

LEMS JOURNAL

LAND EQUIPMENT MANAGEMENT SYSTEM JOURNAL

ISSUE 7

JULY • 2021

IN THIS ISSUE

Project Delivery Updates

Support to Ops

Forward Thinking



National
Defence

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Canada



KEEPING CANADA'S HEAVYWEIGHTS IN FIGHTING TRIM

The Leopard 2 variants A4, A6M, and MBT A4M are an essential part of the Canadian Army's fleet of state-of-the-art vehicles. 1 Service Battalion Maintenance Company has the vital task of keeping these behemoths in a state of readiness. Here the 1 SVC BN 2nd line Ancil Leo Det, consisting of Cpl Paul Letourneau, Cpl Dusty Miller, and Cpl Evan Barnard, under the supervision of WO Jarrit Turnell (TEX) and Capt Daniel Pollard, conduct the first-ever turret pull of a Leo2 A4M in the field during Exercise MAPLE RESOLVE 2021 in Wainwright, AB, taking 15 hours straight from start to finish.

***Read more about Leopard Maintenance
in Western Canada on Page 13.***

Photo credit: MCpl Marco Gagnon



Cover Photo: MCpl Thomas Goodwin sets up the Peri R17 synchronization test equipment on one of the Canadian Armed Forces' Leopards. The equipment ensures that the sight is in line with the tank's gun at various elevations and that the Fire Control Computer is functioning correctly with the sight during an ASP test. More details starting on Page 13.

Photo credit: Sgt Jamie Mathieu



**Director General
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Rob Dundon

Editorial Team

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COS RCME

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Communications Advisor

**Send articles and
comments to:**
LEMSJournalSGET@forces.gc.ca

Coordinating Editor

Tom Douglas
thomasmdouglas@gmail.com
Tel. (289) 837-3168

Graphic Design and Project Management

d2k Graphic Design & Web
www.d2k.ca
Tel. (819) 771-5710

LEMS JOURNAL

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DIRECTOR GENERAL'S COMMENTS

Resilience and adaptability are the keys to dealing with change..... 2

PROJECT DELIVERY UPDATES

The Mack CHRV: Filling the Gap Pending Delivery of the Enhanced Recovery Capability
by MCpl Pierre-Olivier Boisvert and MCpl Mathew Larsh 3

SUPPORT TO OPS

Towing Camp in Valcartier: Familiarization with Basic Extrication Principles
by Lt Zachary Lefrançois..... 5

Food for Thought: Using the Right Coolant for Prolonged Efficiency
by Capt Adam MacDonald 7

Additive Manufacturing: Supporting the Battle
by Lt Sean Menezes..... 9

Introduction to Leopard Maintenance in the West
by MCpl Thomas Goodwin 13

RCME Helps Keep the Royal Canadian Air Force Flying
by Maj Matthew Nixon 17

FORWARD THINKING

The Importance of Critical and Creative Thinking During a Changing Environment
by Cpl Valerie Weight..... 19

From Training to Innovation: Tomorrow's Technicians
by Capt Jean-François Vernier-Lessard 20

RCME Experience on the Advanced Logistics Officer Course
by Maj Dohyun Shin 22

The View from the Other Side: RCME from a REME perspective
by WO2 Richard Gething 23

LEMS Journal is an unofficial publication of the Canadian Armed Forces published by the Director General Land Equipment Program Management. The content of each article represents the views of the author or authors and does not necessarily represent official policy or opinion. The distribution of LEMS Journal is mainly done electronically. A digital version of this issue can be found at <https://www.canada.ca/en/department-national-defence/corporate/organizational-structure/assistant-deputy-minister-materiel.html>. **Unless noted otherwise, articles within this publication may be reprinted.** Proper credit and a courtesy copy of the reprinted material would be appreciated.

ISSN Number: 2561-5874 Bilingual printed version



DIRECTOR GENERAL'S COMMENTS

Resilience and adaptability are the keys to dealing with change

By BGen Rob Dundon

We are undergoing radical change right now. In the *LEMS Journal*, we routinely address technological change, but as we emerge from the pandemic, there are fundamental changes happening above and beyond technological change that are creating anxiety. In our modern world, we see far less incremental change than we used to, and this rapid change is proving to be overwhelming for most people used to a more progressive pace of change. What sometimes helps is if someone can make some sense of what we are experiencing, or put context into what is happening. What follows is exclusively my personal theory, but let me try to explain.

The first step toward coping with a change in the environment is a timely diagnosis of the degree of change. There are four generally agreed levels. An operational change “tweaks” the way we work. Strategic change results in a repositioning or a refocus of what we are doing. Cultural change is a reorientation of

values and beliefs. The fourth is paradigm change where the organization itself has to be recreated. From where I sit, I would assess that we are experiencing a cultural change. We have moved beyond the change of “things” and transitioned into the realm of emotions, fundamental values, and states of mind.

What we are witnessing is a fundamental value shift in the society of the west. I believe readers will all be familiar with the “Generations” of X, Y and Z. As each generation becomes ascendant, its fundamental values come to the fore. We are in the middle of the power transition between Gen X and Gen Y, and the repercussions are being magnified by communication technologies. Gen X are immigrants to the digital world who seek an agreeable work/life balance and value the dignity of the individual to a degree that it was written into the Charter of Rights and Freedoms. Gen Y, just coming into their 40’s, are digital natives and in fact have never known a world without personal computers. They pursue freedom and flexibility in the workplace to the degree that they see themselves as working “with” organizations, not “for” organizations. They are champions of social justice, and intolerant of victimization. They are assuming the reins of our organizations and leadership in society. This phenomenon will repeat itself in about 20 years as

Gen Z comes to the fore. They appear to be technophiles and will have never seen a world without smart phones. Experts think they will be career multi-taskers pursuing security and stability. Their leading edge is finishing their apprenticeships now, and their social values are just starting to coalesce – but rest assured they too will be different from those of the previous generation.

The problem lies in the fact that cultural change can be deep and difficult and ultimately threatening for leadership teams. The very nature of the system that rewarded leaders, by placing them in charge, is changing beneath them. No single individual can stop the change – nor should they try – as it is critical to our cultural evolution. The best advice I can give you for dealing with change is to focus on the things you can control. Influence that which is beyond your immediate control. For those things outside your sphere of influence, adapt what you can, and for that which you cannot, practise resilience. Resilience and adaptability can come from understanding and embracing the changes. And finally, it is important that we all cope with the changing environment because as General Eric Shinseki, a retired Chief of Staff of the US Army, warned us about the next tier, paradigm change: “If you dislike change, you’re going to like irrelevance even less.”

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 fall of 2021. If you want to be a part of the next edition, please send your articles – or your ideas for articles – to LEMSJournalSGET@Forces.gc.ca no later than **September 30, 2021**.

The Mack CHRV: Filling the Gap Pending Delivery of the Enhanced Recovery Capability

By MCpl Pierre-Olivier Boisvert and MCpl Mathew Larsh

Mack Defense, headquartered in Allentown, Pennsylvania, was recently awarded the contract to supply the Canadian Armed Forces (CAF) with recovery vehicles capable of handling Canadian Army (CA) wheeled vehicles as an interim measure until the vehicles from the Enhanced Recovery Capability (ERC) project are delivered. Mack Defense worked in conjunction with Miller Industries, a leader in towing and recovery systems.

