

NOTE

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ARMY HEADQUARTERS

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Policy and Organization for Scientific
Research and Technical Development in
the Canadian Army 1939-1945

POLICY

1. Prior to 1939 no policy on research and development of warlike stores existed in Canada. The Canadian Army relied entirely on British Equipment, and our concern was procurement and distribution rather than development. True, the Master-General of the Ordnance had a research, design and development function as outlined in K.R. (Can) 1939, Para 11 and Appendix VI, Para VII, but in practice the small amount of experimentation which was carried out was done largely by the National Research Council at Department of National Defence's request and was limited to a few problems imposed by Canadian geographic and climatic conditions, or problems relating to certain defensive equipment.

2. Research was not confined entirely within the MGO Branch. In addition, General Staff Branch was responsible for Operational Research, the Adjutant-General's Branch for medical and dental research, and the QMG Branch for research on engineer equipment. However, in these three Branches the research function was more implied than real. Armament research was just another field in our over-all unpreparedness to engage in a war of the first magnitude. The part Canada was eventually to play in war technology could hardly have been anticipated, so perhaps the total lack of policy had no more deleterious effect ultimately than might have resulted from a completely misguided policy which the indifferent thinking of the early 1930's would undoubtedly have produced in keeping with such other military monstrosities as the Maginot Line. At least our research potentialities were not immobilized by a cumbersome structure founded on wishful thinking. When war seemed imminent certain groups within and outside the Army had begun to concern themselves, frequently unofficially, with some of the technical problems which would arise in the event of war. With the object of compiling a complete register of Canadian Scientific workers several professional societies* cooperated in conducting a canvas of chemists, engineers, et al, early in 1939. The

* The participating organizations were:

The Engineering Institute of Canada,

The Canadian Institute of Mining
and Metallurgy,

The Canadian Institute of Chemistry
and The Technical Service Council,

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register indicated the particular type of war work that each individual considered himself qualified to undertake. This work later received official recognition by being accepted as the basis for the operations of the Wartime Bureau of Technical Personnel (P.C. 780 of 12 Feb 41). In 1937 (?) a Central Investigation Committee was set up within the Department of National Defence to carry out a survey of industry in order to determine the adaptability of various organizations to wartime production and testing. Upon formation of the War Supply Board the responsibilities and records of the Committee were transferred to that Board (P.C. 3120 of 21 Oct 39). Thus at the outbreak of war an important step towards the mobilization of scientific brains and industrial production potential had already been taken.

3. During 1940 - 1941 some experimentation and development work was carried on by the Canadian Army in Britain. Such work was limited by heavy existing demands on British workshop facilities where prototypes could be made and by the numerous other requirements of training, etc., which the Canadian Army had to meet. It became increasingly evident that more and more of the development work would have to be carried out in Canada to meet the requirements of user specifications established by the Canadian Army overseas. This period marked a gradual expansion of Canadian Army development agencies in Canada to satisfy the increasing requests emanating from the Canadian Army in the United Kingdom. This expansion, however, was not accompanied by the establishment of any firm policy on development, projects being undertaken by whichever organization appeared best suited for the task, but without any central correlating agency. In certain fields of endeavour such as medicine, communications and chemistry central boards or committees were set up relatively early, often on an inter-service basis, to control and allot research projects in their particular field. In other spheres, particularly in armaments, cooperation and collaboration depended upon the personalities and initiative of the individuals concerned.

4. It is perhaps significant that in those sciences where coordination was achieved at a relatively early date well established professional societies had been in existence for some years, whereas in armament development, for example, from the very nature of the work there were no societies which fostered personal contacts and the inter-change of knowledge. The situation was succinctly summed up in P.C. 1/1640 of 8 Mar 45:

- (a) Prior to the outbreak of the present war, a small ballistic staff existed with the staffs of the Chief Inspector of Arms and Ammunition and the Dominion Arsenal, Quebec.

- (b) After the outbreak of hostilities, this small staff was unable to undertake the increased work in armament research and inspection. As a result of this, the Inspection Board of the United Kingdom and Canada was formed in 1941 and various technical committees and groups were organized under the Department of Munitions and Supply and the National Research Council.
- (c) The number of technical groups and committees was increased with the increased production of weapons, and as a result there was divided responsibility, lack of cohesion and poor liaison between groups and committees.

