

FALL EDITION
2022



ARTICLES

Emerging Trends in Logistics

History Bites

A Snapshot of the Future of War: Keyboard Combat

& MUCH MORE

PRAEFECTUS
ANNONAE



PRAEFECTUS ANNONAE

- i. A Leader in sustainment.
- ii. One who stands in front and supports.
- iii. An organizer of provisions.
- iv. A permanent, distinguished, superior, and distinct support leader.
- v. The name of the Royal Canadian Logistics Service journal.

COVER PHOTO:
Hercules Aircraft,
17 Wing Public Affairs

Design and Layout:



CWO Roger Gonsalves
31 Service Battalion – Bellum est Cras



During the development of this journal, members of the Canadian Forces Logistics Training Centre were invited to propose names for it. Submissions included French, English, Esperanto, and Latin names. Submissions often related to memorabilia, symbolism, history, and cap badges.

These elements were taken into account with an emphasis on both sustainment and leadership. Dean of Humanities and Latin professor Dr. Hugh Elton of Trent University was consulted in order to discuss the various submissions. From this process, Praefectus Annonae was selected as the term that captures the spirit of both sustainment and leadership. We thank Dr. Elton for his expert advice and encouragement as well as all those who submitted suggestions.

The views expressed in this journal are those of the authors and not those of their organizations, DND, or the CAF.



Lieutenant Colonel Bennett, Chief of Staff,
Royal Canadian Logistics Service Integrator.

It's great to have another issue of our journal out and I hope you disseminate it to everyone within your units. Our contributions in this edition come from a wide group of writers from reservists to regular force from new members to ones with decades of experience. This is great as we see our diverse population at all levels contributing and reading the journal. I encourage all to read it and apply the lessons learned that we find herein.

In this and subsequent editions, I'm pleased to publish the winners and runners up of the General Leach Essay Competition. It is important to recognize these writers within our ranks and to share their knowledge with the rest of the logistics service. I congratulate our winners and encourage our readership to participate in the next essay competition.

Over the coming year we will see exciting new projects unfolding including the publishing of an air force textbook, a historical documentary of Canadian logistics, a strategic personnel plan, and other important projects.

As a final note, we will be seeking to publish the journal annually and are in the process of hiring a contracted coordinator. Once done, we will advise our membership who the new point of contact is so our members can submit articles to this new position. Our editorial board will continue to be staffed by members of the RCLSI with the contracted coordinator and editor with contributions from the association.

Happy reading!

**Leadership is the keystone
that holds everything else
we do together.**

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|||||
J4 STRAT
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Fellow Logisticians,

As your newly appointed Strategic J4, I write to you from a key position within our CAF sustainment enterprise from the perspective of 'a Logistician to Logisticians' above all else. Like you, and as one of you, **I want to have a progressive and constructive influence on how we shape change in these dynamic times..**

Through your respective chain of command **you have assuredly heard of the existential need for culture change.** I hope you have discussed it reflected on it, developed an understanding of it and embody it in your daily interactions to ensure we are more inclusive and all members can bring their very best to the table every day. **It is simply the right thing to do.**

We need to acknowledge and act upon, the existential threat from within that exists in the form of the harmful aspects of our culture. **Without a doubt, there are aspects of our culture that are harmful, are exclusionary in nature, and run counter to everything we aspire to as expressed through our CAF Ethos: Trusted to Serve.**

Working with others, **we will conduct an in-depth examination of who we are (our identity), and work to bridge any gaps between that, and who we need to become.** We will particularly be watchful for any signs which could signal a troubling sub-culture within our service, counter to our identity and to what we need to be.

I intend to undertake four first steps in order to bring focus, generate momentum, and deliver effects:

❑ We will conduct an examination of CFLTC from a RCLS perspective. **The RCLS will work hand in hand with CMP and CPCC to ensure that CFLTC is producing Logisticians aligned with our CAF Ethos: Trusted to Serve.**

❑ RCLS will look at how we plan for leadership succession, including the atypical career path, across all rank levels and look at how we train Logisticians at our training establishment, bases and wings.

❑ We will form diverse advisory teams that will conduct this examination on behalf of the RCLS, and they will advise our most senior levels within the RCLS on their findings and make recommendations.

❑ Finally these advisory teams at the strategic level will work with and encourage grass-roots movements at the local level.

This effort will require honest, difficult and uncomfortable conversations. Most of all it will need to yield tangible action. This will require leadership. **Throughout, as we endeavour to improve, we may make mistakes. We must humbly learn from these and strive to accelerate our existentially important cultural growth, in lock step with those we are duty-bound to support, for those we are entrusted to lead, and for the nation we proudly serve.**

Sincerely,

Luc Girouard
Brigadier-General
Strategic J4 / Director General Support
Strategic Joint Staff





Aviator Kyle Mathers, a Royal Canadian Air Force (RCAF) Traffic Technician, builds pallets of COVID-19 related humanitarian and medical supplies that will be delivered on a CC-177 Globemaster to Honduras as part of Operation GLOBE 20-02, at Panamá Pacifico International Airport in Panama City, Panama on July 22, 2020.

Photo: Corporal Jerome Lessard/MSCT-OPTIC/CAF

Emerging Trends in Logistics

EFFECTIVE LOGISTICIANS WILL USE THE PRINCIPLE of foresight to anticipate what future trends might be, both in the short-term, tactical timeframe and in the long-term, strategic realm, depending on their position in the organization. As generations of older logisticians retire and new ones enter the CAF, it is imperative that, as a profession, we have a sound understanding of what trends could impact our forthcoming operations. It is also important to understand the directions in which various industry, government, and allied partners are moving. This article will highlight some of the current trends. Whether they come to fruition or not is another question entirely.

TREND 1: 3D PRINTING

3D printing has come a long way since its introduction in the early 1980s, and has developed into an important trend over the past several years. Items as varied as buildings and drones have been printed in 3D,¹ and replacement parts are currently among the targets of the commercial 3D printing industry.

3D printing has two types of impacts on logistics. First, it has the potential to change what and how logistics is done. Maintaining a stock of raw material for 3D printing may replace on-hand finished parts and thus be considered a critical military resource. Second, 3D printing also enables enemy forces to reconstitute faster and create alternate forms of harassment against supply lines, or otherwise improve their chances of mission success. For example, an enemy force with a swarm of 3D printed drones could readily attack convoys. Therefore, forms of air protection against swarms should be a consideration in future planning. Drones printed on-demand have already been

tested and appear to work well.² While adoption may be slow, customization of drones may factor into how they are employed in both combat and non-combat roles.

TREND 2: GREEN TECHNOLOGIES

Green technology is being championed by many organizations—governmental and non-governmental alike. Logistics considerations will be impacted as other forms of energy come to replace traditional gas and diesel. The following questions come to mind: “Which type of technology should be adopted for CAF institutional use?” “How will green power affect the battlespace?” “Will cutting off traditional petroleum supply lines have the same impact in future wars as it does today?” and “What will be imposed on the CAF by the political level with regard to green technologies?”

The ability to scale up will continue to be problematic in the next few years, according to Professor Iddo Wernick, a senior researcher at Rockefeller University.³ This will affect how much of a technology can be adopted. When and how to adopt green technologies need to be considered, as well as their impacts on available budget monies.

Quick wins from the adoption of green technologies include onsite biodiesel production, hybrid or all-electric vehicles, and local green energy production on the roofs or grounds of DND buildings.

TREND 3: INCREASED RELIANCE ON AUTOMATION

Automation has been driving many industries for decades. The world’s militaries will need to adapt or become less and less effective.

Automation does require a higher level of technical skills to implement, operate and maintain than is currently the

norm among many CAF members. Advanced automation improves the efficiency of supply chains and increases speed while reducing errors. Applications in logistics include warehousing, load planning, asset management, and replenishment, among others.

TREND 4: HUMAN RESOURCE MANAGEMENT

Gone are the days of beating someone over the head and kidnapping them—or being shanghaied, as history calls it—for duty on ships. Also gone are the days of expecting people to just randomly appear at a recruiting centre. Considering the present proliferation of widely varied job choices, the CAF cannot afford to have antiquated human resource management practices, including recruiting. Competition for jobs, impatience, and unacceptable excuses for delays in recruiting will act as a detractor to well-qualified potential candidates. Continuing use of our current system will result in recruiting only those who really want to join or those with no other viable options.

The CAF’s recruiting strategy needs to be driven by the answer(s) to the question “What need(s) on the personnel front does the CAF fill better than any other potential employer?”

Word of mouth and social media will continue to have an impact on attitudes towards the CAF, but with greater impact than before. Online forums such as Reddit, blogs, and others have opened the doors for people to speak freely, attempt to discredit organizations, express opinions, and expose dirty laundry. If our historical recruiting practices continue with their inherent wait times and processes, and engagement with the public is limited, the CAF will not experience the success it needs in recruiting and will face negative commentary in social media.

Voronoi tessellations, as part of load planning, are a form of automation being employed to optimize the use of aircraft cargo space in civilian industry. Given the current spike in fuel costs, optimization of loads is more important than ever for all logisticians. The CAF is likely to see an additional \$10M+ increase in the expenditure for aviation fuel in 2022-23.

Likewise, warehousing operations are increasingly being automated, which reduces errors and decreases labour costs—a particularly important goal in a labour shortage era.

