

LEMS JOURNAL

LAND EQUIPMENT MANAGEMENT SYSTEM JOURNAL

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National
Defence

Défense
nationale

Canada



BATTLING AN UNSEEN ENEMY: COVID-19

202 Workshop Depot stepped into the breach during the current pandemic – answering the call to mass-produce face shields and cloth masks to protect those men and women charged with the defence of this country. From April until the end of September, Cpl Grégory Farmer was part of the mask-making team – producing 27,000 of them.

Read more about this massive undertaking on page 8.

Photo credit: Cindy Pétrin, Communications Officer, 202 Workshop Depot.



Cover Photo: Cpl Chandelle Ainsley, a medic deployed on Operation REASSURANCE in Latvia during Exercise SILVER ARROW in September, practises her IV-insertion skills on a volunteer. Cpl Ainsley, part of the National Support Element attached to the enhanced Force Protection Battle Group, is wearing a face shield originally designed and 3D-printed by RCME members in Petawawa in April 2020 – one of the first designs to then be printed while deployed.

Photo credit: Lt Iain Chiasson



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Tribute to Colonel (Retired) Murray C. Johnston, MSM, CD

As Director and Sergeant Major of the Corps of RCEME, it is with very heavy hearts that we learned of the peaceful passing of Col (Ret'd) Murray C. Johnston on October 20, 2020.

Colonel Johnston was born in 1933 and served as a Regular Force officer from 1952 to 1983. From 1983 to 1991 he was the Director of the National Emergency Agency for Energy in the Department of Energy, Mines and Resources, as well as the Canadian Representative to the NATO Petroleum Planning Committee. Appointed EME Colonel Commandant in 1991, he held the appointment for 13 years until May 15, 2004.

A graduate of the Royal Military College of Canada and of the Canadian Army Staff College, he was a Registered Professional Engineer, and held a Bachelor's Degree in Engineering from the University of British Columbia and a Master's Degree in Automotive Engineering from the University of Michigan.

His postings included: Director Support Vehicles Engineering and Maintenance (NDHQ), Director of Program Plans and Team Leader in the DEVIL Maintenance System Working Group, Commanding Officer 202 Workshop Depot, the Region Commander in the Mekong Delta with the International Commission for Control and Supervision (Vietnam 1973), Senior Staff Officer Maintenance within Headquarters Mobile Command, Ottawa Militia District as GSO 1, 4 Field Workshop (RCEME) in Germany as

Recovery Platoon Officer and 2IC, test engineer on the Bobcat and M113A1 Armoured Personnel Carriers with the Land Engineering Test Establishment, Commanding Officer 2 RCHA Light Aid Detachment, and the Control Officer within 213 Workshop (RCEME) in Winnipeg.

Col Johnston was a Past-President of the Royal Military Colleges Club of Canada, the Friends of the Canadian War Museum, and the EME Association, and was a former Vice-Chairman of the Conference of Defence Associations. From 1997 to 2008 he was a Director of the Perley and Rideau Veterans' Health Centre in Ottawa. Also, he was a member of Branch 616 of the Royal Canadian Legion, a volunteer guide at the Canadian War Museum, President of the RCEME Association, and the EME Branch Historian. In 2002 he was awarded the Queen's Golden Jubilee Medal on the recommendation of the Royal Canadian Legion for his work on behalf of veterans and remembrance. In 2003, at the request of the EME soldiers in Bosnia, he was awarded a NATO SFOR medal in recognition of his 10 trips to the Balkans, including Croatia, Kosovo and Bosnia to visit them. On October 25, 2004, the Governor-General awarded him the Meritorious Service Medal in the military division:

"Col Johnston (retired) has served with tireless dedication and selflessness as Colonel Commandant of the Electrical and Mechanical Engineering Branch of the Canadian Forces since 1991. He has researched and written two



authoritative books on the history of the Branch, and developed the Branch's Honour Roll. His visits across Canada and to soldiers deployed throughout the world, along with his participation in countless charitable and volunteer military support organizations, have been instrumental in bridging the gap between the sacrifices made by Canadian Forces veterans and today's serving soldiers."

Age didn't slow him down as, in 2005 at the age of 72, he completed for the fifth time the grueling four-day 160-kilometre Nijmegen Marches as part of the Canadian Military Contingent. Ultimately, as a testament to his timeless commitment and faithful service, in 2016 he received the Order of St. George, one of his most prized commendations.

Col Johnston's accomplishments are above and beyond that of even the most distinguished members of the Corps. Murray was someone who not only embraced the spirit of *Arte et Marte*, but defined it. He will be greatly missed by the entire Corps family.

Arte et Marte,
Col J.C.H. Spitzig and
CWO K.S. Northorp



DIRECTOR GENERAL'S COMMENTS

The passing of a legend...

By BGen Rob Dundon

As we were going to press, the RCEME community suffered the loss of arguably the most influential member of the Land Equipment Management System we have ever had: Colonel (Ret'd) Murray Johnston.

Like many of you, I got to know him across several decades. If there was one thing Murray brought to equipment management, it was passion. Murray's Celebration of Life was held in Ottawa at Beechwood Cemetery's Sacred Space. If not for the pandemic, I am convinced that those who wished to honour his memory would have required a venue at least 20 times the size.

Murray helped shape the system by which we ensure the Canadian Army is well equipped. I do not ascribe this title to many, but there is only one word to describe him: Legend. He was renowned for capturing our history. He will always be a core component of that history, and I sincerely hope that those of you who were privileged to have met him will honour his legacy.

I often craft my opening comments around geopolitical atmospherics and link them to what we do. As a student of history, I recognized that a pandemic of the magnitude of COVID-19 was only a matter of time, but I could never have anticipated the disruption this Black Swan would cause to land equipment management. The articles within this edition of the *LEMS Journal* capture some of the current zeitgeist and inform on how the only way to cope with the volatility, uncertainty, complexity and ambiguity caused by

COVID-19 is with adaptability, creativity and flexibility at the leading edges of all our organizations.

I am a fan of the mavericks who question our working paradigms and assumptions, so I would hope that everyone takes the time to read specifically Alex Bazinet's article (*See Page 18*) about challenging our thinking on levels of maintenance.

On a more personal note, I want to remind you not just to take care of each other – and your families – but, most importantly, yourselves. We are all called to help others and serve the country, but doing so takes more than just willingness. It additionally demands the readiness to do so, and a major part of readiness is your health – not just your physical health but your mental health too.

Finally, to all those who contributed by providing the articles to this issue, you have my sincerest gratitude for a job well done.

NEXT EDITION

LEMS Journal is your forum for putting forward ideas, commenting on current or past articles, and sharing related experiences.

The next edition of the *LEMS Journal* will be published in the spring of 2021. If you want to be a part of the next edition, please send your articles – or your ideas for articles – to LEMSJournalSGT@Forces.gc.ca no later than **January 29, 2021**.

