium in the 1950's or 60's might have had sessions on chemical and biological warfare, explosives and armament, military medicine, military electronics, and sonar. The main concerns of those at the top of our Department of National Defence and those of allied countries included similar subjects. They wanted better chemical and biological agents, better defence against them, better explosives and armaments, better military medicine, better military electronics, and better sonar. When the scientists made these things possible, they were developed, manufactured, and issued to the armed forces.

That is what defence research was all about. To carry it out we needed engineers, physicists, chemists, mathematicians, and doctors. Similarly the operational research on weapons and

tactics called predominantly for analysts with backgrounds in the "physical sciences", including mathematics and statistics.

Important applications of economic and psychological warfare were made between 1939 and 1945, and research on selection and utilization of manpower and on training methods continued in the aftermath. Most of the researchers in these areas, and some in operational research had professional backgrounds in economics, psychology, biology, or sociology. However this type of defence research was reduced in the 1950's and 60's while the application of physical sciences to weapons systems and their employment increased.

In the 1970's it is very much less clear just what are the main concerns of a defence department in a country such as Canada. More attention is being paid to such things as formula financing, Program Planning Budgetting, Management by Objectives, bilingualism, and recruiting. The acquisition of lethal hardware, although still a concern, has certainly lost its former eminence.

Defence has changed. Evidently, the research appropriate for the solution of its problems needs to change too. Let us broaden the meaning of the word "defence", far beyond the tactics and equipment of active combat between highly organized armies on a well-defined battlefield. Let us include applications of international coercion not involving violence, and let us extend the definition to cover preservation of sovereignty, contributions of the defence establishment to national development, and consideration of the role and place of the soldier in society. Let us equate "defence" to the strength and security of the nation and the preservation of the means to ensure that security. Battlefields are part of this whole, but only a part.

The other recommended broadening is in the "research" to support the broader "defence". As has been mentioned already,

defence research has always involved the physical sciences. The thesis that is being advanced in this paper is that it needs to exploit the social sciences as well.

For our purposes social sciences should be very broadly defined. They would include many of the subjects found in the calendar of the Faculties of Arts and Science of a modern university, with the exception of those considered to be physical or laboratory sciences, but also excluding languages or some other subjects sometimes given the title of "letters". They would therefore include political science, economics, history, sociology, and others which appear to us to have definite contributions to make to defence studies, and also certain aspects of law, geography, psychology, anthropology, criminology, and other disciplines, which may have some contribution to make to defence studies.

A common factor in many of the important advances in scientific research in the last two decades has been the combination of two or more disciplines, formerly considered to be self-contained and, if you like the word, "pure". In many instances, the hitherto unexplored no-man's land between the specialties has turned out to be extremely productive. Thus, in the physical sciences, we are now used to biochemistry and biophysics, and can even tell the difference between geophysics and physical geography.

To a certain extent a cycle which began with the pioneers of "natural philosophy" in the eighteenth and nineteenth centuries has been completed. Natural scientists became specialists, scholarship divided into separate channels. Some of these channels are coming together again in the second half of the twentieth century.

A similar trend is evident in the social sciences. Those professors who dwelt in the splendid isolation of their pure specialty may now find themselves cohabiting with practitioners of foreign arts, as when the subject is social psychology or economic history.

There are even signs of interaction between physical and social sciences, especially in the introduction of mathematical and statistical methods into some of the social sciences. Econometrics is a respectable subject; demography involves statistics, geography and sociology.

Many of the most active controversies on the public scene engage physical and social scientist in the same problems. Preservation of the ecology, supply of the ever-increasing demand for energy without unacceptable social penalties, and reduction of noise, all of these require the attention of both physical and social scientists. In some cases there is a tendency for them to be opponents: the physical scientists and engineers have designed and built machines which, while technically successful, have undesirable social consequences. The social scientists notice these undesirable social consequences and object to them. The redesign of the machines and of their management to produce the required results while minimizing the undesirable side effects is a task in which both types of scientist can usefully contribute.

