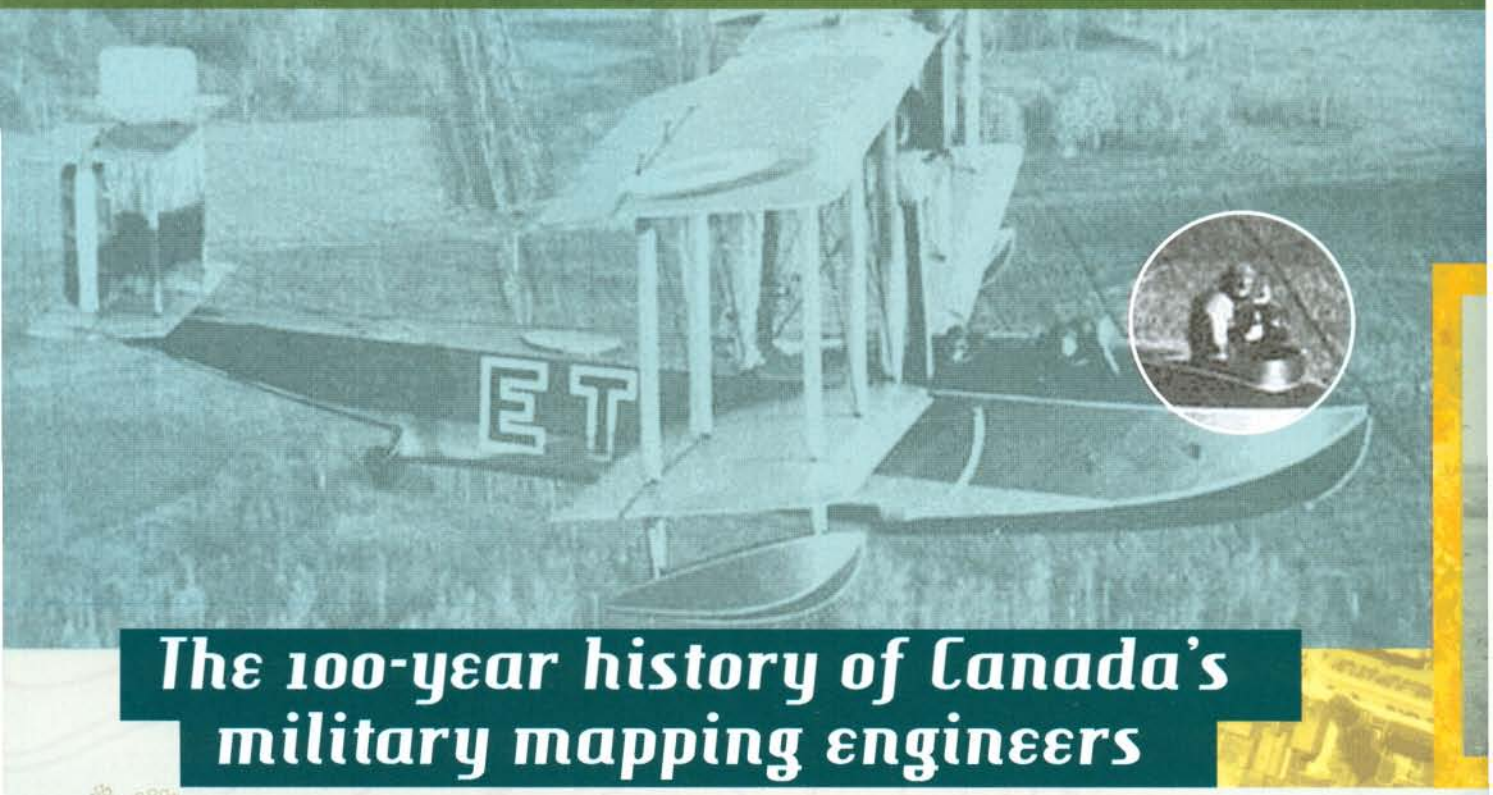
SHOWING THE WAY



The 100-year history of Canada's military mapping engineers

By John C. Sinclair, CD, P.Eng.

The Mapping and Charting Establishment, or MCE, as it's known, has had other names in its history, but this small, skilled engineering organization is as old as the army itself and predates the Canadian navy and air force. It has been located in Ottawa since 1903, where most of the work has been done, except for when units have been sent to war, dispatched on survey parties, or sent to support overseas operations.