In order to overcome the lack of coordination, especially in armament development, General McNaughton proposed the formation of an Armament Development Board. On 10 Mar 42, under authority of P.C. 1875 the Army Technical Development Board (ATDB) was constituted to "promote research, design, experiment and development in connection with all matters and things wherewith the Master-General of the Ordnance is now charged" in other words, to assist the M.G.O. in carrying out the greatly expanded development functions.

The Board was composed of the following:

M.G.O. - Chairman
D.M.G.O. - Deputy Chairman
H.J. Carmichael, Esq., - Dept. of Munitions & Supply
R.E. Jamieson, Esq., - Dept. of Munitions & Supply
Dean C.J. MacKenzie, - Acting President, N.R.C.
Col. (later Brig) G.P. Morrison - Director
Technical Research (later D.M.G.O.(C)).

Mr. J.E. Hahn was appointed Director-General and an additional member of the Board (P.C. 8348 of 14 Sep 42).

5. ATDB supplied a means of coordinating and expediting, at high level, Army development projects relating to specific military requirements other than those for which standing boards or committees were already functioning such as Radar and Chemical Warfare. To carry out recording functions and to implement the Board's actions an ATDB secretariat was established.

6. Following a review of development projects in hand at September 1943 General Staff set up a priority rating system for existing and future projects. Class A was assigned to those projects where available evidence indicated a strong possibility that a design would be finalized in substantially improved form, production initiated and equipment in the hands of troops in quantity before 1 Jan 45. Where availability to troops was indicated between 1 Jan 45 and 1 Jul 46 the project was included in Class B. Class C was applied to

fundamental research, assessment and proofing problems which concerned A and B projects, or to research problems when techniques of operational value were expected to result within three years (i.e., by November 1946). Class D covered long term projects for which no General Staff requirements could be foreseen during the War.

7. In order to ensure the speediest possible transmission of technical information from development establishments in the United Kingdom to those in Canada a Technical Liaison Group, consisting of 57 Technical Officers, was set up overseas (P.C. 118/93 of 7 Jan 44). This group, by providing technical liaison, complemented the higher level work of ATDB.

8. By this time the dependence of the war effort on the sciences and scientific method was well established. It had come to be realized that the use of methods of scientific analysis might be extended advantageously to studies wider in scope than technical development. The British Army had instituted a policy of Operational Research. As a result of a report by Dr. D.C. Rose and Lt.Col. C. Sanford on the British system the Chief of the General Staff recommended the establishment of an Operational Research Organization in the Canadian Army, the function of which would be to "examine equipments and methods from the statistical and scientific point of view, and to provide data to assist in assessing the value in operations and in training". Such an organization would provide the CGS with a means of obtaining scientific advice on which to base decisions of military policy. The recommendation provided for:

- (a) A civilian Scientific Advisor in the Canadian Army Council, with provision for a deputy.
- (b) An Army Operational Research Group made up of suitably qualified Army Officers and/or civilian scientists.
- (c) A Directorate of Operational Research in the Sub-Branch of D.C.G.S.(C).

This was approved by the Minister 23 Oct 43 and implemented by P.C. 74/9542 of 15 Dec 43 (Scientific Advisor), and P.C. 58/1555 of 8 Mar 44 (A.O.R.G.).

9. As a result of experiences in Italy it was apparent that, due to the long channel of communication an excessive delay was occurring in the transmission of user criticism of design detail back to development agencies. With the impending invasion it was important to overcome this delay. Consequently MGO urged the appointment of Field Technical Officers having authority to communicate directly with Development agencies on those technical matters which did not involve any change in GS design Policy. In May of 1944 a Canadian Section Weapons Technical Staff was authorized (P.C. 203/7093 of 13 Sep 44; G.O. 438, 1944). This group

worked with the Ministry of Supply Technical Staff at 21 Army Group. An A.F.V. Technical Staff was authorized (P.C. 203/7093 of 13 Sep 44, G.C. 438, 1944, effective 28 Apr 44) at the same time to work with B.R.A.C. at HQ First Canadian Army. About a year later the two groups were combined with an Operational Research Team to form No. 1 Canadian Field Research Section (P.C. 137/5720 of 24 Aug 45, G.O. 322, 1945, effective 15 Apr 45). As a unit the Research Section saw no active operations, though they functioned on the Continent from 7 May 45 to 14 Aug 45.