The Light Armoured Vehicle Reconnaissance Surveillance System Project – An Overview

By Maj Sterling Scott

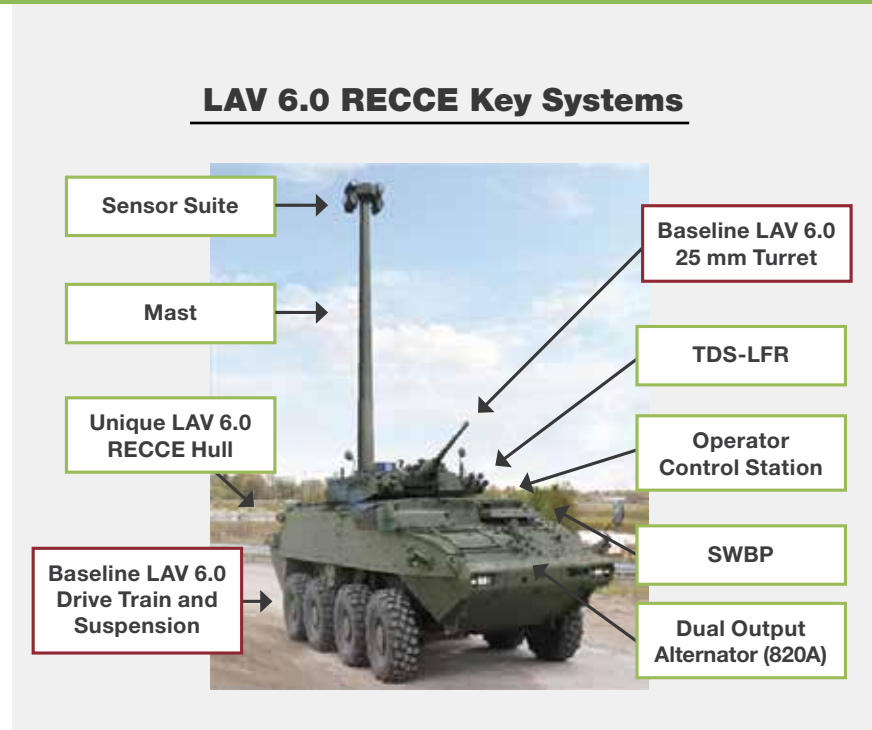
The Light Armoured Vehicle Reconnaissance Surveillance System (LRSS) project will replace the 141 currently in-service LAV Coyote RECCE with 66 state-of-the-art surveillance systems, integrated into 66 Light Armoured Vehicle 6.0 chassis.

The implementation phase of the project was approved November 7, 2014 and two sole-source contracts were awarded to General Dynamics Land Systems Canada in February 2015: the LAVUP project contract option for 66 chassis and turrets and the LRSS Implementation contract to integrate and deliver specific components and systems to produce 66 LAV 6.0 RECCE.

The “specific components and systems” are the meat and potatoes of the project as the LAV 6.0 RECCE is to be the sensory system of the Canadian Army Armoured RECCE Squadrons for the next 20 years. As such, the LAV 6.0 RECCE is to better enable Armoured RECCE in fulfilling sensory mission tasks on the battlefield.

While the Coyote only permitted static observation from either mast-mounted sensors or a remote-mounted tripod, the LAV 6.0 RECCE will be On The Move (OTM) capable. Also, all vehicles will be masted and will include an integrated remote-mounted tripod capability.

The obsolete analogue technology of the Coyote will be replaced with digitized imagery and Beyond Line of



Sight communications. Silent watch capability will double to eight hours. While the quantity of vehicles is 66, the composite RECCE Squadron will utilize the Tactical Armoured Patrol Vehicle (TAPV) for close reconnaissance and the LAV 6.0 RECCE for long-range reconnaissance.

The sensory suite of the LAV 6.0 RECCE features four sensory pods, an Inertial Navigation Unit (INU) and GPS and a Manportable Surveillance and Target Acquisition (MSTAR) V6 radar.

The first of the two High Definition imagers, the Day Imager (DI), provides a colour video output in 1920 x 1080p @ 60 fps resolution. The second imager, the Night Imager (NI), utilizes

mid-wave infrared to provide no-light imagery at 1280 x 1024p @ 30 fps resolution.

The Short-Wave Infrared (SWIR) pod operates in the near and short-wave infrared to produce high resolution viewing through smoke, glass, and rain. The Laser Pointer (LP) and Laser Range Finder (LRF) pod operate in the 830 nm wavelength to provide eight-figure targeting capability at a maximum range of six kilometres. The LP/LRF and SWIR are compatible. The INU and GPS allow self-location to one metre accuracy. The MSTAR V6 replaces the V3 of the Coyote, providing a maximum detection range of 27 kilometres.

All sensory equipment is mounted to the mast via the Gimbal, which provides stabilization on two axes of rotation: 360-degree azimuth and ± 45 degree elevation. The sensory equipment, minus the INU, can be tripod mounted to provide surveillance up to 200 m from the vehicle via fibre optic cable.

The Silent Watch Battery Pack (SWBP) is a key sub-system of the LRSS project. It utilizes lithium ion technology to provide nominally 1600 Ah of charge and enables eight hours of silent watch. The battery, mounted in the winch pocket of the chassis, weighs 575 kilograms, and consists of

10 SWatPacks, each in turn comprised of seven lithium ion cells, connected together in an armoured enclosure.

The SWBP communicates to the vehicle via a Controlled Area Network bus. The LAV 6.0 RECCE will feature an 820 amp alternator to manage both the SWBP and vehicle battery charging requirements.

The implementation phase of the LRSS project had become protracted in the design requirements for a suitable mast since the initial pattern did not meet requirements. With a newly designed mast, the project is currently proceeding

through stability mobility testing to explore the design's worthiness with respect to the OTM capability.

The next key milestone the project will work toward is Reliability, Availability, Maintainability, Durability (RAMD) testing, which is required to confirm the above-discussed capabilities of the LAV 6.0 RECCE prior to fielding and operational employment of the system.

***Maj Sterling Scott, CD is RCEME
Integrated Logistics Systems
Manager PMO LRSS.***

COYOTE	LAV 6.0 RECCE
Obsolete Capability Surveillance System is absolute and non supportable	Future Capability State of the art Surveillance System
Primarily a Surveillance Platform (Static Observation Post: 10 m) (In / Out of Action: 30 min.)	Primarily a RECCE Platform (On-the-Move: 3 to 5 m & Static 10 m) (In / Out of Action: 30 sec)
141 x Sensor Platforms (Mast or Remote Variants)	66 x Sensor Platforms (All Masted with integrated Remote)
Coyote Based RECCE Sqn	Composite RECCE Sqn LAV 6.0 RECCE – long range persistent surveillance and reconnaissance TAPV – close reconnaissance
Baseline Detection, Recognition, and Identification	2~3 x DRI & Resolution of Coyote
Turret Based Image Intensifier	Turret Based II + Sensor Suite (SWIR) & Laser Pointer
1 x Monochrome Display	2 x HD Color Displays (ATD / Image stabilization, blending and fusion)
Six Figure Grid Accuracy with integrated Laser Range Finder	Eight Figure Accuracy Far Target Location Slew-to-Cue between turret and SS
Analog System and Comms	Digital System and Beyond Line of Sight Comms (Satellite On The Move & Analog / Sensor Command and Control Planning Suite & Tactical Battle Management System)
Silent Watch Batteries (~4 hrs)	Silent Watch Battery Pack (min 8 hrs)

The **Munitions Experimental Test Centre** (METC) does its part in the context of COVID-19

By François Lavoie

For the lay person, the Munitions Experimental Test Centre (METC) is an organization that specializes primarily in conducting ballistics and explosives testing and in providing advisory services to a number of clients within the Department of National Defence (DND).

METC is a satellite organization that is integral to the Quality Engineering Test Establishment (QETE) belonging to the Director General Land Equipment Program Management (DGLEPM). The core of METC's activities are located at the 2nd Canadian Division Support Base Valcartier, but also to a lesser extent at the QETE's facilities in Gatineau. METC shares its expertise and some of its facilities in the Quebec City area with the Valcartier Research

Centre (VRC). Since the beginning of the COVID-19 pandemic, METC staff has remained highly active virtually, despite the lockdown imposed by public health.

Since the lockdown began, METC's "field" activities have slowed, but its staff has remained heavily involved in multiple areas of activity. The pandemic has even enabled QETE and METC management to advance critical and significant matters, such as providing advisory services to support procurement projects and preparing internal procedures and standing instructions as part of the Total Quality Management System (TQMS) program, along with other activities. It should be noted that testing has been gradually resuming in the field and in the laboratories since early August.

The Survivability Integrated Support Team (SIST) – made up of staff from the Land Engineering Support Centre (LESC) [202 Workshop Depot], VRC, and METC – was established in December 2019 with the primary mandate of providing consistent and collaborative support in survivability to various defence "clients", mainly for major procurement projects.

