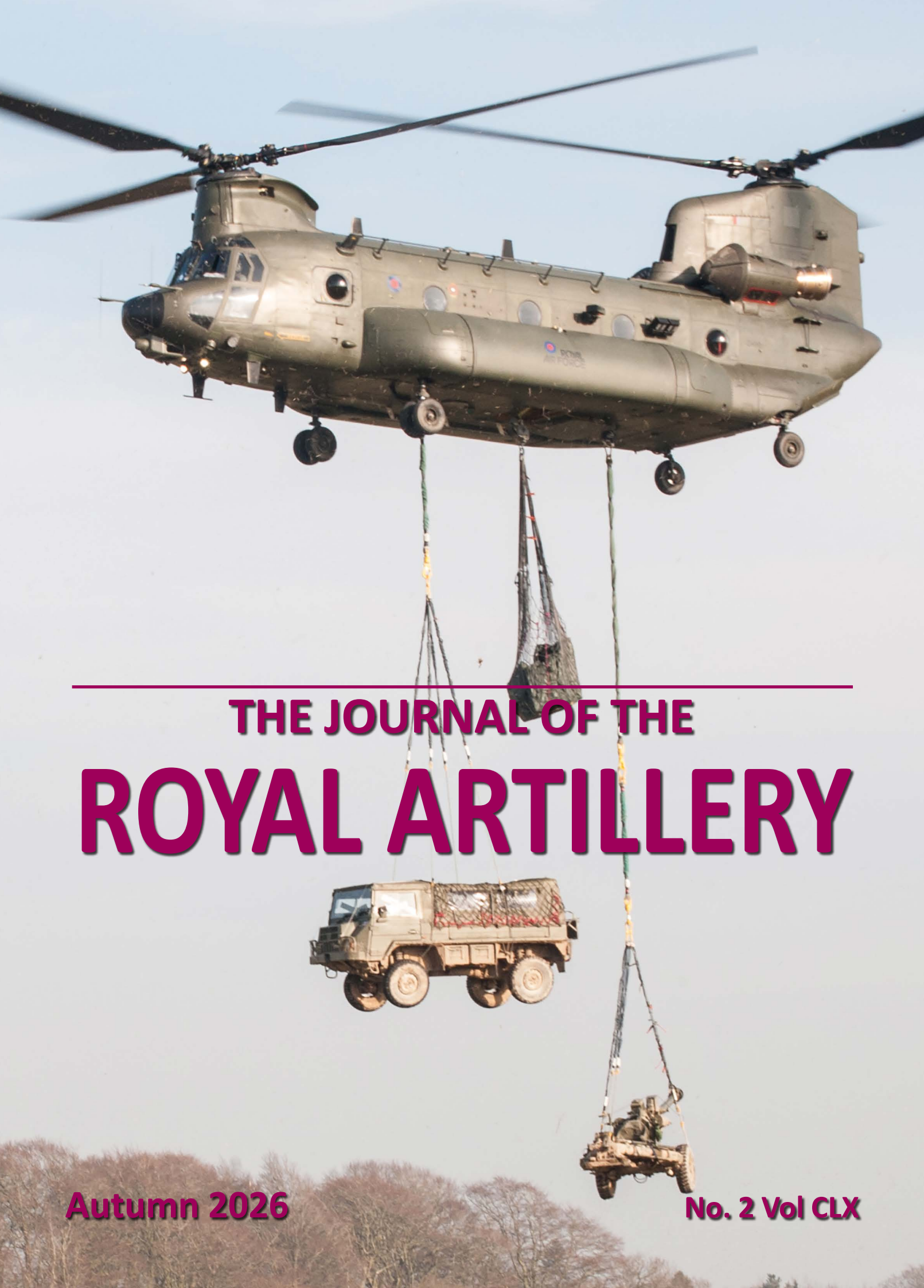


THE JOURNAL OF THE ROYAL ARTILLERY

Autumn 2026

No. 2 Vol CLX

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Cover Picture:
A chinook helicopter lifts a light gun, pinzgauer and ammunition on Exercise STEEL SABRE in 2014 @ TIC.