10. In the following section, the expansion of army technical agencies is outlined. The changes, being made to fulfil the immediate requirements at the time, rather than on a basis of an existing plan, resulted in establishments not only experimental in function, but, in addition, experimentally organized, with the result that, with every change in requirements came a change in organization, and it was some considerable time before a more or less stable organization was achieved.

EXPANSION AND GROWTH OF ARMY RESEARCH AND TECHNICAL BRANCHES

11. The stimulus to expansion of Canadian research resources came from several sources. First, Britain's scientists were fully mobilized and engaged on problems of more immediate urgency caused by the threat of invasion, the menace to shipping and increasing air attack. Secondly, it was realized that Canada was particularly fortunate in having assets due to geography and climate not available elsewhere for carrying out certain types of necessary investigational work. Finally, in command of the Canadian Army overseas we had in General McNaughton, himself both soldier and scientist, a man with a dual background of experience, who was in close contact with the military problems and fully familiar with the research resources which Canada had to solve them. His persistence was largely responsible for the growth of organized scientific military research which took place in Canada and more especially in the Canadian Army.

Branch of the Master-General of the Ordnance

12. It was natural enough that the expansion of the army organization to deal with technical problems should take place first in the Branch of the Master-General of the Ordnance. Prior to the war the MGO Branch consisted of three directorates:

Directorate of Mechanization and Artillery,
Directorate of Ordnance Services, and
Directorate of Clothing, Equipment and
Manufacturing Establishments.

The functions of the Branch as defined in K.R. (Can) 1939 Appendix VI, para VII were:

The scientific development of material for military requirements.
Research, design and experiment pertaining to guns, carriages, tracked vehicles, semi-tracked vehicles, wheeled vehicles, small arms, machine guns, ammunition, grenades, bicycles, chemical defence appliances, position and range finders, optical instruments, technical stores connected with the artillery and engineers, signal stores, ordnance stores, barrack stores, general stores, equipment and clothing.
Provision, storage, issue, inspection while in stores or in possession of troops, and repair (other than first line repair) of the above with the exception of M.T. vehicles on the establishment of A.S.C. units or driven by A.S.C. personnel.
Dress Regulations, Clothing Regulations.
Design and provision of regimental badges and buttons.
In conjunction with the Deputy Minister, inspection before acceptance, of the stores, etc., above referred to.
Inspection of ammunition.
List of changes in war material.
Administration of ordnance services and manufacturing establishments and their personnel.
Advice to C.G.S. in connection with technical training of R.C.O.C. personnel.
Administration of technical committees established for M.G.O. services.
Scales of issue of arms, ammunition, stores and equipment in peace and war and of reserves to be maintained.
Plans for mobilization of civil manufacturing establishments.
Questions regarding inventions, patents, royalties and rewards.
Liaison with the Research Council of Canada.
Salvage in connection with M.G.O. services.

13. In September 1940 the Directorate of Mechanization and Artillery was divided into two directorates: Directorate of Technical Research and Directorate of Ordnance Services (Mechanization). The title of the former implies its functions. More specifically it was charged with:

- (1) The scientific development of material for military requirements.

- (ii) Research, design and experiment pertaining to guns, carriages, small arms, machine guns, ammunition, grenades, chemical defence appliances, position and rangefinders, optical instruments, technical stores connected with artillery, also signal stores.
- (iii) Lists of changes in war material (in conjunction with Director of Clothing, Equipment and Manufacturing Establishment).
- (iv) Liaison with National Research Council.
- (v) Questions regarding munitions, patents, royalties and rewards (in conjunction with D.C.E. & M.E.).

14. DOS (Mech) had similar functions relative to mechanical transport and Armoured Fighting Vehicles (except tanks). In July 1941 some of the functions of both directorates passed to the Department of Munitions and Supply (P.C. 23/4937 of 9 Jul 41). The designing of vehicles ceased to be a DOS (Mech) function and was taken over by the Army Engineering Design Branch (D. of M. & S.). DOS (Mech) henceforth became the Directorate of Mechanization. Concurrently the design and development of signals equipment became a Department of Munitions and Supply responsibility (see page 8).

