Technology in Search of a Role: The Machine Gun and the CEF in the First World War

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Résumé

Pendant les dernières décennies du XIX^e siècle et les premières années du XX^e, la mitrailleuse a été l'arme la plus mortelle et la plus dévastatrice, mais cette caractéristique n'a pas pour autant garanti d'emblée son adoption par les institutions militaires traditionnelles. Dans Technology in Search of a Role, *on examine la façon dont la mitrailleuse a finalement été intégrée aux armes des forces expéditionnaires canadiennes au cours de la Première Guerre mondiale, pour jouer certains rôles spécialisés qui dépendaient du poids et de la mobilité de chaque modèle; les mitrailleuses légères ont été adoptées par les petites unités d'infanterie, et les plus lourdes, par des corps d'armée créés expressément pour elles.*

Abstract

In the last decades of the 19th century and the opening years of the 20th, the machine gun proved to be a most lethal and devastating weapon, but this did not guarantee its large-scale adoption by traditional-minded military institutions. Technology in Search of a Role *examines how the machine gun was eventually incorporated into the Canadian Expeditionary Force in the course of the First World War, playing specialized roles depending on a particular gun's weight and mobility; light machine guns were adopted by small infantry units and heavier weapons were formed into a corps of their own.*

Canadian military historians are a fractious and argumentative group, but on a few points they tend to agree, the country's lack of preparation in the years leading up to the First World War being one of them. There was, of course, no good reason for the young dominion to raise and equip a large army until the European Civil War actually broke out. Canada had far more important priorities in the early years of the century, especially nation-building, leaving few resources to what had to be considered a luxury. Thus, when Great Britain declared war on Germany on 4 August 1914 (which meant that Canada was also at war), it was necessary to mobilize an army from scratch; men were recruited, attested and concentrated at Valcartier, but that still left the problem of how to supply them with the tools of modern war — including machine guns.

Machine guns had proven themselves in many of the small wars Europeans had fought in the great scramble for colonies that characterized the latter third of the 19th century (small wars for the Europeans, for Africans and Asians they were often nothing short of catastrophic). But this did not prove that the weapon would be useful against the large armies of industrialized countries. Racism played a part in military doctrine; European policy makers and staff officers insisted that just because machine guns had cut down Zulu impis or Dervish cavalry did not mean they would be effective against naturally "superior" white troops. Experience did little to dispel such views. British troops in the Boer War complained that the weapon suffered from mechanical failure, was too large and visible to the enemy, and was difficult to transport unless good roads were available — which was rare. The Russo-Japanese War of 1904–05, which around Port Arthur was characterized by siege-like conditions, demonstrated that, in

static positions, machine guns could be very effective against modern armies, but it would take far more than battles fought on distant continents to convince the British that they should adopt such weapons. Though in 1910 Major N. M. McMahon suggested they be issued at the rate of one per company, or eight per battalion, when the First World War broke out units only had two each.[1]

The Canadian Militia took its doctrinal cue from the British, and only four machine guns were available at Valcartier for instructional purposes.[2] Certain individuals were more enthusiastic, however, among them Joe Boyle of the Yukon, who financed a machine-gun company. This "was joined by other units subscribed to by wealthy businessmen fascinated by the possibilities of this new weapon."[3] These did not, however, become integrated into the 1st Canadian Division that made its way to Britain, then France, in late-1914/early-1915, and the story of the motorized units is too lengthy — though interesting — to be recounted here. The focus of this study is how the Canadian contingent came to terms with the potential and problems posed by non-motorized infantry machine guns.

When the formation made its way to the front lines in February 1915, its machine-gun organization had doubled in size, meaning that there were now two sections per battalion, totalling four guns, with an officer, two sergeants, a corporal, 24 privates, six drivers, and a batman, for a total of 35 all ranks and 13 horses.[4] This may not appear to be very substantial, but with battalion strength established at 1 000, it represented a noticeable proportion of a unit's personnel. (A Canadian division was made up of three brigades, each of four battalions.)

The Canadians' baptism of fire came in April 1915, when the Germans launched an offensive, using poison gas for the first time on the western front, aimed at eliminating a salient around the Belgian town of Ypres. On the 22nd and 23rd, thanks for the most part to chemical weapons, the Germans made substantial gains, forcing two French divisions on the Canadians' left to withdraw. The latter were called upon to counterattack, but the Germans used their machine guns to deadly effect. For example, on the 23rd,

> *An attack by one company of the 2nd (East Ontario) Battalion against the German strong point in the southwest corner of Kitchener's Wood failed at dawn, when the ground mist suddenly lifted to reveal the advancing Canadians to a well-entrenched enemy 200 yards away. Within seconds the German machine guns wiped out practically the entire company. Only fifteen survivors managed to crawl back to shelter in the 10th Battalion's trench.*[5]

Not only did the Germans defend their positions well, they also used machine guns in subsequent assaults against Canadian trenches. As Victor Odlum, later to become a diplomat and divisional commander in the Second World War, related in a report, his troops managed to beat off three infantry assaults on the 24th. However, "Under cover of the last attack, the enemy had placed a machine gun on our left flank...and enfiladed the left part of trench with such a terrific fire, that I had to withdraw from it and the enemy occupied it a few minutes later."[6]