The cost of housing and risks associated with moves (including loss of social structures), home equity issues, and fear of the unknown will continue to have a negative impact on recruiting and retention. This is already evidenced by the personnel shortfalls in many CAF occupations, including logistics. Moves are part of human resource management. Housing problems can be mitigated through various methods from rapid, modularized construction to mini homes to partnerships and reduced changes in geographic relocation. The issues of housing, recruiting, retention, the media, and human resource management are now more intertwined than ever before.

TREND 5: SPEED IN DELIVERY

Most consumers today are conditioned to getting quick turnarounds. Same-day or next-day shipping has become de rigueur. Since today's military is comprised of people with these personal expectations, logisticians, contractors, and contracting staff can expect commanders will want rapid delivery and improved responsiveness. Waiting for parts to arrive at an overseas mission from Canada in days, weeks, or months will only create a perceived weakness in logistics as commanders seek the fastest turnaround possible. This does not bode well for the principle of co-operation and will create friction. Additionally, if an enemy force can sustain itself faster than the CAF, we stand a greater risk of mission failure.

TREND 6: SUPPLIER INTEGRATION

Supplier integration into automatic ordering systems is standard protocol for many large firms. Orders for resupply are placed directly with the vendor by the buyer's IT system as soon as it is triggered by a re-order inventory level. As industry moves further ahead with automatic ordering and multi-business integration, with replenishment based on consumption data, militaries will find themselves falling increasingly behind in stock management. Failure to establish systems to create data driven ordering with reliable, trustworthy suppliers, as opposed to simply the lowest bidder, will exacerbate stock shortages. Determining how much stock to hold based on historical and projected data requires a more supplier-integrated approach to prevent stockouts. Contracting practices may also need to be assessed to provide the flexibility and related benefits evidenced in industry.

TREND 7: OMNICHANNEL SHIPPING

Omnichannel shipping refers to when a supplier considers multiple ways a product can be delivered to the end consumer.⁴ For example, a supplier may ship from a warehouse to a consumer, factory to consumer, store to consumer, or an intermediary to a consumer. Reverse logistics would employ the same principle.

Can this trend apply to military or institutional sustainment? Very little is written on its use for military applications, but it could prove to be beneficial. The following supply methods are worthy of consideration, some of which are already in use:

1. National home factory to theatre.
2. National home factory to military hub to theatre.
3. Supplier warehouse to theatre.
4. Allied shared military hub to theatre.
5. Allied supplier to ally then to theatre.

SUMMARY

While it is hard to predict what will happen in the future, these seven trends appear to be progressing rapidly in non-DND venues. As part of the logistics principle of foresight, logisticians need to understand what trends are happening and how those trends could impact CAF logistics.

1. Schutz, T, Stanley-Lockman, Z. Smart logistics for future armed forces. Brief Issue 30, European Union Institute for Security Studies. November 2017.
 2. Stone, A. For the Army, a 3-D printed drone is nice. A customized, 3-D printed drone is better. <https://www.c4isrnet.com/smr/unmanned-unleashed/2018/02/23/for-the-army-a-3d-printed-drone-is-nice-a-customized-3d-printed-drone-is-better/>
 3. Wernick, I. (ND). Green Technologies Have a Glaring Problem of Scale. https://www.realclearscience.com/articles/2021/11/27/green_technologies_have_a_glaring_problem_of_scale_805367.html
 4. 8 Major Logistics Trends Shaping Logistics Management in 2022 <https://www.cleo.com/blog/logistics-management-trends>



Members of the Canadian Armed Forces deployed on Operation GLOBE 20-02 unload pallets of COVID-19 related humanitarian and medical supplies off a CC-177 Globemaster at Argyle International Airport in Argyle, St. Vincent and the Grenadines on July 27, 2020.

Photo by: Corporal Jerome Lessard/MSCT-OPTIC/CAF

History Bite:

Logistics Enable or Disable an Advance

by Evert Akkerman

THE QUALITY OF LOGISTICS CAN DETERMINE THE DURATION and outcome of a battle. You may have state-of-the-art equipment, but it won't do you any good if you can't deploy it. And if you can't get fuel, food, and supplies to the frontlines, any advance will grind to a halt.

With Operation Market Garden (September 17–25, 1944), Field Marshal Montgomery planned to cross the Rhine as a prelude to an attack on the Ruhr. Allied forces were to capture several bridges over the main rivers in The Netherlands. After some initial successes – including the capture of Arnhem bridge – the British 1st Airborne Division and Polish 1st Independent Parachute Brigade ran out of supplies, and couldn't hold on.

Key causes were poor planning, logistics, and communications. First, due to limited numbers of transport aircraft, the British forces were flown in with three lifts instead of all at once.¹ The second lift was supposed to arrive by 10:00 a.m., but clouds and foggy conditions in Britain delayed take-off until midday, and its arrival on the Dutch battlefield until after 3:00 p.m.² Second, parachute drop zones and glider landing zones were too far from the objectives, with General Urquhart picking a spot some 13 kilometres away.³ Third, low clouds over the area made resupplying the troops a challenge and, fourth, their radios didn't work, as the surrounding woods restricted the range of wireless sets.⁴ As veteran Dennis Cutting of the 1st British Airborne Division told me, "This was our biggest let-down: no radio communication. We had a couple of carrier pigeons, but somebody ate them."

At some point, glider pilots managed to get a message through toward the Rhine, requesting that the British 8th Army provide cover and send boats. "We made it to the Rhine and the 8th Army had sent little boats, 12-footers," said Cutting. "Everyone wanted to get in, which would swamp the boats, so a Sergeant Major drew his pistol, put

himself between us and the boats and yelled, 'Stand back, you bastards!' The Rhine was running with blood. Guys drowned... I saw one guy dive in, and he was whipped away by the current. There was so much rain. The 8th was bogged down, they couldn't move their tanks."

Even without these issues, many sources agree that Operation Market Garden was a risky gamble at best. The 1st Airborne Division suffered some 8,000 casualties at Arnhem, out of 10,600. Many dead had to be left behind. RHLI veteran Reginald Harrison rolled through the area later. "We came past Arnhem, where the Americans had dropped paratroopers. We gathered a number of dog tags from the bodies of paratroopers that had been shot down by the Germans. We weren't supposed to do that, since these were needed for identification. Most of those men were burnt... We gave the tags to our officers, who turned them over to American Forces, so at least they could tell the families."

Endnotes

1. history.net
2. historyhit.com
3. tandofline.com
4. namacuk



THE FACES OF TODAY'S

LOGISTICIAN



You've Come a Long Way in a Short Time.

by Jean Makrai, Museum Curator
and OCdt Stefan Bobu, Assistant

FIVE DECADES IS NOT A LONG TIME IN THE LIFE OF AN organization. However, like in a person's life, the early years are a period of exponential growth and achievements reached through many lessons learned.

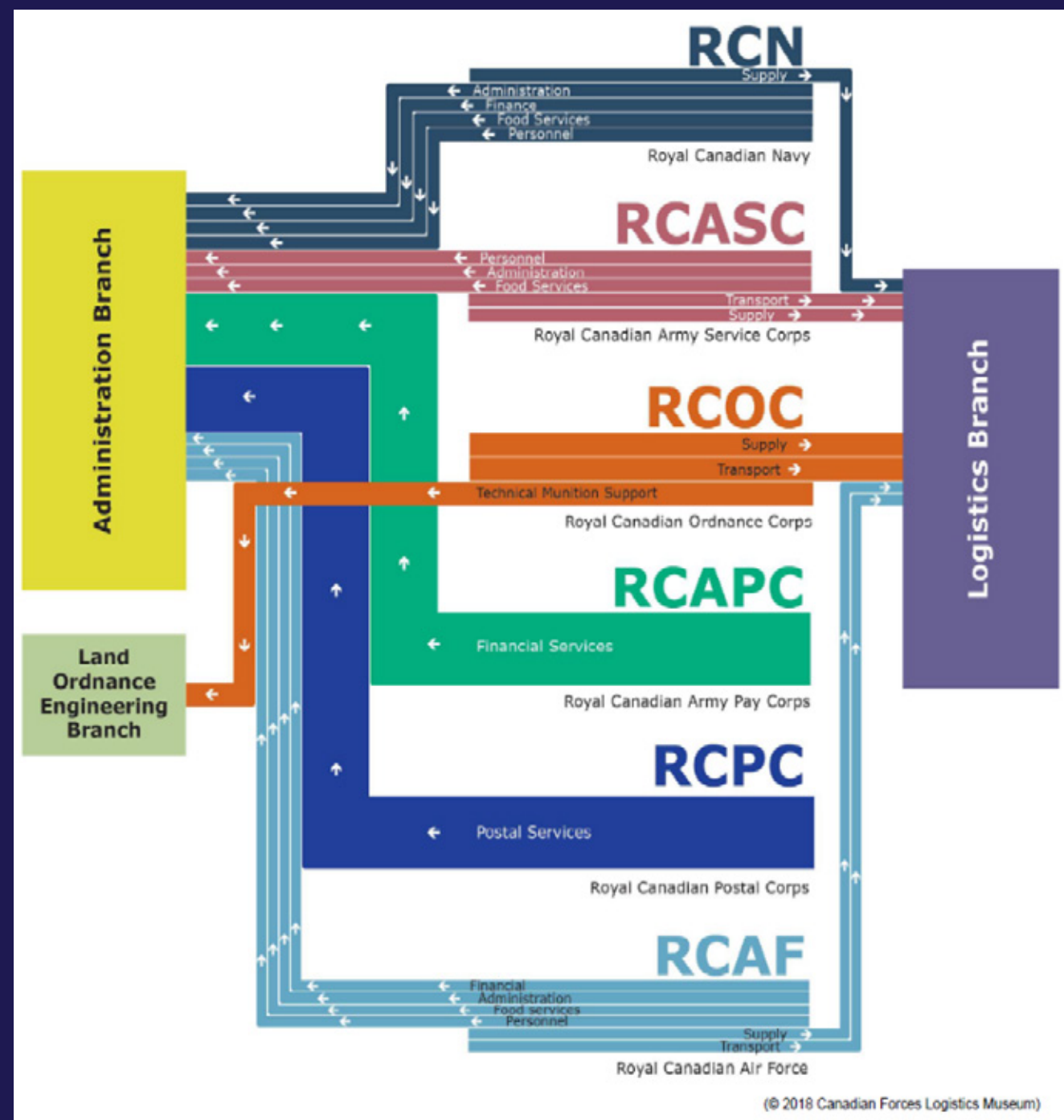
Here is a snippet of the evolution of the Royal Canadian Logistics Service since 1968, as well as a peak at the major changes to CAF uniforms brought forth during that time.