15. In August 1941 two chemical warfare experimental establishments were authorized (P.C. 1/6687 of 26 Aug 41) and for their administration the Directorate of Chemical Warfare was established. The function of the directorate was both administrative and advisory. At first a sub-directorate under the Director of Technical Research, later in the year it became a full directorate.

16. The Directorate of Technical Research was re-designated Directorate of Artillery in July 1943. Its director, Brigadier G.P. Morrison, C.B.E., became DMGO(C), and to him both D. Arty and DCW were made responsible. Subsequently DCW was changed in name to Directorate of Chemical Warfare and Smoke. Later in the same year the Directorate assumed responsibility for design and research on flame throwers and flame thrower fuels, previously a Directorate of Engineering Design duty.*

17. In May of 1943 a new directorate: Directorate of A and B Vehicles and Small Arms was established about the nucleus of personnel of the Small Arms and AFV Armament Section in D. Arty. This directorate assumed D. Arty functions in the design and development of small arms and A and B vehicles.

* An Army directorate in the Quartermaster General's Branch (see page 10) and not to be confused with the Army Engineering Design Branch of the Department of Munitions and Supply.

18. A fifth MGO technical directorate, Directorate of Electrical and Communications Design wandered about, under various authorities before finally settling down under MGO. Before the war a small technical group existed in the Directorate of Signals, Branch of the Chief of the General Staff. With increasing demands and consequent expansion of this group it was transferred to the MGO Branch in May 1940. Its duties included design, development, procurement and inspection of Signal Stores. Later the procurement function, together with a nucleus of trained staff, passed to the newly established Directorate of Ordnance Services (Technical Stores). Similarly the inspection duties passed to the Inspection Board. In July 1941 design and development functions passed to the Army Engineering Design Branch of Department of Munitions and Supply, and what remained of the technical group was absorbed into the Directorate of Technical Research. The Canadian Signals Experimental Establishment, (P.C. 44/89 of 7 Jan 42, G.O. 10 of 1942 effective 1 Dec 41), later designated Canadian Signals Research and Development Establishment, G.O. 335 of 1944, G.O. 346 of 1944, effective 1 May 44) came into being as an Army Establishment towards the end of the same year. In January 1942 with the increasing Canadian design and production effort it was deemed advisable to place the Army technical signals group under Munitions and Supply control, where it was set up as the Directorate of Signals Design under the Army Engineering Design Branch. The workshop facilities (CSEE), however, remained under control of the Department of National Defence. In May 1942 a Signals Production Branch was formed in Department of Munitions and Supply, which took over the production, research and development functions of the Directorate of Signals Design while the design functions, together with the nucleus of a Radar design division, remained under Army Engineering Design Branch. At about the same period the repair functions of CSEE passed to the newly-inaugurated Royal Canadian Electrical and Mechanical Engineers. In June 1943 (P.C. 51/4690 of 8 Jun 43) the responsibility for Signals design and development reverted to the Master-General of the Ordnance from Department of Munitions and Supply, resulting in the formation of the Directorate of Electrical and Communications Design. Radar design and development function was transferred to D. Arty. With the formation of DECD the Experimental Establishment came under its direction. DECD now ceased its meanderings and settled down to a period free from further experiments in re-organization. The history of DECD is the most outstanding example of the haphazard, "ad hoc" expansion of research and development agencies within the Army during the war period.

19. In August 1940 the Directorate of Clothing, Equipment and Manufacturing Establishments was split into various provisioning directorates, of which the Directorate of Ordnance Services (General Stores) was one. The new directorate became responsible for provisioning the Army in Canada with all clothing, necessaries, camp and barrack stores, hand and machine tools, metals, lumber, paints, hospital equipment and all other miscellaneous

items not included in the category of war-like stores. Within this directorate a research and development section was set up in October 1942 primarily to handle work necessary for the provision of specialized clothing (e.g. for winter warfare). The section carried out cold weather trials at Camp Shilo in December 1942 on newly designed experimental winter protective clothing. Upon the formation of the Chiefs of Staff Sub-Committee on Protective Equipment, personnel of the Section were loaned to the staff appointed under this Committee, and subsequently formed the nucleus about which the Directorate of Inter-Service Research and Development was organized (Ref. DOS, (GS) Narrative, Pages 8 and 9).