Second Ypres ended as most battles did on the western front — in stalemate — and the Canadians, who had lost a third of their 18 000-strong division, tried to glean what lessons they could from the carnage. One item to come under close scrutiny was the infamous Ross rifle, which had demonstrated an unfortunate tendency to jam when a soldier needed it most. Also criticized was the Colt machine gun (Fig. 1), which the Canadians used because the British could not provide them with the superior Vickers. One soldier, Private Donald Fraser of the 31st Battalion, simply referred to it as "a useless weapon," with many a drawback. "It was air cooled and heated up quickly. When a stoppage occurred, it had practically to be taken to pieces to have the stoppage rectified."[7] Its complexity was evident in the 348 spare parts and tools machine gun sections held to keep the four Colts of a battalion functional.[8]

Fig. 1
Colt machine gun. Note its high profile, especially in the open training area in which these men are rehearsing. (Courtesy National Archives of Canada, PA4915)

Complaints were sufficient to force an investigation, the headquarters of the 2nd Brigade, commanded by Arthur Currie, relating that,

> *The reports received are almost unanimous in condemning the gun and I have reluctantly come to the conclusion that the weapon is from its complicated mechanism and cumbersome mounting unsuited for service conditions and is liable to fail at critical moments when machine gun fire is essential to save the situation.*[9]

The 5th Battalion, to give just one example, reported that one gun, when fired, jammed, and the barrel had to be changed in the face of the enemy; another was out of action after only a few rounds were fired; a third was not used; and the fourth was abandoned, being too heavy for its crew to carry away in a withdrawal. The unit's commander warned that "It is impossible under present conditions to keep the mechanism of these guns free from sand and grit which in itself is one of the chief causes of stoppages."[10]

The Colt suffered from three main faults: the tripod was too heavy and cumbersome to be moved easily; the extractor, which was supposed to remove each spent casing so a new round could be inserted in the breech, failed often; and the mechanism was too exposed, allowing it to choke on sand and dirt. As Currie reported, "The most serious aspect of the case to my mind is that the men appear to have lost all confidence in the weapon, and I would most strongly urge for consideration the advisability of rearming this Brigade with the British Service 'Maxim' Machine Gun,"[11] manufactured by Vickers. John Lundie, who eventually served with the 4th Machine Gun Battalion, agreed. In an interview 50 years later, he was asked to evaluate the Colt and the Vickers. "There was no comparison," as the former tended to "jam in the dust and stopped firing just at the moment when it was needed most." In short, "The Colt was a washout."[12]

The gun was retained until Vickers replacements became available, but other lessons of the first year of trench warfare were applied in the course of 1915. One was the need to increase the number of machine guns at the front in order to bolster defences. Three developments followed: first, the Lewis gun, or light machine gun, was issued on an experimental basis at the rate of four per battalion in July; second, the heavy guns thus released (whether Colt or Vickers) were grouped together under the control of brigade headquarters; and finally, in October, establishments were increased so each battalion had eight Lewis guns and each brigade had 16 Vickers.[13] The next step followed in early 1916 with the formation of machine gun companies to handle the latter; the 1st Canadian Machine Gun Company was formed in January, with 15 more created by the end of 1916. By then the Canadian Corps, as it came to be called, had four divisions under command, so each of these had four machine gun companies to support its operations.

Another post-Ypres development was far more controversial. As described in a post-war report by Captain (later Major-General) F. F. Worthington, a lifetime proponent of the machine gun,

> *It was during this period that the terms of indirect fire began to show life. A considerable amount of experimenting took place followed by much adverse criticism from the infantry who no doubt had just cause for complaint. I dare say indeed there are of the infantry in those days and many to follow who did not suffer in some way from the over-zealousness of the machine gunners. The writer when in the infantry has a vivid recollection of a certain unpleasantness occurring from our machine guns firing into the front line.*[14]

An army is a society onto itself, and indirect fire on the part of machine guns might be viewed as a threat to one of the senior branches of that society — the artillery — so its proponents faced challenges more than technical in nature.

A less controversial lesson of the first year of war was the need to keep machine guns mobile so they could be placed where they would be needed most. To this end, the British developed intricate drills which choreographed every move by each member of the team. Though George Coppard, a machine gunner who later wrote about his experiences, described the Vickers as "the most successful...highly efficient, reliable, compact and reasonably light"[15] gun; this was only in comparison with other types. In fact the gun weighed 28 pounds *without* its water jacket, while the tripod weighed 50, not equipment that could easily be maneuvered around a battlefield — especially one with bullets and shells flying about (Fig. 2). Each member of the team thus had to know his role in detail and be able to carry it out without hesitation. When the weapon had to be moved, the number 1 carried the tripod and placed it where he wanted the gun to fire from. The number 2 placed the weapon on its mount,

Fig. 2
Vickers machine gun. More reliable than the Colt, this photo clearly shows that it was not much more mobile, and had to be broken down into pieces to get it across no-man's-land. (Courtesy National Archives of Canada, PA635)

while the number 1 locked it into place. The number 3 carried 250 rounds of ammunition, handing it to the number 2 when needed, and the number 2 loaded it into the gun from one side while the number 1 pulled it through and ensured it was feeding properly, cocking the weapon at the same time. It was then ready for firing.[16] Three other members of the six-man team were responsible for carrying extra ammunition, the Vickers being able to fire 600 rounds a minute.