The idea of unifying the logistics services of all three military environments to create what is now the RCLS predates the 1960s. It emanated from the need to streamline the Canadian military. However, the concrete plan of Unification was the idea of the Honourable Minister of National Defence Paul Hellyer. The plan was shaped by his own experiences during WWII, and the insights he gained during the 1963 Glassco Commission on recommendations for more efficient methods of operation within the Canadian government.

In search of efficiencies and economies, Minister Hellyer presented his White Paper on Defence in 1964. His policy was twofold: Integration and Unification. First came Integration, which began to merge logistics trades together, and combine them with administration support services.

The biggest and most consequential change came about in the second phase, Unification. This disbanded the Royal Canadian Navy, Canadian Army and Royal Canadian Air Force in favour of a single armed service: the Canadian Armed Forces (CAF). The policy, which took effect on 1 February 1968, also created the first rendition of a combined logistics service, initially in the form of two branches: Logistics and Administration. (Fig. 1)

FIG. 1



Division of the Logistics Elements by function at the outset of the Unification of Canada's Military in 1968. At the time of Unification, Support units of each element were broken up by function. Supply and Transport went to the Logistics Branch. Administration, Food Services, Finance and Postal were merged into the Administration Branch, while Technical Munitions Support had been sent to the Land Ordnance Engineering Branch (LORE) in 1966.

Chart produced by the CFLM.

Notwithstanding any benefits, the loss of esprit de corps that resulted from unification sowed much discord. People would now belong to "Personnel Branches". These Branches were to enable members of the Canadian Forces in related occupations to identify with each other in cohesive professional groups. However, lessons had to be learned, as the initial combination of administration functions did not work well in practice. A, various changes to trades and training approaches were not always beneficial.

Yet, arguably by 2007, the harmony envisioned in 1964 was for the most part realized, with the absorption of the last remnants of the Administration Branch into a unified Logistics Branch. Today, the RCLS's value within the CAF lies in training world-class Logisticians across all three elements. Its mission also includes supporting these professionals throughout their careers, just as they support the combat arms with essential materiel and services, without which CAF missions could not succeed.

CAF UNIFORMS SINCE 1968

Over the same period as these structural changes, the Canadian Forces uniforms went through several major iterations. These reflect not only the changing times, but in some ways the lessons learned, and improvements made since 1968.



Unified Tri-Service Canadian Forces Women's Uniform

This uniform pattern highlights the evolution of the role of women in CAF. It resembles that of a flight attendant of the times, rather than a member of CAF.

It also could be argued that this promotional photo from 1968 is a reflection of the idealized view of the efficiencies of unification.

Note that this image is discoloured. What appears to be an Air Command blue tunic is actually a dark-green Unified Tri-Service uniform tailored to the Women's standard.

Also introduced at that time was the CAF cap badge, which replaced the distinctive trade badges on headdresses.

Photo by CF Photo Unit, 1968.



CF Green Unification Work Dress

The standardization of the Canadian Military as one unified CAF from 1968 onwards is demonstrated by this CF Green Unification Work Dress, worn by members and officers of all environments, from soldiers to sailors and air personnel. Nicknamed "gas station attendant uniforms", they were gradually distributed between 1968 and the mid-1970s.

Pictured here are two Supply Technicians on board HMCS Cormorant in 1980.

Photo by MCpl Rogers.



FIN Clerk wearing Unification Work Dress

Pictured here: a Finance Clerk wears the Unified Tri-Service Uniform without the jacket. Around his neck is a dickey in the colours of the Logistics Branch.

THE TRANSITION PERIOD OF THE 80S AND 90S

In the mid-1980s, the adoption of the Distinctive Environmental Uniforms (DEU) reflected a return to an explicit recognition of the Maritime Command, Land Force and Air Force. In a way, this mirrored the gradual acknowledgment that not all Logisticians could be tri-service, but rather some had distinctive roles and responsibilities, whether serving on a ship, an army base or on an aircraft.



Traffic Technician in Base Dress Air Command pattern - Introduced in 1986

Here a Traffic Technician is inspecting a duffle bag of personnel leaving on deployment with the United Nations Peacekeeping Force in Cyprus (UNFICYP). The member of the PPCLI on the left is wearing the Combat Dress (Olive Drab), used from 1963 to 2000.

Photo by CF Photo Unit, 1991.



Maj Sargeant, WO Goumans,
MGen Leach, Capt Julien,
LCol McDermid.

Army Garrison Dress

The No. 4 Garrison Dress (GD) was part of the distinct-element uniform drive of the 1980s. It consisted of work trousers and either a dress shirt or work shirt, with an optional sweater. Its most distinctive element was a non-tactical camouflage jacket, worn by three of the servicemen in this photo. It was nicknamed the "paint-by-numbers jacket" or "Canex camouflage". The jacket was hot and could quickly take on a faded and worn look, and its belt had no purpose; all of which contributed to its discontinuation in 1995.



Return of the DEU Service Dress

The issue of Distinctive-Environment Uniforms marked the definitive return to the original branches of the Canadian Armed Forces, with the addition of the CANSOFCOM.

The uniform itself has undergone some minor modifications since first being introduced in the 1990s. New features include outer pockets for the women's jacket, making it more practical.

Pictured here: DEUs worn by Logisticians graduating from their Resource Management Support Clerk course, 2007.

CAF UNIFORMS WORN BY LOGISTICIANS TODAY



CADPAT, Temperate Woodland

Gradually introduced from 2001, it was first worn by members of ROTO 9, Op PALLADIUM in Bosnia-Herzegovina.

The CADPAT is rated highly by NATO for its camouflage quality.

Pictured: a Finance Clerk on guard duty while on deployment with NATO forces in Bosnia-Herzegovina, November 2003.

CADPAT, Arid

This version of the CADPAT was introduced in 2005 and saw use in the many conflicts and operations involving the Canadian Forces in the 21st century.

Pictured here: Food Services Officer Capt Christian K. Chriska receives the General Campaign Star from LCol James Jensen at Kandahar Airfield, Afghanistan.

Photo by Sgt Halina Folfas, 2010

During this relatively short period of 50 years, the Royal Canadian Logistics Service has evolved into a truly comprehensive construct, tested in peace and war, overseas and across Canada. The constant during these times of change and growth has been the professionalism of you Logisticians supporting our missions and moving forward.

SERVITIUM NULLI SECUNDUS!

**SERVITIUM NULLI SECUNDUS:
AN ANALYSIS OF OVERLOOKED CANADIAN
LOGISTICAL SUPPORT DURING THE
WORLD WARS**

By A/SLt Karakoy, Anastasiya

INTRODUCTION

LOGISTICS FORMS ONE OF THE THREE COMMONLY accepted components of warfare – the other two being strategy and tactics. It enables the employment of the latter two and so is an integral aspect of military doctrine. Despite this, Logistics is the least studied component of warfare and is often overlooked in the face of its more thrilling counterparts. While Logistics exists to support both strategy and tactics – and so may be perceived as subservient to the latter two components – this in no way diminishes its importance to the success of military operations.¹

Although overlooked by many, the importance of Logistics was nonetheless very well understood by some of history's greatest leaders. Of note, five-star U.S. Army General Dwight D. Eisenhower – the Supreme Commander of the Allied Expeditionary Force during World War II, then later the 34th president of the United States – is famously known to have said, "You will not find it difficult to prove that battles, campaigns, and even wars have been won or lost primarily because of logistics".² While the study of Logistics can be clearly traced back as far as 17th century France under the reign of Louis XIV, it gained recognition as its own separate military entity only as recently as World War II, when the term was first officially employed by the U.S. military to describe the military requirement of mobilization and sustainment of personnel, supplies, and equipment in support of operations.³

In the context of Canadian military doctrine, Logistics was not clearly identified as a distinct entity until 1968, when Unification, which amalgamated the Canadian Army, the Royal Canadian Air Force, and the Royal Canadian Navy, created the Canadian Forces Logistic



PHOTO: Corporal David Veldman, Canadian Armed Forces Photo

Branch. On its 50th anniversary in 2018, it was renamed to its current title, the Royal Canadian Logistics Service (RCLS).⁴ Spanning all three elements of the Canadian Forces, Logistics is a dynamic pillar of military doctrine which must lead innovation in order to remain adaptable to the ever-changing environments and conditions of warfare. This essay examines the role of Logistics during three critical moments in Canada's participation in the two World Wars; the Hundred Days Campaign, the Battle of Britain, and the Battle of the Atlantic. It will highlight the important role Logistics plays in the success of military operations, as well as showcase the need for more research on this topic.

