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Call Sign "C-MERT": The development of the Canadian Medical Emergency Response Team

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Introduction

The evacuation of wounded military personnel is an important aspect of modern warfare. Although casualties are fewer, the public attention those casualties receive is much greater. Militaries are expected to use every possible means to rescue those in urgent need of medical treatment.

The transport of wounded soldiers has evolved with technology, in particular the advent of helicopters. As advances in helicopter technologies have permitted more reliable aircraft and improved capabilities, emergency medical response has become both quicker and more sophisticated. This article traces the historical use of helicopters in the development of emergency medical evacuation and discusses the capability gaps and lessons learned during Canada's long war in Afghanistan. It then explains the evolution of the Canadian Medical Emergency Response Team (CMERT) which ultimately deployed with "advanced clinical competencies further forward in the

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battlespace"[1] during Canada´s one-year air task force commitment to the United Nations peacekeeping in Mali (2018-2019).

Background

Medical evacuation (MEDEVAC) can be defined as the ground or air movement of casualties from the battlefield to a medical facility and between medical facilities.[2] This activity traces its origins to the army of the Eastern Roman Empire, better known as Byzantium. *The Strategikon*, a manual of war written by emperor Mauricius, transmitted meticulous instructions on the use of *Scribones* and nursing staff. These battlefield medics, sited a hundred meters behind the front line, followed the troops "to pick up and give aid to anyone seriously wounded in the battle, or who has fallen off his horse"[3] and were rewarded with a gold piece for each casualty they recovered.

Before the French Revolutionary and Napoleonic wars of the late 18th Century, there was no organized system for French casualty evacuation. However, Baron Dominique-Jean Larrey, Napoleon´s surgeon, employed horse-drawn wagons called *flying ambulances* to evacuate wounded soldiers from the battlefield. The first recorded report of a successful air evacuation happened during the First World War when the French succeeded in evacuating Serbian casualties from Albania.[4]

The use of helicopters in forward aeromedical evacuation (FAME) operations began in April 1944, when a United States Air Forces YR-4 helicopter –designated the *egg-beater*- transported wounded Allied troops from Japanese-occupied Burma to British

[1] H. Al-Aryan, "The Future of Healthcare for Deployed Forces," *The Maple Leaf*, 28 February 2020, https://www.canada.ca/en/department-national-defence/maple-leaf/defence/2020/02/the-future-healthcare-deployed-forces.html.

[2] Department of the Army, *Medical Evacuation in a Theater of Operations: Field Manual 8-10-6* (Washington, DC: US Government Printing Office, 1991).

[3] Mauricio, *El Strategikon* (Madrid: Imprenta del Ministerio de Defensa, 2014), p. 263.

[4] J. Portal, "Le fabuleux destin de Louis Paulhan Le Dr. Patrice Borel retrace la vie de son ancêtre, pionnier de l´aviation" [*The fabulous destiny of Louis Paulhan: Dr. Patrice Borel retraces the life of his ancestor, aviation pioneer*], *La Provence*, 22 October 2015, https://www.laprovence.com/article/edition-alpes/3634573/le-fabuleux-destin-de-louis-paulhan-le-dr-patrice-borel-retrace-la-vie-de-son-ancetre-pionnier-de-?fbclid=IwAR0HWqR0oe_IT7In6Tx55tONleY6Rbgcrf-DUbP6v6NcbE5g3N6hfZuP7GY

India.[5] This extraordinary feat was repeated the following year in the Philippines. Four conflicts that occurred in the mid-20th Century: Korea (a conventional war), Indochina (a mixture of conventional and unconventional warfare), and Malaysia and Algeria (two counterinsurgency operations) highlighted the necessity of having a FAME platform.