The Commercial Heavy Recovery Vehicle (CHRV) model chosen, the Century 9055-B, has a tow rating of 80,000 pounds, two 25,000-pound two-speed winches and an extendable boom that can lift 60,000 pounds fully retracted. It sits on a Mack Granite platform with a tandem rear axle and added drop axle to improve weight distribution for heavy loads. Its recovery capabilities far surpass the current Heavy Logistics Vehicle Wheeled (HLVW) 10 Ton Wrecker. It features a Power Take Off (PTO) with a dual gear hydraulic pump that can operate multiple systems simultaneously.

Utilizing this asset for recoveries improves rigging methods and reduces downtime, allowing technicians to safely extricate casualties with less effort than that of its predecessors. The accessibility of storage and vehicle auxiliary components allows for efficient, effective recovery and repair methods. The vehicle is equipped with front and rear outriggers to alleviate point load pressures for maximum vehicle stability. With the main extendable



boom and dual winches, casualties can be recovered in place without the need to reinstall rigging equipment or the repositioning of the recovery vehicle. The recovery platform also features rear deck controls on either side of the vehicle and a wireless remote controller, allowing technicians to be more observant both on scene and away from any potentially dangerous situations.

CFB Gagetown's Canadian Army Trials and Evaluation Unit (CATEU) conducted various assessments to test the capability of the new CHRV. The vehicle was put through rigorous testing to get "hands on" technical input for the end

users. The Light, Medium and Heavy standard military pattern (SMP) wheeled vehicles, Light Armoured Vehicle (LAV) family, Tactical Armoured Patrol Vehicle (TAPV) and Expedient Route Opening Capability (EROC) fleets were all tested in various configurations to assess the new wrecker's capabilities as delivered. Extensive testing and measuring of the equipment confirmed that proper weight distribution and safe working limits of the CHRV were within the required specifications of the rear deck.

All the attachment procedures were examined and thoroughly tested in various operational situations

according to the manufacturer's recommendations and cross-referenced to the Canadian Forces Standard Operating Procedures on recovery techniques. Multiple video conferences with Mack Defense, the project Technical Authority (Director Support Vehicles Program Management 4-5) and the project Sponsor (Director Land Requirements 6-4-2) were conducted on the progression of the trial and in assessing any corrections needed to be put into the vetting process. The platform proved to be more than capable of recovering the complete range of vehicles in the CAF wheeled fleet.

The CAF has acquired eight of these vehicles – with distribution planned for CFBs Gagetown, Shilo, Valcartier, Petawawa, and Edmonton gradually over the current fiscal year. The new CHRV is expected to be an excellent tool for the foreseeable future, enabling safer and more efficient recoveries. This is especially true today with the current



Eight members from Technical Services (Tech Svcs) Maintenance Company (Maint Coy) with the CHRV.

generation of larger and heavier equipment that the CAF has recently procured. It will become a vital National Recovery asset for years to come on every operational base across Canada.

MCpl Boisvert is the 2 I/C of TAPV at CFB Gagetown. MCpl Larsh is 2 I/C of Recovery Section at CFB Gagetown.



Measuring CHRV front axle weight (drop) with suspended HLWV Cargo.

Towing Camp in Valcartier: Familiarization with Basic Extrication Principles

By Lt Zachary Lefrançois

As part of preparing the vehicle technicians of 5 CMBG for deployment on Operation REASSURANCE, the 5 Canadian Mechanized Brigade Group ran a towing camp focused on extracting casualties from damaged vehicles. With the expertise of firefighters from Valcartier fire station and medical technicians from 5 Field Ambulance, 11 vehicle technicians and seven

medical technicians were familiarized with basic extrication techniques with aim of removing wounded soldiers from an accident vehicle.

In garrison, extracting casualties in hazardous conditions is an institutional mandate of the fire department. Firefighters receive the training needed for performing rescues in a variety of difficult-to-reach locations,

including inside accident vehicles. However, the situation in theatre can be very different. When institutional garrison services are not available, it is entirely conceivable that a mobile recovery team could well be the first to arrive at the site of a vehicle accident. It would then be the responsibility of the RCME vehicle technicians to work with the paramedics to extricate the



Another example of extrication training. Canadian instructors of Joint Task Force – Ukraine give Ukrainian Armed Forces students some tips on vehicle recovery. Photo courtesy Joint Task Force – Ukraine.

passengers and administer first aid along with medical personnel before continuing with their recovery task.

The towing camp took place over a five-day period, the first day of which was devoted to reviewing towing concepts and theories for vehicle technicians in the towing section deploying on operations in the coming months. On the second day, medical technicians joined the group to receive demonstrations and instruction on basic extrication principles provided by the firefighters from Valcartier fire station. The latter taught a variety of techniques for getting at a passenger inside a damaged civilian vehicle, ranging from breaking glass to completely removing the roof. After the demonstration, the group practised the techniques they learned on derelict vehicles under the supervision of the firefighters.

During the remaining three days, the group was divided into teams that went through towing scenarios involving multiple casualties inside civilian accident

vehicles. The Maintenance Company command post was deployed to initiate battle procedure following a Repair and Recovery Request (RRR). Once at the. Once at the accident site, the recovery team had to assess the situation and work with the medical technicians to extract the casualties as safely and quickly as possible. Once the evacuation was completed and the casualties were attended to by the medical personnel the vehicle was then recovered. The last scenarios of the week did not involve casualties and focused on practising more complex towing techniques on an upside-down, hard-to-reach end-of-life armoured vehicle.

Since extracting casualties from accident vehicles in theatre is now part of the mandate of the RCEME, the intent is to repeat this training on a cyclical basis in order to prepare personnel for expeditionary deployments, while retaining some expertise within the company's towing section. The knowledge gained by our technicians during this towing

camp will enable them to respond effectively if an extrication situation should arise during a mission abroad.

Among future challenges, the ability to extricate casualties from an armoured vehicle will be taught, which is much more complex and requires in-depth training before being put into practice. The knowledge gained at the towing camp will enable the participants to provide the RCEME School with valuable lessons learned that could assist in developing the unique towing specialization qualification for vehicle technicians. This embryonic capability is an important undertaking to enable our technicians to stay relevant on the battlefield in order to help maintain the operational excellence of the RCEME Corps.

Members of the Quebec Immediate Reaction Unit prepare to take part in Operation LENTUS 1703 at CFB Valcartier in Courcellette, QC. Photo by Sgt Marc-Andre Gaudreault, Valcartier Imaging Section.



Food for Thought: **Using the Right Coolant for Prolonged Efficiency**

By Capt Adam MacDonald

As the Canadian Army (CA) vehicle fleet continues to age, maintenance protocols change to accommodate the equipment that we as a Corps maintain. In any of these fleets, there are various diesel engine layouts that require different specific lubricants – and coolants are a vital lubricant that is often overlooked.

Coolant technology has changed over time to accommodate the new steps found in metallurgy and corrosion inhibitors. Coolant usage within the CAF has changed many times as new products have been added to the market, and extended life and general coolants have come to the forefront of popularity within North America. However, issues have followed with different coolants operating within engines that were decidedly designed for unique products.

Engine coolant is broken down into three parts: water, the base, and additives. Water is an abundant substance, containing great heat transfer properties that can be used for heat conductivity. The main coolant base, making up as much as 90 percent of all coolant types sold in North America, is ethylene glycol – which has a very broad operating temperature. The CAF uses this substance for the majority of its fleet because the coolant can operate in a variety of extreme conditions while performing and protecting the engine.