Back Cover Picture:
7 Parachute Regiment RHA take part in Exercise RHINO TITAN, this year, as 16 Air Assault Brigade demonstrated its Joint Airborne Task Force (JATF) capability as part of a major multinational exercise in Germany.

The views expressed in this publication reflect the opinions of the authors and do not necessarily reflect official opinion in any way.
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EDITORIAL

By Lieutenant Colonel Nigel Cooke

Welcome to this edition of the Journal of the Royal Artillery, now in its 168th year. “The Times They Are a-Changin” was written and sung by Bob Dylan, an American singer songwriter, and released on 10 January 1964; five years before I went to the Royal Military College Sandhurst. As I prepare for handover and retirement it seems to be an apt comment and a reminder of how quickly time passes, although that is as far as the analogy goes. After all, it was a protest song, but it came to me in the fresh air recently as I pondered my future. It has been an exciting and extremely interesting nine years in post as the Journal’s editor and rewarding to have helped record some of the Royal Regiment’s history in that period.

The important part is the material and a huge thank you goes to all those who have contributed articles and continue to provide submissions for publication. It is our Journal, but it has a global reach, and perhaps like the Regimental Headquarters Royal Artillery, punches above its weight - not that I am biased (!) - and I stand by the saying: “once a Gunner, always a Gunner”.

Sadly, we continue to live in extremely unsettled times and whilst the majority of us may well feel that humanity is fundamentally kind and caring, there are a number of ne’er do good detractors who think otherwise. We need first and foremost to have a strong defence, not least because it enables us to act freely as a nation and thrive. The former Secretary of State for Defence proposed a significant uplift but, by some calculations, that seems to have been watered down since he became Chancellor of the Exchequer. Who would be a politician? It is a difficult job, and they probably cannot be entirely honest all the time. They certainly can’t please everyone all the time, but if the population at large can’t sleep at night because of potential external threats, then it becomes more of an issue. We are not there yet, but the parlous state of our manpower and equipment is worrying, and one only has to look at Eastern Europe to be concerned. Lest we forget, and it is that time of the year, World War Two was supposed to be the last world war.

Some readers may wonder why there is a picture of a light gun on the cover of this Journal. Turn to the first article inside these covers and there is a very interesting explanation by Colonel John Musgrave about the adaptability, survivability and incredible endurability of this gun. I trained on it in Colchester during my first tour as it came into service. Fifty years of service and it is still relevant and going strongly.

Drones are very much in the news at present; widely and effectively used in Ukraine, Russia and the Middle East. They are cheap to produce, especially when compared to field artillery rounds and can take out targets with pinpoint accuracy. They will not replace field artillery with its sheer power, but will be used in conjunction with it, notwithstanding limitations such as the weather and visibility.

On a lighter note, for the first time I have included a short story in the Journal. It is about drones, portraying a futuristic picture and reflecting what might be, for those serving today. It is set in a domestic, military setting and is, as they say, a very good read.

The Duncan Essay competition is also faring well and those essays placed first and second in the 2026 competition are published in this Journal. Both are topical; discussing the move from tubes to drones in Ukraine, and a comparison of the Russo-Japanese War with that of the current Russo-Ukraine War.

The Ordnance Survey is 235 years old this year having been established in 1791. Major General William Mudge, a Gunner, had much to do with its development and his tale is carefully covered by a former Regimental Secretary following a great deal of research. He has followed that with a detailed account of another extraordinary Gunner, Major General Sir Edward Sabine: soldier, physicist, geodesist, astronomer, ornithologist and polar explorer.

As a final comment, we should continue to have great faith in the youngsters of today. They may arrive rough and unready but those serving, officers and SNCOs, will train them and then, in time, be replaced by them.