Because heavy machine guns were grouped under the control of the brigade commander, the mainstay of battalion automatic fire was the Lewis (Fig. 3). Considerably lighter than the Vickers, various estimates placing its weight between 25 1/2 and 28 pounds (11.7 and 12.7 kg), it fired not from belts but from a 47-round magazine. One reason for its greater portability was the fact that it was air- rather than water-cooled, and that it was stabilized by a bipod much lighter than the tripod used for heavier guns. Operated by a crew of two (with four others to carry ammunition), one of whom carried extra magazines, it could only be fired in short bursts, as opposed to the streams of bullets that came out of the Vickers. In well-trained hands, however, it could keep up almost the same rate of fire. One still had to beware of overheating, as the barrel could droop if it became too hot and maleable, and could even split open, rendering the weapon useless. It was, however, easy to maintain, and could be taken apart with only the nose of a bullet as a tool, most useful given the gun's exposure to dust, mud and other foreign matter.[17]

Like any other technology, the Lewis was only as useful as its users were skillful, and

Fig. 3
Lewis light machine gun. Though there is no record of it having been used in the manner demonstrated, this photo shows its comparative lightness and ease of use. (Courtesy National Archives of Canada, PA69844)

Notes on Lewis Guns and Machine Guns reminded soldiers that "the mobility of a gun depends largely upon the mobility of its ammunition,"[18] and that gunners might well need carrying parties from the infantry units they were supporting. Such a logistical burden was justified, at least in the minds of commanders, by the advantages a machine gun conveyed. It could open a heavy and concentrated fire at a moment's notice, which it could maintain until two-thirds of the six-man crew had been killed or wounded. It offered maximum fire while taking up a minimum portion of front, each burst representing 20 to 30 rifles.

In defensive positions, Lewis guns were best arranged in a "belt of fire" across the entire front, with overlapping arcs of aim. They did not point directly forward, but diagonally, in effect protecting their neighbours rather than themselves; this allowed them to cover more ground, and their fire was less likely to be seen. It also meant that enemy attacks would be enfiladed, waves of infantry coming under fire from the flanks. The gun's weight also allowed it to be used in an attack, its role was to cover the infantry advance by keeping down or unsteadying enemy fire; it could also delay the movement of enemy reinforcements by firing into communication trenches.[19]

It was tested in trench raids and many small actions in the latter half of 1915 and through much of 1916, and the Canadians attempted to apply machine gun doctrine on a large scale in the Battle of the Somme. The campaign began on 1 July 1916, when the British assaulted German positions, and suffered horrific casualties (about 59 000 in that single day), but the Canadians did not go into the line until September, by which time they had learned much from the fighting there. Their first major battle on the Somme was the assault on Courcelette on 15 September and subsequent days, and though the attack is best remembered for the first use of tanks on any scale on the western front, it also demonstrated how machine guns were used at the half-way point of the war.

The attack was carried out by the 2nd Division's 5th Brigade, with 44 Vickers machine guns in support, divided into two groups, referred to simply as "left" and "right." On 15 September, "at 12.40 pm the 3rd Can Division reported that the trench...was full of Germans and requested that the trench should be engaged by Machine Gun Fire. All guns of the left Group opened fire on this trench a few minutes afterwards and cleared the trench which was taken later without resistance."[20] The right group also had a role to play, engaging enemy machine gun batteries on the 16th; the 5th Brigade's 25th Battalion reported that the Germans had managed to withdraw the guns only with heavy casualties.

The Vickers' usefulness was sometimes suggested by the consequences of not having any available, as during a 1st Battalion attack on the 22nd. "On the left sector, the attack fell down — due to no failing of the attackers. They went out from around the quarry into the impassable belt of German Machine gun fire. The first report of their fate came from returning wounded about 8.50 pm and it was to the effect that the waves had been practically annihilated."[21] Whether or not machine gun support would have made a difference cannot be determined conclusively, but as the campaign continued into October, it was obvious that unsupported assaults verged on the suicidal. On 1 October, the 22nd Battalion (after the war the Royal 22e Régiment) assaulted a position called Regina Trench. "From the time of leaving their trenches they were subjected to rifle and machine gun fire from Regina Trench and from their flanks. What was left of the attack — a few men here and there — reached Regina Trench and were either killed or taken prisoner."[22]

One attempt to mitigate such casualties was to send Lewis guns forward to support the attack, but often this simply meant that machine gunners suffered with the rest. On 16 September the 5th Brigade reported that machine guns suffered heavy casualties from enemy shelling throughout the day, and got no sleep or rest. Referring specifically to Lewis guns, the brigade reported that they did good work early in the attack but were soon put out of action by shell fire.[23] On the 22nd, the 1st Battalion noted that two of its eight Lewis guns "were completely destroyed by shellfire."[24]