One of the primary additives is a corrosion inhibitor that reduces the oxidation of the metals within the system

that water-based products can cause, such as the head, block or intake manifold. These additives can be classified into three types: conventional, hybrid, and Organic Additive Technology (OAT). In general, conventional additives deteriorate the quickest and provide only average protection, while OAT additives have a long operating life and provide substantial protection under the correct engine conditions.

Within the CA, platforms such as the Armoured Heavy Support Vehicle System (AHSVS), Light Utility Vehicle Wheeled (LUVW), Medium Support Vehicle System (MSVS) Milcots, Tracked Light Armoured Vehicle (TLAV), Special Equipment Vehicles (SEVs), and MSVS Standard Military Pattern (SMP) all use different coolants for reasons relating to the corrosion

inhibitors. These decisions for various coolants are based heavily on the material existing within an engine block, radiators, water pumps, and heat exchangers.

Certain types of coolant can cause engine block and internal assembly pitting or cavitation over a long period of time if not specified for that engine. Studies show the deterioration of particular metals differs between various coolant types – especially when considering specific corrosion inhibitors such as conventional, hybrid, and OAT additives. The type of coolant used within an engine block is dictated by the manufacturer. However, due to supply issues, the CAF will run universal coolants in its fleets when directed. The effects of running out of spec coolants in various engines



will not be noticed immediately but will cause deterioration over the course of years.

It has been well-documented that different engine coolants containing incorrect additives can cause significant harm to the special corrosion inhibitor layers protecting the engine and metal surfaces within the engine block, resulting in increased corrosion to the radiator, engine block, and other metal components. This will affect cooling system longevity and impact thermal transfer efficiency. With the wrong coolant, the protective layers in the cooling system gradually become thinner and more porous, necessitating the replacement at more frequent intervals, or swapping to another type altogether. Using the wrong engine coolant can gradually lead to corrosion and damage to the water pump, radiator, radiator hoses, and any gaskets in contact with the coolant. If left unchecked, this can cause significant engine damage rendering the equipment non-serviceable or even beyond economical repair.

There are a few vehicle platforms in the CAF that are currently running different coolants than prescribed by the manufacturer due to supply chain shortages and difficulty in acquiring the product. One prime example is the LUVW where, upon entering service in 2003, it was mandated that the vehicle use G48 (Blue) ethylene glycol coolant within its cooling system. This changed recently as it was becoming more and more difficult for technicians to order in the blue coolant. It is now customary to use universal coolants G05 (Yellow) ethylene glycol within this vehicle platform. Tests on the two coolants have shown that the corrosion of aluminum is higher within the G05 than it is in the G48 coolant. As the LUVW has an aluminum engine block, it follows that the G05 coolant is deteriorating the LUVW engine, though at a very slow rate.

The maintenance effects of the wrong coolant can be fairly substantial if cooling system maintenance is not followed appropriately within proper intervals. The lifespan of the vehicle fleet could be drastically shortened. As a group

of strong technicians and leaders, the RCEME Corps strives to ensure the best for CAF equipment and maintenance. Still, we must remain aware of how we maintain our equipment to keep the CAF on the ready.

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Capt MacDonald is the A Vehicle Pl Comd at 1 Service Battalion and soon to be the Technical Adjutant at 1 RCHA.



Additive Manufacturing: Supporting the Battle

By Lt Sean Menezes

If England's Richard III had the advantage of Additive Manufacturing (AM) he might not have met his inglorious end at the Battle of Bosworth Field in 1485.

Historians claim that Richard's kingdom was lost – all for the want of a horseshoe nail. This famous proverb describes the importance of the logistical supply system to the battle, and the overall war. Following the introduction of a dedicated additive manufacturing team and the expanding fleet of 3D Printers in Latvia, the understanding and applications of this new technology continue to grow. With the printers in the hands of the skilled technicians of Operation REASSURANCE Battle Group Maintenance, these new capabilities are being pushed to the forward echelons and leveraged to greatly support the battle on the front lines to avoid a similar catastrophe – all for the want of a horseshoe nail or its modern-day equivalent – since today it can be readily printed right on the battlefield!

With COVID-19 impacting Local Purchasing Officer (LPO) opportunities, scarcity of replenishment service flights, and inadequate tooling, Engineering Support Services (ESS) requested the manufacturing of specialty tooling for water filtration systems to continue providing real life support to Camp Adazi. The tooling was designed by MCpl Raphael Dufour-Savard and printed the same day to continue providing water to critical camp functions without delay.



Broken Hubbell Electrical Receptacles compared to the installed 3D Printed Variant (red).

Similarly, with an abundance of broken electrical receptacles critical for generator use and function that in the marketplace sell for more than \$CDN200 each, Cpl Ricky Loewen redesigned and printed replacements for a fraction of the cost at under \$20. But the logistical support didn't end there! Technicians continued to design components, returning a range of equipment to service from wood saws and video cameras to Armoured Heavy Support Vehicle System (AHSVS) vehicles.

Enthusiasm for AM expanded to become multinational, with requests soon flowing in from Slovenian Joint Terminal Attack Controller (JTAC) forces to augment and improve their current soldiers systems. To more



3D Printed Water Filtration Tool.



efficiently integrate electronic equipment on operations and improve freedom of movement, the Canadian AM team designed and printed the MOLL-E, a lightweight electronic mounting system capable of securing electronics onto a plate carrier with minimal obstructions to key equipment. The equipment was used and trialed on Exercise CRYSTAL ARROW and adopted by Slovenian and Italian operators for future use.

Prior to deployment on Ex CRYSTAL ARROW, the Multinational Logistics Coordination Centre (MNLCC) was equipped with map models of their specific assets to provide commanders with a tangible representation of the increasingly complex and multinational battle space to ensure replenishment cycles were planned and executed to support the battle as efficiently as possible.

During Ex CRYSTAL ARROW in a forward-deployed, non-permissive, and austere environment, the AM Light Support Vehicle Wheeled Mobile Repair Team (LSVW MRT) added to Maintenance was able to supply items ranging from ignition keys, Light Utility Vehicle Wheeled (LUVW) strike catches, and adjustable buckles to



omnidirectional tourniquet mounts for Italian medics and material to repair tripod platforms for their sniper teams.

Where with Ex CRYSTAL ARROW the enemy was clearly defined and apparent, another battle is currently taking place at home and abroad against an invisible enemy, the COVID-19 pandemic. Operation VECTOR, the CAF vaccine distribution plan, will be conducted concurrently in Latvia by Health Service Support (HSS) personnel. With PPE and LPO limitations, in-theatre AM began mass-producing face shields designed by MCpl Dufour-Savard, following feedback and redesign from medical personnel.

Due to the large scale of the operation and minimal 3D printing assets in theatre, an AM production request



Lt. Menezes with Ruggedized S5 Ultimaker on EX CRYSTAL ARROW.