REGIMENTAL EVENTS 2026/27

5 November	Field of Remembrance	Westminster Abbey
8 November	RA Ceremony of Remembrance	Hyde Park Corner
8 November	Remembrance Minute Guns	London (KTRHA)
25 November	RA Board of Management	Larkhill
4 December	TCs Dining In	Larkhill
6 December	St Barbara’s Day	Larkhill Garrison Church
9 December	158th Master Gunner’s Committee	Larkhill
12 February	Troop Commanders’ Guest Night	Larkhill
17 February	Cannon Ball Trophy	HAC London
18 February	RA Gold Cup	Sandown
4 March	Alanbrooke Lunch	London
18 March	RA Boxing Finals	Larkhill
19 March	Spring Dinner	Larkhill
19 March	Gunner 27	Larkhill
25 March	RACF Welfare Committee	Larkhill
16 April	Troop Commanders’ Dining In	Larkhill
18 April	Gunner Sunday	Larkhill

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The Light Gun Turns 50

By Colonel John Musgrave



Colonel (Retd) John Musgrave is an independent defence consultant with 35 years' experience in the British Army, primarily in the Royal Artillery. His senior appointments included Commandant of the Royal School of Artillery and Offensive Support Capability Director, with responsibility for developing the Army's artillery and indirect-fire capabilities. He is now Director of John Musgrave Consulting Ltd, advising defence industry on military capability, equipment procurement and modernisation. He is the author of Firepower: ***Making 21st Century Warfare Decisive,*** *which examines the changing character of warfare and the capabilities required to achieve battlefield success. He regularly chairs international conferences on artillery and mortar systems, bringing together military practitioners, government officials and defence industry. He has just submitted his University of Southampton doctorate research thesis into British Army equipment procurement, examining how organisational culture and military decision-making at project initiation influence subsequent outcomes.*

INTRODUCTION

For For 50 years the 105 mm L118 Light Gun has been the mainstay of British light artillery. Yet its contribution has extended far beyond its intended role. It has repeatedly provided a stand-in when other artillery capabilities were unavailable, equipped formations for which it was never originally conceived, and has spawned a dedicated ceremonial variant. Most importantly, generations of Gunners have learned their trade on it. The physicality of serving a gun, the precision of its drills and the absolute dependence of every detachment member upon the others have made Light Gun training an important repository of Gunner ethos, teamwork and professional identity.

At 50, however, the question is no longer what the Light Gun has achieved, but whether a weapon designed in the 1970s can remain operationally credible on the battlefield of the 2030s. The evidence suggests it can; but only if sustainment is used as an opportunity for modernisation.

HISTORY OF ITS SERVICE

Entering British service in 1976, L118 replaced the Italian-designed L5 105 mm Pack Howitzer, whose mobility was offset by inadequate range, robustness and responsiveness. The new gun was soon tested in war. Thirty deployed to the Falklands in 1982, where some fired up to



400 rounds per gun per day during the final battles. It subsequently served in the Balkans, Sierra Leone, Iraq and Afghanistan.

Its influence spread much further. The Light Gun was developed as the L119 variant to fire the widely available American-designed NATO 105 mm ammunition family. Exported extensively, the L118/L119 family was also manufactured under licence overseas: Australia produced the weapon as the Hamel Gun, while Thailand obtained a production licence. Most significantly, the L119 was selected by the United States and became the basis of the American-built M119 family, which remains in US Army service today.

The scale of this success is remarkable: some 50 years after the original L118 entered British service, variants of the Light Gun family remain in service with around 19 countries. India's very large 105 mm Light Field Gun fleet reflects many of the same design characteristics, although it should not be described as a licensed derivative of L118.

This matters because 105 mm artillery is sometimes treated as a historical niche. It is not. Several thousand 105 mm guns remain in worldwide inventories, despite the greater investment in 155 mm. For many armies, 105 mm also retains an important close-support advantage: its smaller lethal area permits suppressive fire considerably closer to friendly troops than 155 mm, allowing artillery to support assaults and defensive battles at distances where heavier artillery may be constrained. Light artillery therefore remains both an important operational capability and a substantial potential replacement market.