There were many lessons to be learned, and though the staff officers and commanders of the First World War have long been portrayed as donkeys, they did attempt to determine what had gone wrong when attacks failed, and what techniques and technology were worth retaining when they succeeded. Canada's 5th Brigade, which had begun its Somme campaign at Courcelette, suggested that heavy machine guns might have a continuing role to play in future assaults. Infantry officers reported that, on those occasions when there was little or no rifle fire over the ground they had to cover, it was often due to Canadian machine gun support. The latter, however, had to be well coordinated,

requiring good communications between them and the riflemen they were supposed to cover. Otherwise, they had to follow a set schedule, taking on one target and then another, and hope that the infantry were somehow keeping up. Machine gunners were becoming part of a system, and their value was determined in no small part by the personnel available to lay telephone lines (battlefield wireless was still in its infancy). Logistical considerations included, of course, a plentiful supply of ammunition, but also cooling water, and an advanced water pump might prove useful in that regard.[25]

The infantry commented in far more detail on the usefulness of the Lewis gun, a logical development given its role in the attack and consolidation phases of an assault. The 5th Canadian Mounted Rifles (CMR), an infantry battalion in spite of its name, obviously found it of some use. This unit suggested it come under the control of company commanders, further decentralizing the light machine gun organization within the Canadian Corps.[26] The 2nd CMR agreed, insisting that it should "have Lewis Guns absolutely at disposal of Coy Commanders. As many as possible and pushed well forward."[27] Even the commander of the 8th Brigade, who had the CMRs under his control, agreed on the decentralization. Tactically, the 1st CMR suggested sending them ahead under cover of darkness to take suitable cover, half of them (four out of eight) to follow the first wave, with the balance to be employed as the situation demanded. Finally, the 22nd Battalion, which had done well the first day of the battle for Courcelette, suggested Lewis guns accompany the second wave, and that they were of sufficient importance to have extra men allocated to carrying their ammunition.[28]

Battalion commanders were suggesting machine guns specialize according to their weight and firing characteristics, and that the Lewis be integrated into infantry companies while the Vickers be formed into batteries analogous to the artillery's organization. According to Bidwell and Graham, who have written extensively on British doctrine and military technology in the first half of the century, it was still too early to attempt to form anything resembling a machine gun corps, "perhaps because its young and agressive officers were not part of an established social and political organization and were not noted for their tact."[29] There were changes afoot nonetheless, one of the more important ones for the infantry battalions being the doubling of the Lewis gun establishment from eight to 16. This provided sufficient weapons to allocate one per platoon, though their control was centralized under the company commander, as so many reports from the Somme fighting had suggested. In February 1917, Canadian brigades were instructed to have their battalions indent for 14 guns each, with two Colts to be replaced later. Thus, to give just one example, the 2nd Canadian Infantry Brigade reported in March that its 2nd Canadian Machine Gun Company held 16 Vickers and 36 mountings, while each of its battalions possessed two Colts and 14 Lewis guns.[30]

Machine guns obviously had a role to play in defensive positions, and as the Canadian Corps moved to the base of Vimy Ridge in late-1916/early-1917, it was suggested that the weapon become the linchpin of the new trench works. By then defences were effectively divided into three zones: forward observation posts to warn of an enemy attack and otherwise keep an eye on no-man's-land; a main defensive trench system to bring such an attack to a halt or from which to launch assaults of one's own; and reserve trenches from which counter-attacks could be sent forward should the enemy succeed in capturing Canadian positions. Machine guns could obviously be very useful in the main defensive areas, but they might also serve further ahead, giving forward observers, who were necessarily few in number, increased fire power with which to defend themselves.[31] Lewis guns, thanks to their superior mobility, could be established anywhere within the system, as demonstrated in the course of a German raid in early 1917, where the enemy used hand grenades, or bombs, to get into Canadian trenches. "Lance Corporal Hutt in charge of No 12 Post which was between 35 and 40 yards [32 and 36.5 m] on the right heard the bombing and immediately after, [a] party of Huns rushed along the top of parapet towards him, he opened fire with Lewis Gun and the enemy immediately turned about and ran back towards gap in wire towards their own lines."[32]

As the Canadians prepared to assault the formidable Vimy Ridge, they carried out many trench raids of their own, in part to examine enemy defences to see what they would be coming up against, and also to capture prisoners who might provide further information concerning German deployments. Machine guns supported many of these "minor operations" by firing along fixed lines to cut off the target area from immediate relief. When the 78th Battalion made its way towards enemy

lines on 19 February, "All machine guns in the Division took part in the operation, forming a defensive barrage around the raided area and firing on certain selected localities."[33]

According to Bidwell and Graham, the Canadians were innovators in the use of machine guns, one example being the attack against the ridge. We have already seen Lewis guns pushed foward in the assaults on the Somme while heavier Colts and Vickers provided support; at Vimy the latter were put to use in interdiction operations. Locking the gun into a high elevation, a stream of bullets could be sent over forward infantry positions and observation posts towards German communication trenches, tracks, and cross-roads, to hinder the movement of ammunition, food, water and personnel. On one occasion, for example, Colts broke up a tranport column moving up a road towards the village of Vimy, just the other side of the ridge.[34]