With SIST being established in late 2019, the team was able to quickly organize to provide targeted advisory services, via video conference, for projects during the pandemic. In this instance, the Commercial Pattern Armoured Vehicles (CPAV), Logistics Vehicle Modernization (LVM), Enhanced Recovery Capability (ERC), and Armoured Combat Support Vehicle (ACSV) projects, in support of



the Canadian Army and the Special Forces, directly benefited from the SIST's services. As an example, the team's work enabled these projects to begin or fine-tune the drafting of the survivability technical specifications, seamlessly continue to engage with the industry in this field, and undertake or finish the drafting of testing plans in this specialty.

In short, the concerted effort and flexibility exhibited by the members of the SIST team, which METC is part of, enabled these projects to advance the Canadian government's procurement program effectively in the pandemic context.

Aside from the testing ramping back up since August, METC staff has been working hard to advance a number of other important matters that have, or will have, a real impact for its clients. Here is a summary:

- **Support for the survivability projects (advisory services) continued** – With the establishment of SIST, backed up by 202WD and VRC cooperation, METC is now in a better position to effectively meet the growing needs of its clients from the Materiel Group and Defence. The pandemic context has forced stakeholders to come up with and introduce virtual communication methods. These are likely to become more broadly employed in the future.
- **Establishing service contracts** – The pandemic has enabled targeted service contracts to be established in life-cycle simulation – which will give METC, and especially its clients, greater flexibility for levelling out demand during peak periods – in this case for conducting “S3” testing for the Director Ammunition and Explosives Management and Engineering (DAEME) and the Director Soldier Systems Project Management (DSSPM).



- **The Total Quality Management System (TQMS) in catalyst mode** – METC staff pitched in to start drafting internal routines for the purpose of documenting the work procedures and protocols used in conducting the centre's operations. The lockdown will have accelerated the progress of the TQMS program by several months, thereby enabling the centre to benefit much sooner from clear procedures. As a result, the centre will be more efficient and faster, on the basis of a quality control system.
- **Conducting priority testing despite the hygiene rules imposed** – METC was quick to resume a number of priority tests in the lab or on the firing ranges in the sectors supporting procurement and capability development projects for the Special Forces. METC staff used a great deal of imagination to ensure that the testing was conducted in a safe environment.

In conclusion, we trust that the Land Equipment Management System (LEMS) recognizes and appreciates that METC is an essential organization for its defence clients and that it has



managed to hold its own, despite this unprecedented health crisis. This was made possible through the creativity and dedication of all its members.

Hats off!

François Lavote is Senior Project Engineer at the Munitions Experimental Test Centre.

202 Workshop Depot met the massive challenge of producing protective masks to help guard against COVID-19

By Cindy Pétrin

With COVID-19 being recognized by the World Health Organization (WHO) on March 11th of this year as a pandemic that could well change the course of history, many people stepped up to battle this pandemic.

Since there was a dire shortage of protective equipment in the country and around the world, the priority of the Department of National Defence (DND) was to look after civilians and military members protecting Canada's sovereignty during this extraordinary situation. With this in mind, the Chief of the Defence Staff (CDS) called for non-medical masks (NMMs) to be produced within the Canadian Armed Forces (CAF).

On April 9th, the Director of Land Equipment Program Staff (DLEPS) asked 202 Workshop Depot (202 WD) to move quickly to obtain a mask model along with a Canadian Forces Technical Order (CFTO).

True to form, 202 WD jumped on that opportunity to demonstrate its agility and mandated one of its programs, the Land Engineering Support Centre (LESC), to come up with an NMM design that would be issued the next day. Many discussions ensued regarding the choice of materials, dimensions, and colours. Five days later, LESC materials technicians had produced



four prototypes that were delivered to the CDS on April 15th for approval before production started.

When the prototype passed muster, 202 WD's Logistics Group was given the green light to start the process for purchasing the equipment needed for setting up a production line, since textiles hadn't been among the 202 WD's responsibilities for several years. The challenges were great because there was a procurement problem during the pandemic and the deadlines were short for setting up sewing production.

Despite these hurdles, the local procurement/contract team managed to acquire 10 sewing machines plus all the ancillary equipment in record time.

Two essential purchases were made at the outset – rolls of elastic and grey fabric – so that masks could first be made to protect the staff who would be doing that job going forward. In fact, 202 WD would be one of the first units to introduce mitigation measures and return to work on site in the current pandemic context – *Primus Inter Pares* (First Among Equals). Lastly, in cooperation with the Director Soldier Systems Program Management (DSSPM), they received everything required for producing both Canadian Disruptive Pattern (CADPAT) and black fabric masks.

Less than 11 days after being assigned the job on April 20th, the production line was operational. The masks were



In total, more than 27,000 masks were produced by 202 WD. Those NMMs were provided to all 202 WD staff, to the Assistant Deputy Minister (Materiel) team, and to soldiers deployed on Operation REASSURANCE, Operation IMPACT, and Operation LASER. 202 WD did a remarkable job, within tight deadlines, to support the resumption of operations during the COVID-19 pandemic. It was able to be a key player by responding quickly to an urgent call to protect the force. Once again, 202 WD demonstrated its relevance, speed, and agility within the CAF!

Ready to act, no matter the weapons system!



produced primarily by materials technicians, but also by two vehicle technicians who wanted to get involved.

Civilian machinists produced the metal nose clips, while land weapons, communications, electronic-optronic, and procurement technicians looked after preparing all the materials. 202 WD would continue turning out NMMs at the rate of at least 1,000 per week until September 18th.

Cindy Pétrin is Communications Officer at the 202 Workshop Depot.



The **Equipment Fielding Detachment's** contribution during COVID-19

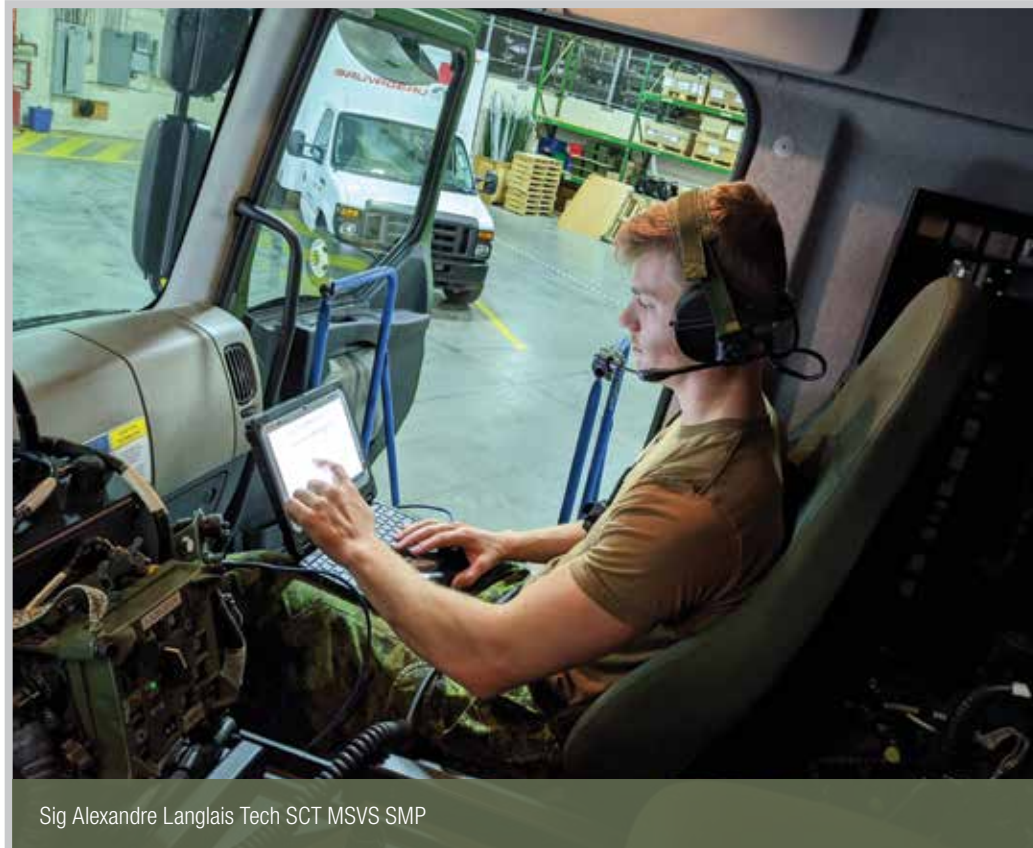
By Capt Stéphan Bouffard

Being no exception to the rule, after the Chief of the Defence Staff (CDS) issued the directive regarding the COVID-19 pandemic, the operations of the Equipment Fielding Detachment (EFD) were suspended as of March 13, 2020.