During the Korean War (1950-1953), the US Army deployed a dozen Bell H-13 Sioux helicopters for casualty evacuation. In addition, the US Marine Corps employed the S-51 rotary-wing aircraft for rescuing wounded troops and transporting them to the base hospital. However, both platforms lacked an appropriate communications network and interior lighting. They were also not suitable for long-range missions.[6] Despite these initial platform limitations, or perhaps because of them, the warfighting experience in North-East Asia persuaded the US Army to create an organization devoted to this mission. Near the end of the campaign, helicopter evacuation sections were integrated into the Army Medical Service.[7]

Around the same time (1948-1960), the British were combating a Communist insurgency in the Malayan Emergency. Despite the fact that there was no hostile air force or antiaircraft fire[8],[8] if a British soldier fell ill or was injured during a patrol, his companions had to hand-carry him to the nearest road. At that time the only helicopter suitable for evacuating casualties was the Westland WS-51, baptized *Dragonfly*. As the cabin was not vast enough to accommodate a patient, it was decided to adapt two special containers or "pods" outside the cabin, one on each side of the aircraft.[9] Besides the Dragonflies, the only support aircraft available were the Bristol Type 171 Sycamore helicopters, which were highly dangerous and could not lift heavy weights.[10] Despite

[5] Interview with USAAF Second Lieutenant Carter Harman. *Sikorsky R-4 Hoverfly*. Jul 18, 2009 https://www.youtube.com/watch?v=o3o1SFeLJTY

[6] "Sikorsky Helicopters Came of Age in the Korean War." *Sikorsky Archive News.* October 2017, pp. 2-3 https://sikorskyarchives.com/wp-content/uploads/archives-newsletters/NEWS-2017-10.pdf

[7] S.H. Neel, "Medical considerations in helicopter evacuation," *US Armed Forces Medical Journal* 5, 2 (1954): pp. 220-227.

[8] J.A. Nagl, *Learning to Eat Soup with a Knife: Counterinsurgency Lessons from Malaya and Vietnam* (Chicago: The University of Chicago Press, 2005), p. 95.

[9] E.B. Harvey, "Casualty evacuation by helicopter in Malaya," *British Medical Journal* 2, 4730 (1951): p. 542.

[10] K. Connor, *Ghost Force: The Secret History of the SAS* (London: Weidenfeld & Nicholson, 1998), pp. 25-26.

these shortcomings, the Sycamore was able to evacuate casualties from small clearings in jungle country.[11]

Meanwhile, the French, who had employed the Hillier H-23 and Sikorsky H-19 Chickasaw helicopters for casualty evacuation in Indochina (until 1954), were conducting a counterinsurgency campaign in Algeria (1954-1962). The French Army Light Aviation flew American-made rotary-wing aircrafts such as the Sikorski UH-34-D Seahorse and the Piasecki H-21 Workhorse, dubbed *Flying Banana,* to lift into action paratroopers and legionnaires who were employed as shock troops[12] because of their "hard-hitting mobility and sheer ruthless professionalism." [13] The French aviators realized that casualties evacuated by air had a greater chance of survival. In addition, medical evacuation helped to sustain the morale of the troops fighting in the *djebel* (the Arabic word for *mountain* which became French military slang for Algeria).

The hard-learned lessons in Indochina, Malaysia and Korea convinced the US Army in 1952 to build a helicopter according to medical department stipulations. The result was the Bell UH-1B Iroquois, nicknamed *Huey*, a "single-turbine, twin-blade rotor aircraft with a capacity for six litter patients."[14] The UH-1B exhibited the Red Cross and provided en route care. The expanded flight crew incorporated a pilot, copilot, crew chief, and flight medic and transported injured personnel to the nearest care facility. The radio call sign for these crews was *Dustoff*.[15]

In 1965, the United States Air Force (USAF) was conducting combat search and rescue (CSAR) and personnel recovery (PR) missions in Vietnam. The first Air Force helicopter used in the CSAR role was the Kaman HH-43 Huskie, which used the radio call sign *Pedro*. This airframe was replaced in 1967 by the gigantic Sikorsky H-3, a