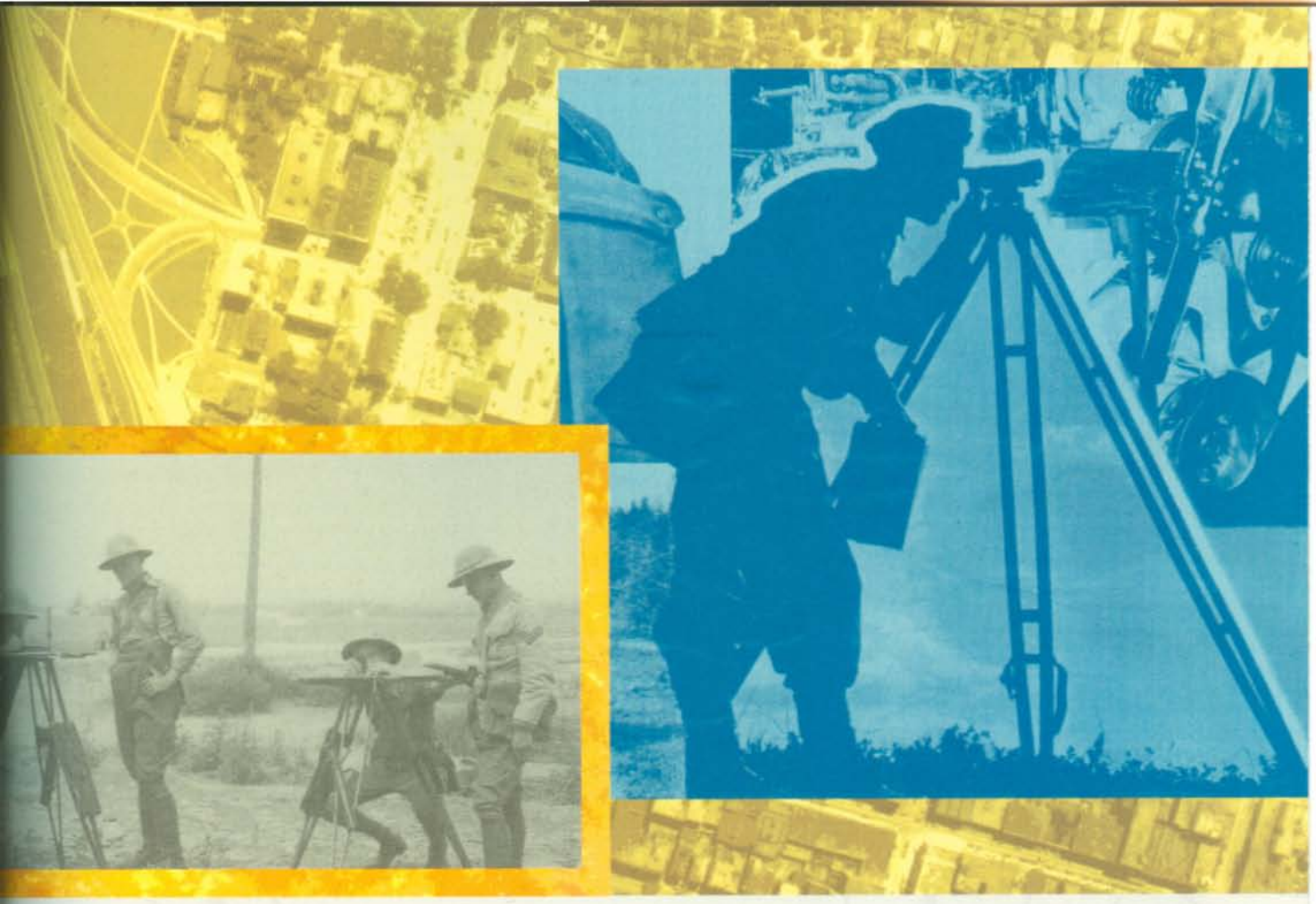
For over 100 years, MCE has been steadily providing geographic information to the forces in peace time and war and has built a reputation for producing some of the best maps in the world.

IN THE BEGINNING

In 1903, Canadian officers returning from the war in South Africa recognized that Canada had no topographical maps suitable for conducting military operations. Frederick Borden, the minister of militia and defence at the time, authorized the formation of a small engineer-run mapping unit, whose job it was to help government agencies map all of Canada to the high standards of measurement and cartography that existed in Europe.

The mapping unit employed graduate engineers from the Royal Military College (RMC), the only place in Canada where topographic mapping was being taught, topographers from the British Royal Engineers, and a few talented civilians like Morris Phelan, a civil engineer and surveyor, who, in 1905, walked from Ottawa to Montreal with his team surveying the exact distance by "transit and chain."

The prospect of mapping a nation that is 18 times the size of France was daunting. With the painfully slow mapping techniques of the age–prismatic com-



Clockwise from left: Aerial mapping with a Vickers Vedette, a three-seat flying boat with an air-cooled engine and floats used in the 1920s and 1930s. Bob Davidson is right out front in this photo; an early map of Ottawa circa 1928; a WWII surveyor; WWI mappers using plane-tables to make detailed contour maps

pass and pacing–it was estimated then that mapping Canada would take 3600 years. But, undeterred, the unit started their part of the national mapping program in Nova Scotia. It seemed never-ending.