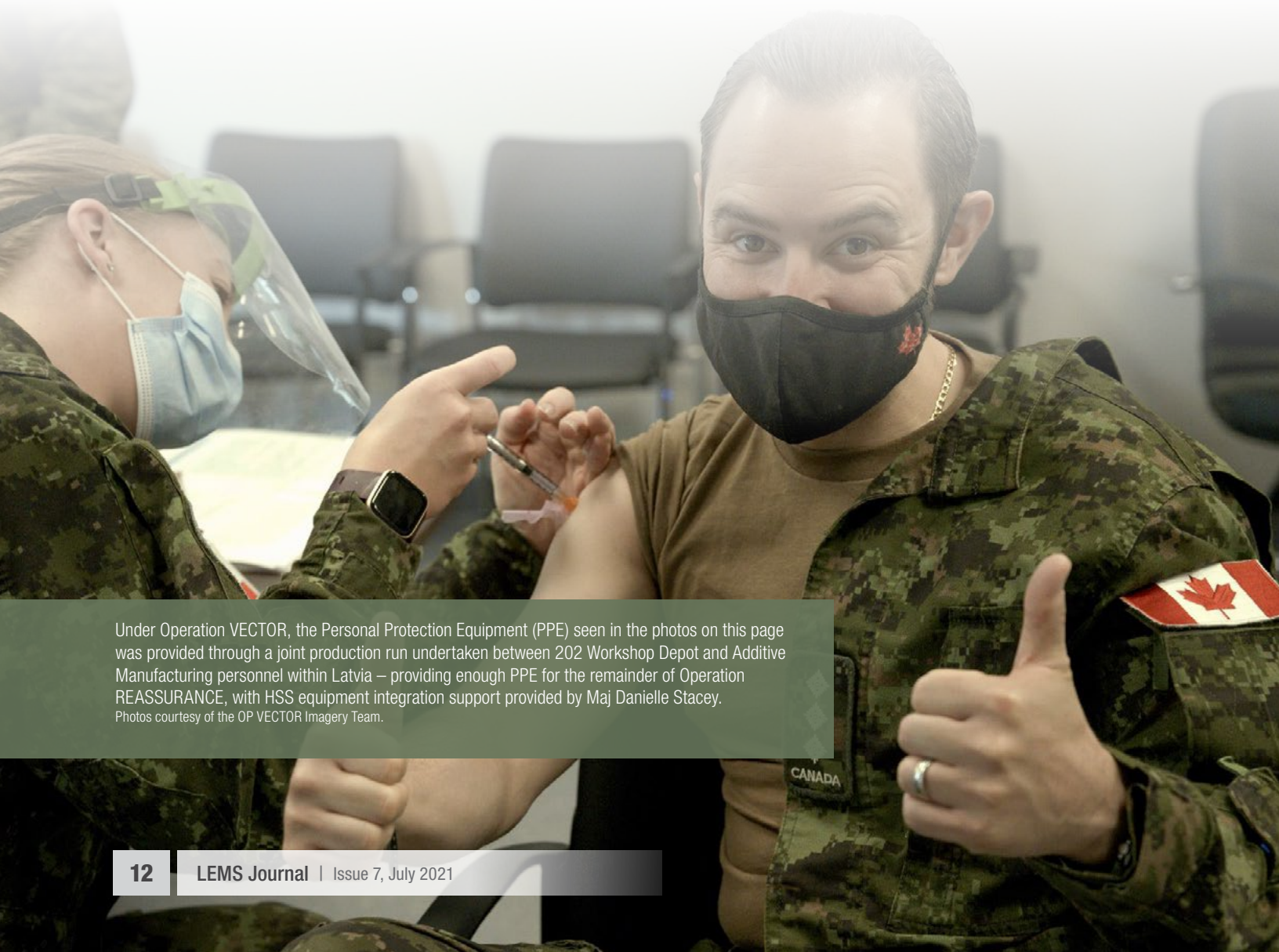
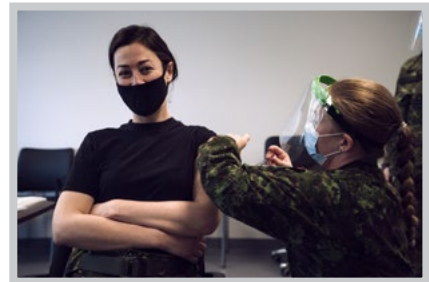
Italian Operator wearing 3D Printed Tourniquet Mount.

with the electronic design file was sent to 202 Workshop Depot (202WD) in Montreal. Civilian and military members at 202WD were able to spool up their fleet of printers for a one-week period. This rapid production effort delivered a total of over 100 reusable face shields to HSS, providing personnel with the required Personal Protection Equipment (PPE) to conduct Op VECTOR, and sustain the remainder of the rotation.

As Additive Manufacturing continues to integrate in theatre, on future operations overseas, and in bases across Canada, it is clear the capability

reduces extended reliance on the supply chain, improves currently existing capabilities, and continues to build interoperability with NATO allies. For the want of a nail a long-ago kingdom might have been lost, but, with 3D printing on the front lines, that's definitely a worry of the past!

Lt. Menezes is a RCEME Officer and Additive Manufacturing TAV Lead from 202 Workshop Depot, Montreal integrating deployed additive manufacturing for the Enhanced Forward Presence Battle Group.



Under Operation VECTOR, the Personal Protection Equipment (PPE) seen in the photos on this page was provided through a joint production run undertaken between 202 Workshop Depot and Additive Manufacturing personnel within Latvia – providing enough PPE for the remainder of Operation REASSURANCE, with HSS equipment integration support provided by Maj Danielle Stacey. Photos courtesy of the OP VECTOR Imagery Team.

Introduction to Leopard Maintenance in the West

By MCpl Thomas Goodwin

Main Battle Tanks (MBTs) are the embodiment of speed and aggression, and an essential part of the Canadian Army's forces. The word alone brings to mind the heavy, loud, and intimidating monstrosities employed by Lord Strathcona's Horse (Royal Canadians) [LdSH (RC)] in Western Canada to enact swift and accurate violence against targets at up to four kilometres away within seconds.

The Leopard 2 variants A4, A6M, and MBT A4M are the fighting vehicles that make up our fleet. Maintaining the state of readiness required from 1 Canadian Mechanized Brigade Group (1 CMBG) for these titans to support Canadian defence and national interests is not an easy task. As the Greek gods needed their fellow deity Hephaestus to craft their weapons and armour, Leopard 2 tanks need RCME soldiers to provide service and support to maintain lethality. One such Leopard maintainer detachment's mission, based in Edmonton, AB, is to maintain the "fire and forget" attitude of these green steel beasts.

At 1 Service Battalion Maintenance Company, the Leo Det team, supervised by Sgt Jamie Mathieu, is maintaining the F6 inspection and repair cycle. This cycle is a symbiotic effort from the Electrical-Optronic and Weapons Tech trades to overhaul the turrets of the A4 and A4M variants at a second line maintenance facility. The primary focus is to conduct a deep dive into preventive maintenance on a four-year cycle on major turret systems. Secondary to this



MCpl Nicholas Mastalerz sets up the manual pull back equipment on an A4, with Cpl Jonathan Seguin assisting. Photos for this article by MCpl Thomas Goodwin.

is the reduction of Vehicle Off Road (VOR) levels by repairing the turrets to a high serviceability level.