[11] Bristol Sycamore HR14 https://www.rafmuseum.org.uk/research/collections/bristol-sycamore-hr14/ The Sycamore was a single-engine, five-seat utility helicopter employed as air ambulance, army communications and search and rescue. Despite its deficiencies, this rotary-wing aircraft proved the importance of helicopters for transporting troops and supplies into harsh terrain.
[12] B.B. Fall, *Street without Joy: The French Debacle in Indochina* (Guilford: Stackpole Books, 2018), p. 186.
[13] A. Horne, *A Savage War of Peace, Algeria 1954-1962* (New York, the New York Review of Books, 2006), pp.165, 334-335.
[14] R.A. De Lorenzo, "Military Casualty Evacuation: MEDEVAC," in *Aeromedical Evacuation: Management of Acute and Stabilized Patients,* edited by W.W. Hurd and J.G. Jernigan (New York: Springer, 2003), p. 57.
[15] C. M. Olson, Jr., J. Bailey, R. Mabry, S. Rush, J.J. Morrison and E.J. Kuncir, "Forward aeromedical evacuation: A brief history, lessons learned from the Global War on Terror, and the way forward for US policy," *The Journal of Trauma and Acute Care Surgery* 75, 2 Suppl 2 (August 2013): pp. 130-131.

version of the S-61 Sea King nicknamed *Jolly Green Giant*. These flew the Pararescuemen (PJs) into hostile environments. These highly-trained operators had the exceptional task of diving into jungles, forests and swamps. Once they have landed, the PJs provided first aid under fire.[16]

The success of the forward aeromedical teams in Vietnam motivated governments in Europe and in the US to use helicopters in civilian emergency medical service (HEMS. Over time, these civilian aerial ambulances became more sophisticated, and advanced training and certifications were required to operate physiologic monitoring equipment, defibrillators, and IV pumps.

The post-Vietnam era witnessed the deployment of US FAME units in Operation Urgent Fury in Grenada (1983), Operations Just Cause in Panama (1989-1990), Enduring Freedom in Afghanistan (2001-2014), and Desert Shield (1990-1991), Desert Storm (1991) and Iraqi Freedom in Iraq (2003-2010).

The quintessential British Medical Emergency Response Team

At the 2004 Istanbul conference, the North Atlantic Treaty Organization (NATO) decided to expand its presence in southern Afghanistan. Under Operation Herrick 4, British troops deployed to Helmand Province in the spring of 2006. The arrival of the UK forces was fiercely opposed by the local Pashtun population. Helmand and the British main base, Camp Bastion, were the testing grounds for the Medical Emergency Response Team (MERT), a concept that originated in the experiences of the Incident Response Teams during the First Gulf War, the Balkan conflicts of the 1990s and Operation Telic.[17] This conception was revolutionary for two causes: First, MERT takes the "most experienced healthcare professionals directly to the most critically wounded

[16] "Combat Search and Rescue in Southeast Asia," *National Museum of the United States Air Force,* https://www.nationalmuseum.af.mil/Visit/Museum-Exhibits/Fact-Sheets/Display/Article/195919/combat-search-and-rescue-in-southeast-asia/

[17] M.J. Roberts, M.A. Fox, C. Hamilton-Davies and S. Dowson, "The Experience of the Intensive Care Unit in A British Army Field Hospital During the 2003 Gulf Conflict," *Journal of the Royal Army Medical Corps* 149 (2003): p. 284.

on the battlefield."[18] The MERT consists of a senior emergency physician, an emergency nurse and two paramedics. All of them are highly qualified in emergency response, trauma life support, weapons handling, and aeromedical evacuation training. Second, the platform chosen by the Royal Air Force (RAF) to carry out medical evacuation was the powerful CH-47 Chinook helicopter, which accommodates eight litter patients and twenty wounded and can still carry more equipment than any other helicopter. This airframe allows the MERT to provide the following medical capabilities: consultant lead, advanced resuscitation and airway management, and tranexamic acid administration, as well as forward damage-control resuscitation ability (including thoracic trauma management and circulatory support.[19] For this reason, MERT can be compared to a helicopter-borne Mobile Trauma Bay.[20]

In Afghanistan, the British effort was hampered by a critical shortage of helicopters,[21] so this weaponized HEMS was treated as a high-value asset. Because of this, it was protected by four heavily-armed members of the Quick Reaction Force. Besides the specific medical capabilities, the best service that MERT provides, according to Fiona McGlynn, a RAF emergency nurse, is morale. The troops on the ground know that no matter where they are, we will fly in and do everything we can to ensure they get home in the best possible condition to their families".[22]