DESIGN CONSIDERATIONS

The Light Gun was a product of both NATO standardisation and British wartime experience. The choice of 105 mm reflected the emerging Western standard for light artillery, but British thinking also retained an older lesson: the principal contribution of close-support artillery is suppression, and suppression depends less upon the size of each individual explosion than upon the ability to put repeated rounds onto the target. The ancestry of the 25-pounder is consequently visible in several elements of L118's design, including its vertical sliding-block breech, box trail and circular firing platform.

Direct fire was also taken seriously. A gun supporting light forces might have to defend itself, while the requirement for all round indirect fire produced the platform that facilitates 6,400 mil traverse.

Mobility imposed compromises. The gun needed to be narrow enough for towing and tactical movement and suitable for strategic movement by air, sea and rail. The resulting narrow wheel track created one of the Light Gun's most distinctive peculiarities: the barrel cannot be rotated from its travelling position without removing one wheel.

Ironically, the gun itself has aged better than its mobility solution. From the one-ton Land Rover onwards, finding a suitably light, compact and tactically mobile towing vehicle has repeatedly proved one of the system's Achilles heels.

REPRIEVED FROM A PLANNED REPLACEMENT

Until recently, the Light Gun appeared to be approaching the end of its British service. Its planned out-of-service date was 2030, with Project STOKES' 120 mm Light Mobile Mortar intended to replace it. The Defence Investment Plan's decision not to proceed with STOKES as planned means that L118 must now remain operationally credible well into the 2030s. The challenge is therefore not simply to sustain an ageing weapon, but to exploit that necessary investment to enhance its capability. Given the lessons emerging from Ukraine, that reprieve may prove fortunate.



LESSONS FROM THE RUSSO-UKRAINIAN WAR

Ukraine challenges the proposition that survivability can simply be reduced to "towed versus self-propelled". A more useful distinction may be large and persistent versus light, dispersed and mobile. Open-source evidence from the conflict supports this: approximately 28% of the M777 155 mm howitzers supplied to Ukraine have been visually confirmed as lost, compared with only around 2–3% of the M119/L119 105 mm fleet. These figures should be treated cautiously; visually confirmed losses are not comprehensive and differences in numbers, employment and exposure complicate direct comparison, but the disparity is nevertheless striking.

Ukraine's response is particularly significant for Britain. Rather than regarding light 105mm artillery primarily as an expeditionary capability for light forces, Ukraine sees sufficient value in it during intensive conventional warfare to invest in an indigenous capability. In July 2026 BAE Systems signed an agreement enabling a Ukrainian partner to manufacture a locally produced L119 variant. This indicates that the Light Gun's combination of danger close suppressive fires, mobility, dispersion and low signature may be attributes of particular value on the peer battlefield, rather than merely compromises accepted by light forces unable to deploy 155mm artillery. Fig 5 (sunlight through trees)

REFERENCE ARMY - THE US APPROACH TO LIGHT GUN MODERNISATION

The United States provides a useful comparator. Rather than treating the M119's age as grounds for replacement, the US Army has adopted a combination of mechanical sustainment and progressive digitisation. Approximately 600 guns are being retained following conversion to the M119A3 configuration, whose Digital Fire Control System (DFCS) provides autonomous position determination and supports rapid "shoot and scoot" operations through digital fire missions.

Alongside digitisation, troublesome mechanical components have been redesigned and an organic support capability sustained. Modernisation continues: FY2026 funding includes enhanced Assured Position, Navigation and Timing for GPS-contested operations and further DFCS hardware and software development.

The lesson is important. American Light Guns are not being replaced simply because of their age. Their enduring mechanical virtues are being retained while the elements that determine their reliability, responsiveness and resilience are progressively modernised. This provides a useful model for Britain.

SUSTAINING THE LIGHT GUN

The first requirement is to sustain the weapon itself. Barrels are consumables, and intense warfighting could generate more wear and erosion in days than years of peacetime firing. Adequate stocks of replacement barrels will therefore be essential. Carriages, recoil systems and other high-wear components will similarly require repair, remanufacture or replacement. Continued American and now Ukrainian investment in the Light Gun family should make this considerably easier.