The Maint Coy Leo Det has set a standard to ensure 100 percent turret serviceability and battle readiness of all tanks as they leave the unit. Every fault is repaired, unserviceable components replaced, the turret is fully cleaned – all while maintaining efficiency and unit requirements. The scope of work involved reduces strain on first line maintenance by conducting F6-related and first line repairs with a one-team, one-mission mentality. The scope of work includes – but is not limited to – barrel removal, full ordnance checks,

main and secondary sight servicing, and turret removal from the chassis. This requires the attention of seasoned technicians at the height of their abilities to inspect, diagnose, and repair these systems. Each trade involved employs its own unique skill set to accomplish these tasks.

EO Techs are responsible for maintaining the overall operation of the turret system. The tanks have the ability to send a tungsten dart into the face of the enemy, blowing a hole through modern armour with a deviation of +/- 1m at up to four kilometres with the on-board Fire Control Computer. To accomplish this, the entire system



Cpl Peter Ayles (with torch) and Cpl Jake Catton (with hammer) work on removing a bent pin on a loaders hatch from a Leo2 A4.

is required to be perfectly tuned to the main sight, the EMES 15, and the secondary sight, the PERI R17 A2.

During the F6 inspection we run an on-board test system known as the FLOK, to verify all the electronic components, conduct synchronization of the gun to the sights, and frequently delve into faults that are complex and unique to each turret. EO techs have to be completely versed in the theory of operation for the entire turret – including the components that fall under the scope of work expected of a weapons technician. This is due to the complexity and the variety of subsystems that are involved in normal operation. When a fault presents itself, EO techs generally recite operation from memory in order to break down possible causes that could range from mechanical to electrical.

Weapons technicians are the backbone of the F6 inspection cycle and are essential to its success. From the armour, the 120mm ordnance, hydraulic drive systems of the A4, ammo bunkers, and internal protection systems to the seats supporting the gunners, this trade makes magic happen. The F6 task list relies heavily upon weapons technicians to provide preventive maintenance in areas that are not normally a focus of the first line technicians due to the time required and the physical size of component systems.

Due to the high tempo of the Leopard fleet in Western Canada, it is common to expend extra time stripping apart major assemblies to service or repair them, such as the hydraulic power pack and hydraulic elevation and azimuth motor systems. The Senior NCO weapons tech also performs

MCpl Nicholas Mastalerz instructs Pte Connor Cantwell on the use of a hand pump for the manual pull back pump for the 120mm ordnance. MCpl Mastalerz tests how the ordnance functions, under control, to ensure that all components operate correctly when fired.



precision bore exams using specialized equipment called the Rib 2000 – a scope that goes into the barrel and can identify, photograph, and measure size and depth of any defect inside the bore. This confirms the integrity of the barrel for safety of live fire exercises such as gun camps and brigade-level collective training.

The Leo Det also gets assistance from other trades within Maintenance Company. Mat Section has been consistently involved in maintaining the Leopard fleet. When the EO/Wpns remove armour, components, and the turret, surprises are frequently found under heavy levels of hull sludge and grease. As the heaviest armoured kit we employ, welding hulls and turrets from stress

fractures is not an easy task – well maybe for mere mortals – but our in-house advance weld demi-gods have not failed yet.

As the fleet ages and our tempo increases, Mat Section has been keeping the armour together from the C6 fire of eager infantry and maximum aggression jockeying. A special mention must also go out to the Leopard-qualified vehicle techs. Though not directly involved in the F6 inspection cycle, they are the Hercules of the Leopard world – the unsung heroes of every tank commander in every squadron. For, unlike the Roman god (or his Greek counterpart Heracles), the list of their labours does not stop at 12. They are the ones up at 2 a.m. in P9 Wainwright covered in sweat,

blood, and oil, running on coffee, cigarettes, and anger while making that chassis move.

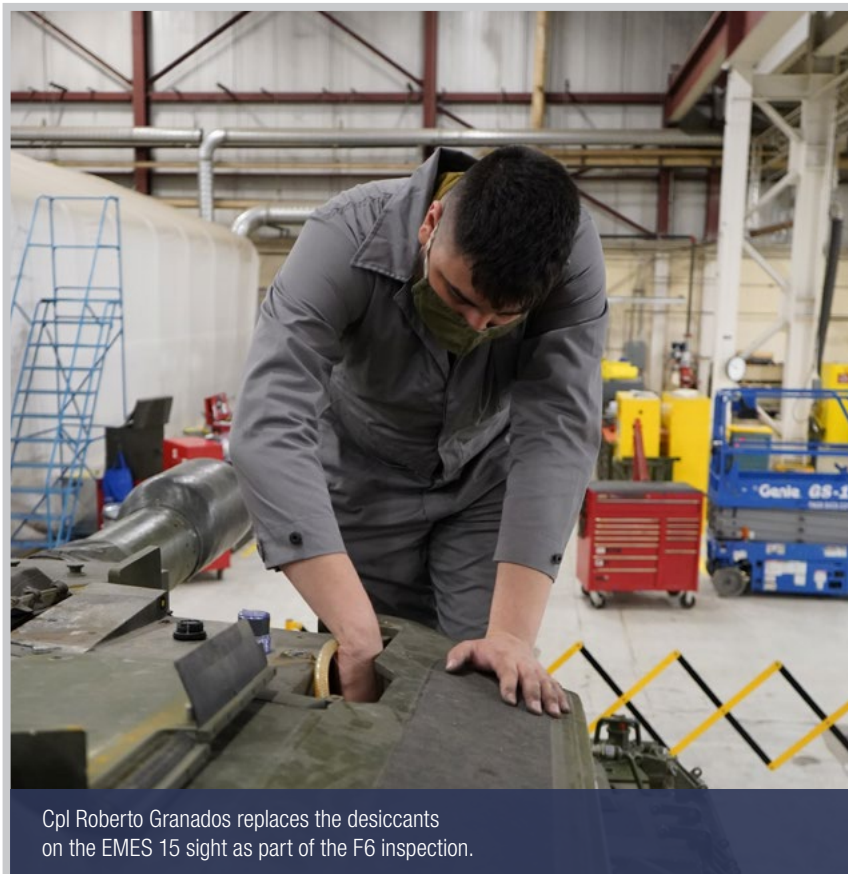
The F6 inspection program has its own set of challenges. As with many other detachments, we face parts issues, logistical challenges, time constraints, organizational difficulties, and real estate and tooling problems. Unique to the F6 and other Leopard dets is our staffing and the amount of time required to conduct repairs. One work order on an F6 inspection can total over 200 hours, the repair work order 300 to 500 hours, and push up to 80 line items of operations – on a fleet of only 42 tanks in Western Canada. This causes consistent pressure for the qualified techs to perform at their best. There is no room for error. On



Cpl Dusty Miller (blue hardhat), assisted by members of 1 SVC BN Maint Coy, leads the installation of a turret ring during Exercise MAPLE RESOLVE.



The Leo Det IC, Sgt Jamie Mathieu, reviews the Peri R17 set up on Leo 72347.



Cpl Roberto Granados replaces the desiccants on the EMES 15 sight as part of the F6 inspection.

top of that, our Leopard technicians are required to attend specialized training at the RCME School that can take up to 50 training days. This has the potential to significantly hinder our ability to replace or fill positions in this environment, adding risk of failure to a heavily relied upon fleet.

The F6 inspection cycle is an exhilarating challenge and adventure. It pushes your limits, tests your abilities, and develops you into an elite technician. Everything seems easier after working with the most advanced war machine in our arsenal. You see your efforts come to fruition when LdSH (RC) meets its training requirements, and your first line soldiers tell you the turret was “minty” on Range 25. It’s a love-hate relationship that I personally wouldn’t change and am thrilled to be a part of.

