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A BRIEF HISTORY OF DRES--1941 - 1985

In this century alone Suffield has been invaded three times by the British.

In 1909 Canadian Wheatlands Limited, a speculative land-development Corporation with roots in Britain, established its headquarters in what is now Suffield (named after the Fifth Baron of Suffield, one of the financiers of the C.P.R.). Some 64,000 acres were acquired and preparation for seeding began. In 1912 11,000 acres were seeded, 10,000 more were added in 1913 and in 1914 there were 22,000 acres seeded. But 1914 was a disasterously dry year and the hoped-for crops of wheat, flax and oats withered and died on the stalk. Not a single acre was harvested. This, plus the outbreak of World War I which dried up the flow of money from Britain, resulted in the demise of one of the largest farming enterprises ever undertaken in Canada. The once-thriving Village of Suffield which boasted five grain elevators and three hotels (one, the Alamo had a bar 40 feet long) swiftly deteriorated into a ghost town.

The second invasion was in 1941, the year in which the Defence Research Establishment Suffield (DRES)* was established. Considerable coverage of the event was given in the Medicine Hat News from April to July 1941. This is how it came to pass.

* In October 1941 the name was UK/Canada Field Experimental Station (FES). In November 1941 the name was changed to Experimental Station Suffield (ESS). In August 1950 it became Suffield Experimental Station (SES). Since 1957 it has been DRES.

SUFFIELD EXPERIMENTAL STATION DURING WORLD WAR II

The horrors of gas warfare committed by both sides in World War I left a never-to-be forgotten impression on the generation of that time and in 1925 a large number of nations signed a protocol in Geneva vowing never to be first to employ toxic gases in warfare, but reserving their right to use them in retaliation. The consequence was that research continued in many countries and stockpiles were formed. Today we know that the known competence of the Allies to retaliate swiftly was the deterrent which persuaded the enemy in World War II that they would be foolish to employ gas. In World War I gas was responsible for over a million casualties on the battlefield. In World War II there were none.

Prior to 1939 most of the chemical warfare research in the British Commonwealth had been done in Porton, England. The British and French co-operated very closely in this field and in Algeria a joint experimental station had been constructed in the Sahara at Beni Ounif, 200 miles south of Oran. The size of this station - it was 75 miles by 25 miles in area - its relative isolation, its accessibility and the fact that there was a prevailing wind made it an ideal testing site. However, when France fell in 1940, the site was lost to the Allied cause and it was of course impossible to find a suitable substitute in the densely populated United Kingdom.

Shortly after the loss the Canadian Government signified its willingness to provide an alternative testing site in Canada and conversations were initiated with United Kingdom authorities. In June of 1940 Mr. E.L.I. Davies, who was then Superintendent of Experiments at Porton, was requested by his Government to write an appreciation

outlining the requirement for a chemical warfare experimental station. In October of the same year Mr. Davies came to Canada where he discussed the situation with personnel in the Department of National Defence.

A paper survey was made of sites in various parts of Canada. A site in Tracadie, New Brunswick, which had already been procured by the Department, was rejected as being too densely wooded and difficult to traverse. Two possible sites in Northern Quebec and Northern Ontario respectively were rejected because they would have been too expensive to open up on account of heavy bushland in those regions. A possible site near Brandon, Manitoba, was impracticable because it was in the vicinity of Shilo military camp. A site was considered near Maple Creek, Saskatchewan, and though this would have been ideal in almost every respect, there were in this area over 1000 properous farms which would have had to be evacuated. Finally the choice rested on Suffield, Alberta, where there was an area of more than 1000 square miles of relatively flat territory running down to the South Saskatchewan River. In this area there were only 125 farms, of which just five were paying propositions.

It was consequently recommended that Suffield should be chosen as a site for a combined United Kingdom-Canadian chemical warfare experimental station. In December of 1940 Mr. Davies returned to the United Kingdom to advise the War Office on the suitability of Suffield. In February of 1941 the Canadian Government and the Government of the United Kingdom agreed to share all operating costs at Suffield on a fifty-fifty basis. At the time these were about two million dollars a year in addition to capital costs.