In recent years, as the real purchasing power of the defence budget has shrunk, as the amount of new military equipment produced in Canada or even imported from abroad has reduced, and as the former emphasis on military contribution to NATO has shifted towards support of Canadian national aims, the most serious decisions facing defence officials and their political superiors have had an increasing content of strategic policy and finance,

and less of the selection of the products of the latest engineering technology. Typical questions* have been:

1954: What should be the range and speed of the next antisubmarine torpedo?

1964: Do we need a new antisubmarine torpedo?

1974: Do we need to be able to conduct antisubmarine warfare?

The answer to the first question requires engineers and military scientists of the laboratory type. The answer to the last question requires defence research, but this will be concerned with strategy, international relations, and economics as well as physics and engineering.

Indeed, to follow the example of the academics in coining new subjects by combinations, what we need to help our decision makers with their new problems are studies that could be categorized as belonging to the economics of defence, the politics of defence, the history of defence, the sociology of defence, or the psychology of defence.

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* A similar kind of question discussed in G.D. Kaye's paper "Operational Research in Peacekeeping" was

(1) How can Canadian armed forces carry out UN-type peacekeeping activities most effectively?

(2) In what peacekeeping operations is Canada likely to participate in the future, and to what extent?

(3) What resources should Canada devote to peacekeeping activities?

See CORS Journal, 6,3, 1968, pp 133-139.

Among the various kinds of services expected from a research organization working inside a defence headquarters one is likely to find:

- long and medium term research investigations undertaken by our own staff and staff of the armed forces;
- long term research contracted outside of the department to universities, industry, or consulting firms;
- provision of advice regarding decisions that are pending or negotiations that are in train;
- obtaining and assessing scientific and technical information.

In order to carry out these functions and provide these services in the areas of the physical sciences, and over a period of twenty five years, DRB has found it essential to acquire a permanent in-house staff of high quality professional scientists who are at the same time knowledgeable regarding defence problems, known to and trusted by the officials of the Defence Department and the military officers, and competent and well-regarded in their scientific discipline. It was also most desirable to establish close relations with a number of leading members and institutions practicing the various physical sciences in universities and industry, outside of the government, and to have close links with individuals and institutions in the defence establishments of allied countries interested in the same types of science.

It is not a simple matter to convert a substantial portion of a permanent defence research staff over from physical to social science, and it seemed highly desirable to seek assistance from persons professionally trained in the disciplines not in the repertoire of existing DRB staff.

In commencing our search for colleagues and recruits, a problem of considerable magnitude has been the uninterested or unsympathetic attitude towards defence exhibited by many of the groups engaged in the social sciences. It seems that many of the protest and anti-establishment movements have been in university social science departments, who object to any communication between their colleagues and a defence department. They insist, sometimes to the point of violence, on the academic freedom to not listen, to not communicate, and to prevent their colleagues from listening to or communicating with persons believed to hold undesirable views. Although some academics have been cooperative and helpful we are conscious that there are also others who would like to help us, could do so, and perhaps will do so, but who are inhibited or even threatened by the behaviour of their colleagues. This situation, however, seems to be improving with time. But the difficulties created for the support of defence research, and defence itself are amplified by the activities of hostile commentators seeking to influence the political attitudes of the entire country.

Less difficult, but also a serious problem, is the lack of knowledge and interest regarding defence. It is not a subject given much sympathetic study in universities today, and it is easy to see why social scientists might never think of defence problems as suitable subjects for their research. Moreover it has been our feeling that many social scientists are more interested in discovering, observing and classifying problems than in solving them. It must be admitted that most of their colleagues in the physical sciences also prefer basic to applied research, but perhaps less so than in the social sciences. There has, however, been some recent evidence that this situation may be starting to change.

One step which we expect to be very valuable for this new program of application of social science to defence problems is

the formation of two new DRB advisory committees. In one, The Advisory Committee on Political, Economic and Strategic Studies, we have assembled a group well qualified to give advice on political science, strategic studies, economics, history and international affairs. The other, The Advisory Committee on Defence Aspects of Social Research, is strong in sociology and psychology. We hope to develop a useful set of studies to be done under university grants, but we also intend to use the two new advisory committees to help us to design a modest in-house program, and to establish links with those in Canada able and willing to make a contribution.