WWI

Towards 1918, military mappers pioneered the accurate location of artillery targets and prominent landmarks using photos taken from early, fragile military aircraft. Using these maps and under the leadership of a former professor of engineering at McGill University, Brig. Andy McNaughton, Canadian gunners excelled at crisscrossing enemy ground with accurate shelling, minimizing risk to their infantry. In a post-war address, McNaughton said, in effect, that many returning Canadian soldiers owed their lives to that "efficient body of surveyors and mappers."

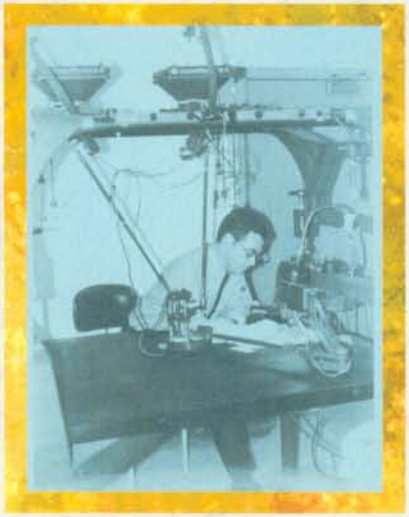
It would be hard to exaggerate the support this soldier-scientist provided to the Canadian mapping community. Not only did he stress the importance of Canada's military keeping a well-trained mapping organization, he emphasized the need for national mapping and air survey programs to support economic development. He also predicted the enormous impact of aerial photography on cartography and the mapping of Canada.

McNaughton went on to become one of Canada's foremost soldiers, the minister of national defence, and an Ontario professional engineer. In the 1920s, he saw to it that Canada developed an airplane that could photograph our remote regions and enlisted young Edson Lewis "Tommy" Burns, an RMC teacher, mathematician and engineer, to lead the fledging military mapping organization.

DEPRESSION ERA

It was in the 1930s that military mapping came of age. In 1934, during the depression, the most modern facility in the commonwealth for aerial mapping was built at the Rockcliffe Air Station in Ottawa. The "White House," as it was called, was where the army converted to making their maps from air photos.

Bob Davidson, a brilliant University of Toronto engineer, flew the first photo missions and then, with the Department of National Defence (DND), became a pioneer in the science of photogrammetry. In the hard times of the 1930s, the military begged for equipment. This is when Burns and Davidson convinced Imperial Oil to buy a state-of-the-art German air photo plotter for DND, from which topographical maps could be made. Burns also formed a militia survey company, and preparations began for war.



Cpl. Ron Cassidy and the Kelsh mechanical plotter

The cover of the May 1951 issue of *Canadian Army Journal* featured an illustration based on a photo of WO2 John Clarkson on the Wild Autograph stereo-plotter, a stereo photogrammetric machine that generated highly accurate, correctly scaled planimetric plots from stereographic imagery.

WWII

In 1939, England requested technical troops, and our mappers from Ottawa, led by Maj. W. J. Baird, MC, P.Eng., OLS, were one of the very first Canadian units to go overseas.

Arriving in England in January 1940 fresh from the previously active ocean liner the Empress of Australia led the group to forever be known as "the yacht club boys." Baird, a decorated militia major from Fort York in Toronto, branded those under his command as green recruits and set out to train them from their arrival–but he had his work cut out for him.

He wrote in his diary of March 31, 1940: "Today we heard that two sappers [Canadian military engineers] distinguished themselves by getting arrested by the Southampton police. They were found breaking into a church army hut. Mr. Robinson visited them in jail. April 1, 1940 they were discharged by the civil court. Mr. Robinson brought them back."

Nevertheless, Canada built an incredible operational mapping capacity that gained a powerful reputation. In northwestern Europe, they excelled at rapid-mapping, producing excellent combat maps and handled an on-the-move inventory of 14 million maps!

POSTWAR

Although, sadly, 19 of the mappers were killed, Col. Jerry Meuser, the wartime director of military survey, and his deputies, Lt.-Col. Sam Gamble and Maj. Cy Smith, brought 700 trained mappers home to Canada after the war. Every effort was made to keep them. After all, there was still a big job to do–mapping Canada.

To help with the job, Maj. Lyle Trorey brought back the SHORAN (SHOrt RAnge Navigation), a precise radar-based navigation used by aircraft in the late war, to get the north measured up.