Ammunition requires similar pragmatism. Britain's existing stockpile strongly favours continued use of L118's bespoke ammunition, but there is a case for converting part of the fleet to L119 configuration to exploit the much larger international stockpile and industrial base for US-pattern 105 mm ammunition. Cheaper, more widely available ammunition could also meet much of the peacetime training requirement, preserving British war stocks; an approach previously employed at the Royal School of Artillery with their L119 battery.

Changes to force structure may meanwhile allow a smaller operational fleet, concentrating resources, spares and the best remaining guns where they are most needed. There is therefore no obvious mechanical obstacle to sustaining L118 into the 2030s. The more important question is whether a serviceable Light Gun would also remain operationally credible.



HOW CAN L118 REMAIN OPERATIONALLY CREDIBLE?

Here Britain has already travelled part of the American path. Since 2002, L118 has been equipped with the Laser Inertial Navigation Artillery Pointing System (LINAPS), replacing conventional surveying and dial-sight laying with autonomous position and orientation and digital gun laying. In broad terms, LINAPS digitised where the gun is and where it points; the American DFCS demonstrates the potential next step; digitising how the gun receives, calculates and executes the fire mission.

This provides a clear pathway for British modernisation. Rather than simply sustaining the existing LINAPS capability, its next generation could provide a much more complete gun-level fire control system. Britain would therefore be building upon an extant British capability with an established industrial and support structure, while following an approach already demonstrated on the closely related M119A3.

With expenditure on LINAPS sustainment and obsolescence management becoming unavoidable, the opportunity is to turn necessary sustainment into capability enhancement: creating a more autonomous, responsive, resilient and survivable Light Gun.

THE KEY ENHANCEMENTS

Four enhancements would be central to achieving this. First, on-gun ballistic computation would allow each gun to generate its own firing solution, reducing dependence upon the Command Post and allowing guns to disperse more widely. Second, digital receipt of fire missions would enable fire orders to pass as data rather than voice, reducing mission times, transcription errors, crew workload and unnecessary electromagnetic emissions.

Third, resilient position, navigation and timing would preserve accurate position and orientation as GNSS and the wider electromagnetic spectrum become increasingly contested. Finally, integrated muzzle-velocity measurement could automatically feed actual weapon performance into the ballistic calculation, improving the solution for subsequent rounds as ammunition conditions and barrel wear change.

Together these changes would transform LINAPS from principally a navigation and laying system into the core of an autonomous gun-level fire-control system.

HOW GOOD COULD A FULLY DIGITISED LIGHT GUN BE?

The combination of Light Gun's existing physical characteristics and a modern digital fire-control system would produce a surprisingly capable weapon for the peer battlefield.

Survivability is central. Used in its rapid A-frame configuration rather than deployed on the firing platform, Light Gun can be brought into action in around 30 seconds. Combine this physical speed with on-board ballistic computation and digitally transmitted fire missions and the gun could fire within seconds of completing its deployment before rapidly displacing. Digitisation would therefore convert the Light Gun's inherent mobility into tactical survivability.

L118 also offers approximately twice the range of a conventional 120 mm mortar, together with a lower firing signature. Its ability to fire low-angle trajectories can exploit terrain masking from hostile radar while reducing time of flight and increasing responsiveness. The gun can also exploit both high and low-angle trajectories to increase the number of rounds arriving almost simultaneously, while retaining direct fire for self-defence.

There remain trade-offs. A 120 mm mortar bomb offers greater fragmentation effect despite carrying a broadly comparable explosive mass; a vehicle mounted mortar can operate with a smaller crew and removes much of the physical burden associated with serving and moving a towed gun.

A fully digitised L118 would nevertheless be much more than an ageing gun kept in service. It would be a highly mobile, low signature, digitally networked artillery system capable of concentrating fire rapidly and dispersing before an adversary can effectively respond.

THE FUTURE - BUILDING THE NEXT LIGHT GUN

The 50th anniversary should also prompt a more ambitious question: not simply how long L118 can be kept in service, but what should eventually replace it. Modernising today's Light Gun could provide part of the answer. Enhanced LINAPS would develop and de-risk the digital fire-control architecture, resilient PNT, autonomous ballistic computation and network integration required by its successor.