After reading this article, if you are someone who likes a challenge, wants to test your technical prowess, and would like to be a part of a unique group of RCME warriors, we are always looking for new technicians. But don’t just take my word for it:

“It’s not what it is, it’s what you make it!”
— Sgt Mike Dobson

“Let er’ buck, bud!” — Sgt Brian Miller

MCpl Goodwin has spent the last seven years working on Leopards. He was qualified on the first Leo FOV course in Canada in 2014. Cpl Goodwin was posted to dSH(RC) in September 2015 and left in July 2019 to assist in managing the Maint Coy — Ancil Pl Leopard Det until July 2021.

RCEME Helps Keep the Royal Canadian Air Force Flying

By Maj Matthew Nixon

The Royal Canadian Air Force (RCAF) is comprised of the Chief of the Air Force Staff, an Air Warfare Centre, two Air Divisions, and 14 Wings spread across Canada. Additionally, Forward Operating Locations (FOLs) in Inuvik, Iqaluit, and Yellowknife are used by the RCAF to support the North American Aerospace Defense Command (NORAD) Canadian Region operations in defence of the nation.

The RCAF is unique with the centralized control and decentralized execution required to support daily operations across the globe. Canada's air arm provides support to the Government of Canada (GoC) and the Canadian Armed Forces (CAF) through Aerospace Control (fighters, ground-based radar), Tactical Aviation (air/land integration with helicopters), Search and Rescue (SAR); fixed and rotary wing), Maritime Operations (Maritime surface and sub-surface surveillance), and Air Mobility (airlift operations in Canada and around the world).

The RCAF tactical unit is the Squadrons (Sqns) that is specialized to fulfill certain operational missions and may require support from other Squadrons or Wings. In a deployed context away from the Wing or Main Operating Base, Sqns will force generate capabilities (normally aircraft) to form Air Detachments, which in turn may fall under the command and control of an Air Task Force.



Civilian Francois Desbiens maintaining AMSE, a MNJ nitrogen cart, TGM 3 ESM Bagotville, QC.

From 9 Wing in Gander, NL to 19 Wing in Comox, BC, RCEME plays a critical role in providing essential support to RCAF operations with just under 300 RCEME techs and officers who are employed in workshops scaled to support RCAF requirements. This includes full RCEME workshops situated in the six largest Wing Mission Support Squadrons (MSSs) and smaller workshops and detachments located at

smaller Wings. The variety of workshop sizes and capabilities provides unique opportunities for leadership at all levels.

Individual MSS size and capabilities range from somewhere between a Combat Service Support (CSS) Company to a Service Battalion (Svc Bn), providing first and second line support to the Wing and integral and lodger Units/Squadrons. The MSS also provides

support to Reserve Force (Res F) units. This provides the opportunity for techs to gain experience maintaining a wide variety of equipment ranging from the typical green fleet held by Tactical Aviation Squadrons, w Wing (RCAF's Air Expeditionary Wing) and Res F units to specialized equipment supporting aircraft operations and runway snow and ice control (SNIC).

The main difference between LEMS in the RCAF and the Canadian Army (CA) lies in the equipment supported by the RCME workshops. Unlike the CA workshops, which maintain both fighting and support equipment, RCAF RCME workshops focus almost exclusively on maintaining support equipment within the Wings and for deployed Air Detachments/Air Task Forces. Some deployments for which RCME has provided important

maintenance support to the RCAF include Operation IMPACT in Kuwait, Op ILLUMINATION in Iceland and Op REASSURANCE in Romania, as well as high-profile exercises such as Exercise MAPLE RESOLVE.

The majority of RCME supported RCAF equipment types are Special Purpose Vehicles (SPV), Ground Support Equipment (GSE), and Aircraft Maintenance Support Equipment (AMSE). This includes specialized airfield refuellers, SNIC equipment (sweepers, plows), Anti/De-icers, Airfield Rescue and Fire Fighting Vehicles (ARFFV), Material Handling Equipment (MHE) such as armament loaders and cargo loaders, heavy equipment, aircraft towing equipment, and AMSE.

AMSE support is particularly unique as the RCAF, through 2 Canadian Air

Division, operates an AMSE course to qualify RCME Vehicle Techs to conduct repairs on such things as chiller carts, Ground Power Units (GPU), Oxygen/Nitrogen carts, Hydraulic Test Stands (HTS) and much more.

RCME roles and responsibilities definitely extend beyond the CA with important employment opportunities supporting RCAF operations. LEMS in the RCAF ensures support to the specialized vehicles and equipment critical to operating and maintaining RCAF aircraft, thus ensuring RCAF operational readiness in support of the CAF and the GoC.

Maj Nixon is the A4 Log Plans Officer at 1 Canadian Air Division HQ, RCAF RCME Sr Rep.



Cpl Maxime Brault-Masse maintaining GSE, a D-8 Tractor (Mule), TGEN 3 ESM Bagotville, QC.

The Importance of **Critical and Creative Thinking** During a Changing Environment

By Cpl Valerie Weight

The pandemic has changed the way we live and work – bringing on numerous challenges that, up until this past year, would have seemed unfathomable. Yet here we are.

The extent to which the impacts of COVID-19 can be felt have reached every aspect of our working environment – from health and safety protocols; to the procurement of material goods, to priority of work, and, to staffing levels – all within a constantly changing scenario.

The solutions we relied upon in the past and, to some extent, the way we managed our daily tasks have been challenged time and again in terms of how they translate to this new environment. We have had to evolve our thinking and practices to be adaptable and flexible in order to meet our changing circumstances.

A technician often refers to, “adding one more tool to our toolbox” to describe an accumulation of skills learned and to be applied, as needed, to the appropriate job in the future. The pandemic has highlighted the need for a ‘combination’ tool to be added to the toolbox that will augment the skill of the technician moving forward. When approaching this new environment, the tools we must reach for are those of critical and creative thinking.

Critical thinking is defined as, “the objective and evaluation of an issue to form a judgment”. Whereas, creative thinking has been described by author Stephan Mumaw as the ability to, “develop novel or unorthodox solutions that do not depend wholly on past or current solutions.” When applied in conjunction with our technical training and knowledge,

the combination of these two skills creates a technician who is adaptable, flexible, and resourceful.

One example of challenges and adaptations that we have had to make during this time is a redesign of our workspace – both on the shop floor and perhaps from home – to keep in line with Public Health measures. We, as a team, have had to hone our communication skills to facilitate a fluid environment that supports the continuation of production, while also minimizing the interruption of services and maintaining operational effectiveness.

Despite the enormous challenges in the way we perform our daily routines during the pandemic, an opportunity has presented itself in terms of the cultivation and strengthening of both our critical and creative thinking. In pairing and fine-tuning these two skills, a technician can adapt to and even overcome a rapid succession of challenges and obstacles, thereby, creating new and innovative solutions during this time of upheaval and beyond.

Cpl Weight is a Material Technician and a member of LSS Maintenance at CFB Kingston.



MCpl Nicholas Mastalerz instructs Pte Connor Cantwell on the theory of operation and safety measures of the Leo2 A4's ordnance. Photo by MCpl Thomas Goodwin.