Under Operation LASER, the main objective was to preserve the health of the force and to maintain a state of operational readiness in order to execute future mission tasks assigned to 2 Canadian Division (2 Cdn Div). During this heightened posture, the EFD staff at Canadian Forces Base (CFB) Valcartier effectively kept the detachment operational by adapting a flexible Business Resumption Plan (BRP) that enabled the detachment to resume activities in support of the strategic initiatives for integrating new capabilities within the Division.

The primary mission of the EFD, which reports to the Support Group (SG) of 2 Cdn Div, is to execute fielding and divestment activities for the Canadian Army (CA) involving communication systems, vehicles, and major equipment within the division.

As such, since some functions were deemed essential, all activities were reinstated quickly, such as the receiving of equipment associated with the Headquarters Shelter System (HQSS). Therefore, the EFD quickly adapted to the situation, demonstrating agility by instituting mandated public health measures in the workplace.



Sig Alexandre Langlais Tech SCT MSVS SMP

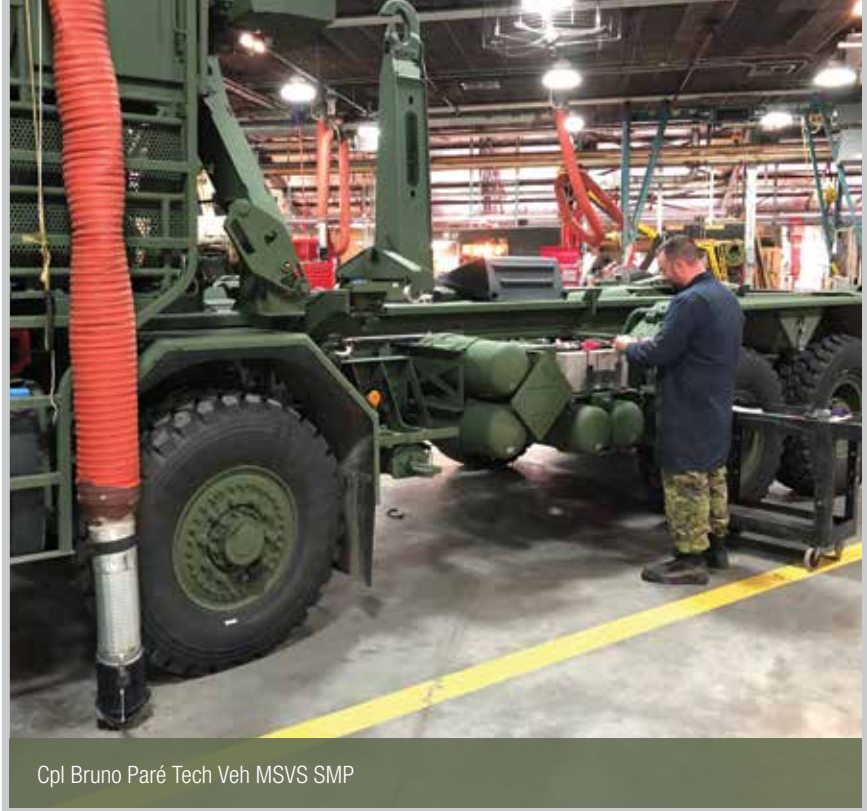
To that end, the expertise and exceptional dedication of the EFD staff made it possible to successfully resume the detachment's operational mandate. Specifically, the fielding of the Medium Support Vehicle System (MSVS) was able to be promptly reinstated, thereby enabling the receiving units to obtain their vehicles in order to deploy to the various locations in the province of Québec as part of Operation LASER. The EFD team also completed

installations of more than 65 communication systems in the new MSVS, which required specialized expertise and attention to detail by the land communication system technicians. In addition, 375 heating and air-conditioning units from the HQSS project were received, thoroughly inspected, and eventually inventoried in the integrated Defence Resource Management Information System (DRMIS).

Furthermore, the dedicated and skilled technical team supported the movement of the CA's equipment, processing 12 equipment movement orders (EMO) originating outside CFB Valcartier. Lastly, the EFD directly supported the 35 Canadian Brigade Group (CBG) by returning to service some operationally required vehicles with their respective communication systems.

The achievements of this remarkable team from various trades could not have been attained without the significant contributions of technicians mainly from the Royal Canadian Electrical and Mechanical Engineers Corps, the Royal Canadian Corps of Signals, and the Royal Canadian Logistics Service who all greatly contributed to the success of 2 Cdn Div's operations.

Despite the force protection measures in place, and having to work different shifts in order to respect social distancing, the members' sense of duty, focus, and



Cpl Bruno Paré Tech Veh MSVS SMP

morale remained at an all-time high resulting in a capacity to sustain the detachment's throughput and quality of workmanship during a critical period of uncertainty surrounding the COVID pandemic.

Capt Stéphan Bouffard is OIC EFD / Technical Services / 2 CA Div SG Canadian Armed Forces.



Cpl Daniel Drolet Tech Veh AHSVS

The Canadian Armed Forces Arctic Training Centre: Meeting the challenges of the North

By Cpl K. J. Bayona

The Canadian Armed Forces Arctic Training Centre (CAFATC) in Resolute Bay, Nunavut – the second most-northern community in Canada – is used as an Arctic training area for units all across the country and is well-known for its contributions towards Op NUNALIVUT.

The hamlet is named after the Arctic exploration ship *HMS Resolute*. It is located on the southern end of Cornwallis Island, which sits on 75th Parallel North. The locals of Resolute Bay refer to themselves as *Qausuitturmiut*.

Resolute Bay (known familiarly as Resolute) started as a joint US-Canadian weather station in 1947 and became a Royal Canadian Air Force (RCAF) base in 1949. In August 1953, the High Arctic Relocation occurred. Families from the Inukjuak and Pond Inlet areas were moved from northern Québec and the Northwest Territories to Grise Fiord and Resolute to maintain control of Canada's northern territories during the Cold War.

With this area being the gateway to northern Canada, the Department of National Defence (DND)/Canadian Armed Forces (CAF) frameworked the defence policy to ensure the Inuit had homeland security and infrastructure. CAFATC opened on August 16, 2013 as a way to train for Arctic operations, thus having faster response times to support operations in the area.



Figure 1. Hamlet of Resolute Bay.

RCME's role in CAFATC is to provide support to the units coming in for training and to maintain the large Bandvagn 206 (BV206) tracked vehicle fleet – as well as snowmobiles and other miscellaneous vehicles such as Electric Ground Service Equipment (EGSE), blue fleet trucks, and All-Terrain Vehicles (ATVs). However, maintaining and repairing vehicles exposed to Arctic temperatures is not the only challenge RCME techs must overcome.

Adjusting to 24-hour daylight, local wildlife, and the quickly changing weather are all hazards the techs have to face. In the winter, the buddy system becomes far more important. Blowing snow and storm-like conditions cause the thermometer to dip well into the minus 50-to-60 range, making it very easy to get lost outside the compound when faced with 24 hours of darkness. The well-being and health of individuals has always been an ongoing concern – even before the COVID-19 pandemic.