The Alberta Government under Premier W. Aberhart was most co-operative in expediting the enterprise. The Department of National Defence bought the property. Much of the land was purchased from the Canadian Pacific Railway and the Hudson's Bay Company at the nominal price of one dollar an acre and those farmers who had to be evacuated were given fair compensation.

In the spring of 1941 a small nucleus of British scientists (about 10 in number - the second invasion) came to Canada to form the core of the experimental station. This small group of key personnel was responsible for the initial planning of the station program and for the training of the remainder of the staff, which was entirely Canadian. When operations began in the summer of 1941 the station was set up as an Army establishment, although provision was made for the employment of civilians and for the inclusion of a small RCAF detachment.

On June 11 1941, the Canadian Army officially became responsible for administering the station but at this time there was in truth very little to administer. When the first group of Canadian Scientists headed by Dr. H. M. Barrett arrived at the location in July there were no buildings erected, the surveyors were still at work, and about the only indication that a station was developing was a group of scattered tents, a few bulldozers levelling the ground and a work gang building a runway. The scientists therefore had to set up their headquarters in Medicine Hat armouries where they remained until the middle of August. By that time the first building was considered habitable - although it had as yet neither doors nor windows - and the scientific staff moved out to the station to begin the first experiments and field trials immediately.

While they were established in Medicine Hat, the original scientific staff were kept busy employing additional personnel, accumulating stores and recruiting scientific help at Canadian universities. The first shipment of experimental stores consisting of several railway carloads of gases and artillery shells, arrived from the United Kingdom at about this time. All the scientific personnel at the station, together with what troops and workers were available, had to assist in the unloading of these stores. Since there was no storage space available, it was necessary to cache them in trenches which had been dug for the purpose. Later some of these gases were to be manufactured in Canada.

By the end of the war the total number of personnel employed at the station was 584 of which 50-odd were professional staff who were trained in chemistry, physics, meteorology, mathematics, pharmacology, pathology, bacteriology, physiology, entomology, veterinary science and mechanical and chemical engineering. Included in the total establishment were over 100 qualified technicians and a field staff of approximately 60 who had been trained in the techniques necessary to carry out large-scale experiments. Ultimately, approximately 75 percent of the technical staff and all of the administrative and field staff were in uniform. On the scientific side under the Chief, Mr. E. L. I. Davies, there was a Superintendent of Research, Dr. H. Barrett, who had four sections reporting to him - one dealing with chemistry, one with physics and meteorology, one with offensive munitions and one with physiology. In addition there were experimental officers from each of the three Services. In December of 1942 a chemical warfare school known as S-11, was established at the station under the command of LCol J. Roberts. This school, which was originally set up for the training of mortar companies, also conducted experimental field trials with mortars and rockets using gas-filled shells.

Although the station was originally established as a chemical warfare station, it was equipped to carry out research in many other fields as well. It had the longest artillery range in the Commonwealth and possessed a good aerodrome and excellent facilities for high-level bombing trials by an RCAF unit attached to the station. Laboratory facilities were ultimately available for research in most of the basic sciences. Work was also done on smoke, flame warfare and ballistics.

With respect to chemical warfare a great deal of research was undertaken to determine how clouds of gas dispersed under various conditions of temperature, humidity, wind, etc. One of the earliest large trials was the study of the diffusion of gas from very large sources (many tons) to determine whether England should worry about gas releases from occupied France. In such experimental work, one is really studying physical rather that chemical events so that correct answers can often be found by using harmless gas rather than the real thing.

Entomological research for the Allied Forces was another wartime activity at the station. In 1945, far-sighted officials recognized that the vast disseminating chemical warfare agents would be of value in studying the various factors governing the efficient employment and application of the new organic insecticides. The decision to form a distinct Entomology Section in April 1945 was prompted by a request from Dr. Otto Maass, acting in his capacity as Director of the Pulp and Paper Institute, that the station investigate the feasibility of using aerial applications of insecticides for the control of the spruce budworm, a project of great economic importance to Canada. The projects undertaken were all relatively short-term, most arising from specific requests for work and involved the unique facilities offered by the station as a whole.