If we subscribed fully to the new quantitative management techniques we might feel obliged to write down the objectives that have just been described into a timetable, with exact costs. However, we are not dealing here with a factory, or even with the application of engineering to weapon systems, activities much easier to predict and measure than the workings of countries, economies or human individuals, and if we are not prepared to undertake some investigations that are clearly speculative and cannot be guaranteed to be cost effective, then we must resign ourselves to continuing ignorance of many subjects likely to have great significance for the future of defence in this country. We wish to make a plea for the retention in a research establishment of the capability to initiate and carry out a modest program based on search, speculation, and exploration, and not have absolutely everything tied to short-term, predictable, even guaranteeable results.

The recent exploratory program in application of social science to defence problems has been centred in the Defence Research Analysis Establishment. The ancestors of DRAE are operational research groups concentrating their attention on problems of tactics and employment, with most of the work requiring a combination of physical science with military knowledge. In more recent years many of those groups, or people who

had served in them, began to work in systems analysis concerned more with future than present operations. Scientists who have been employed in this type of activity are accustomed to working in inter-disciplinary teams, composed of military as well as civilian participants, and they are inured to the difficulties of incomplete data and uncontrolled variables, often obtained from events which were imperfectly recorded and which cannot be repeated. They are always on the lookout for quantitative data, even in areas where it is normally unavailable, and they are inclined to seek models, often mathematical models, to replace the real processes under study by something simpler and more tractable. They are partial to cost effectiveness analysis.

Persons with this type of background may not find the current social sciences immediately adaptable to their way of thinking, but when faced by new problems it is a very natural instinct to seek to employ approaches known to have succeeded in former applications. Rather than starting brand new teams composed entirely of social scientists without experience in defence, we have preferred to mix these two kinds of people together and also to include military officers in the teams. In this way new research groups were established within DRAE, beginning some ten years ago with a group to study strategic problems. Later a logistics analysis group and still later a manpower analysis group were formed. Most recently a group was established to conduct studies of the social and economic aspects of defence. In addition, we are arranging for some work to be done outside of the department by universities or consultants, who in most cases have little or no familiarity with defence problems and who are practically innocent of physical sciences.

Annex A to this report contains brief summaries of some of the recent and current projects. They are discussed in three groupings, depending on whether their scope is international, Canadian, or confined to the Department of National Defence and the Canadian Armed Forces. To a certain extent our work can be

categorized as looking outwards at international society, looking at Canadian society, and looking at ourselves. However, it is evident that many of the important questions refer to the interfaces between these three sections.

Some of these studies contain aspects subject to security classification, and there are others not mentioned here, which are entirely classified.

Finally, a bibliography is attached as Annex B, listing many of the unclassified publications by DRAE and its predecessor analysis organizations or resulting from DRB grants or contracts, which fall within these general categories of strategic, economic and social studies.

The reports are listed in the bibliography under the following headings:

General Strategic Studies
Weapon Systems and Military Strategy
Maritime Strategy
Arms Control
Peacekeeping
Allocation of Resources
Economics and Canadian Defence
Sociological Aspects of Defence
Miscellaneous.

Many of the studies done by DRAE's logistics analysis group and manpower analysis group might also be considered to relate to economic and social science, but these have not been included in either of the Appendices to this paper. Nor does this paper attempt to cover the work done in other DRB establishments.

ANNEX A

A RESUME OF SELECTED RECENT DRAE STUDIES IN THE AREA OF SOCIAL SCIENCE

GROUP I - INTERNATIONAL

ARMS CONTROL ANALYSIS

These studies deal with the relationship of military strategy and arms control; and cover programs relating to the effects of limitation on the strategic balance and the implications of possible arms control agreements on Canadian as well as worldwide military postures. Most of the work to date has related to Mutual Force Reductions in Europe, but other topics considered are Non-Proliferation Treaty, Comprehensive Test Ban, Demilitarization of Outer Space, Strategic Arms Limitation Talks, Arms Limitation on the Seabed, Restrictions on Chemical and Biological Warfare.