Firing at targets one could not see was obviously very impersonal, giving the western front its machine-like quality; participants often commented on this aspect of industrial warfare, one being Private Donald Fraser, whom we met at Second Ypres. In his diary entry of 25 February, he mentioned that "tonight I shot away a couple of thousand rounds of indirect fire. Indirect fire is not very satisfactory — you cannot see your target and, of course, do not know what damage, if any, is done. Besides, the belts have to be refilled and it is a blistery job forcing the shells in with the palm of the hand without a protective covering," such as a thick glove.[35] Barrage fire remained controversial, and Worthington later noted that "there was still a good deal of opposition re overhead fire and this great volume of fire about to be loosed on Easter Monday was looked on in askance from our infantry."[36] As one critic put it, "It is true that bullets blanketing a cross-roads in the rear were disconcerting, but it is doubtful if they were more effective than a few well-placed 18-pounder shells."[37]

Final preparations for the assault, which took place on 9 April, proceeded apace in the weeks leading up to the attack, and included instructing Lewis gun crews and others on the mechanisms of German automatic weapons so the latter could be put to use if captured. Other training focussed on lessons learned from French fighting near Verdun in the last half of 1916, the platoon having become a much more specialized and sophisticated unit of maneuver. Each was formed of four sections, one with a Lewis gun, another armed with rifle grenades, a third with rifles, and a fourth with bombs (later called hand grenades), and in the months leading up to the battle these were put through their paces to learn to work together. They would have the support not only of artillery, but of 150 heavy machine guns emplaced so as to fire over the heads of attacking infantrymen during the assault, while plans were laid to move them forward to help consolidate any gains the troops might make.[38]

The Germans, however, also readied their machine guns for an assault, the preparations of which the Canadians had been unable to camouflage completely and when it was launched, casualties in some sectors were heavy as a result. In 1st Division, the advance went pretty much as planned to the first objective — enemy artillery interfering little. "The German machine guns, however, were handled with skill and bravery. The crews appeared to be picked men and in all cases continued fighting until killed or surrounded."[39] The 5th Battalion began its advance at 5:30 in the morning, and the unit reached its first objective 40 minutes later, but casualties amounted to over 200, or almost a third of those engaged, "a great many of which were caused by machine gun fire."[40] By 9:00 it had reached its final line for the day, by which time 264 of its members had become casualties.

One way to counteract the destructive capabilities of German automatic weapons was to use one's own, and the Lewis gun was rather prominent at Vimy Ridge, each section carrying an extra 32 magazines in expectation of a heavy commitment.[41] The doctrine that guided their use was simple, based on the fact that "it has been found that if the Lewis gun opens fire first [before other weapons of the platoon], the German machine gunner will almost invariably direct his attention to it, and owing to the apparently limited traverse of the German machine gun, it may then be possible for the other Sections to work round to either flank and get within the range of their particular weapons."[42] For example, the Lewis gun section could open fire, drawing attention to itself, while the rifle section gained a flank position from which to attack with rifle or bayonet. Rifle grenades could also be fired, and might be most effective in conjunction with the Lewis, which the 8th Battalion made more mobile by devising a sling so the gunner could carry it more comfortably — and hence further.[43]

The battle was a success, the Canadians pushed the Germans off the ridge and gained a point of observation that allowed them to dominate the land beyond, though at a cost of

some 13 000 casualties, about 16 per cent of the attacking force. In the months that followed the machine gun element of the Corps continued to be put to use, though first it was necessary to clear away old problems, and the remaining Colts were ordered withdrawn only a few weeks after the ridge was secure.[44] At about the same time, on 16 April 1917, the Canadian Machine Gun Corps was formed, an event of more than symbolic value, for there was now an official chain of command from the Vickers gunner in the field to brigade, division, and even Corps headquarters. It was an important step towards making the heavy machine gun the organizational equal of the artillery piece.

The next opportunity for the weapons to prove themselves came when the Canadians attacked Hill 70 in August. The plan was for the Corps to capture the hill and force a battle of attrition as German counterattacks were beaten off. To this end, 90 000 rounds per Vickers were issued, though not without creating some transportation difficulties.[45] Using the same tactics as at Vimy, the operation achieved its goals, defeating 21 counterattacks with platoon weapons and heavy machine guns as well as artillery. Enthusiasts referred to Hill 70 as a "Machine Gunners Battle,"[46] and they had a point; Corps staff officers gained enough confidence in automatic weapons for them to figure prominently in the formation's organization in the months to follow.

A trend beginning with the issue of Lewis guns in late 1915 became more pronounced two years later — machine guns became ever more specialized within the Canadian Corps' and were organized according to such characteristics as weight (and hence mobility), range and rate of fire. The Lewis, which could be carried by one man (though perhaps with some difficulty over rough ground), was definitely established as a platoon weapon (Fig. 4). The Vickers, heavier but with the necessary mechanism and range to fire indirectly at distant enemy positions and communications nodes, answered to ever higher levels in the chain of command, until, in September 1917, companies were detached from infantry brigades and formed into divisional machine gun battalions.