Some of the ancedotal accounts of the early years at the station make interesting reading. We were intrigued to learn, for instance, that water was too valuable for bathing. The custom was to bathe for .50¢ at the Cecil Hotel in Medicine Hat, on weekends, after a normal two-hour drive to get to the Hat!

The daily trip to and from Medicine Hat in those days sometimes offered a challenge to the adventurous. The Trans-Canada Highway had not been built and the existing gravel road was narrow and could be treacherous in wet weather. In winter the trip was frequently slow and uncertain because of drifting snow and on at least one occasion road travel was completely stopped for a period of days. On this occasion the RCAF detachment operated an air-lift for key personnel between the Hat and the station. There was usually two or three full-scale blizzards during the winter and at these times travel was especially hazardous. At one stage a bus left the station and was "lost" in transit for some 20 hours.

The most unpleasant travelling conditions generally occurred at spring run-off time. Then the road was pitted with numerous axle-deep mud holes and was under water in low sections. One reporter of the first 10 years can remember sitting in a stalled staff car with water up to the floorboards in the middle of a "lake" some hundreds of yards in diameter, while the driver waded to Redcliff to get help. The worst conditions occurred about 1950. They were so bad that vehicles had to travel in convoy for the sake of mutual assistance. Buses left the Hat at 7:30 in the morning and arrived at the station about 10:00. In the evening they left the station at 5:00 p.m. and arrived in the Hat sometime between 9:00 and 11:00 p.m. There was one period in which the Administration gave up the attempt to operate road transport and hired a train to run between the station and the Hat.

The year 1950 was indeed a year of weather. Another reporter of the time had this to say.

> The thaw resulted in the South Saskatchewan being blocked by the ice flows, with flooding of Medicine Hat, and our RCAF contingent, myself as auxillary crew member, were called upon to drop H. E. bombs to loosen up the ice. Success was not conspicuous, but all enjoyed themselves immensely. When the freeze was at its height in 1950, our Dakota was used to fly party including myself, around the Northern Territories, including places like Cambridge Bay and Baker Lake, but nowhere was a temperature encountered anything like as low as the one at Suffield mentioned above, -54°F.

Still another reporter of those early days recalled these anecdotes.

> After a trip to Medicine Hat to see the Chief about an appointment at the Station, I was offered a six-week trial and landed there in late August of 41. The Mess was in the Administration Building and we slept in what was afterwards the Chemistry Building. The Officers' Mess Kitchen was an open framework with a tarp roof. The food was passed in through a window and all the flies came in with the food. A number of them left when the dishes were sent back to the kitchen. (The dysentery epidemic was colossal.)
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> However, we were all working long hours and I can't remember any complaints about conditions and gradually the Messes occupied their own buildings and comfortable quarters were provided. I have been on many Stations and in Military Camps in two wars and I believe Suffield was the best one I was ever in. When a new soldier arrived in Suffield, he would ask to be paraded before me as soon as he could. He wanted to be transferred out at once. Everyone did it. There were no exceptions. I didn't treat them roughly but told them to come back in a week's time and I would consider their application. They never came back. In one week they wanted to stay.
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> The trials of the Administration Section in keeping the men fed, clothed, provided with beer and leave, and the methods (not always orthodox) of doing this, could provide material for a booklet in itself, but were all part of a pleasant occupation at Suffield.

THE SUFFIELD EXPERIMENTAL STATION (SES) UNDER THE DEFENCE RESEARCH BOARD

In 1946 the station became an all-Canadian enterprise when British financial support was terminated. Since the station facilities had been so valuable during the war both to Canada and to her Allies and since the need for an extensive experimental range would continue in times of peace, there was general agreement that the station should be maintained on a permanent basis. In common with most establisments of this nature, however, the station lost many of its key personnel as soon as the war ended and for a number of months only the most important projects could be continued.