20. DIRD was organized in January 1945 at the direction of the Chiefs of Staff Committee on the recommendation of the Chiefs of Staff Sub-Committee on Protective Equipment. The Directorate is administered by MGO. (HWE. Cdn V/305E/1) and operates under the authority of the Chief of the General Staff memo S.D. 1-2486 dated 11 Apr 45. This directorate was responsible for the development, proofing, drawing up of specifications, packaging, and drawing up repair and maintenance instructions for all items of "General Stores", which besides clothing and personal equipment (except anti-gas equipment) includes camp and barrack stores, furniture and bedding, shelter and messing equipment, together with the raw materials from which they are made. The directorate is "inter-service" in both function and organization (Ref. DIRD Narrative).

21. Reference has been made (Page 3) to the Secretariat set up to implement the actions of the Army Technical Development Board. The Secretariat itself was authorized in March 1943 with an establishment of 19 officers and 13 other ranks. It was divided into two sections, Liaison and Administration having the following duties:

(a) Liaison Section

- (i) Carrying out such directions of the Board as pertained to liaison matters, as contained in minutes of meetings of the Board;
- (ii) Maintaining liaison with the various development Directorates and agencies, including NRC and various universities;
- (iii) Coordinating and expediting Army development projects (eliminating duplication of effort, arranging priorities, drawing attention to those projects which were lagging, etc.);
- (iv) Maintaining an historical resume of all Canadian development work;

- (v) Maintaining an index of foreign development projects;
 - (vi) Preparing a monthly report on the status of all projects recorded with the Board Secretariat.
- (b) Administration Section
- (i) Carrying out such directions of the Board as did not pertain to liaison matters, as contained in the minutes of meetings of the Board;
 - (ii) Accounting for the funds allotted annually to the Board;
 - (iii) Preparing agenda for and minutes of meetings of the Board;
 - (iv) Distributing the monthly Report on Status of Projects (in addition to the NDHQ distribution, copies of this report were sent to other countries in the British Commonwealth, and to the United States);
 - (v) General administration of the Board Secretariat.

Branch of the Chief of the General Staff

22. Reference already has been made (Pages 4-5 to the inception of an Operational Research policy in the Canadian Army.

Quartermaster-General's Branch

23. Engineer services are the responsibility of the Quartermaster General who, at the outbreak of war, had in his branch a Directorate of Engineer Services. Within this Directorate an engineer equipment section was formed 1 Dec 40 consisting of one officer and one other rank. By 31 Mar 41 the section had expanded to one officer, two other ranks, one civilian engineer and one civilian draughtsman, whose duties were investigation, development, design, and drafting specifications for Engineer and Ordnance equipment used by R.C.E., the procurement of engineer equipment, maintaining a library of descriptive commercial literature, besides recording, filing and amending R.E. & R.C.E. specifications and drawings, War Establishments, Mobilization Stores Tables, Scales of Issue, Instructional Pamphlets and Engineer Publications. A staff of five sounds hopelessly inadequate to carry out such an imposing list of duties.

Small wonder it became necessary in June 1942 to split up the Directorate of Engineer Services into the Directorate of Works and Construction and Directorate of Engineer Development. DED had the dual function of provision and development of technical Engineer Stores as opposed to Ordnance Supplies, including bridging, earth moving equipment, tunnelling and drilling equipment and bomb disposal stores.

Adjutant-General's Branch

24. Since the Directorates General of Medical and Dental Services are responsible to the Adjutant General, medical and dental research therefore comes under AG supervision. The Medical Services maintained a Research Directorate, the operations of which are discussed elsewhere (see RCAMC Narrator).

RESEARCH AND EXPERIMENTAL ESTABLISHMENTS

Chemical Warfare Experimental Station, Suffield

25. The Experimental Station at Suffield was jointly operated by the Department of National Defence and the British Ministry of Supply. It was set up in order to carry out large scale trials with Chemical Warfare munitions and became a necessity on account of the limited area of the British Chemical Warfare Station at Porton, Wilts, and due to the loss of the joint French-British Field Station in North Africa in 1940. The building of the station was authorized in August 1941 (P.C. 1/6687 of 26 Aug 41, G.O. 191 of 1941, effective 1 Apr 41). The largest station of its kind in the British Commonwealth, it covered an area of one thousand square miles and enabled trials, comparable in size to operational chemical attacks, to be carried out under a wide range of weather conditions. Such trials were its chief function and as a result of its work important contributions to chemical warfare theories have been made. Assessment work on flame throwers and flame thrower fuels was carried on at the station. In addition to the main work of assessment some development was carried on and the station exercised technical supervision over operational reserves of chemical warfare agents and munitions.