The Hundred Days Campaign, 1918

The Hundred Days Campaign was one of the greatest series of battles ever fought in Canadian military history. The Canadian Corps, commanded by Lieutenant-General Arthur Currie, fought tirelessly in several battles, from 08 August until 11 November 1918, which ultimately brought the Allies to victory in Europe. With the enormous losses

sustained at Passchendaele in 1917 still all too fresh in their memories, the Allies began this campaign dispirited by the bloodshed experienced up to that point in the war. The Germans on the other hand, having recently been freed from fighting on the Eastern Front due to the Russian Revolution, began this part of the war in high spirits, believing, perhaps too confidently, that their victory was now close at hand.⁵

At the fall of Imperial Russia on 11 November 1917, General Erich Ludendorff, Quartermaster General of the German Army at the time, resolved to achieve a decisive victory against the Allies within the coming year. To his dismay, however, Ludendorff's plans for victory far outstripped his army's logistical capabilities. The Allied blockade on the Western Front was causing grave shortages of industrial raw materials. The Germans had no new weapons with which to mount an offensive, and no urgent orders for new tanks were placed until August 1918.⁶ Upon moving his troops from the Eastern Front to the West, Ludendorff found that the strength of his force just matched those of the Allies; it did not overpower them.

As the Hundred Days Campaign unfolded and the Allies began defeating Ludendorff's army, the morale of German soldiers began faltering in the face of the lavishly supplied Allied force. Despite being constantly promised that their victory was close at hand, many German soldiers could not help but feel that they were fighting a war they had already lost.

Unlike the German Army, the Allied forces were well-supported logistically, which was crucial in light of recent changes to their strategy and tactics. The Hundred Days campaign saw the employment of a relatively new tactic at the time – the creeping barrage – which ultimately helped lead the Allied forces to victory. Military doctrine at the onset of the war called for the advancement of troops towards enemy trenches only after artillery fire had ceased. The creeping barrage however, worked by advancing troops towards enemy lines concurrently with artillery being fired at the enemy trenches. This way, by the time the German infantry could retaliate, the Allied troops were already storming their trenches. Once a trench line was overtaken, the artillery was moved forward to fire upon the next one while Allied infantry advanced to overtake it.⁷ While little information is readily available on the logistical requirements of sustaining the creeping barrage during the Hundred Days Campaign, it is not hard to imagine how complex the supply and movement of artillery and ammunition would have been in this context. This tactic requires a consistently reliable supply of ammunition as well as the constant movement of artillery pieces over a battleground pockmarked with craters. Had it not been for a highly efficient supply chain providing ammunition, as well as the flawless advance of the artillery, the creeping barrage would have failed.

Ultimately, despite it being rarely mentioned in accounts of the Hundred Days Campaign, Logistics played an integral role in securing a decisive win for the Allies. Without this success, an Allied victory in Europe could not have been guaranteed, and geopolitical relations as we know them today might have turned out very differently.

The Battle of Britain, 1940

The Battle of Britain was the first decisive battle of World War II, as well as the first battle in history to be fought exclusively in the air.⁸ From 10 July until 31 October 1940, the German Luftwaffe attacked British military and civilian targets almost daily in an attempt to demoralize British citizens, cripple military establishments, and ultimately weaken British military capabilities, in order to allow for a German invasion of the United Kingdom. Over a hundred Canadians participated in the aerial combat in the Battle of Britain, both as part of the RCAF's No.1 Fighter Squadron as well as with other Royal Air Force (RAF) units. RCAF aircrew were responsible for the destruction of 70 enemy aircraft during the four-month conflict, at a cost of 23 fatalities.⁹

While Canada's combat role in the Battle of Britain was quite small considering the grand scheme of the conflict, Canada played a significant role in supplying aircraft for the battle. In the early years of World War II, Allied fighter planes were in short supply. The first Hawker Hurricane fighter plane was produced only in 1940, after which three to four of these fighter planes were manufactured every week. This incredibly high speed of production achieved in such a short time was due to the efforts of engineer Elsie MacGill of Fort William (now Thunder Bay, Ontario). Just 35-years-old, aside from being the world's first female aeronautical engineer, she was also one of Canada's top practitioners in this field. MacGill worked for the Canadian Car and Foundry Company (CanCar). Due to her experience in designing and testing training planes prior to the war, in 1940 she was tasked with turning CanCar into an airplane assembly line.

During the Battle of Britain, Hawker Hurricanes played a significant role in securing an Allied victory. These planes went on to be used in more fronts throughout World War II than any other British fighter plane. By the end of the war, every tenth Hurricane in the British fleet (2,000 fighter planes in total) had been built at CanCar under MacGill's direction.¹⁰

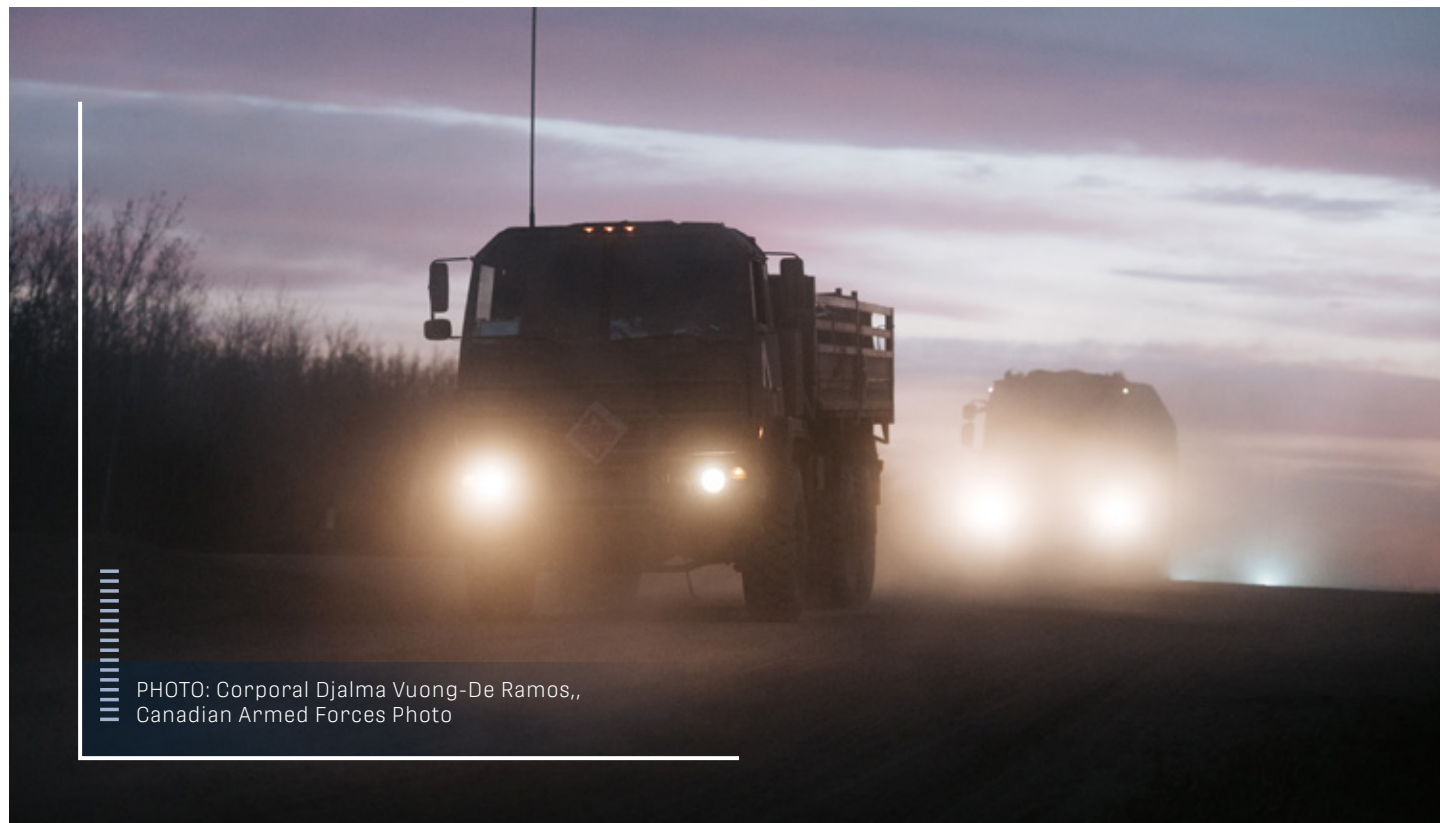


PHOTO: Corporal Djalma Vuong-De Ramos,,
Canadian Armed Forces Photo

While little is written on the Logistics of the Hawker Hurricane project undertaken by MacGill, one could easily deduce that such a high speed of production could not have been achieved so quickly without a great amount of logistical planning and organization. Logistics bridges engineering and operations, and so works closely with both organizations to help achieve a military objective. Producing so many aircraft so efficiently required many logistics processes to be established, including a highly efficient supply chain, in order to provide CanCar the parts they needed.