The station was officially taken over by the Defence Research Board on 30 April 1947. At that time the establishment called for a total of 46 professional personnel and 341 non-professional staff but it was to be a number of years before this table of organization was to be adequately filled. The personnel problem was a serious one everywhere but at the station it was doubtless aggravated by the remote geographical location. Since it was so isolated, being 30 miles from the nearest town of Medicine Hat, one of the ever-present problems was housing for married personnel. In the autumn of 1947 approval was given for the construction of 60 prefabricated housing units at an estimated cost of $483,000.

From this beginning was to grow the present thriving community of Ralston, situated two miles from the main laboratory. It is named after Colonel the Honourable J. L. Ralston who had been Minister of Defence when the station project was initiated. In addition to the housing required there was also need for a community shopping and

recreational centre, a school, a water and gas system, a fire hall and garages. Unfortunately this building program was unexpectedly slow and was continuously subject to shortages, delays and postponements, but by 1953 all the major construction had at last been completed at Ralston Village.

For many years after the Defence Research Board was formed the station was the "cinderalla of the family" as far as permanent buildings were concerned. The old temporary wartime buildings continued to serve the various sections until the well-appointed Central Laboratory was opened on 29th September 1955. Major General William M. Creasy, Commanding General, U.S. Army Chemcial Corps (which had been closely associated with the station in many aspects of its program) officially opened the building.

After the transfer of staff and equipment to the new laboratory (the large main building), much of the old wartime accommodation which had served its purpose so admirably was demolished. However, several of the 43 DRES buildings in use today date from 1941.

THE RESEARCH PROGRAM AFTER WORLD WAR II

The functions of the station changed considerably after World War II, as military requirements altered. In the early days the station was mainly a field test facility with a supporting staff of scientists. It later evolved into a major laboratory research facility - with the Suffield range used to investigate the applied or large-scale aspects of the basic laboratory programs.

Testing of all offensive weapons terminated. Research into the defensive aspects of chemical and biological warfare continued and is

active to this day. In addition other research interests began to absorb the attention of the SES scientists.

One biologically-related problem area was the determination of the manner in which bacteria travel in airstreams. To this end SES constucted the largest low-speed wind tunnel in Canada. Controlled air movement was provided by the propellors of three aircraft engines.

Another interest, particularily in the 50s, was in fallout from nuclear explosions in other countries. SES scientists frequently flew to great altitudes to make measurements of radiation. Studies in radiation biology were also initiated, using a Van de Graaff generator.

Still another interest was in explosions, big chemical explosions. In the 50s and 60s there was great interest in the physics of nuclear explosions, in being able to predict with precision the behaviour of nuclear explosions of varying sizes. Other nations used actual nuclear devices for this type of research. (In fact, in the mid 50s two teams of SES scientists were invited to go to Australia and take part in a British nuclear explosion; one team measured blast effects and the other gamma radiation.) At home the SES team simulated tiny nuclear explosions by employing very large amounts (up to 500 tons) of harmless (non-radioactive) TNT.

After sufficient mastery of this type of problem was gained the large SES explosions came to an end, the last being in 1968. However, interest continues to this day at a very fundamental level in the physics of shock and blast from explosions.

One interesting consequence of this considerable expertise is that

DRES became very involved in Naval problems, an involvement which also continues to this day. It began in 1968 when DRES was tasked with determining the effect on Naval vessels of the blast of missiles being fired. Later work was aimed at determining the effects of blast on masts and antennas and the effects of blast of new Naval guns on ships' superstructures. As recently as September 1980, DRES shook a Navel ship 130 miles offshore Halifax by underwater explosions to determine its resistance to underwater shock. Preparations took months. The ship was instrumented in over 100 locations and the effect of blast at each location was recorded for later analysis. The instrumentation alone consumed 32,000 feet of electric cable. The charges had to be transported out into the Atlantic. The data obtained concerning structural weaknesses will be of enormous value to the designers of the next generation of Canadian naval vessels.

Along with this appreciation of shock and blast expertise to Naval problems DRES has been deeply involved in electronic problems associated with Naval sensing and weapons systems. Recently completed research in a very different field has resulted in a method of cooling the funnels of naval vessels by several hundred degrees so that they will be much less detectable to heat-sensing devices.