The journey to Resolute is long. Evacuation takes at least four hours for a plane from Edmonton or Ottawa to reach the area. COVID-19 provided new challenges to an already difficult situation. The last group that was in Resolute in March had to return early and many of the repairs that are normally completed at the end of the exercise were halted. The number of techs being sent are limited in order to adhere to the regulations set by the Nunavut government. COVID preventive guidelines were implemented – which led to changes on the shop floor, common areas, and dining hall.

Here are some thoughts and experiences from the author's trip to CAFATC this summer:

- Getting caught up with repairs from previous exercises, as well as preventive maintenance, was a priority. Cpl David Janssen and I were tasked with inspections and repairs of snowmobiles while Cpl Jon Lukawesky and Cpl Steve Tomkin looked after the BV206s and the rest of the vehicles. Time was spent familiarizing ourselves with the equipment we had not previously worked on, giving both crews their fair share of challenges.
- I spent time finely adjusting carburetors on Light Over Snow Vehicles (LOS) and even taught some of the supply techs and our med tech how to complete simple repairs or engage in operator maintenance to expedite our work.
- The vehicle techs on the floor had to remain flexible in order to handle the workloads in an isolated environment and successfully welded broken exhausts on a BV206, – a task normally dedicated

to a Material Technician, all while completing a full engine swap of a BV206 with repairs and transfer of components so that it was up and running in under eight hours. This is a difficult task even under normal circumstances, but we were proud to overcome small challenges along the way.

- During our last few days we even had time to stop by the RCMP detachment to ensure that their ATVs and snowmobiles were ready for the year.

Being in one of the coldest, most isolated places in the world can be tough. But it makes all the difference when you have good food, great team members, and can find a spot where you are able to get one bar of service to call home.



Figure 3. Two BV206s.

And it's all accomplished with the proud knowledge that the work done today lays the groundwork for continued success in future training above the 70th parallel.

Cpl Keith Bayona is a Vehicle Technician at 3CDSG Wainwright.



Figure 2. View from the snowmobile compound.

Fabricating the Future: Additive Manufacturing on Operation REASSURANCE

By Cpl Joseph Tran, Capt Chad Mooney and Maj Jess Ross

There's an old proverb that states, in part: *"For want of a nail... the kingdom was lost."*

Nowhere is this cautionary tale more relevant than when it comes to supporting the Canadian Armed Forces (CAF) in remote locations – from small communities in Canada's North, to austere deployed missions – where it can be a challenge to source specialized materiel when the local economy is small, and supply lines are extended. Finding creative solutions is a fundamental component of our culture when faced with such challenges so that LEMS considerations do not jeopardize the success of a mission. This is why it is so exciting to be putting Additive Manufacturing (AM) to the test on Operation REASSURANCE – a tool that can help fabricate whatever 'nail' may be needed.

Building on the experience gained by a small team in Petawawa that 3D-printed hundreds of face shields in support of Operation LASER, this same group of specialists arrived in Latvia as part of the National Support Element of Rotation 20-02 of Operation REASSURANCE – ready to receive a shipment of two Ultimaker S5 printers from 202 Workshop Depot.

The set up and operation of these printers marked an important first for the Canadian Army. This milestone will enable the Army to examine *how* AM might be implemented, not only from a training perspective, but also in the development of the tactics, techniques,

and procedures (TTPs) that will lay the foundation for the long-term development of this capability.

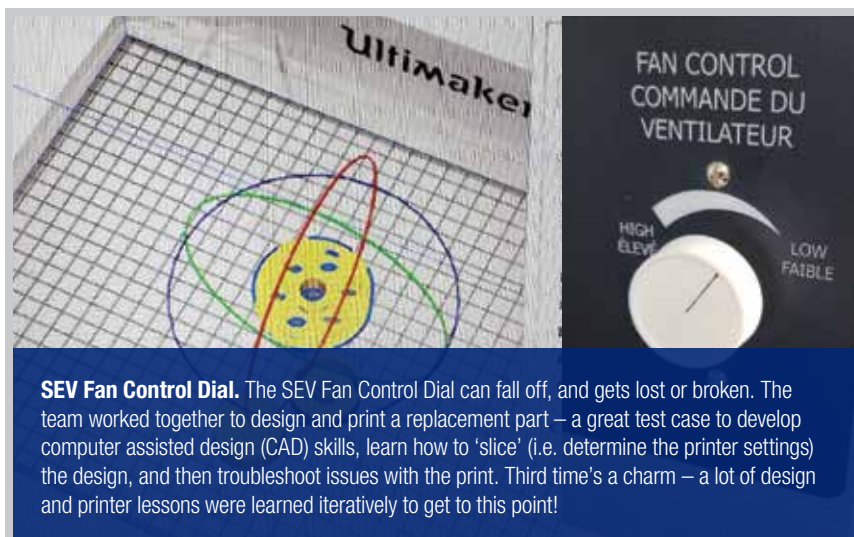
Quickly realizing that a larger cadre of technicians capable of designing and/or operating the printer would be needed to maximize this opportunity, a series of training sessions was conducted for interested technicians, with representation across all ranks and RCME and Signals trades. The training took place on evenings and over weekends since it was not an official primary duty of the members of Rotation 20-02. However,

a dedicated core of technicians quickly formed and worked closely to share experience and troubleshoot design and print challenges.

It immediately became clear that one of the most appealing aspects of AM was the ability to take an idea of how to solve a problem, turn it into a design, and then see that design become a reality. At the very first training session, proposals included a variety of knobs, dials, and switches, which were perfect candidates for starting to learn how to design parts using SolidWorks.



The printers are fondly referred to as HAL and KVN, and are always hard at work!



SEV Fan Control Dial. The SEV Fan Control Dial can fall off, and gets lost or broken. The team worked together to design and print a replacement part – a great test case to develop computer assisted design (CAD) skills, learn how to ‘slice’ (i.e. determine the printer settings) the design, and then troubleshoot issues with the print. Third time’s a charm – a lot of design and printer lessons were learned iteratively to get to this point!

As skills and confidence developed, this cadre engaged other technicians and users to seek out more applications. Imagination became the team’s limit – once a part was identified as a print candidate, a risk assessment was conducted to determine what level of approval might be necessary based on DGLEPM’s Interim Guidance. Then the design and prototype process began.

So far, all of the parts identified and printed were deemed as “Acceptable Level of Risk” (ALOR), which meant they were approved and installed with the Maintenance Officer’s approval (or equivalent). However, as the design skill level increases and the understanding of the capabilities and limitations of AM develops, the team will need to leverage the support of 202 Workshop Depot (202 WD), the Quality Engineering Test Establishment (QETE), and the Land Engineering Support Centre (LESC) to look at more complex prints.

Throughout this design effort, there has also been a significant contribution from the team working with LESC to refine the processes to enable technicians on the ground to make best use of this capability while ensuring proper information management.

The creativity and ability of our LEMS technicians to quickly gain new skills and see potential applications demonstrate a culture of innovation at the grassroots level. The challenge now will be to harness this energy, while ensuring that the processes put in place are agile enough to continue to foster this creative problem solving.

The effort to deploy the printers to Latvia came together quickly, seizing on an opportunity that had been lost when Exercise MAPLE RESOLVE 20 was cancelled. This is where the deployable AM capability had been intended to initially be tested – as outlined in the previous edition of the LEMS Journal (Number 4 – February 2020). A series of factors lined up that set the conditions for success:

- the experience of the small team from Petawawa;
- the fact that Petawawa was the brigade on high readiness;
- the ability of 202 WD to quickly deploy the printers; and
- a series of conversations between members of all these organizations who were passionate about AM – perhaps the most important of all.



LAV Windshield Wiper Handle. The handle for the LAV windshield wipers is often broken (threads ripped, gets stepped on). Corporal Donny Purcell created two designs – one modelled after the original handle, and one that he modified based on an assessment of where the failure usually happened.

The few short weeks that AM has been deployed into Latvia are clear evidence that this capability is a force multiplier that is here to stay. These skills will ensure that we are always able to repair as far forward as possible, without worrying that we didn’t bring enough of the right ‘nails’ along with us!