In addition, the efficient management of CanCar employees ensured that the required output would be attained in a timely manner.

The Battle of the Atlantic, 1939-1945

The Battle of the Atlantic was the longest campaign of World War II. A source of pride for all servicepeople of the RCN as well as for Canadians as a whole, it was fought over a vast and dangerous ocean against an often-unseen enemy – the German U-Boats. Throughout the battle, the RCN, in partnership with Canada's Merchant Navy, was tasked with the transportation of food, supplies, weapons, and personnel, which were all essential to the success of the Allied war effort in Europe.

Canada's Merchant Navy travelled across the North Atlantic to Europe in convoys, and despite being defended by Allied warships and aircraft, ships were sunk by the thousands, often being destroyed faster than they could be replaced. In order to maintain defence of the Merchant Navy convoys, the RCN's fleet expanded drastically during World War II, from 13 warships and 3000 personnel at the beginning of the war, to 350 warships and 90,000 personnel by war's end. The RCN's fleet at the time consisted largely of corvettes, which, despite being intended for coastal use and being notoriously uncomfortable in rough seas, were quick to produce and thus were relied on heavily in the early years of the war.¹¹

The quick pace of the corvette shipbuilding program relied on the successful provision of construction items from the Department of Defence Production. Additionally, once these new ships were ready for sea, they had to be supplied with additional material to keep them operational. The success of this logistical challenge came about via close teamwork between Canadian logisticians and other Allied forces, who planned to share common equipment for the ships. The Canadian Engineering Branch ensured that the new corvettes would be built to be compatible with equipment supplied by both the U.S. Navy and Royal Navy.

The Battle of the Atlantic is an example of a military logistical success, given that the Canadian Merchant Navy and the RCN worked closely together to maintain a reliable supply line to the European front, which was critical to the success of the overseas war efforts. At the beginning of the war, this supply line was under threat not only from German U-boats, but also by the mere fact that the demand for items to be sent overseas far outstripped the supply. Inventory quantities were based on pre-war requirements and practices, and it was not until major changes in the complexity and accountability of the naval stores system were undertaken that RCN logisticians were able to properly equip the ever-increasing number of ships deploying to Europe. Consequently, the delivery of items to ships improved, as did accountability of inventory in warehouses. Without these changes, ships could not have been properly equipped to sail on time or to be able to search for and fight enemy vessels.

The efforts of Canadian logisticians to build up the RCN, as well as to provide the necessary supplies and equipment to be shipped overseas in a timely manner, played a major role in enabling Canada's Merchant Navy convoys to deliver much needed supplies to the front lines. This in turn helped to secure an Allied victory in Europe.

CONCLUSION

Logistics is a dynamic component of warfare which must constantly adapt to the ever-changing environments and conditions of warfare. While Logistics exists to support strategy and tactics, its importance to the success of military operations cannot be underestimated. The logistical implications of the conflicts discussed in this essay have often been overlooked in the face of the more thrilling strategies and tactics used in these monumental battles during the two World Wars. Nonetheless, the logistical considerations taken to ensure the success of the battles discussed were integral in determining the course of human history as a whole. Despite little information being readily available specifically pertaining to the Logistics of these battles, one can easily imagine just how complex those considerations were.

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A SNAPSHOT OF THE FUTURE OF WAR: KEYBOARD COMBAT

by Evert Akkerman

IT LOOKS LIKE THE FUTURE OF MILITARY OPERATIONS will be digital warfare, conducted by a hybrid force of crewed and uncrewed systems. We will increasingly come to rely on new technologies such as artificial intelligence (AI) and machine learning, the internet of things (IoT), drones, robots, and 3D printing.

More and more, armed forces aim to augment their capabilities through technology – waging war remotely while keeping personnel out of harm’s way. The benefits are obvious. Drones allow military commanders to get close to targets without having to send in people. If a drone is shot down, you lose money but not lives. These uncrewed aircraft are also used for gathering intelligence (recce, surveillance), logistics (dropping supplies), and launching actual attacks.

The use of robots in warfare is not a new development – in WWII, the Germans developed a miniature tracked vehicle called Goliath that carried explosives.¹ However, there is renewed interest and future wars will likely see a growing deployment of robots, including autonomous jets and bombers. Such equipment will be guided, at least in part, by artificial intelligence. According to U.S. Army developers, robots are able to leverage computer processing to collect and organize data that come in fast.²

Solutions and applications that seemed futuristic even a few years ago are now in full swing. One of lessons learned from the pandemic was the vulnerability of our supply chains. As this realization sank in, the U.S. started using 3D printing as a supply chain solution, from spare parts for fighter jets to concrete bunkers.³ This, of course, eliminates the need for expensive and time-consuming shipping. Also, if you have no supply lines, the enemy can’t cut these off either. It is even possible to 3D print drones.

The term machine learning (as a subcategory of AI) refers to the building of software that can teach itself

to improve by recognizing patterns, and thereby respond faster and more effectively because its predictions are better. As with any technology, the capacity for machines to learn is only as good as the people who build them. One factor that is difficult to stamp out is the mindset of the designers and operators, who each have their own filters, biases, and preconceived notions. Also, there is no guarantee that personnel operating these systems have been properly trained in aligning these systems with the requirements of the operation, or in correctly interpreting the results.

An emerging issue is bias in AI: whenever we automate processes, we run the risk of building biases into a system. Biases that we are not aware of (also called “unconscious biases”) can lead to mistakes when these seep into systems that collect and evaluate data, which may impact outcomes and recommendations.

As our reliance on technology increases, people can continue to make a key difference by building in pauses to ask critical questions and probe for submerged biases, dropping small “pings” on every system, like navy destroyers using sonar to detect submarines, with the ideal outcome of forcing these to the surface.

While we have various electronic tools at our disposal to facilitate operations and logistics, common sense and critical thinking are still required on every battlefield and every peacekeeping mission. There will always be a need for making judgment calls, especially in non-standard settings and situations. Quoting Gil Grissom on CSI: “Machinery should never matter more than our mind.”

Endnotes

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PHOTO BY CASH MACANAYA ON UNSPLASH

PHOTO BY CANADIAN ARMED FORCES PHOTO

THE CHINA-BURMA-INDIA THEATRE

Excerpt from the forthcoming RCAF logistics textbook

BACKGROUND

THE TERRAIN WAS UNFORGIVING, CREWS WHO crashed far from a base would be unlikely to see rescuers, the enemy was a perennial threat, and obtaining supplies was a constant struggle. Such was the “China-Burma-India Theater”. Known as the CBI, it was the Allied effort to support China, an ally, and Allied units in the region against the Imperial Japanese.

Allied forces in the theatre, including the world-renowned Flying Tigers, conducted combat operations against the Japanese and flew massive amounts of cargo over “The Hump”, the eastern end of the Himalayas. This was an intensively logistics-dependent theatre.

It is still considered by many to be the most challenging resupply theatre in WWII. Issues ranging from transport, to a lack of parts, to resupplying unconventional forces, to weather and illness, were all operational hinderances. Its 42-month duration involved Americans, British, Australian, and Canadian pilots and crews, plus army personnel from India, Nepal, Africa, and China.



A Map of the CBI Theater

Sustainment was orchestrated primarily by the United States Army Air Force's Air Transport Command. It had little to no experience with air logistics operations and so had to build the organization from the ground up, beginning in 1942. It recruited and relied heavily on former civilian airline executives to do this.

So challenging was the work, that President Franklin D. Roosevelt personally directed that the Air Transport Command receive a Presidential Unit Citation in 1944—a first for any non-combat organization.

STRATEGIC CONSIDERATIONS

The strategic considerations in aiding the Chinese were two-fold. First, there was fear that the Japanese would expand into India, causing a loss of British Empire territory if not kept in check. Support from the Soviets would be non-existent, given the signing of the Soviet-Japanese Neutrality Pact in April 1941. The pact protected the Japanese northern flank, which meant those forces could be poured into other areas such as Burma, India, Australia, and the Pacific.

Second, the Allies, by supporting the Chinese, kept one million Japanese troops tied up fighting in China and southeast Asia, thus preventing them from reinforcing other areas of the Pacific. Such a fixing strategy was particularly important given that Darwin, Australia was bombed on 19 February 1942; Rangoon, Burma fell in March 1942; Java, Dutch East Indies (now Indonesia) was invaded on 14 February 1942, and the invasion of the Philippines started a mere 10 hours after the attack on Pearl Harbor.

These strategic objectives could only be realized with significant sustainment operations. Once the Burma Road was cut off by the Japanese, the only remaining viable option was by air.

A CHRONOLOGY OF IMPERIAL JAPANESE ACTIONS

Japanese territorial expansion began in 1931 with the invasion of Manchuria, but it wasn't until the attacks on Pearl Harbor on 7 December 1941 and the Philippines the following day that the Allies became seriously engaged. The United States had imposed trade sanctions on the Japanese in the summer of 1941, while the year prior the Japanese, Germans, and Italians had signed the Tripartite Pact. These attacks on American territories not only brought the United States into the war, but set a trend in motion what would continue throughout the Pacific.