They used converted Lancaster bombers to fly north from Ottawa. While McNaughton convinced Ottawa to fund a 20-year engineering program to map all of Canada's topography, Smith formed the Army Survey Establishment (ASE). But first he needed to replace the soldiers who left the army. It was like a press gang recruiting sailors.

Here is one story recalled by Chief Warrant Officer Bernie Gallant:

"I was in the Pay Corps in Ottawa. What a bunch of misfits we were. One of our officers made a visit to the Hull jail every morning to bail out the adventuresome. Two years on, in 1947, I met WO2 Tom Poeltzer, RCE, at the bar of the Alexander Hotel who informed a number of us over a beer that ASE was recruiting. We were put on a short course and ended up on a very cold winter survey at Churchill, Manitoba. I never regretted the decision."

And so, the massive effort to map this nation began. They went into the mountains of British Columbia and into the Yukon. They used pack horses in the west and dog teams in the north. After Korea, helicopters appeared. There was always action and high adventure. Gallant said that they crashed on takeoff at Victoria Falls and walked out 40 miles to the hot springs on the Nahanni River and then by canoe to the base camp at Nahanni Butte.

To map the Arctic in the 1950s, Smith recruited young military engineers who would pioneer the effective use of electronic distance measurement and, in the 1960s, the new computer technology. In Ottawa, ASE, now called MCE, acquired every modern piece of air survey equipment on the market and fancy printing equipment. The place was like a map factory.

By 1970, the mapping of Canada was complete. It was a great engineering accomplishment. For those who took part in the operations, there was a feeling of satisfaction, high achievement and of having had an adventure not likely to be repeated.

About 40 per cent of the maps of Canada and 75 per cent of the Arctic field surveys had been done by our military mappers.

But there were new challenges to come. During the Cold War, MCE joined with the US and other allies in producing quality air and land operations

charts. MCE made a major contribution to the world-wide Joint Operations Graphics (JOGs) program, a project to map NATO nations and other areas of interest for air and ground forces. These maps showed the detail normally found on topographical maps but with the addition of features needed by pilots of low-flying aircraft.

GOING HIGH-TECH

Technology soon changed the way maps were made. In 1965, members of MCE joined a US program to triangulate positions in the Arctic from satellites. This was a start. For many years, satellite positioning was studied and assessed. Doppler satellite receivers were the next step and engineer Col. John Dawson said no new contrivance works the first, the second, or even the third time. It took many years, but the global positioning system, combined with the role of computers in collecting and storing geographic data, has brought about a new way of doing business, now called geomatics.

Today, MCE is a sophisticated, high-tech military engineer unit that concentrates on the military application of computer-supported geographic science. Gone are the rooms full of stereo air photo plotters. The skilled draftspeople working on light-tables have been replaced by skilled technicians at computer stations. Today's map data is mostly available from computer memory. Lt.-Col. Steve Gregory, the commanding officer of MCE, declares: "It's all about data." Map-making in the 21st century involves collecting and manipulating terrain information in a digital environment. MCE concentrates on moving this data to operational theatres.

Mappers in the field are called geomatics support teams (GSTs). Since 1993, GSTs have seen duty in Bosnia Herzegovina, Croatia, Haiti, Kosovo and Mozambique. And, in what the United States calls its longest war, MCE has, for the last 10 years, sent teams again and again into Afghanistan.

Over the years, well-deserved honours have come to many. The careers of McNaughton and Burns are legend. Col. Smith was awarded the Gold Medal of the Canadian Geographical Society. Kodak Corporation honoured Davidson as the man who "made the most outstanding contribution to aero photography since 1909." Eleven ex-military surveyors became presidents of the Institute of Surveying. From MCE, Dave McKellar, a leader in geomatics, became the president of the Institute of Geomatics. Others, like Lt.-Col. Gamble, went on to head major Canadian government mapping agencies. The US secretary of defence recognized the outstanding contribution of MCE in a certificate of appreciation. Most recently, Glenn Cornect, whose MCE team provides digital data for use in Afghanistan, received an innovation award from the deputy minister and the chief of defence staff.

These, and all of the other skilled mappers who have been a part of this fine organization over the past century have more than lived up to MCE's motto: Ostendamus Viam (Showing the way).

Sgt. Isabelle Couture at a TERA (terrain analysis) terminal in Afghanistan. TERA data can be collected from recent air photos, observations, other computer files, and a variety of other sources. Included in this information could be the heights and diameters of trees, watercourses and their depths, or any other information of topographical interest to a mission commander.

Paul Metivier, Canada's senior mapper (blue cap), unveiled a plaque commemorating 100 years of military mapping in Canada, on July 2, 2003 in Ottawa.

More about the storied tradition of military mappers in Canada can be found in: ***One Hundred Years of Canadian Military Mapping 1903-2003: An Illustrated History*** available from:
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