Cpl Joseph Tran is a Signal Technician in the enhanced Forward Battle Group Latvia. Capt Chad Mooney is the Operations Officer of the National Support Element. Maj Jess Ross is the Officer Commanding Technical Services Company within the National Support Element. All three are currently deployed on Rotation 20-02 of Operation REASSURANCE.

Are we Ready for the New Disruptive Technologies?

By René Provencher

In the not-too-distant future, the Canadian Army (CA) can expect to encounter new land weapons that will incorporate advanced disruptive technologies, such as artificial intelligence (AI) and robotics. Some of these new weapons include:

- Intelligent munitions launched from artillery cannons, rockets, armoured vehicles, or even from soldier-portable firing posts that can correct these flight patterns to search for, identify, lock on, and hit the most vulnerable area of an enemy target
- Active protection systems (APS) for armoured vehicles
- Suicide swarming unmanned aerial vehicles (UAVs) armed with explosive charges
- High energy weapons, such as lasers, rail guns, and particles beams
- Enemies hiding and fighting in complex urban environments (CUE)
- Cyber attacks on embedded electronics

These new and powerful weapon systems are currently being researched and will likely be deployed in future combat situations in which Canada may participate. Will we be ready to face these new weapons?

History tells us that a leap in weapons technology can completely change how we fight wars – and that to counter new weapons, we may need to introduce our

own innovations. One such occasion took place more than a century ago when breech-loaded artillery and machine guns gave an army the ability to generate an unprecedented concentration of fragments and bullets: a “storm of steel” as Ernst Jünger titled his famous account of the First World War.

“These new and powerful weapon systems are currently being researched and will likely be deployed in future combat situations in which Canada may participate.”

In 1903, an Austro-Hungarian army maintenance officer named Günther Burstyn witnessed the effects of these new weapons and instantly realized that unarmoured infantry would be massacred. He was driven to find a solution to give his army a fighting chance in any future conflict, so he tried to adapt the design of his navy’s heavily armoured ships into a land version.

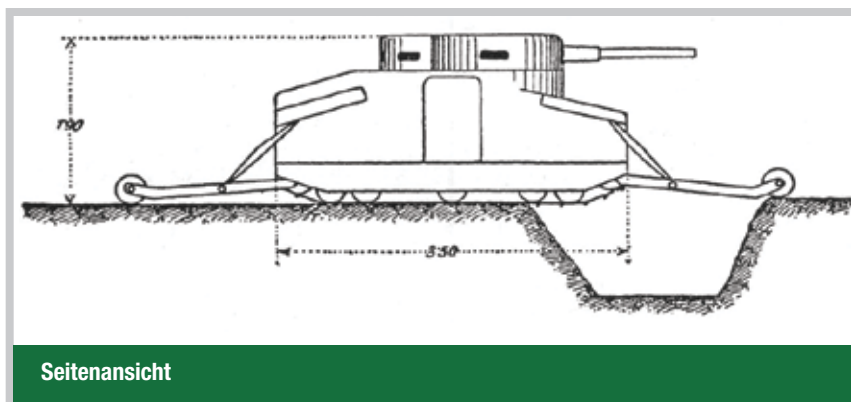
Although armoured cars were already being produced, he knew that they would not have the mobility needed to cross trenches or operate in muddy, cratered battlefields. On his own initiative, and inspired by the American Holt agricultural tractor crawler track design, he created on paper and also fabricated a model of a small, tracked vehicle, which he called a *Motorgeschütz* (motor-gun).



In October 1911, both the Austro-Hungarian War Office and the German War Department returned the designs to Burstyn. Neither wanted to pursue development of the *Motorgeschütz*, even though a leading German military journal endorsed the idea. The senior army leaders saw a future conflict more as a repeat of previous Napoleonic-style wars.

When World War One began, there was nothing to shield the troops from the shrapnel and bullets that saturated the battlefield. As Burstyn predicted, men died without even getting close to the enemy and the result was a slaughter. By Christmas 1914, just five months after the start of the war, one-quarter of the four million soldiers fighting in the war had died. The survivors began digging trenches on the edges of the battlefields where they would be safe from enemy fire and the conflict fell into a bloody stalemate. It took three years for the armies involved to develop and field tanks in great number.

This story demonstrates that engineering and technical personnel can sometimes have greater insight into the capabilities of new weapons. It also tells us that these insights must somehow be communicated to senior leadership in a manner that will encourage a proactive response.



With this example in mind, the Land Engineering Support Centre (LESC) works with Canada's defence scientists, intelligence personnel, land requirements staffs, and allied armies to monitor and analyze these disruptive technologies. In collaboration with the Land Material Assurance (LMA) section, LESC then performs risk assessments that clearly identify the possible threats posed by new weapons for a given future operation. These risk assessments are then formally communicated to Canadian Army (CA) senior leadership on a regular basis through DGLEPM. The information gathered is kept in a repository of knowledge that can be accessed in time of need.

If we want to successfully counter new weapons that feature disruptive technologies, we must adopt a proactive approach. If we don't, we may suffer

“This story demonstrates that engineering and technical personnel can sometimes have greater insight into the capabilities of new weapons.”

significant losses and perhaps even fail to achieve our objectives in future missions – the fate that befell the armies of the First World War.

René Provencher is Land Engineering Support Centre (LESC) Leader.

Is there a better way?

Rethinking Levels of Maintenance

By Maj Alex Bazinet

Try this small experiment: Go to the closest maintenance shop and ask the technicians what distinguishes first-line from second-line repairs. You might be surprised to see them struggle to give you the doctrinal answer: Time. It's not that the technicians don't remember – it's that they question whether this doctrine is still applicable.

It could be argued that the current process of determining the levels of repair by **time** is outdated. This doctrine was created and was relevant during the Second World War when the battle was linear. Maintenance units were required to move forward constantly over extended lines of communication. Paradoxically, defining the levels of repair by **time** actually constrains our ability to complete repairs as far forward as possible as per one of our key tenets.

Each instance where a maintenance task is pushed to another level of repair there are three areas where inefficiency occurs:

- The first takes place at the technician's level where there is a duplication of effort in inspection and diagnosis, which increases the overall repair time.
- Secondly, the supply system gets unnecessarily activated with repairable items that could have remained in a single location, impacting the availability of spare parts, thus burdening the system in general.



- The third inefficiency stems from the coordination, scheduling, movement, and prioritization of the repair with a second unit that has different internal priorities and pressures – again increasing the overall repair time.

This demonstrates that defining the levels of maintenance by time induces inefficiency. Furthermore, it goes against some of the operating principles found in close engagement

and could be at odds with the future of centralized maintenance workshops purposefully built to support newer fleets.

Consider the following hypothesis: If we redefine the levels of maintenance to consider tooling and infrastructure as the limiting factors – instead of time – we will increase the efficiency of maintenance tasks.

These new definitions could separate the levels of maintenance by unit, formation, national, and industry. Each level is defined by the tools and infrastructure unique to the particular level.

Like any hypothesis, it needs to be tested. To do so, an experiment might well be undertaken that would empower a first-line unit to execute all repairs for which they possess the tooling and infrastructure. To enable this experiment without negatively impacting other LEMS functions, a second-line team would be attached to the first-line unit. The size of this team would be proportional to the work previously completed by the second-line organization. Both first- and second-line technicians would now be able to complete “unit level” maintenance. The unit would only push repairs to the “formation level” (i.e. Maintenance Company) if they lacked the tooling or infrastructure to complete the task.