The Japanese advanced quickly into Guam, Wake Island, Hong Kong, the Dutch East Indies, Malaya, Singapore, and Burma, between December 1941 and the spring of 1942. They also bombed Darwin, Australia, and in May they occupied Burma. It wasn't until the Battle of Midway, in June 1942, and the Battle of Guadalcanal, on 7 August, that the Allies were able to halt some of the Japanese advances.¹



Their advances would continue to push the Allies into eastern India from Burma well into 1943. That same year, the Indian 14th Division, led by Major General W.L. Lloyd, attacked the Japanese, but his frontal assaults in the First Arakan Offensive failed. Consequently, he was removed from command and the Japanese counterattacked, causing more havoc on the Allies resulting in further retreat. The Allies had failed to learn from mistakes in the past, including the misguided use of roads, as opposed to jungles, to attack the well dug-in, camouflaged Japanese troops. It was not until after these debacles, later in 1943, that long range jungle patrols were established in earnest.

Author's Note on Lloyd's Attacks
It is interesting to note that the full frontal assaults Lloyd employed were similar to the ones unsuccessfully used in the Second Boer War, WWI in Europe, and Gallipoli. They did not work well then, so it is interesting to see them being used again. This may be the result of a "same as last year" mentality, copying from the previous war, or falling back onto what one knows as opposed to what needs to be done. In any case, wave after wave of frontal assaults failed. What changed between them? It appears nothing. So why did Lloyd continue to do the same thing that failed previously and in prior wars? Was it a failure in training, a failure in military education, apathy, bravado, ignorance, or something else? Furthermore, some of his peers even supported his actions and disagreed with his removal from command. This also begs the question "What were they thinking?". Like-minded individuals on a wrong path represent a recipe for disaster.

¹ Some historians will postulate that the Battle of the Coral Sea, 4-8 May 1942, was the first turning point for the Allies in the Pacific. However, this is contested because of the metrics used to calculate a win, including tonnage destroyed and holding the field afterward. Others will argue that the Battle of Coral Sea helped set the conditions for the Battle of Midway and avert a Japanese attack on Port Moresby.

RESUPPLY BY AIR

Air resupply had been considered in plans to support the Chinese as early as 1941. However, with the fall of Rangoon, the land route through Burma, called the Burma Road, was cut off, forcing sustainment for Allied forces in China and the jungles of southeast Asia to come by air. The mule trains employed later in the theatre did not yet exist.

Two proposals for aerial resupply were considered. The first proposed route was from Delhi north to the Chinese side of the Himalayas and into Kunming (and other areas as needed). This would require a leap frog process, would be slow, and aircraft loads would have to be reduced to enable extended aircraft ranges.² The route's location far from the Burma border meant that Japanese air attacks would, at least in the short term, not reach the aerial resupply bases in India. However, the risk of insufficient resupply could force the Chinese out of the war and unfix³ the Japanese, thereby giving them freedom of action against India and the Pacific. The second proposal was to conduct sustainment from eastern India to Kunming (and other locations). This approach would be faster, payloads could be higher, but it required flying over and through mountainous terrain, with little support. Air attacks against resupply bases could also be a threat. Both options came with substantial, but different, risks. The latter option was selected.



Options for the Resupply of Kunming. Note: Routes are shown for illustrative purposes. The exact routes varied. Likewise, multiple staging and delivery locations also existed.

“Perhaps the most unlikely Canadian unit represented in South East Asia was the Veteran's Guard of Canada. In the summer of 1944, and again in the spring of 1945, contingents of the Veterans were employed as mule skimmers, escorting shiploads of mules from the United States to India and eventually the jungles of Assam and the Arakan where they were much needed for transportation.”

-Veterans Affairs

The distance from eastern India to Kunming was about 500 miles (800 kilometres). The elevation started at 90 feet (27 metres) then rose quickly up mountain walls to 10,000 feet (3,000 metres). Pilots would then traverse over several 14,000 to 16,000-foot (4,200 to 4,900 metres) ridges, arriving at the Santsung mountain range at 15,000 feet (4,600 metres). This rising and falling route with valleys separating mountain peaks was difficult for the heavy-laden planes to negotiate. A fully loaded Douglas DC-3 Dakota (also known as a C-47 Skytrain) would take nearly 10 minutes to arrive at its operating ceiling. They were not combat aircraft and those in the Burma theatre had to be outfitted with superchargers for improved high-altitude performance. Frequent thunderstorms, strong mountain winds, updrafts, rain, impenetrable cloud formations, and icing, were all factors that could change between take-off and landing. An aircraft could be lifted up thousands of feet and then dropped to 6,000 feet (1,800 metres) in a matter of minutes due to up- and down-drafts. Oxygen was required for heights above 10,000 feet (3,000 metres).

The unpressurized C-46 Commando became known as the “flying coffin” because of its heavy construction, ease with which it iced up, and lack of glide ability during emergencies. The results were frequent crashes. Radio operator Wendall Phillips stated “The Hump became littered with our aircraft. On a clear day, you could see the sun reflecting off the wreckage of crashed planes lying there.”⁴ The mission was so dangerous that the RAF would only send volunteers.⁵ Likewise, members of the American Volunteer Group, were recruited as a special air unit to support the Chinese. Volunteers came from all elements. 1st AVG was famously referred to as the Flying Tigers, who

flew the Curtis P-40 Warhawk fighter, and the 2nd AVG piloted B-25 Mitchell bombers. They were both folded into the United States Army Air Force in 1942.



It should also be remembered that many pilots were inexperienced, having never flown before the war. In 1937, there were only 184 flight school graduates in the United States military. This number increased into the thousands by 1940. Pilots graduated in nine weeks,⁶ with 75 hours of practice and were expected to perform in whatever airframe they were trained on in advanced training or assigned in theatre.

The monsoon season further complicated the situation, with 500 centimetres (196 inches) of rain and high winds that buffeted the aircraft; but it at least slowed an advancing enemy. On top of the natural obstacles was the threat of Japanese attack aircraft and anti-aircraft fire. The only advantage of the monsoon in 1942 was a

five month reprieve for preparations in India before the Japanese started air operations against Allied air bases in Assam, north-eastern India.

The pilots and crews of the AVGs were a unique breed of soldier—they were not officially listed as pilots or crew, but as consultants, mechanics, aircraft operators, instructors, metal workers, carpenters, electricians, musicians, and one was even listed as being a farmer on his passport. They were hired on a one-year contract with the Chinese manufacturing company Central Aircraft Manufacturing Company (CAMCO) –a Chinese government company. Crews were subject to firing for insubordination, abuse of drugs or alcohol, illness, malingering, and security infractions. They were also offered bonuses of 500 dollars for every confirmed enemy plane destroyed.

Other challenges included a lack of communications and weather reports. Aeronautical maps were infamously inaccurate. The campaign frequently lacked supplies, spare parts in particular, due to priorities in other theatres and shipping challenges.

Search and rescue operations were comprised of a second aircraft launched when one aircraft did not return as scheduled. The searching crew would parachute supplies and a flight surgeon to the scene—if the aircraft was found or contacted by radio. Rescue supplies included trinkets used to bribe locals. In some cases, locals helped downed aircrew. In others, crews were captured by the enemy or those attempting to curry favour with them, or who were coerced to comply with enemy demands. All aircrew were directed to try to find a river and follow it downstream. If they encountered locals, pilots carried cards that asked the local to take them to the nearest base for a reward.⁷

2. CNAC (1999)

3. The term “unfix” is used here as a contrast to the mission task verb “fix” meaning to force an enemy to remain in one location without moving. Fix is often followed by “strike” or “destroy” in the next phase of an operation.

4. Shurkin (2017)

5. Ibid

6. National Museum of the USAF

Canadian pilot Ken Stone, assigned to the Royal Air Force's 238 Squadron, flying DC-3s, recalled flying numerous supplies to guerrilla forces. Guerrillas would radio an intelligence officer to establish the drop zone and Flying Officer Stone and his crew would drop the goods. His missions included unloading or air dropping dehydrated and tinned food, animal carcasses wrapped in cheesecloth, 45 gallon drums of fuel, mail, troops, and rice. Rice was loaded into jute bags three quarters full and pushed out of the plane at 200' above ground.⁸ In respect of flying people through the valleys and up over the mountains, Stone recounted "I'll never forget what the troops ate for breakfast that morning."⁹



Long range Allied patrol forces operating with mules in Burma were resupplied by air. Supplies included animal feed and even a falcon for hunting Japanese carrier pigeons, as a means to cut off communications—complete with mice for food.¹⁰ Two groups of patrols were operating in the area, the British-Indian Chindits and Merrill's Marauders from the United States.



So desperate was the need for materiel that B-24 bombers were converted to cargo planes and sent to the CBI theatre. With minimal modification, they were also used to lay underwater mines to prevent Japanese resupply. The magnetic mines were fitted with special countermeasures that prevented enemy minesweepers from detonating them during mine sweeps, but would be triggered by other warships that sailed the harbour after the sweep was done. The design of these mines also prevented them from detonating on civilian wooden fishing vessels.¹¹

The Japanese continued to attempt to advance on the Allies. On 4 February 1944, their offensive Operation Ha-Go was launched against the British XV Corps in an attempt to force the Allies to relocate and commit their reserve forces. The Japanese were planning a major offensive in

Assam, about 500 kilometres away from Arakan, Burma. Arakan was the decoy and having no Allied reserve force to respond would make the operation easier. Consequently, the 7th Indian Division's HQ was overrun in Arakan. Its survivors retreated to the rear supply area called "the Admin Box" and were surrounded. Field Marshall Slim ordered the Corps to hold and defend while reinforcements were summoned. There was a problem, however, resupplying the Admin Box.