PEACEKEEPING

The problems of peacekeeping are not only military but also social and economic. A peacekeeping force is neither an army of occupation nor a friendly cooperating force, but must deal with at least two antagonists and with a civil population, and in some cases these may not be clearly identifiable. The differences in social mores of the participants and local population often result in misunderstandings.

ANNEX A

SCIENTIFIC AND TECHNOLOGICAL ADVANCES

DND is interested in identifying scientific and technological changes which may have a profound effect on national policy. Applications of advanced technology may also affect the relative strengths of nations, or spawn international disputes.

GENERAL STRATEGIC STUDIES

DRAE conducts and sponsors miscellaneous strategic studies of interest to Canada. These are related to work done by the Intelligence Branch of DND and by the Department of External Affairs. A few of the topics covered are: The Middle East Crisis; the Pacific Strategic Alignment; the Soviet Far East, Manchuria, and Japan; the Security of the Indian Ocean; Political Change in East Germany.

GROUP II - CANADIAN

DND SUPPORT FOR NON-MILITARY OBJECTIVES CONTRIBUTING TO NATIONAL AIMS

DND attempts to identify all practical areas in which the Canadian Forces can make a meaningful contribution to national aims without prejudice to their primary objective.

THE ECONOMIC AND SOCIAL IMPACT OF CANADIAN FORCES BASES AND THEIR SURROUNDINGS

There are many Canadian Forces bases and stations located throughout Canada. The presence of each of these has an influence on its surroundings. The economic and social aspects of this influence is being studied for a sample of bases, with the intention of developing a general model that can be applicable to any base or station. This information would be useful for

decisions regarding opening new bases and closing old ones, and also as a general assessment of one aspect of the effects of defence expenditures.

CANADIAN FORCES EDUCATION AS A CONTRIBUTION TO NATIONAL DEVELOPMENT

DND considers training as a cost and the departure of a trained man from the Canadian Armed Forces as a loss. For civilian industry, the acquisition of a trained man from the forces is a gain. Vocational training in the CAF represents 27% of the federal government expenditure on vocational training in Canada, and 45% of this is also applicable to activities in the civilian sector (i.e. is not specialized military training). The CAF also support and provide formal academic training for many of their personnel. The armed forces are therefore making a significant contribution to national development as a fallout from their expenditures on personnel training.

STUDY OF THE NET COST OF THE DEFENCE PROGRAM

The net cost of the defence program to the Canadian taxpayer is less than the amount of the annual defence appropriation, because of leakages in the form of various material and personal taxes etc. which cycle back to the government. These leakages are large and may exceed those experienced by other departments. The objective of the study is to identify and determine the size of these leakages, and to compare them with those from other departments.

THE DEFENCE PROGRAM AND NATIONAL INDUSTRIAL DEVELOPMENT

Recent indications are that defence equipment acquisition programs will be determined on the basis of national economic and social development as well as on purely military factors. This study explored a number of environmental factors which influence

industrial growth in Canada. These include the dominance of the United States in defence technology, uneven rates of economic growth, and the influence of multinational firms in Canadian industry.

THE ROLE OF DEFENCE SCIENCE IN THE SUPPORT OF SOVEREIGNTY

The objective of this study was to examine territorial, political and economic aspects of sovereignty and to determine what contribution can be made to its maintenance. A list of types of research that could usefully be conducted was developed for each of the three types of sovereignty. Among the areas considered were territorial waters, under-ice research, seabed studies and internal security.

THE IMPORTANCE OF SEABORNE TRADE TO CANADA

This study was conducted in relation to maritime defence requirements. It demonstrated the large extent to which the Canadian economy is dependent on seaborne exports and imports. The "strategic" importances of seaborne trade was also considered and the materials included under this heading were bauxite, chromium, magnesium and crude petroleum.

THE INFLUENCE OF THE CANADIAN FORCES,
THEIR RESERVES AND CADETS ON NATIONAL UNITY

In this project DRAE undertook to study the present and potential contributions of the armed forces to national unity. The findings concluded that national unity was enhanced by the forces as a result of the assurance of protection to citizens, search and rescue etc., maintenance of visible Canadian symbols in the forces, implementation of bilingualism and biculturalism, international recognition, and other activities.