26. The station is an outstanding example of a cooperative effort, its officer staff (which numbered 75 at VJ day) being drawn from British and Canadian civilian scientists, British and Canadian Armies, Royal Navy, Royal Canadian Navy, Royal Air Force and Royal Canadian Air Force. In addition there was almost constantly at least one United States Chemical Warfare Services Officer in residence. The station contributed to the staff of the Joint United States - United Kingdom - Canadian Tropical Chemical Warfare Station in Panama.

Chemical Warfare
Laboratories, Ottawa

27. Shortly before the war the National Research Council instituted a programme of chemical warfare research in its own laboratories and at a number of Canadian Universities. The laboratories and personnel at the National Research Council were taken over by the Department of National Defence in August 1941 and formed the nucleus of the Research Establishment (Chemical Warfare) (P.C. 1/6687 of 26 Aug 41), (later designated Chemical Warfare Laboratories) (G.O. 49 of 1942, effective 1 Dec 41). At the cessation of hostilities the establishment numbered 84 officers and 73 other ranks. Although vacancies on the establishment could be filled by Navy, Army, Air Force or civilian personnel, in actual fact almost all the staff were members of the Army with no Navy and only one Air Force officer on strength. A few appointments were filled by civilians. Several technicians were drawn from the Canadian Women's Army Corps.

28. Perhaps the most important contribution of the establishment was in the technical assistance given to Canadian industry in the manufacture of Chemical Warfare offensive and defensive equipment and in the critical examination of such equipment. In addition it carried out extensive development work on anti-gas equipment. A pilot plant was operated for the production of special chemicals required for Chemical Warfare purposes, including Toxic Gases. At a critical period this pilot plant was the sole source in Canada of D.D.T. The requirements of the three Services for this material were met completely by the output of the pilot plant. The Chemical Warfare Laboratories maintained a central information service on Chemical Warfare and related subjects, some 30,000 technical documents having been filed and indexed there.

War Disease Control
Station

29. The establishment of this station was authorized in December 1942. It was a Joint United States - Canadian project. At VJ day, the establishment numbered 22 officers and 123 other ranks (P.C. 70/10933 of 2 Dec 42, G.O. 480 of 1942, effective 15 Oct 42). The station carried on work related to defence against biological warfare.

Extra-Mural Group

30. While not, strictly speaking, an establishment the extra-mural group of workers in Chemical Warfare functioned as though it were. The programme originally set up by the National Research Council and supervised by it until 1943 had been

financed since 1941 by the Department of National Defence. In 1943 the Directorate of Chemical Warfare assumed the supervision of this group. The group carried out, for the most part, fundamental investigations of a long term nature, though a number of problems for immediate urgent requirements were undertaken as well.

Armaments: Canadian Armament Research and Development Establishment

31. Although this establishment was not authorized until 1 May 45 its functions had been performed by a number of organizations which were finally unified under this designation. At the outbreak of war there were two ballisticians on the staff of the Dominion Arsenal at Quebec. This number was inadequate even to perform the duties of inspection which became necessary as a result of the wartime increase in production, to say nothing of carrying on research and development work. In 1941 the newly formed Inspection Board assembled a small group of scientists to deal with the technical problems of manufacture and proof of ammunition. From time to time the group were asked to undertake additional studies, chiefly by National Research Council or Department of National Defence. These additional jobs so increased in number that by the spring of 1944 the Inspection Board feeling that the group had expanded beyond their requirements, requested that the responsibility for their work be assumed by the Department of National Defence. This group became the Physics and Mathematical Group ("B" Wing) of C.A.R.D.E., and its work deals with various phases of theoretical and applied ballistics.