Slim ordered the 14th Army's supply officer, Brigadier General Arthur "Alf" Snelling, to sustain the Admin Box. Kolakowski, writing for the Journal of Indo-pacific Affairs, states

Snelling's staff, aided by their comrades in the RAF and USAAF, had already assembled supplies and planned an airlift down to individual planeloads. Ground crews also improvised parachutes out of jute material to solve a shortage of real ones. "The switchover [to air supply], as far as I was concerned," said Slim, "was simple, thanks to the preparation that Fourteenth Army, Third Tactical Air Force, and Troop Carrier Command together had made - it required only the word, 'Go!'"¹²

This resupply effort had a major impact on the viability of the defence and the demise of the Japanese. A total of 714 sorties were flown to support the Admin Box. Meanwhile, the Japanese began to run out of supplies.



The experience of the Allies in the Admin Box would prove essential in the Battle of Imphal a mere five weeks later, when the Japanese launched an attack against the British IV Corps. Realizing that the Corps had only 30 days of supplies, Lieutenant General Geoffry Scoones, the Corps Commander, ordered a ration cut for men and pack animals to one third the daily norm while reducing movement to preserve fuel. All supplies and casualty movement would have to be by air.

Scoones' area of operations had six airfields and four dirt runways. Supplies were ferried in and casualties and non-combat troops evacuated out by air. The Corps strength was 155,000 men and 11,000 animals, requiring 540 tons (nearly half a million kilograms) of material per day. Weather turned into an obstacle for both ground and air movement. Dirt airfields turned to mud, hampering delivery, while poor weather prevented aircraft movement.

7. The Air Mobility Command Museum. (2012)
8. Bennett (1992a)
9. Bennett (1992b)

10. Shurkin (2017)
11. Collins (2021)
12. Kolakowski (2020)

A UK-US force named Operation Stamina was given 232 dedicated C-47 cargo aircraft. Even with air superiority, after 12 days of resupply operations, the Corps was still short 1,250 tons of materiel. Congestion at airfields, damaged planes, weather, lack of hardstand, slow handling, and navigation problems, all contributed to a slower than expected delivery rate. To simplify and accelerate material handling, Bengal airfields were designated as single commodity.



As the air resupply continued into May, deficits in delivery were growing increasingly problematic, necessitating further ration cuts. Artillery fire was limited to six rounds per gun per day (a similar problem for the Turks in Gallipoli decades earlier). As one Lieutenant stated “We smoked a lot to stop thinking of hunger.”¹³ A lack of rain gear and clothing amplified discomfort and affliction. Noted one staff officer “Life during the siege of Imphal was strenuous for all and devoid of comfort and it imposed a strain on the nerves.”¹⁴

As the Corps was running down to its last week of stores, relief forces broke through and reopened the lines of communication, stopping the siege.

The recapture of Burma began with the failure of the Japanese to take either Assam or Arakan. The Allies began their advance in the latter half of 1944. The Japanese forces, having moved northward, stretching their lines of communication, suffered from disease and a lack of provisions, but fought courageously as the Allies pushed forward. Operation Dracula, the airborne-amphibious plan

to recapture Rangoon, was activated earlier than anticipated so as to avoid supply disruptions from the upcoming monsoon season. Ironically, the season started early—on the very day Rangoon was abandoned by the Japanese and retaken by the Allies. In spite of Allied celebrations in Rangoon, Japanese forces continued to fight in the jungle. They were finally pushed back by Allied forces and guerrilla fighters, resulting in an estimated 10,000 casualties. The final planned blows were Operation Zipper, intended to capture Malaya, and Operation Mailist, to capture Singapore. However, the surrender of the Japanese following the atomic bombings precluded these operations from being fully executed.

AFTERMATH

Major General Ichida of the Imperial Japanese Army declared that two vital factors contributed to the retaking of Burma:

*Allied air supply, which permitted ground forces in Burma to consolidate their position without being forced to retreat, and thus rendered the enemy's infiltration and encircling tactics abortive...[and] Allied air superiority, which so disrupted Japanese supply lines, both in Burma and further afield, that starvation and illness overtook thousands of Japanese troops... and also denied them the essential supplies of fuel, equipment and material with which to fight a superior equipped, and better supplied, Allied Force.*¹⁵

Without the problem-solving abilities of logisticians and the dedication of tens of thousands of Allied troops in the Burma theatre, the war could have turned out to be very different. The Japanese would probably have invaded India, overrun China, and expanded further into the Pacific and Australia. The commitment and sacrifice of thousands of logisticians created a supply system that enabled combat forces to defend, block, fix, and strike the enemy.

While Canada had a minor role to play compared to the United States, India, China, or England, the impact of the Allied contributions was enormous and produced major strategic effects. The memories of fighting in this theatre remain indelibly inked in the minds of the approximately 8,000 Canadians who served, including two Squadrons with 225 aircrew, 1,700 personnel embedded with the RAF squadrons or other units, and 6,100 in other roles.

The Chindits numbered 3,000 as they embarked on their first mission. However, during the three month operation, played out over hundreds of kilometres, they lost one third of their force to death, capture, or disease. Another 600 were so badly wounded or ill they were unable to return to active duty. After a period of planning and reconstitution, they were assigned to Operation Thursday. They moved over harsh terrain with the objective of establishing forward operating bases with resupply runways. This ended up requiring significant air support in the form of over 600 sorties to support 9,000 troops and their eventual evacuation by air following Japanese advances. Historians, military commanders, and former Chindit members have hotly debated their success, with arguments suggesting that the resources expended to form, employ, and sustain them brought minimal effect in Burma. Others herald their success as making a significant contribution.

Brigadier General Frank Merrill's special forces generated more success than the Chindits, but their casualty rates were just as high. Their operational success relied on mule sustainment, the element of surprise, local Kachin scouts, mobility, support from the Office of Strategic Services Detachment 101, and Japanese-American intelligence translators—services that were not as abundantly available to the Chindits. They were successful in harassing Japanese forces, cutting off supply lines, and seizing an airfield. Of the original 2,997 men, only 130 were combat effective by August 1945, only two had not been hospitalized for wounds or illness, and all support horses and 80 percent of their transport mules died.

Many of the casualties were due to diseases such as scrub typhus, dysentery, exhaustion, and malnutrition.

The demanding conditions of the Marauders necessitated a daily diet of 4,000 calories. However, the lightweight option, high calorie ration was discontinued in 1943 due to cost. With advice from supply officers in Washington, General Joseph “Vinegar Joe” Stillwell and his G4 staff determined that a 2,830 calorie per day ration issue would be sufficient for the troops. However, this cost saving in money and weight came at a price paid in casualties. Aerial resupply occasionally dropped additional foodstuffs, but the nutritional and caloric intake was insufficient, resulting in exhaustion, poor health, an inability to fight off illness, and combat ineffectiveness. Troops resorted to

trading cigarettes to Chinese troops for food.

Improper sanitation procedures and impatience using halazone tablets (taking them like pills instead of putting them in canteens) led to bloody dysentery.

Nevertheless, advances were made against the Japanese, albeit at great cost. This is not to suggest the Japanese suffered less. In many cases, they, too, faced illness and a lack of supplies, resulting in combat ineffectiveness in defending key areas such as airfields.

CONCLUSION

The aircrews supporting the Hump delivered over 650,000 tons of materiel, flew 156,977 sustainment flights taking 15 million flying hours, and transported 33,400 personnel. Several pilots from the Burma theatre, with the lessons learned, also flew in the Berlin Airlift a few years later.

Wrote General Slim in 1956,

*A most distinctive aspect of our Burma war was the great use we made of air transport. It was one of our great contributions towards a new kind of warfare and I think it fair to say that, to a large extent, we discovered by trial and error the methods of air supply that later passed into general use . . . Ours was a joint land and air war; its result, as much a victory for the air forces as for the army.*¹⁶

After the war, a number of the aircrew became notable figures, including airline founders, senior political appointees, ambassadors, scientists, senators, NFL players, CEOs of blue-chip companies, and at least one movie star. Of particular note, future Secretary of Defence Robert McNamara served in the CBI in a statistical control unit, creating schedules for bombers doubling as cargo aircraft. He left the military after the war at the rank of Lieutenant Colonel. Meanwhile, entertainer Gene Autry was a transport pilot with Air Transport Command.

Nearly 600 aircraft were lost and at least 1,650 aircrew killed or missing.¹⁷ Seventy years later plane wreckage was still being found and personnel were still listed as missing. The nickname “aluminum trail” still echoes today due to the number of crashes on the route.

To quote Dr. Rob Santino, Senior Historian at the National World War Two Museum in New Orleans, “It’s a supply flight and no one’s ever going to make a movie called ‘Supplying Private Ryan’.”¹⁸ Nevertheless, we can still learn from this operation.