THE THIRD INVASION

Just as huge unpopulated areas of land are required for the field testing of devices used in chemical warfare so are large areas required for training for mechanized warfare. Western Europe has no such areas nor has Great Britain.

In 1971 the British and Canadian Governments came to an agreement permitting the British Army to train for all-arms mechanized warfare on the Suffield Range. With a British military presence on property

belonging to the Canadian Department of National Defence, there had to be, too, a Canadian military presence. The consequence was that DRES suddenly had two new neighbors; the British Army Training Unit Suffield (BATUS) and the Canadian Forces Base Suffield (CFB Suffield). CFB Suffield became the helpful landlord, supplying administrative services to both DRES and BATUS and acting as overall co-ordinator of activities. One major consequence of the arrival of BATUS was that a very large chunk of the Suffield range was turned over to BATUS for training purposes. However, of the 1005 square miles of territory (a little larger than the Country of Luxembourg) some 205 square miles remained to DRES for field trials. Because of the now very different types of DRES field operations from those of World War II, 205 square miles is a just-adequate spread for most of the current DRES work.

DRES has since acquired two additional neighbours. One is the Alberta Energy Company which since 1976 has been developing natural gas and oil deposits lying under the Suffield range. The Company has about 3,000 gas wells on the range, several hundred of them on DRES property. They are not visible as their caps and piping are several feet under ground. The other neighbour is the Prairie Farm Rehabilitation Agency (PFRA) which grazes 7,500 head of cattle on various portions of the range.

THE BLUE YEARS

In 1974 the Defence Research Board (DRB) ceased to function as an independent advisory body to the Military services within the Department of National Defence and DRES (plus her five sister Establishments*) was brought into closer partnership with the military.

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* There is a sixth Establishment which has no laboratories as it operates primarily by employing mathematics. It is not a CRAD Establishment.

All DRB employees became Federal Public Servants and the Establishments ments now answered directly to a civilian Chief of Research and Development (CRAD) at NDHQ.

Shortly before, however, it was decided that a new Defence Research Establishment would be built in Winnipeg. In order to finance such an undertaking, DRES, an expensive Establishment to operate, would have to close!

So began the blue years. Many highly skilled DRES personnel left for greener fields. The annual budget was lowered to a level which would bring DRES to a limping halt in a few years. Morale was at an all-time low. However, some employees and some fine DRES friends decided to fight the decision to close DRES.

And they won! In 1977 it was decided that the Establishment in Winnipeg would not be built and that DRES would not close. Shortly thereafter it was decided, in fact, that DRES research programs would expand!

DRES IN THE 1980's

From the perspective of mid-1985 the decade of the 1980's will be remembered at DRES as one of renewal in the areas of chemical, biological and biomedical research and new directions in the research and development program of the newly established Defence Technologies Division.

By the early 1980's most of the staff who had implemented the DRES chemical and biomedical programs retired, and a new team took up the challenges - both old and new.

Research at DRES has led to better a understanding of the mechanism of action of nerve agents which has in turn resulted in the development of improved drugs for the treatment of nerve agent poisoning. DRES has continued to develop and test standard operating procedures for the use by the Canadian Forces in the event they were placed in a chemical or biological contaminated environment. As well, the tremendous problems involved in the treatment of casualties in a contaminated environment came to be recognized, and dealt with, through a series of major exercises with the medical corps. Essential procedures and new equipment were developed and tested under realistic conditions.

Better methods of testing military equipment to assess its ability to function in a chemical environment have been and are still being developed by DRES. This work has involved the evaluation of many significant items, from battle tanks to destroyers to the CF 18. In addition DRES has provided and continues to develop training aids in the form of equipment and procedures to enhance chemical defence training for the Canadian Forces.

Similar types of research in support of defence against biological agents has also been undertaken, that is, in the areas of detection and identification of dangerous bacteria and viruses, the development of protective clothings and means of decontaminating equipment, clothing and terrain contaminated with bacteria or viruses, and determining the spread of biological agents. In addition, DRES has a highly active program studing the active transmission of naturally occurring respiratory diseases ("flu", "common cold" and meningitis) aimed at providing that information as needed by the Surgeon General to control these diseases in the Canadian military populations.