32. Encouraged by the success of Canadian Research workers in the field of explosives, an Explosives Pilot Plant, financed by Department of National Defence was constructed under the supervision of National Research Council. With the formation of C.A.R.D.E. the staff and plant became the chemical wing ("C" Wing) of this establishment. It is equipped to carry out all chemical investigations on explosives as far as the manufacture of small lots.

33. Prior to the war no armament design group existed in Canada. As requirements arose design was carried out either by the Military Technical Advisor to the Department of Munitions and Supply or by D. Arty. In 1944, National Research Council, at its own expense, loaned certain civilian design personnel to D. Arty. Following authorization of C.A.R.D.E., (P.C. 1/1640 of 8 Mar 45, G.O. 115 of 1945, effective 1 Oct 44), Canadian officers, trained in the United Kingdom, were posted to the Engineer Design and Service wing of C.A.R.D.E. This group was responsible for design and modification of weapons and projectiles.

Engineer Equipment: Experimental
Establishment, R.C.E.

34. The formation of an Experimental Establishment, R.C.E., was authorized October 1942 (P.C. 49/9776 of 8 Oct 42, G.O. 435 of 1942, effective 1 Oct 42). The unit was built about the nucleus of the existing R.C.E. Workshop set-up a few months previously to carry out work for experiments with Anti-Tank mines and camouflage materials. (Ref. HQC. 70-5-331; HQ. 54-27-76-12-41).

Signals Equipment: C.S.R.D.E.

35. Reference has been made already to Canadian Signals Research and Development Establishment (Page 8). Its functions included:

- (i) Research in electrical and communications fields leading to service applications.
- (ii) Development of electrical and communication equipment as directed.
- (iii) Manufacture, experiment and development models of equipment as directed.
- (iv) Manufacture of limited quantities of production models of equipments as required by reason of security or expediency.
- (v) Carrying out tests and measurements on electrical and associated equipments.
- (vi) Services in connection with custody of stores, draughting, photographic work and transportation as required.

The establishment on the termination of hostilities numbered 25 officers and 197 other ranks, 179 of the latter being tradesmen.

Vehicles: Vehicle Proof
Establishment, N.D.H.Q.

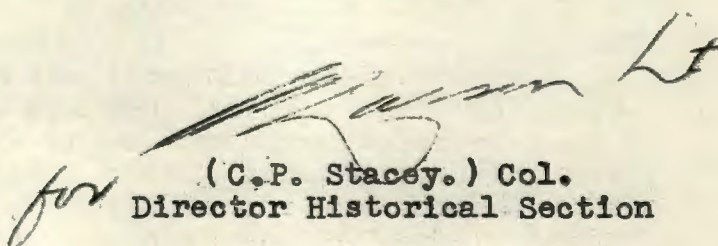
36. The majority of vehicle design work was done by the Army Engineering Design Branch of the Department of Munitions and Supply. In order to carry out the necessary acceptance tests of new vehicles and accessories a Proving Ground Detachment, R.C.O.C., consisting of four officers and 64 other ranks, was authorized in July 1941 (G.S. 233 of 23 Jul 41, P.C. 99/7841 of 9 Oct 41). While its function was primarily assessment and proofing a certain amount of development work was

carried out. With the inception of Directorate of Development of (A) and (B) Vehicles and Small Arms the detachment came under the supervision of that directorate. The work of the group increased considerably. In August 1944 the authorized establishment stood at 12 officers and 147 other ranks (P.C. 47/8367 of 3 Oct 44) and the designation was changed to Vehicle Proving Establishment, N.D.H.Q.

37. The functions of the establishment may be summed up as follows (Memo M.G.O. to C.G.S. H.Q.C. 70-5-538A, Vol.2, 12 Jul 44):

- (a) Acceptance trials of pilot models for the General Staff.
- (b) Production tests for the Inspection Board.
- (c) Testing of components and ancillary equipment developed by various directorates.
- (d) Testing for Army Engineering Design Branch as requested.
- (e) Special Trials of equipment and components for D.D.E.E.
- (f) Arranging and conducting demonstrations at the request of the General Staff, National Research Council and other organizations.
- (g) Tests on foreign material.

38. The compilation of this report was completed by Dr. E.E. Massey in March 1948, but the report was not mimeographed until April 1953.

for  Lt
(C.P. Stacey.) Col.
Director Historical Section