From Training to Innovation: Tomorrow's Technicians

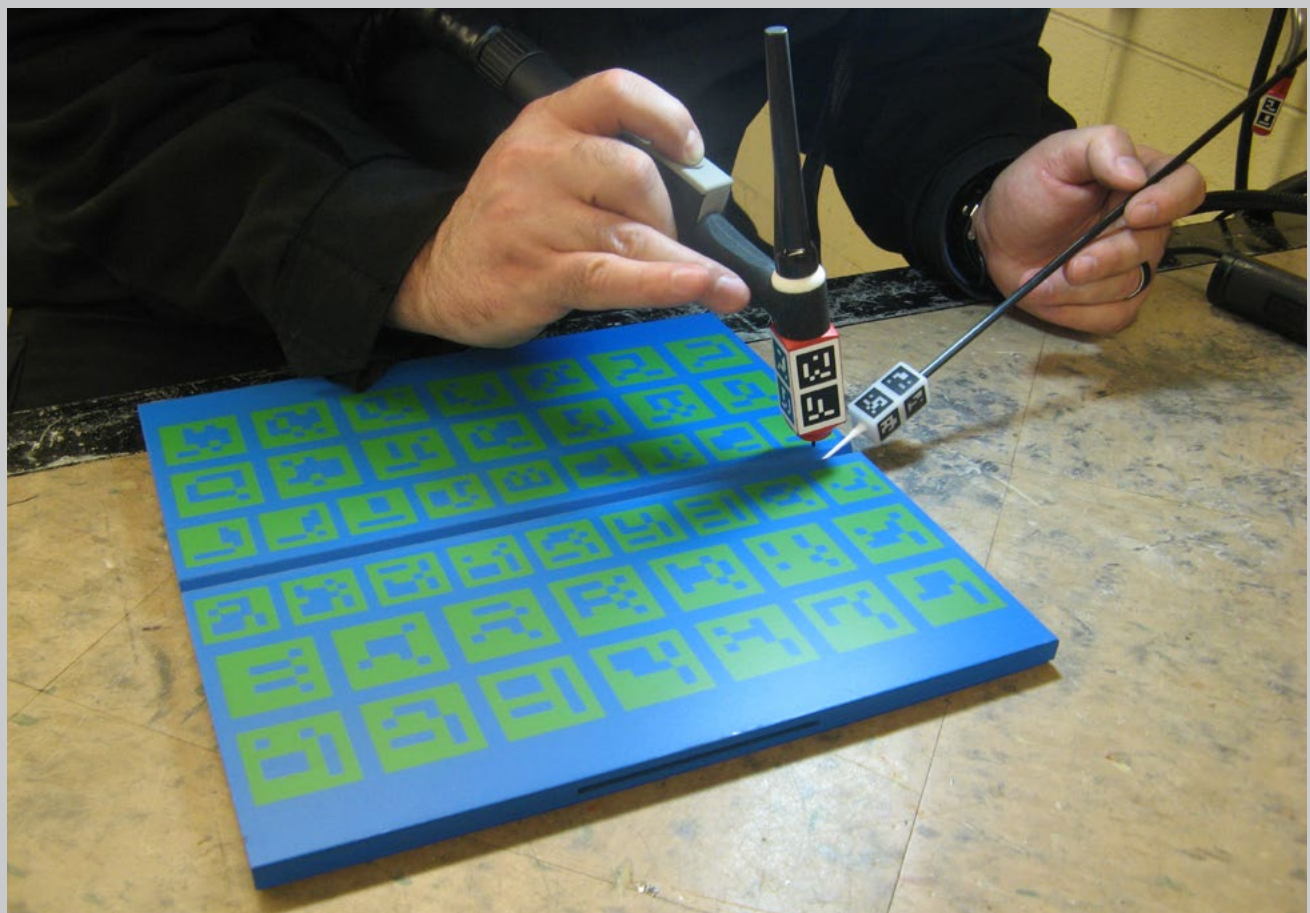
By Capt Jean-François Vernier-Lessard

The vehicles and work tools that we use every day have changed considerably in recent years. They have been honed to more effectively meet the needs of land operations today and in the future. Equipment operators often take for granted that the material will work properly while carrying out their missions. However, it is the maintenance people who face increasingly complex challenges. Technological advancement requires a much higher

level of technical expertise than 30 years ago – a time when the most valuable tool for vehicle technicians was the adjustable wrench. Today, the computer is considered the pinnacle of instruments for engine repair and diagnostics.

The training platoon of the 5th Service Battalion is the centre of excellence for on-the-job training within 2nd Canadian Division. Its mission is to assist the RCME's technicians in

reaching the operationally functional point of each trade and to provide a framework for their training. The instructional system is based on equipment maintenance standards established for the entire Canadian Armed Forces. It thus needs to be adapted to advances in new in-service systems. One question arises: Does our method of instruction enable us to be aligned with constantly changing technologies? Perhaps it's time to consider changing



our approach and innovate in order to better meet the needs of tactical and operational support. It is from this perspective that the Valcartier Training Support Centre undertook these new initiatives. Consisting of the team from the Maintenance Company's training platoon, the Centre's mission is to support the realignment of the RCEME's technician training, while supporting the continuous instruction provided under the Canadian Army's Equipment Readiness Program. That team is also working to develop an advanced continuous training program to meet the specific needs of the Valcartier units.

The Training Support Centre first wants to expand its network of internal and external contacts at the Department

to provide ongoing training using the latest technologies. In conjunction with Caterpillar technicians, that includes setting up annual training on advanced diagnostic procedures for the C9 engines currently in use in light armoured vehicles 6.0. The knowledge gained during that training will make it possible to obtain in-depth knowledge about the drive train, and continue providing this fleet with high-level maintenance.

The November 2020 edition of The Journal (No. 5) referred to a new additive manufacturing capability used during Operation REASSURANCE. That capability requires technicians to be able to model parts using the SolidWorks software to then produce those parts with a 3D printer. To this

end, the Training Support Centre is currently developing a technical drawing training program for all RCEME trades with the aim of creating a large community of technicians ready to contribute to the effort of National Defence and the Canadian Armed Forces. Since the program's possibilities are unlimited, the people trained will be able to reinvest their knowledge in other projects, thus exponentially increasing the return on that investment.

In order to acquire superior dexterity and master the various welding methods, materials technicians require a considerable number of hours of hands-on training. As such, the Training Support Centre intends to acquire a simulator to improve the quality of the training. Using a virtual reality headset, apprentices will be able to perform various welds and perfect their techniques in real time with the software's instructions. This approach will also result in significant savings on materials used and greatly improve the health and safety conditions during training.

Going forward, the Training Support Centre intends to develop training that focuses on the skills required for meeting current and future demands of the Canadian Army's units. The Centre itself will be coordinating the basic technician training programs to create considerable synergy between basic training and advanced training. The training for future RCEME technicians is now ensured for future generations.



Capt Vernier-Lessard is CO of the Valcartier Training Support Centre.

RCEME Experience on the Advanced Logistics Officer Course

By Maj Dohyun Shin

For most officers who work within LEMS, the tasks that exist in the strategic domain seem obvious. The National Capital Region (NCR) is filled with positions for military and civilian LEMS practitioners, mostly within Adm(MAT), in roles such as equipment program management, project management, systems engineering, and various others. For most technicians and officers who worked in base or first line units, tasks at the tactical level built the credibility of LEMS and the Corps of RCEME.