ANNEX A

PUBLIC SCRUTINY OF DND

This project was an experiment in contracting studies of the interaction between DND and Canadian society. The contractor examined the type of administrative decisions of the department that might be subject to scrutiny, the form that the scrutiny might take, and the characteristics of the groups that might conduct the scrutiny. "Scrutiny" in this context includes, in addition to responsible and constructive examination, the subjection to undesirable and biased publicity with the intention of applying pressure to force a change of decision.

GROUP III - DEPARTMENT OF NATIONAL DEFENCE

THE ANALYSIS OF RESOURCE INTERDEPENDENCIES IN THE DND PROGRAM DATA BASE

A decision to modify one part of the Defence program will affect many other parts of the program. The relationship among the various parts, and the resources available to carry out the program is complex. Consequently, when developing and improving the program it is very time-consuming to calculate the second and third-order effects of tentative modifications. This project is an attempt to develop an input - output model which will indicate both the absolute and time-dependent effects of various force development decision options for the allocation of existing and projected resources of all types.

EQUIPMENT AND MANPOWER RATIOS IN THE CAF

This was a historical review of the variation in value of the ratio:

$$\frac{\text{equipment inventory value}}{\text{annual manpower costs}}$$

in the land, sea and air environments from 1947 to 1972. Based on the 1972 figures, each $1000 worth of equipment purchased for the sea element would generate a requirement for $177 worth of new manpower, with $377 and $621 as the equivalent figures for the air and land elements. This demonstrates the very different degrees of "capital intensiveness" of different defence activities.

A STRUCTURE FOR IDENTIFYING THE RELATIONSHIP AMONG OPERATIONAL, OPERATIONAL/SUPPORT, AND SUPPORT PERSONNEL AT VARIOUS LEVELS OF DETAIL OF MILITARY FORCES

The study included consideration of the various definitions of the terms in the above title, and the ways in which the definitions could vary, depending on the level in the forces organization from which the problem was viewed. The model that was developed was applied to a combat group for illustration. In general, among components which are considered to be "support" by lower level formations there may be some which would have been considered as "operational" when viewed from higher up.

A LOGICAL APPROACH TO PROGRAM FORECAST COST ALLOCATION

The problem arises from the fact that many of the defence program elements are multiple tasked, and costs and tasks cannot therefore easily be assigned.

The method proposed for allocation of costs to tasks was to identify as many as possible of the special costs that were unique to each task, (including equipment and training), to compare the costs of alternate methods of carrying out the tasks, and then to allocate the remaining costs in the order of priority of the tasks.

ANNEX A

CANADIAN ARMED FORCES RESERVES

The Canadian Forces consist of a combination of regular military personnel who spend all of the working day on defence activities, and reserve personnel who spend their days as ordinary citizens, working, attending school, etc. but who take military training in the evenings, weekends, and holidays, and are available to carry out defence activities in times of emergency. The costs of these types of forces are different and their availability and effectiveness are also different. The problem being studied is the optimum ratio of personnel in the two types of forces, given the current and possible future defence commitments, and the current and possible future social conditions which affect the recruiting, and therefore the costs of both types of force.

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Since World War II the types of demand for operational research in Canadian defence have gradually changed. Formerly the demand was almost entirely confined to the selection of weapons and their tactical application. Later, interest broadened into analytical studies of logistics and manpower. Some years ago activity was extended to include international strategic studies, and at present there is a developing interest in research on the effects of defence activities in general, internationally, and also on the Canadian economy and on Canadian society. In order to meet these new demands the Defence Research Analysis Establishment (DRAE) has had to expand its field of academic competence to include not only the traditional "hard sciences" but also political science, economics and other "social sciences".

This report contains brief resumes of some of the projects in DRAE related to these new fields, and a list of the more relevant unclassified DRAE publichations is attached.

Key Words: Social Science Physical Science
Application to defence problems
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DC

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