That successor should begin with the characteristic that made L118 internationally successful: genuine lightness. Rather than allowing requirements progressively to produce another medium weight artillery system, carriage beneath a Black Hawk-class helicopter and suitability for airborne operations should impose a hard design constraint. Within that envelope, modern materials, reduced crew burden, integrated digital fire control and contemporary ammunition could produce a genuinely 21st century Light Gun.

The potential market extends well beyond Britain. With thousands of 105 mm systems remaining worldwide, a modern replacement could offer an alternative to ever heavier and more expensive 155 mm systems. There would also be historical symmetry: Britain provided America with the design ancestry of both M119 and M777. Perhaps the next Anglo-American towed howitzer should also begin here.

CONCLUSION

So, happy 50th birthday, Light Gun. But this is not a retirement party. The requirement now is not simply to sustain L118, but to exploit that sustainment programme to make it credible on the peer battlefield. And, perhaps, to use those lessons to build a British successor worthy of replacing it.



The Journal of the Royal Artillery
The Journal of the Royal Artillery
The Logistic Build-up to D-Day

The Logistic Build-up to D-Day A Presentation to the Royal Artillery Historical Society

By Lieutenant Colonel Chris Barrington Brown



Lieutenant Colonel Chris Barrington Brown was a regular Gunner for 12 years, and a reservist for 33, specialising in Cyber. After leaving the army, he set up and ran a small software company producing defence and counter-terrorist applications, which he sold to his employees in 2022. His retirement project, which can be found at www.ddaybuildup.info, forms the basis of this article.