But LEMS is not an independent system. Rather, it is part of an intertwined and dependent organization. The four domains within LEMS – mobility, survivability, supportability, and lethality – seem connected with other institutional and operational activities. Having spent a part of my career in the field force, I became interested in sustainment planning at the operational and strategic levels. Through training at the RCEME school and employment within Adm(MAT), I developed an elementary knowledge of LEMS – especially while working as the Director Land Equipment Staff (DLEPS) 3-5 in assisting with the update to the LEMS doctrine. However, I wanted to zoom out and gain a better perspective on how LEMS interacted with one of the most common system it's coupled with – the sustainment system.

When a heads-up came from the RCEME officer career manager for a spot on the Advanced Logistics Officer Course (ALOC), I asked to be nominated as

I wanted to learn more about the broader sustainment system and better understand its intricacies with LEMS.

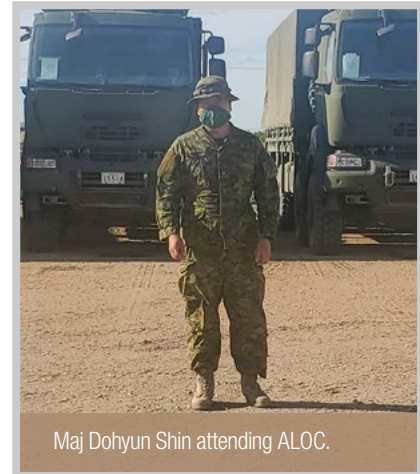
In terms of the content and delivery, ALOC was similar to a course offered called the RCEME Advanced Officer Course (RAOC). This undertaking involved engaging presentations from various sustainment leaders within the Canadian Armed Forces (CAF).

Whereas RAOC provided more information and presentations from a project management and Adm(MAT) perspective, ALOC was more focused on operational sustainment. This included an exercise near the end of the course called Operation BEAVERTAIL where a support concept for a fictional joint multinational operation had to be developed. For those who may have completed the Army Operations Course, it would have been a familiar application of the operational planning process. This enabled the candidates to see the linkages between the supply chain in an international context to LEMS considerations.

ALOC, much like the RAOC, offered strategic topics that the course takers had to contend with. The Vice Chief of the Defence Staff (VCDS) gave the Royal Canadian Logistics Service (RCLS) five topics to examine during the course, assigned to each of the five syndicates.

The topics included broader issues at the institutional level:

- diversity and inclusion;
- integrating the RCLS community;



Maj Dohyun Shin attending ALOC.

- empowering NCMs;
- mentorship; and
- balancing the operational and institutional competencies.

As a RCEME officer with experience mostly within LEMS, it was a great opportunity to see how the related systems interacted while learning with our colleagues in the RCLS. Having gone through ALOC, I would highly recommend that others in the RCEME community take the course if the opportunity is presented. It provides a well-needed perspective and considerations on what goes into developing a sustainment plan, including how to integrate LEMS considerations within the broader process.

Maj Shin is currently the Officer Commanding Maintenance Company at 1 Service Battalion in Edmonton.

The View from the Other Side:

RCEME from a REME perspective

By WO2 Richard Gething

I am currently serving my 20th year in the British Army as a REME Artificer Weapons “*Weapons Tech*”, I am a Warrant Officer Class 2 (WO2) “*MWO*” with 3 Armoured Close Support Battalion REME (3 REME), based in Tidworth, South-West England.

3 REME is a second line repair unit similar in size and function to Maintenance Company, 1 Service Battalion (1 Svc Bn) where I am currently attached as part of Exchange Programme LONG LOOK, and currently deployed to CFB Wainwright for Exercise AGILE RAM and Ex MAPLE RESOLVE 21. During my time in the REME I’ve served at first line Light Aid Detachments (LADs) and Workshops (Wksp) “*Maint Platoons*” and second line REME Battalions in the UK, Germany, Iraq, Jordan, Afghanistan – and at the British Army Training Unit Suffield (BATUS) at CFB Suffield.

The first difference I recognized between RCEME and REME is our different trades. We have eight; Vehicle Mechanic “*Vehicle Tech*”, Armourer “*Weapons Tech*”, Electronics Technician “*EO Tech*”, Technical Support Specialist (TSS) “*Supply Tech*” (within REME LAD/Wksp and Bns), and Metalsmith which is Mat Tech minus the wood and textiles. Then we have Recovery Mechanic that specializes in vehicle recovery and when not deployed inspects and certifies units’ lifting equipment and accessories, and Aircraft Technician and Avionics Technician that maintain the Army Air Corps’ fleet of helicopters.



WO2 Richard Gething (front) and WO Jarrit Turnell complete a 10km Ruck March for the UK's REME charity.

Except for TSS, Recovery Mechanic, and Metalsmith, other trades have the opportunity to be selected for Artificer training two years post Class 1 “*DP2*” which involves completing a Higher National Diploma “*Two-year college diploma*” and three months of leadership and management training, with the reward of promotion to Staff Sergeant “*Warrant Officer*” and to be an Artificer Weapons/Vehicles/Electronics/Aircraft.

Much of the technical language is close enough that interoperability between REME and RCEME would not be difficult. We may call a Repair and Recovery Request (RRR) an Equipment Support Request (ES Req), and a Mobile Repair Team (MRT) a Forward Repair Team (FRT), but when it comes to talking about first, second, and third line, G4, EMAs, ECPs, BLPs, BSA, Echelons, and Esprit de Corps we are speaking the same language.

The equipment 1 Svc Bn uses to support 1 Canadian Mechanized Brigade Group (1 CMBG) has a familiar look to that with which 3 REME may deploy to support 20 Armoured Infantry Brigade and other units of 3 (United Kingdom) Division. The armoured recovery vehicle (ARV) looks and sounds like the monster that is the Challenger Armoured Repair and Recovery Vehicle (CrARRV), with the T-LAV family of vehicles bearing a close resemblance to the Bulldog group of vehicles we use in the UK.



Britain's Integrated Review 2021 recently revealed the cancellation of the upgrade and life extension to our tracked armoured personnel carrier (APC); Warrior, from the 30mm RARDEN Cannon to a stabilized Bushmaster 40mm Cased Telescoped Armament System, instead opting for the new wheeled Boxer 8x8 family of Mechanized Infantry Vehicle that has a common drive module and a removable 'mission module'. This can be removed to re-role a command or troop-carrying variant to an ambulance, repair/recovery or reconnaissance variant, in a little over an hour and can be done in the field. The Boxer is a lot closer to the LAV than the Warrior is.

The structure of units is a little different. A REME Battalion typically sits at a strength of between 360 and 410. A separate Logistics Regiment of a similar size with its own CO, RSM and command team may deploy squadrons

or as a whole with the REME Bn or a Company or two to form a Combat Service Support(CSS) group for military exercises or operations.

My interactions so far with 1 Svc Bn have been nothing less than a display of professional and technically capable soldiers and officers, sharing the REME's ethos of a Corps forged in war that stops at nothing to keep the punch in their Army's fists, determined to deliver the solution no matter the problem.

WO2 Gething is an Artificer Weapons currently in an exchange position with Maintenance Company, 1 Svc Bn Edmonton.

WO Richard Gething assists the Weapons Techs and EO Techs in reinstalling a Leopard turret at P12 CFB Wainwright during Ex MAPLE RESOLVE 21.