Afghanistan: The Canadian experience

From late 2001 to 2005, Canadian troops assumed several roles in Afghanistan: fighting al-Qaeda remnants, and taking the leading role in the Kabul Multinational

[18] D. Vasallo, "A short history of Camp Bastion Hospital: part 2-Bastion`s catalytic role in advancing combat casualty care," *Journal of the Royal Army Medical Corps* 161, 2 (2015): p. 160.
[19] A. Apodaca, C.M. Olson, J. Bailey, F. Butler, B.J. Eastridge and E. Kuncir, "Performance Improvement evaluation of forward aeromedical evacuation platforms in Operation Enduring Freedom," *The Journal of Trauma and Acute Care Surgery* 75, 2 Suppl 2 (August 2013): p. 158
[20] J.E. Clarke and P.R. Davis. "Medical Evacuation and Triage of Combat Casualties in Helmand Province," *Military Medicine*, 177, 11, (November 2012): p. 1264
[21] F. Ledwidge, *Losing Small Wars: British Military Failure in Iraq and Afghanistan* (New Haven and London: Yale University Press, 2011), pp. 118-119.
[22] M. Di Lauro, "The flight of angels: saving lives in Afghanistan's airborne A&E 2," *Daily Mail*, 7 February 2010, https://www.dailymail.co.uk/home/moslive/article-1248526/The-flight-angels-saving-lives-Afghanistans-airborne-A-E.html

Brigade of the International Security Assistance Forces (ISAF). However, in May 2005, the Canadian government declared that it would increase its military contingent in Afghanistan and assume a new role in Kandahar Province.

In the second part of 2006, the Canadian Forces, supported by their Afghan and NATO allies, were involved in heavy fighting in the Panjwaii District, Kandahar Province. Nonetheless, there was one gaping hole: "Canada had no helicopters, not even for the essential service of medical evacuation (medevac)"[23] because it had sold its CH-147C Chinooks to the Netherlands in the early 1990s. Therefore, Canada had to rely on its partners. However, only two stepped forward: The Americans, who would be the most reliable in their support, and the British, who would help when they could.

In the fall of 2007, Premier Stephen Harper appointed former deputy prime minister, John Manley, to lead an autonomous commission on Canada´s contribution in Southwest Asia. In early 2008, the *Independent Panel on Canada´s Role in Afghanistan* recommended the acquisition of a medium helicopter lift capacity because it would diminish the peril of roadside bombs and suicide attacks on Canadian ground forces.[24] For this reason, Canada acquired six used CH-47D helicopters from the US which became operational in 2009 and decommissioned in 2011 after Canada´s Afghanistan combat commitment ended. At the same time, they ordered 16 new Chinook helicopters which were all delivered by 2014.

The impact of the Joint Task Force Afghanistan Air Wing Chinooks cannot be exaggerated: from January 2009 to July 2011, the heavy-lift helicopters transported "more than seven million pounds of cargo and just under 90,000 passengers."[25] In addition, the rotary-wing aircraft allowed the Canadian soldiers to get to their objectives more rapidly, safer and with a huge element of surprise in their favour.[26]

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[23] D.J. Bercuson and J.L. Granatstein, "Lessons Learned? What Canada Should Learn from Afghanistan," *Canadian Defence & Foreign Affairs Institute*, October 2011, p. 16.

[24] Canada, "Independent Panel on Canada's Future Role in Afghanistan," *Public Works and Government Services Canada*, 2008, p. 38, http://publications.gc.ca/collections/collection_2008/dfait-maeci/FR5-20-1-2008E.pdf

[25] C. Mantle, "The Loss of a Canadian Chinook in Afghanistan: The Pilot´s Recollection of 5 August 2010," *Canadian Military History* 24, 2, (Summer/Autumn 2015): p. 269.

[26] D. Menard & K. Stachura, "Canadian infantry, helicopters execute first air-mobile mission," *The Maple Leaf*, 25 March 2009, p. 7.

Moreover, the transport capability reduced the amount of time spent on the roads, and only one Canadian Chinook was shot down, call sign *Blowtorch 61*.