Of course, not everyone agreed on the proper use of the heavy machine gun. One who insisted on the utility of indirect fire — hence giving the Vickers a doctrinal place of its own between infantry and artillery — was Raymond Brutinel. Born in France, he was an officer in the French Army before emigrating to Canada in 1905; at the outbreak of war, he joined the Canadian Militia and organized the Automobile Machine Gun Brigade. He went

Fig. 4
Platoon tactics. Note the man on the left in the second wave, prepared to fire his Lewis gun from the hip. (Courtesy National Archives of Canada, PA4773)

overseas as a lieutenant-colonel in 1914, continuing to be active in machine gun units and proposing their greater autonomy. Many disagreed with his views; the commander of 2nd Infantry Brigade, F. W. O. Loomis, stated emphatically that "The Machine Gun is an Infantry weapon, and its employment in warfare cannot be separated from the Infantry with success. Machine Guns cannot be handled in the fight by a formation higher than the Battalion, successfully." He went on to suggest that laying on a barrage was not the weapon's normal function, though it might prove useful in that role on occasion. "Every machine gunner should be an Infantryman. A Rifleman first and a Machine Gunner second."[47] After more than three years of warfare, the proper function of the heavier automatic weapons was still the subject of debate.

Doubts in the minds of infantry brigade commanders did not prevent machine gunners from preparing for a wide range of roles as the Corps got ready for its attack on the ridge near Passchendaele. The British had first launched the offensive on 31 July 1917, and had known success and failure (perhaps too much of the latter), both demanding a heavy price in blood. As casualties mounted, divisions were rotated through the mud, and the Canadian Corps' turn came in October, after its commander, Sir Arthur Currie, had demanded sufficient time to prepare. The Corps carried out a series of assaults on 26 and 30 October and on 6 and 10 November, which finally crested the ridge, at a cost of some 16 000 dead, wounded, missing or captured.

Only a month before, heavy machine guns had been reorganized into larger units, of 64 crews each, and for one of the attacks the 2nd Division's machine gun battalion ordered 40 guns, or five batteries, set up for barrages in support of the infantry's advance. To avoid losing too many gunners to hostile artillery, they moved into the line only 24 hours before an assault, and were withdrawn about two days later. In the 1st Division, the 1st Brigade alone was alloted 44 Vickers to cover its assault; 32 for the supporting barrage, eight to follow the infantry and repel German counterattacks, and four for sniping (that is to say, to engage specific targets with direct fire).[48]

Quite clearly, there was no way to guarantee, regardless of the amount of artillery and machine gun support available, that determined enemy troops could be forced to remain in their shelters until an advance overran them, and German machine gunners proved especially effective at Passchendaele. As the 46th Battalion reported after the 26 October assault, "The attack was carried out most excellently by this Battalion, all objectives being quickly gained against very severe opposition and heavy machine gun fire. Severe casualties were caused this Battalion by the MG fire experienced 70% of the attacking force becoming casualties,"[49] hence the need for machine gun crews to help defend hard-won positions; the 12th Brigade reported that five of six crews sent forward with the advance brought their weapons into operation.[50]

Lewis guns were called upon to carry out a wide variety of roles. In the course of assembling an attacking force, for example, observation posts were pushed out into no-man's-land, to within 40 yards of enemy lines if possible, and manned with a Lewis-gun crew and infantry whose task it was to protect the assembly area. In the attack itself, a Lewis team continued to form one of four sections within a platoon, though maneuvers held in September had determined that the section commander required a certain amount of independence, since he was in the best position to determine how to carry out an assigned task.[51] With such autonomy, the team still faced serious difficulties, especially in the legendary mud of Passchendaele. As Leon Wolff described the situation before the Canadians arrived: "The Lewis gunners slipped and fell and swore, and their heavy, clumsy weapons often became choked with mud."[52]

Some managed to rise above the obstacles set in their path and complete their missions. One innovation the Germans had adopted at Passchendaele was to build pillboxes to protect their heavy machine guns, but the Canadians had been rehearsing platoon tactics to deal with these and so managed a modicum of success against them. The Lewis gun played a role, keeping a strong point or pillbox under heavy fire so it could be enveloped around the flanks by infantry firing rifles and lobbing grenades. "As soon as our men closed in, they surrendered immediately or were wiped out,"[53] one officer reported, and another noted that "Lewis Guns were most effective and were kept in action till the last."[54]

One way to boost a battalion's fire-power, first adopted on a large scale at Vimy Ridge, was to capture enemy machine guns, which one report noted "were supplied with ammunition and were kept in action in our positions."[55] In some areas the technique proved particularly effective, the 12th Brigade related that "Both

72nd and 78th Battns were successful in bringing into action early in the operation, captured German machine guns, and the value of the training which had been given men in the operation of enemy guns was most apparent."[56] Such education must have been comprehensive, for not only was it necessary to learn how to operate enemy weapons, but since these were sited to take on attacking Canadian troops, they had to be removed from their set positions and placed, facing the opposite direction, to help repel inevitable counterattacks. It was something of a race between Canadian soldiers attempting to get enemy equipment into action and German troops trying to force them out of their newly won positions.