Adjustments to doctrine and policy would undoubtedly have secondary effects in other areas of Combat Service Support and could not be changed in isolation. As such, the application of this change in a field environment is currently out of scope for the proposed experiment, but it would help inform

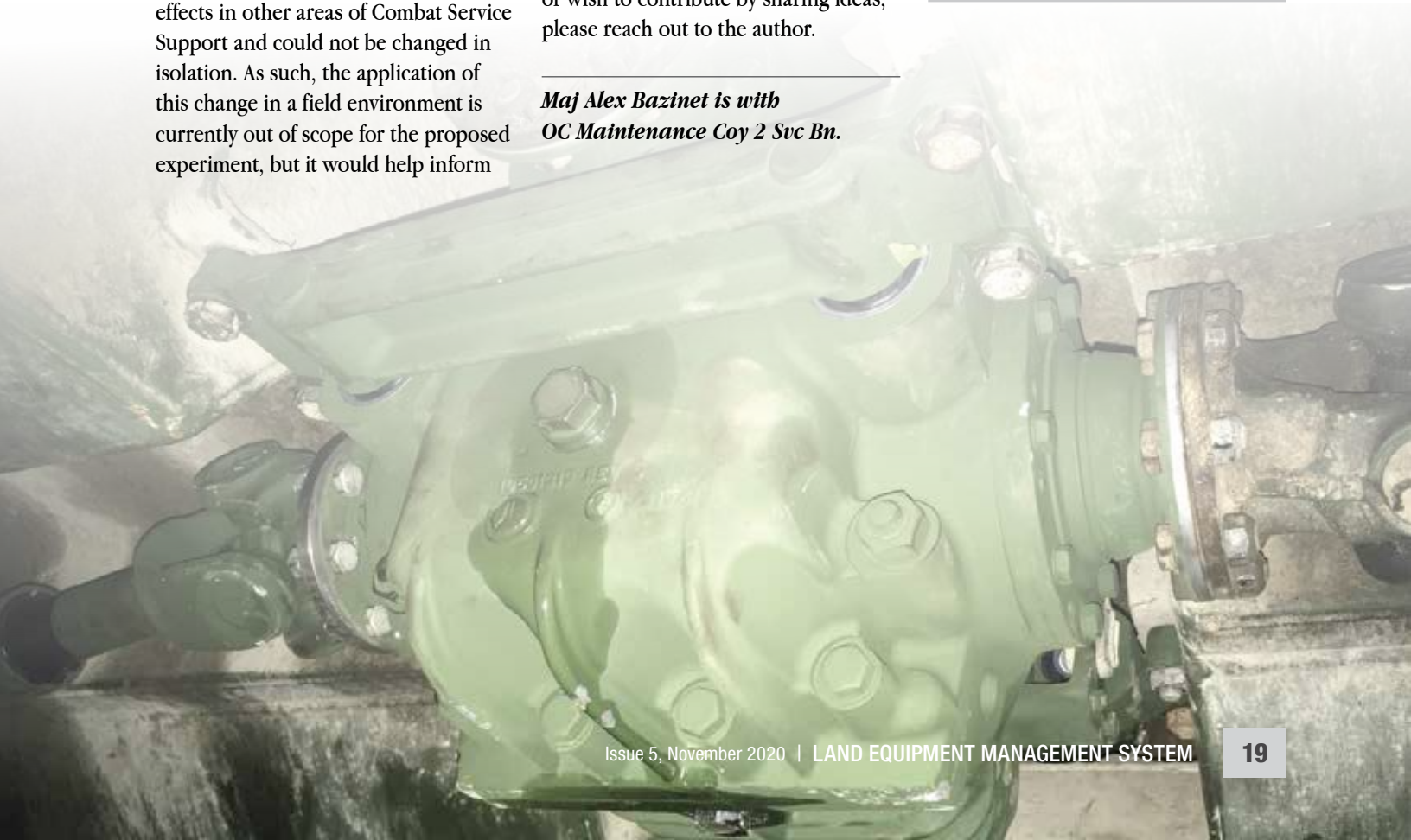
the applicability in a tactical setting if the hypothesis tested true. This may appear at first glance as an effort to decentralize technicians, when in fact it's an effort to centralize the work with a view to increased efficiency.

This experiment could serve as a catalyst to better define other unknowns:

- What will be left of a second-line organization if a fraction of its workload and workforce is absorbed by the first-line units?
- Will parts scaling or the supply system have to change to enable “unit level” maintenance?
- How will this new definition of the levels of maintenance work on exercise or operations?
- How will we measure the success of the experiment?
- Will our culture accept this change?

2 Canadian Mechanized Brigade Group (2 CMBG) is about to launch such an experiment to test the hypothesis. If you want more details about the experiment or wish to contribute by sharing ideas, please reach out to the author.

***Maj Alex Bazinet is with
OC Maintenance Coy 2 Svc Bn.***



Never bring a knife to a gun fight!

By René Provencher

You have it in your sight: the front of the chassis of the Tiger tank your Sherman has been driving towards. Steady, steady... you squeeze the trigger, the anti-tank round flies across the field and *bang!* A direct hit! But to your horror, even at such a close range, you realize that the round merely bounced off the armour and now, through your sight, you are staring down the barrel of the Tiger...

This was the story of too many young Canadian Army (CA) Sherman gunners in the days following the D-Day Invasion of Normandy on June 6, 1944. Why were the Allied forces so badly outgunned? And why was there such inferior armour on their tanks that, even at close range, they could not kill their enemy – and would pay the ultimate price?

In the fall of 1943, the US had ordered the delay of production of the M26 Pershing, which was a heavier, much better-protected tank than the Sherman with a high-pressure 90 mm gun that could punch through Panther and Tiger tank frontal armours. But why? Because at the second battle of El Alamein in late 1942, the Sherman, with its sloped or curved armour on its turret and chassis glacis, had earned its stripes and was considered the “new” and best tank in the battle – handily taking on Panzer IIIs and IVs.

US generals stated at the time that the Sherman had an ideal combination of mobility, dependability, speed, protection, and firepower. They believed that heavier tanks would be too much of a logistical burden to ship overseas and

were unnecessary. Insufficient intelligence-gathering and a lack of foresight had blinded the US Army senior staff to the fact that tank design was undergoing an arms race as a result of the German Army encountering the Russian T34 tank.

What can be learned from this? Namely that we must not fall into complacency: we need to continually keep up with the latest technology and improvements in military equipment. Moreover, given potential CA deployment in counter-insurgency and even UN missions, we need to follow the proliferation of this technology, specifically what is available on the “black market” and what could potential adversaries get their hands on. Knowing this, we must determine the impact of such technology on CA equipment.

What if CA Sherman tanks had been deployed with at least some form of add-on armour... how much more effective would the Canadian Army units have been and how many lives could have been saved? Therefore, another key to operational success is having the right equipment before engaging the enemy. This means that we must dedicate qualified engineers and technicians to work with CA staff – gathering intelligence and analyzing this information in order to foresee where potential weaknesses lie in our equipment if deployed to a given operation.

LESC survivability, lethality, and mobility specialists are working with land requirement staff, defence scientists, and intelligence personnel



One of the first tanks of WW1.



Maj David Currie, VC on Sherman M4.

to ensure a regular review of evolving technology, its proliferation, and what we could immediately acquire or modify to meet these evolving threats. LESC has identified this work as one of its primary tasks.

What else can LESC and the RCME Corps do to better prepare the CA for the next operation? Stay tuned....

René Provencher is Land Engineering Support Centre (LESC) Leader.

Fond Remembrances of Retired Master Warrant Officer Reverend Donald Russell Chisholm CD2, SSM

By Capt Caroline Ly and Capt Gregory Kit (Sponsored by the RCEME NCR LAD 104)

Master Warrant Officer (MWO) (Ret'd) Donald Chisholm, the RCEME Corps' National Padre, was always devoutly dedicated to the RCEME Corps, like all things he tackled throughout his life. He has always been energetic and enthusiastic (read outspoken) in his remarkable career as well as in his personal life – especially in matters of true importance.

His interesting, and sometimes ribald, stories deserve mention. However, it

is only possible to share just a few of them with the RCEME Corps family in this article!

After completing Grade 10 in Halifax, NS and then moving to Saint John, NB, for Grade 11, a young man named Don Chisholm studied mechanical technology – a keen interest for him – to perfect his mechanics skills.