Lessons learned

The lessons learned by the Canadian Forces in Afghanistan prompted a period of reevaluation. One of the conclusions was that the Chinooks´ airlift capabilities were pertinent and responsive in direct combat, in the activities labelled *operations other than war*, and, especially, in support to combat operations (aeromedical evacuation and logistical support). Moreover, this potent tandem-rotor helicopter operated in all weather conditions. However, this airframe is vulnerable, due to its size and limited maneuverability.[27]

When the first brand-new CH-14F Chinook was delivered to the Royal Canadian Air Force (RCAF) in 2013, this variant had been modified to meet requirements for operating in Canada, "including the installation of long-range fuel tanks which allow it to fly twice as far as previous models. This dramatically increased range is particularly important for mission in Canada`s vast northern regions."[28] Moreover, it was also equipped with defensive features: advanced radar and laser warning, ballistic protection gear, and chaff and flare dispensers.

Another lesson was that the RCAF had no forward air evacuation competence and realized that aerial health care demands a whole new level of organization, resourcefulness and energy. As noted above, Canada had to depend on its Anglo-American allies for medical evacuation support during the Afghan campaign.

In 2016, a group of members of the Canadian Armed Forces led by lieutenant colonel Leilani Doyle, an alumna of the MSc in Trauma Sciences (Military and Austere) from Queen Mary University of London, wrote a memorandum proposing the creation

[27] T. Kupecz, "Escort of Canada´s Chinook Helicopter," *Canadian Military Journal*, (Autumn 2007): p. 91.
[28] C.E. Howard, "Canada takes delivery of first CH-14F Chinook helicopter," *Intelligent Aerospace*, 1 July 2013, https://www.intelligent-aerospace.com/helicopter/article/16539814/canada-takes-delivery-of-first-ch147f-chinook-helicopter.

of a MERT-type capability.[29] In 2017, the Chief of the Defence Staff approved the idea and ordered the formation of a brand new forward aeromedical evacuation competence.[30]

The Canadians sought advice on developing this capability from their colleagues with the U.S. Army, the Royal Air Force and the Dutch Air Force. After careful consideration, the RCAF decided to adapt the British MERT model and to develop its own program, the Canadian Emergency Response Team (C-MERT). There were three motives for this decision: first, the British MERT "produced a slightly better survival rate than the traditional system of deploying emergency transport to a nearby hospital."[31] Second, "this model takes full advantage of the Chinook´s spacious cabin to deliver a sophisticated medical capability."[32] Third, the Chinook has extended range fuel tanks and can also "add complementary capabilities like counter-IED and K-9 teams, or force protection teams…without compromising the ability to manage patient load."[33]

Deployment in Mali

In April 2013, the United Nations Security Council established the United Nations Multidimensional Integrated Stabilization Mission in Mali (MINUSMA) with the aim of supporting the "political processes in that country and carry out a number of security-related tasks."[34] This resulted after a year of political instability in Mali: The Tuareg, a nomadic people, rebelled against the Malian government in 2011-2012 with

[29] Lieutenant Colonel Leilani Doyle. "The creation of the Canadian Emergency Response Team (CMERT)." video posted by Coda Change, 30 November 2020, https://www.youtube.com/watch?v=hqdDsYod0eY.
[30] C. Thatcher, "Casualty evacuation: Fine-tuning the RCAF´s CMERT capability," *Skies*, 18 January 2023, https://skiesmag.com/features/casualty-evacuation-fine-tuning-rcaf-cmert-capability/
[31] J. Semple, "Canadian helicopters are 'flying emergency rooms' in Mali peacekeeping mission," *Global News*, 11 September 2018, https://globalnews.ca/news/4439300/canadian-helicopters-flying-emergency-rooms-mali/.
[32] E. Head, "Mission in Mali," *Vertical*, 6 February 2019, https://www.verticalmag.com/features/mission-in-mali/.
[33] J. Attariwala, "Medevacs from Mali," *AirMed & Rescue*, June 2021, p. 14.
[34] United Nations Multidimensional Integrated Stabilization Mission in Mali. "Supporting political process and helping stabilize Mali,"(continuously updated) https://peacekeeping.un.org/en/mission/minusma

the aim of achieving independence for the Northern region of Azawad, while jihadist forces took advantage of that instability and expanded their presence in northern Mali. After a coup in Mali´s capital Bamako in March 2012 and a threatened advance on Bamako by jihadist forces later in the year, French military intervention in early 2013 stopped that immediate danger, with follow-on support from African forces (AFISMA). MINUSMA began deploying across the country in the second half of the year.