In the end, it was the Canadians who held the top of the ridge and the village of Passchendaele, and it was again time to evaluate the equipment, tactics, and training of the Canadian Corps to determine what worked, what did not, and what could be improved. The Vickers crews had suffered:

> *more severely than anticipated. This is explained by the fact that under the present conditions of warfare Machine Gun Companies must work in more advanced positions, and often without cover. Also, there is no doubt whatever, that the system of area shoots carried out by the enemy, and which are very largely directed against Machine gun Companies, has caused a very large number of casualties.*[57]

One way to mitigate such losses was to hold back, with gunners moving forward only far enough to get clear of the enemy's shelling of no-man's-land, "from this point they should advance by bounds to positions which have been reconnoitred by the section commander."[58] The difficulties of the task were exemplified by Lieutenant Hugh Mackenzie, CMGC, who won the Victoria Cross for holding a spur against German counterattacks for eight hours. As one witness reported: "he was a godsend....He didn't belong to us, he had no business — to be in the front line. The front line accidentally happened where he was."[59] As for the Lewis guns, perhaps their utility could be determined by the demands placed upon them, and while the average rifleman at Passchendaele fired 70 rounds of ammunition, or about a third of his normal load, in the course of an attack, the average Lewis gunner went through 25 full magazines.[60]

After the mud-splattered Passchendaele campaign wound down, the Canadians returned to their trenches and billets in the Vimy sector. Vickers gunners took up defensive positions, as did Lewis teams, though the latter also practised the platoon tactics that had shown some success in 1917. In March 1918, automatic weapons gained greater autonomy and divisional machine gun battalions became separate units within the Canadian Machine Gun Corps. Developments elsewhere favoured the CMGC, for while the British were dealing with infantry shortages by reducing their brigades from four to three battalions, Currie not only insisted on retaining the larger structure, but increased the machine gun establishment so there were enough gunners and crews to handle 96 Vickers per division (organized into 16-gun batteries), compared with 64 in British formations. The fact that the Canadians were asked to take responsibility for more frontage also favoured the expansion of the machine gun arm,[61] and Canada's 5th Division, still training in England, was broken up to allow such changes.

Brutinel had won out over those who saw heavy machine guns as exclusively infantry weapons and he himself took over command of the new branch.

> *The machine-gun service was to be regarded as a distinctive arm, intermediate between the infantry and the artillery, and with tactics of its own. Though there were occasions when MG companies or batteries might be temporarily attached to infantry brigades or battalions for duty, machine-gun battalions were divisional troops under the command and tactical control of a Divisional Machine Gun Commander, whose position was closely analogous to that of the CRA [Chief Royal Artillery] of a Division with respect to artillery.*[62]

Brutinel's success was due to his ability to convince Currie of the justice of his cause; the Corps commander insisted that he would "proceed immediately with the organization, if I can obtain the guns. Official sanction can come later."[63] The specialization of automatic weapons according to characteristics such as weight and mechanism was complete; the Vickers was gathered into an arm of its own while the Lewis was closely integrated into the structure, training and tactics of the infantry platoon. With the number of Lewis guns doubling in the early months of 1918, further changes were made to the infantry platoon, formed of two rifle sections and two light machine gun sections.[64] The machine gunner, whether heavy or light, had most definitely come into his own.

In the winter of 1917–18, the raiding and counter-raiding that had characterized static warfare a year previously resumed, with the odd German success often blamed on the mechanical breakdown of Lewis guns, now considered essential in defence. There was little time to belabour such issues, however, since the Germans launched the first of a series of offensives on 21 March in the hopes of ending the war before the Americans, who had declared war a year before, could bring their full weight to bear. The Canadians on Vimy Ridge were left untouched, except for the odd raid, and so had the luxury of learning from what was happening on the British and French fronts. The enemy relied heavily on machine guns in these assaults, with some 350 heavy and medium automatic weapons per division[65] for "facilitating the approach of the groups to the enemy's position by keeping the latter under fire."[66] As for more portable automatic weapons, "The light machine gun and the rifleman formed the infantry group, which had to hang together in trouble and danger and the life-and-death struggle. Its fire-power was further increased by quick-firing weapons and all kinds and various sorts of rifle grenades."[67] Their tactics were very similar to those of other protagonists on the western front, including the Canadian Corps, which saw its own developments vindicated in German successes — temporary as the latter might prove.

On 18 July, French, American and African forces launched a counter-offensive that brought the Germans to a halt and began to roll them back. By this time the enemy, who had kept the Allies to limited and bloody gains in 1916 with some 11 000 machine guns, had built up a force of 32 000 heavies (Maxims) and 37 000 lights (Bergmanns), but something had changed in two years, for no fewer than 29 000 automatic weapons were captured by the British alone in the summer and fall of 1918. The machine gun, which Tom Wintringham claimed "locked" the front in 1914, could no longer do so, as "Tactics and technology had caught up with them...accurate artillery fire crushed them; concentrated British machine-gun and Lewis gun fire neutralized them and sometimes tanks rolled over them."[68] Automatic weapons were more weapons of offense than defence in the last eight months of the war.