The story goes that during a mechanics class, the shop teacher – by position; not experience – was demonstrating

the skill of changing a vehicle's oil. Once the teacher had removed what he referred to as the "oil pan plug" and proceeded to advise the students on the importance and procedure for oil changes, young Donald raised his hand. When the teacher – with oil dripping down his recently-clean white smock – acknowledged the raised hand, Don asked: "Are you going to fill the engine with oil, when you just drained the transmission?". This was the defining moment of Don Chisholm's



Padre Donald Chisholm can be seen at the far right of the back row during his RCEME basic training in 1953.

brilliant, no-nonsense career as a vehicle mechanic. Don, with his parents' permission, then joined RCEME as a vehicle technician.

In 1952, Craftsman (Cfn). Chisholm joined the RCEME Corps as a Veh. Tech at 17 years of age in Fredericton, NB and completed his basic training and trade course (Veh. Tech "Tracked") at the RCEME School in Kingston, ON. He continued in the RCEME trade and served most of his career in field units.

When asked what his two most memorable postings were, Padre Chisholm proudly referred to his time with the Land Engineering Test Establishment (LETE) in Ottawa and 4 Service Battalion (4 Svc Bn) in Lahr, West Germany. These postings made Padre Chisholm realize the significant difference between working in the field and operating in a static workshop. Creativity and employment of improvised materials, known colloquially as "Field Expediency and McGiverism", are the

norm, as all field-experienced RCEME folks know so well. The luxury of ordering – and getting – parts in the static workshop was never a concern and vehicles can wait on the floor, but not at the field unit. You had to improvise and use anything at your disposal to "make it happen" to move on with the operations.

During a winter exercise in Stephenville, NL in 1965-66, Cpl Chisholm, was tasked with



Padre Donald Chisholm is seated at the far right at a 2019 function at Ottawa's Army Officers Mess (AOM).

preparing 17 Standard Military Pattern (SMP) trucks of the Black Watch to be sent to Norway from Newfoundland. Stationed in Gagetown, he got an urgent call in the middle of the night from the Experimental Service Battalion Duty Officer to deal with a situation involving the designated trucks. He was expected to “make it happen”, so demonstrating true RCEME commitment and dedication, he and his partner immediately flew on a DC-3 to Newfoundland where the 17 trucks were grounded.

One of the 2 ½ ton kitchen trucks, which, of course, is a priority, had broken down and five snowplows had failed after clearing snow, thus breaking the front axle. As luck would have it, all the trucks presented similar problems – they were all sitting there with broken axles due to the extreme winter conditions. Without hesitation, Cpl Chisholm engaged his partner to cut the front axles and, in no time, they managed to render the vehicles moveable. This accomplishment earned him and his partner a week off.

On another notable occasion, Cpl Chisholm was called to the Officer’s Mess by the CO of 2 Royal Canadian Regiment (2 RCR) to fix the broken rear axle on his jeep. The CO was reticent to return to the unit in a tow truck, so he called on the RCEME group, and in particular Cpl Chisholm, to save his proverbial bacon from an attack of embarrassment and a staccato burst of shameless mocking.

Immediately, Cpl Chisholm jumped into action. He quickly assessed the situation and removed the rear axle. He put it in the back seat of the CO’s

jeep and drove away in his own vehicle. An hour later, he was back behind the steering wheel of the jeep – which now had a piece of wood inserted to prop up the rear suspension, making it in his assessment “field” roadworthy. He

“MWO Chisholm’s dedication, humour, integrity, loyalty – and yes strong will – served him and the RCEME Corps well throughout his career. He exemplified what it means to live and work by our Corps Motto: Arte et Marte – By Skill and By Fighting. His biological family, and his family within the Corps, were blessed by, and are grateful for, his service and accomplishments.”

turned it back over to the CO with a proud smile for having readily solved the problem, and the CO drove to the unit maintenance facility for the jeep to be repaired.

Last but not least, during a field exercise with 4 Svc Bn in Lahr, MWO Chisholm, stationed at a tricky intersection to avoid lost and stray packets during a Battalion road move,

was challenged by a young platoon commander who stated that the MWO’s directions to the Battalion Rendezvous Point (RV) were not in agreement with his own interpretation of the route cards and map. MWO Chisholm being certain of his directions but choosing at that point to provide the relatively inexperienced Captain with a valuable learning experience, chose not to dispute the young officer’s contention and allowed him to lead his packet on his chosen route. Hours later, when the rest of Maintenance Company had arrived and marshalled at the RV, the Officer Commanding Maintenance (OC Maint) – then Major Gilles Nappert – asked his Company Sergeant Major (CSM) if he had any information about the Captain’s whereabouts. CSM Chisholm relayed the complete story, as he knew it, to the OC, and further advised him that a recovery call had come in with the lost Captain’s call sign from a swampy area not far away from the tricky intersection the CSM had been stationed at to direct traffic. The OC directed that recovery not be sent out as yet, providing a learning experience for the young officer, who arrived at the RV location several hours late and covered in mud – much to the delight of the whole company, who greeted him with a hearty round of applause.

MWO Chisholm’s dedication, humour, integrity, loyalty – and yes strong will – served him and the RCEME Corps well throughout his career. He exemplified what it means to live and work by our Corps Motto: Arte et Marte – By Skill and By Fighting. His biological family, and his family within the Corps, were blessed by,

and are grateful for, his service and accomplishments. His advice was sought regularly at all rank levels by every link in the chain of command, and everyone was convinced that there would never have been any hesitation on his part to jump into the “burning flames” for the better good of his family, his Corps and his country.

Futhermore, as if an illustrious career in the RCME Corps weren't enough, in 1982 – after 30 years of loyal military service – MWO Chisholm retired from the Canadian Army in order to pursue his second passion. He had answered God's call and entered into His ministry. He graduated from Queen's University with a Bachelor of Theology degree, and was ordained as a United Church of Canada minister in 1986. Padre Chisholm then served as a chaplain in provincial and federal prisons in the Ontario cities of Brockville and Kingston where he counselled numerous inmates across the criminal spectrum from petty drug and alcohol addicts to murderers and rapists – including the infamous serial killers Clifford Olson and Paul Bernardo. Throughout these challenging times, Padre Chisholm never at any time shirked his responsibilities. On many occasions, with a bit of

tenacity and sheer will, he stood up for the downtrodden on both sides of the criminal justice system.

Certainly, Padre Chisholm's faithful devotion still guides him to this day. Since settling in the Kingston area, Padre Chisholm has been actively engaged in the RCME Association. He conducts the Sunday morning memorial service during the annual reunion each year in Kingston and participates in the November 11th Remembrance Day service at the RCME Memorial Gate.

Padre Chisholm has devoted his entire life to volunteerism – including serving as a member of several chapel committees. In addition to his appointment as RCME Padre, he was the National Padre for the Canadian Army Veterans Motorcycle Unit and the Legion Riders of Eastern Ontario. He continues to be involved with other civilian committees such as Interval House (Women's Shelter), the Salvation Army, and the City and County Sexual Harassment Committee. He was a certified motorcycle instructor, and still is a motorcycle enthusiast and rider. He was a Boy Scout leader and a member and/or leader of many

community help organizations, such as the Single Parents Association, several religious-based organizations, the Royal Canadian Legion (member and padre), and others too numerous to mention.

Not only was he a dedicated tradesman and soldier, a devoted follower and teacher of Christian principles, and an outstanding pillar of support in the community, he is also a loving and devoted husband and father to his wife Helen and his children, a man of decent character and an all-round nice person. His dedication to serving the Canadian Armed Forces and volunteering to help others deserve our respect and appreciation for his abilities, stellar qualities, and achievements.

BZ Padre MWO Donald R. Chisholm and Godspeed in all you choose to do. Those who admire and respect you – and they are many – know that you will never stop fighting the good fight!

***Capt Caroline Ly is RCME Officer
Army Technical Staff Officer
Program RMC. Capt Gregory Klt is
ILS Manager – TLAV DGLEPM.***