Four years later, during the 2017 UN peacekeeping summit in Vancouver, Prime Minister Justin Trudeau, as part of the *return to peacekeeping* mantra, declared his decision to augment support for UN peacekeeping operations. The UN requested the deployment of forward aeromedical evacuation assets to Mali.

In March 2018, the Canadian government announced Operation Presence: the deployment of an Air Task Force to support the UN Mission in Mali. RCAF colonel Chris McKenna was appointed as Detachment Commander. The Canadian Forces would provide forward air evacuation competence and logistical support to the United Nations. This UN peacekeeping operation was chosen for two reasons. First, it "offers a slightly less complicated political and operational environment compared to"[35] other countries in the region. Second, it is relatively less demanding to support logistically from Canada.

As soon as the political decision was made, personnel of the 450 Tactical Helicopter Squadron (Petawawa), armed with CH-147H Chinooks outfitted for aeromedical evacuation, and 408 Tactical Helicopter Squadron (Edmonton), equipped with CH-146 Griffons, plus medical and force protection specialists, began pre-deployment training at CFB Wainwright. In order to prepare the crews, the Canadian adopted the Dutch Air Force´s Operational Readiness Aeromedical Course (ORAC), which emphasizes real-life situations during a deployment or as part of an evacuation of military service personnel.[36]

[35] C.W.J. Roberts, "OP PRESENCE-Mali: Continuity Over Change in Canada´s ´Return to Peacekeeping´ in Africa," *Canadian Global Affairs Institute*, October 2018, p. 10.
[36] C. Kuit & P. Kievit, "Aeromedevac the Dutch Way ´We Care, Anytime, Anywhere´," *Defence Turkey*, August 2022, https://www.defenceturkey.com/en/content/aeromedevac-the-dutch-way-we-care-anytime-anywhere-5197.

In June 2018, the Theater Activation Teams, responsible for initiating the infrastructure and communications support required in-theatre, arrived in West Africa. The first Canadian rotary-wing aircraft arrived at Camp Castor, Gao, in July 2018 and, one month later, Task Force Mali achieved full operational capacity. Because the Chinook, whose basic design dates back to the Vietnam War, is suitable for the rigours of Special Operations service, the first Canadian mission was to transport a Dutch Long Range Reconnaissance Patrol.

Although the operational tempo was comparatively low compared to Afghanistan, the main challenge for the Canadian Forces was the environment: first, the heat of this desolate scrubland suffocates; second, the dust is omnipresent; third, the Haboob season, an interval in the summertime plagued by sandstorms and windstorms, augments the potential damage for the airframes.[37]

A *can-do mentality*, based on teamwork, discipline and practice, allowed the Canadians to overcome those obstacles. This meant conducting 11 forward aeromedical evacuations and treating around 40 casualties without losing any single aircraft or personnel. The Canadian helicopters accumulated "more than 4,000 flying hours, transported approximately 2,800 passengers and delivered more than 370,000 pounds of cargo."[38]

Conclusion

The importance of medical evacuation has increased with the increased media reporting of casualties, and the technical ability to use helicopters to reduce fatalities. As helicopter technology has advanced the success of evacuations, the role of emergency response teams has been elevated. In addition to their mission of saving lives, helicopter-based medical evacuation boosts the morale of the troops on the frontlines.

Canada, due to the painful lessons learned in Afghanistan, has developed its own advanced aeromedical capabilities, which are modelled after the British MERT. These skills were put to the test on the arid plains of northern Mali, and the Canadian

[37] D. Palma, "Maintaining an Aircraft in Mali," *The Maple Leaf*, 6 March 2020,, https://ml-fd.caf-fac.ca/en/2019/06/30484.
[38] J. Attariwala, "Medevacs from Mali," *AirMed & Rescue*, June 2021, p. 18.

Forces succeeded in their task. This is a groundbreaking event because these experiences will serve Canada well on future foreign battlefields and the home front.