Having planned an offensive in the area of Amiens before the Germans had even begun their spring and summer campaigns, once the Germans had been turned back, the British set out to begin moving forward again, in what came to be known as the Hundred Days. In the following battles machine guns would play an important role, though not necessarily due to their technical or tactical characteristics. As a letter from the Canadian Corps to its representative at Britain's General Headquarters explained in the midst of the campaign: "As the question of manpower becomes more acute, the desirability of getting the maximum of fire power from the minimum number of men must be appreciated. To do this we must increase the number of light machine guns or automatic rifles."[69] For this and other reasons, Corps staff officers concluded that "the experience gained in the fighting this year prove[s] that the whole structure of attack or defence is built up around the machine gun."[70]

If this was the case, training those who would handle automatic weapons would be crucial, and Lewis gunners were expected to be able to change a magazine in five seconds or less, load bullets into a magazine by hand in less than two minutes, be able to get five out of six rounds into a 6-inch (15-cm) circle at 30 yards (27.5 m), and have a detailed knowledge of the mechanism so as to effect minor repairs. With ever more faith being placed in such technicians, ammunition expenditures were prodigious, and for the Lewis gun alone, the battalion quartermaster was expected to hold 160 magazines (7 520 rounds) and eight more boxes (9 984 rounds) for a total of 2 184 per gun to carry out a single attack. Transporting such necessities was a major challenge, and involved mules, wagons, and lorries — and sometimes even tanks — to move up ammunition.[71]

In battle, it was often a case of machine gun against machine gun, and at Amiens, where the offensive was launched on 8 August, the 5th Battalion reported that "The opposition encountered, apart from the enemy barrage, which was very severe on the left sector of the Brigade Front, consisted mostly of Machine Guns."[72] The Canadians' success against such defences required their own automatic weapons to carry out "fairly intricate manœuvres in open country, but they took out the opposing machine-gun nests with rifle grenades, bombs, and Lewis guns just as they had practised doing during their summer's training,"[73] hence proving the utility of platoon tactics similar to those used at Vimy and Passchendaele. The 1st Battalion, however, had to point out that "as usual, personnel of the Crews suffered heavy casualties."[74] After a month of fighting, staff officers noted that "Machine Gun Nests

cannot be rushed. Troops must learn *to be patient* — and know *when to stop* as well as when to advance."[75]

Vickers teams followed to help consolidate gains, or supported the assault with fire; the 3rd Company of the CMGC's 1st Battalion fired over the heads of infantrymen as the latter attacked up a slope.[76] Many went even further than that, actually accompanying the attacking battalions. The 3rd Brigade reported that "These batteries advanced with the Infantry, and had a certain amount of close fighting in the mist. Targets of opportunity were taken on and observed fire directed, and they quickly took up defensive positions to assist the defence of the Green Line,"[77] one of the intermediate objectives. At Canal-du-Nord, on 27 September, the 7th Battalion was almost gleeful over the help the machine gunners had provided, relating that "Four guns of 'G' Battery, 1st Canadian Machine Gun Battalion under Lieut Balfe, did splendid work in assisting the Battalion to overcome the resistance on the Green Line. They moved forward with the Front Lines of Infantry and by engaging enemy machine guns and giving covering fire, rendered invaluable assistance."[78]

There was little doubt that machine guns, whether heavy or light, were important assets when used in direct support, but the controversy continued to rage over the use of the Vickers in an indirect role. During the assault on the Drocourt-Quéant Line of 2 September, artillery was held back because Brutinel insisted his guns were able to protect the attack, but many German batteries remained in action, creating a vicious unopposed fire. After the last set-piece attack of the Canadian Corps, at Valenciennes on 1 and 2 November, Brigadier-General A. G. L. McNaughton, commander of the Corp's heavy artillery, ordered a survey of enemy-dead to determine what had killed them; Brutinel claimed that machine gun fire had been mainly responsible. The study's conclusions are no longer extant, but McNaughton also requested that intelligence personnel interview prisoners-of-war, and those of the counter-attacking battalions were near-unanimous that artillery, and not machine guns, had broken their assaults.[79]

Such evidence is not necessarily conclusive, but what is clear is that the role of the machine gunner changed dramatically from 1914 to 1918. At the beginning of the war the Canadian contingent simply had too few automatic weapons for them to play any important part in either defensive or offensive tactics, and what they did have — the Colt — proved unreliable. By the Hundred Days, the situation was much different; members of machine gun units had expanded from 350 all ranks to 8 364. If casualties are any measure of a branch's role on the battlefield, it is worth noting that the CMGC lost 2 339 men from August to October 1918, compared with 1 881 in artillery batteries — an indication of the machine gunners' closer physical involvement with the infantry battle. As for Lewis gunners, they were an integral part of the platoon, and made up almost half its strength and no doubt their casualties were comparable to those of riflemen. In both cases, though their training was very much that of the technician, they were definitely still soldiers — and suffered accordingly.

NOTES

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