The new engineering programs implemented in the late 1970's, after

the closure order was rescinded in 1977, flourished in the 1980's as young staff matured rapidly and focussed their attention on urgent requirements of the Canadian Forces in their areas of responsiblity.

The team that developed a computer based system to monitor the performance of the Tribal class destroyers weapons suite went on to develop a variety of towed, ballistic, drone and remotely controlled targets to provide realistic threats capable of scoring the effectiveness of Canadian Forces weapons systems. As well, based upon the interest of the various project management offices it appears likely that the DRES range, targets and resident expertise will become heavily involved in air defence weapons evaluation and training throughout the last half of the decade.

The Remotely Piloted Vehicle (RPV) team which was initially a spin off from the targets group, by the mid-80's, became a major influence in choosing the way ahead for deployment of this class of vehicle in the Canadian Forces for a host of roles.

The 1980's also witnessed the growth of a close relationship between the military engineers and DRES as the team responsible for air blast and underwater shock studies in the 1970's diversified to tackle fuel-air explosives, standoff demolition of hard targets, standoff detonation of minefields and practice mines in addition to the detonation physics, cratering, ditching and ordnance detection studied in the 1970's. By 1985, the development of a small family of inexpensive, explosive carrying containers that could double as versatile demolition charges was well advanced, with excellent prospects for sales abroad.

Attention in shock and blast shifted to predicting the response of ships' structures to such threats. This was needed for determining

detailed requirements and for the design of new ships for the Canadian Forces. Participation in large scale trials in the United States resumed through the mid-1980's, as did the air blast testing of ships' panels on the DRES Experimental Proving Ground.

By mid-decade the group established in the mid-70's to find ways to detect the residue of artillery training on military ranges, was busy developing prototype equipments for that purpose, rendering mine detectors "smart" enough to cope with non-ferrous mines, developing a practice mine to enhance military training exercises as well as to investigate the new generation of microprocessor controlled, multi-sensor, "smart" mine fuzes. A new and challenging area that was just well underway in mid-85 was the standoff detection of minefields - probably eventually from an RPV.

The Vehicle Mobility Section became established after moving from its earlier homes in the Ottawa and Valcartier laboratories. In 1985 one group was busily putting the finishing touches on a kit which greatly improved the cold weather starting and operation of diesel vehicles used in Arctic conditions. The other group had established an ability to compare vehicle mobility using the latest computer model, and was deeply involved in developing codes suitable for those special off-road Canadian terrain conditions; snow and muskeg. Mobility Experimental Research Vehicle (MERV), the multi-faceted, fully instrumented mobile test bed was used to collect the data to validate computer programs.

The experimental range at DRES has always been a cornerstone of the program. Considerable emphasis in terms of money and effort was devoted to establishing permanent research facilities throughout the DRES Experimental Proving Ground. DRES now has field defence research

and experimental facilities comparable to the best in the western world.

In the 1980's DRES moved fully into the mainstream of R&D vital to DND. It is no longer a remote testing station, but an Establishment with two major, integrated, laboratory-based programs supported by extensive facilities. DRES has advanced a long way from the first early crisis days of 1941 and the blue days of the early 1970's when closure seemed so certain.

It takes a lot of skilled people to have a significant impact upon the problem areas outlined above and DRES has just 200 people. So a lot of our research (and development) is done by others for us. We have contracts with a number of Canadian Universities from coast to coast, from the University of Victoria to Dalhousie University. We have contracts with Canadian industry at many centres in Canada and also with Canadian Hospitals where research is done.

Another way to get information is by trading. We have formal agreements to exchange information with defence scientific organizations in several other countries. We work closely with our counterparts in the NATO Countries, as well as with those in Australia and New Zealand. We routinely visit laboratories in Canada and in other countries; and as a member of the CRAD organization, we have access to the Canadian defence research liaison staffs in Washington, London, Paris and Bonn.