POINTS TO CONSIDER AND QUESTIONS TO ASK

1. When the high caloric rations were cut due to budget limitations, what other options should the supply chain have considered to provide the necessary nutrients and calories?
2. How did the role of finance and cost savings affect the combat effectiveness of the special forces? How can we avoid having this occur today? How can one determine the true cost of budget cuts? Were there other options besides budget cuts that could have been done that could have balanced the desire to cut costs with the need to supply troops?
3. How does food affect morale?
4. What happens when sanitation discipline is not followed?
5. Was the war in Burma truly a joint operation or was it one element simply serving another?

WHAT CAN WE LEARN?

1. The CBI Theater had a strategic goal of fixing the Japanese forces to prevent them from spreading to India and reinforcing other locations in the Pacific. Logistics support to the Chinese was critical to fixing the enemy.
2. Logistical sustainment supports strategy through tactical means.
3. The impact of weather and geographic terrain cannot be underestimated.
4. Different plans each have their own trade-offs. Seldom will there be a perfect solution.
5. Significant misery, illness, casualties, and poor morale occur when logistical support is insufficient to support a mission.

6. Cutting off an opponent’s lines of communication can impose psychological and physical effects on them.
7. Airpower and aerial resupply can act as force multipliers for ground troops.
8. Innovation and problem solving are necessary in sustainment operations.
9. Employing the available resources in creative ways can help achieve necessary effects (e.g., turning bombers into cargo aircraft).
10. Budget cuts cannot justify a reduction in required materiel (e.g., the caloric intake of fighting forces) when the full cost of the cuts is not considered. As seen in this case, the justification was made without considering all stakeholders and outcomes. This was an opportunity to innovate, but that did not happen and troops suffered as a result. The cost savings in money may have been realized, but the wasted manpower, loss of life, combat ineffectiveness, and loss of momentum were all non-monetary costs that exceeded the monetary savings. This is a classic case of turning only to numbers as opposed to the full (qualitative and quantitative) costs of a mission. Had this mentality persisted in other areas of this theatre, the theatre would have been lost. Non-logisticians and financial personnel failed to understand the implications of financial cutbacks without backstopping the cuts with innovative solutions to achieve the mission or understanding that cuts would detract from the strategic and political intent—even senior generals were guilty of this. Manpower losses for the men on the ground (there were no women with the Chindits or Marauders) meant significant waste in troops, training, uniforms, combat effectiveness, etc. Whatever monetary savings were made on food paled in comparison to the human and combat losses. The savings also failed to consider the monetary cost of replacing troops, death benefits, burial costs, training costs, and materiel replacement costs. Although it has not been calculated, the full cost of the food reduction would most likely have resulted in a negative monetary outcome given the monetary inputs into these other areas. The lesson here is to understand the full cost of decisions, not just the monetary cost in one silo.

11. The preparation of Snelling and his troops demonstrates a number of principles of logistics, including cooperation and foresight, while problem solving by logisticians was concurrently imperative.
12. The aircrews in Burma were daring, risk taking, risk calculating, dedicated, hardworking, brave individuals who volunteered for their duties. These are characteristics of good officers.
13. Healthcare direction and advice should be followed, with exceptions considered only from well justified claims or support from experts. In the case of the special forces not using the halazone tablets correctly, the result was combat ineffectiveness and death.
14. Aerial resupply is resource intensive.
15. Effective logistics personnel must be proactive.

13. Kolakowski (2020)
14. Ibid
15. London Gazette. (1951). Pg. 2154.
16. Kolakowski (2020)
17. Some references will show 373 aircraft lost, but a figure closer to 600 appears to be more accurate and account for all flying nations.
18. First Coast News (2020)

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Mobilizing Civilian Industry for War

The Canadian Pacific Railway during the Second World War

■■■■■■■■■■■■■■■■■■■■ by Corporal Henry Guzman-Diaz

THE CANADIAN PACIFIC RAILWAY (CPR) HAS BEEN LINKED to almost every military operation in which Canada has taken part. From its earliest days, the CPR supported the movement of soldiers across Canada, for example, toward the Northwest Rebellion in 1885. Its founder, Sir Donald Smith (Lord Strathcona) raised a regiment for service in the Boer War in 1900 – Lord Strathcona’s Horse. The CPR supported the nation once again in its First World War effort, with the transportation of troops and materiel by rail and sea. In total, 52 CPR ships were used for war service with 12 being sunk by German U-Boats. Outside of corporate mobilization, fully 11,340 CPR employees enlisted to serve in the Navy, Army and the fledgling Royal Flying Corps. Of these, 1,116 were killed. Four CP employees were awarded the Victoria Cross for gallantry in action.

With the outbreak of the Second World War, the CPR again answered the call to action to support Canada’s participation. CPR President Edward Beatty placed the full resources of the company at the disposal of our country and the British Empire.

On land, CPR moved 307 million tons of freight and 86 million passengers, including 150,000 soldiers. They re-tooled their locomotive shops for the production of weapons and munitions. The Angus Shops in Montreal were responsible for the manufacturing of Valentine tanks, of which 1,420 were built, primarily for the Soviet Union. Canadian Pacific also provided the memorable setting for the two Quebec Conferences it hosted at the Chateau Frontenac in 1943 and 1944. These conferences were attended by British Prime Minister Winston Churchill, American President Franklin Roosevelt and Canadian Prime Minister Mackenzie King, the three of whom developed plans for fighting the war in the coming years. It was during the first conference where the idea of the D-Day invasion initially took shape.

At sea, 22 ships served during the war and 12 of them were sunk, including CPR’s largest ship – The Empress of Britain II, which was almost as big as the Titanic. The Ogden Shops in Calgary were re-tooled to manufacture naval guns and by the end of hostilities, had produced more than 3,000 for use on Royal Navy and Royal Canadian Navy ships. Other items fabricated by CPR included 75 ship engines, anti-submarine devices and fire control systems.

In the air, the Canadian Pacific Airlines was responsible for creating the “Atlantic Bridge”, which ferried bombers from Canada to Britain. This was eventually turned over to the Royal Air Force Ferry Command. The CPR was also responsible for the establishment of British Commonwealth Air Training Plan (BCATP) schools in Alberta, Manitoba, Ontario and Quebec. In all, 29,130 aircrew were trained at these schools that were staffed by the RCAF, but managed and run by the CPR.

Wartime shop production signaled the end of the Great Depression and provided jobs for many formerly laid-off CPR employees. One such case was an Angus Shops carpenter’s son. Hockey legend Maurice “Rocket” Richard worked as a machinist for CPR’s Munitions Department in 1942. Although on leave from the company since October of that year, the “Rocket” didn’t resign his “secure” job until he was comfortable with his hockey career...a few weeks into the 1944- 1945 hockey season, when he scored his record-setting 50 goals in 50 games.

The war was costly to the CPR in both material and men. In total, 21,787 CPR employees left the company to enlist in the Navy, Army and Air Force. Of these, 658 paid with their lives. One of these employees who didn’t come home was a Winnipeg employee - Company Sergeant Major John Osborn was killed fighting in Hong Kong with the Winnipeg Grenadiers. The action in which he perished earned him a Victoria Cross for gallantry in the face of the enemy.

With the conclusion of the war, CPR re-hired many of the veterans who had gone overseas and returned their factories to making locomotives and railcars. The impact that the CPR had on supporting Canada and the British Empire in the victory of the Second World War was second to none.

Endnotes

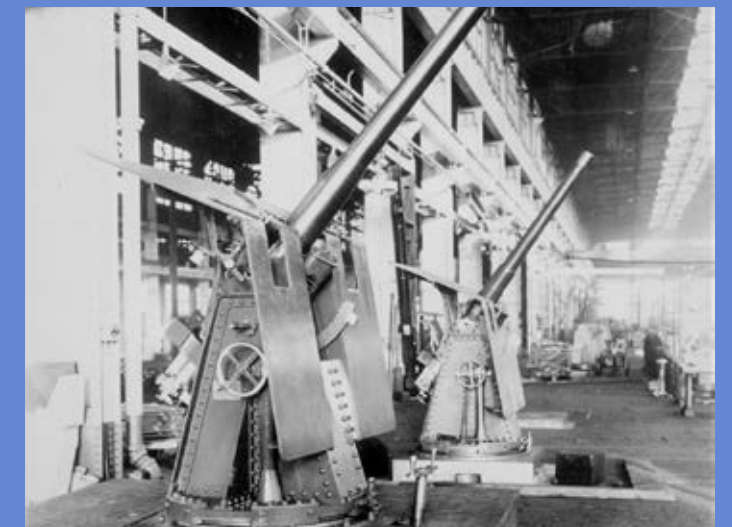
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Valentine Tanks coming off the production line at the CPR Angus Shops in Montreal.



Naval Guns being produced at the CPR Ogden Shops in Calgary.



British Commonwealth Air Training Plan (BCATP) students at No. 2 Air Observer School in Edmonton, AB which was staffed by RCAF members, however managed and run by CPR employees.



Is your unit doing something interesting?

Do you have expertise in a certain area?

Is there a recent book that you recommend to others?

Did you just return from a mission and have lessons to share with the logistics community and our allies?

Do you have useful practices from industry or our allies we should adopt?

If so, we are accepting submissions with the following guidelines:

1. Ten pages or less
2. English or French
3. Pictures welcome with notations
4. Sources must be referenced as end notes, if using references

Email your submissions to Gordon.Bennett4@forces.gc.ca

We welcome submissions from any rank, any trade, and any element.