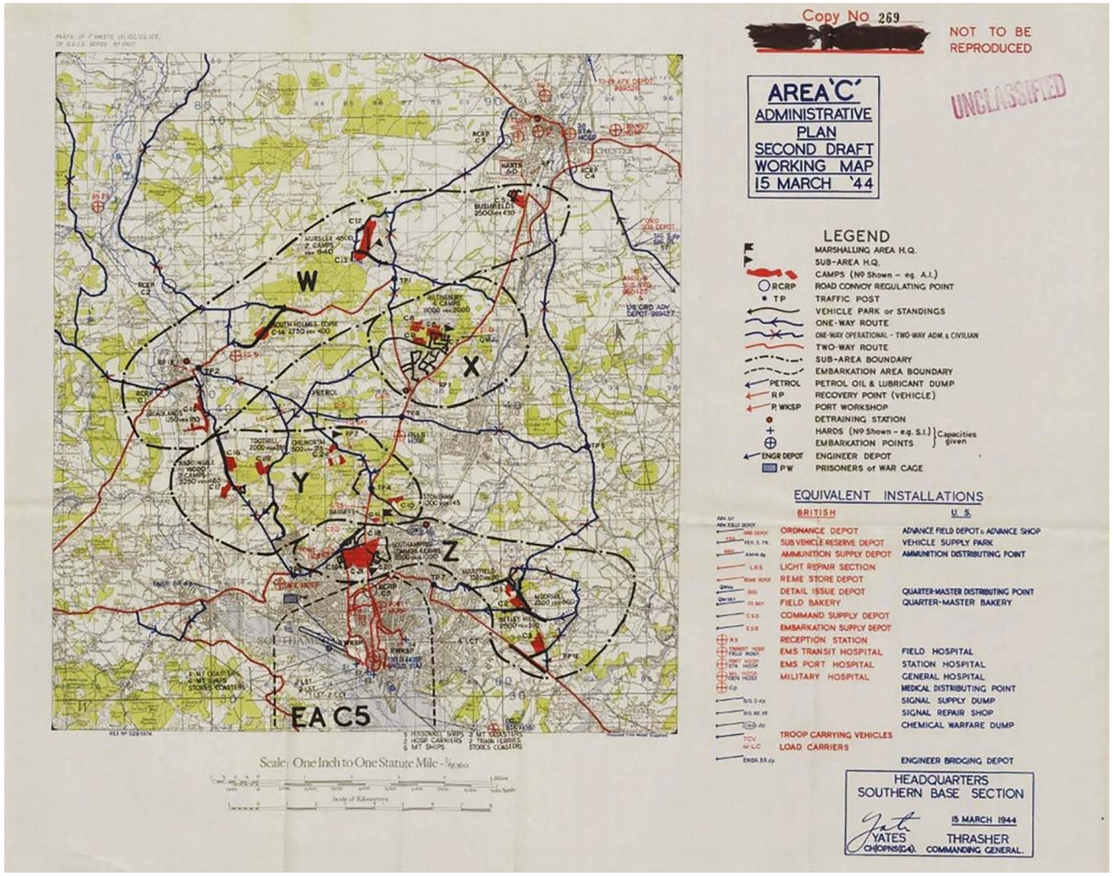
INTRODUCTION

There is a quotation, attributed to General Omar Bradley, that 'amateurs talk tactics, professionals study logistics'. That is not 'pithy' enough for today; and some naval officers I met said they now use: 'No missions without logisticians.' Whichever, although it's not very 'sexy', logistics is absolutely critical to achieving anything in warfare.

D-Day was the most amazing operation. But most of the books about it start with soldiers charging ashore on the beaches or jumping out of aeroplanes, with very little about how they got there. As a military person I wanted to know how they were fed, equipped, trained and all those other things which you need to get right before an operation can succeed. I thought maybe I would write a book about the build-up, but I rapidly realised that such a book would be 200 or 300 pages long, with 10,000 pages of annexes. Difficult enough to carry, let alone to put together in a form that was attractive to read!

SCOPE OF PROJECT

The idea for my project came at the D-Day Story at Southsea where I came across Map 1 which is of the area around my home in Romsey, near Southampton. It shows where all the camps, vehicle wading pits, hospitals, ammunition points, and everything else needed to mount the operation were located. Since this is



Map 1 - Marshalling Area C - Southampton © NARA via Carl

Area C, I reasoned that there must have been at least Areas A and B. In fact, there are 22 areas which had these maps. I thought maybe I could use my particular skills to take the information overlaid on these maps, which is of course from the 1940s, at 1 inch to 1 mile, and put it on modern mapping so that people can see what happened in 'their backyard'. I thought there was a germ of an idea here. Maybe I could produce a website. I decided to try to answer three questions.

- How did the pre-D Day logistics work? That is mostly text, with some diagrams and a few maps. While there is much still to write, in embryonic form it is available on the website (address in CV above).

- What happened in my area? This is also live, and you can go anywhere on the map on the website in England and Wales, and see what installations were where. You can see overlays on historic and current topographic maps, on modern aerial photography and in some places, WW2 aerial photography. For various technical reasons, Scotland and Northern Ireland aren't being done.

- Who was Where, and When (and to an extent, Why)? There is still much research required on this, but from a location you can find what units were there and when, and from a unit you can see where and when it moved location. There are also lots of relevant photographs (with videos to come), which can be searched by keyword, unit, or location.

The most difficult part of the whole project is trying to create something which will work in 20 years' time. I'm aiming to have the database and website still working on the 100th anniversary of D-Day in 2044. Since the underlying technology will change about 3 times during those 20 years, and I may not be alive to manage these transitions, there are some interesting technological challenges to be overcome.

MANPOWER

The most important resource in the army is soldiers. A lot of people think the whole of the UK in late May 1944 was like a coiled spring with every soldier ready to invade across the Channel. In fact, only around 750,000 British and Canadian soldiers (plus some from occupied nations) in 21 Army Group were ready to do that. There were another 250,000 that were part of Air Defence of Great Britain (ADGB) defending the home base. The German V1 offensive started a week after D-Day, so ADGB was very busy. There were just under 1,000,000 soldiers in Home Forces who were equipping, protecting and getting 21 Army Group ready to go. I do not know yet exactly how many airmen there were in the RAF in UK in June 1944, but my guess is about 250,000.

The Journal of the Royal Artillery
The Logistic Build-up to D-Day

In the US forces, there were about 1,500,000 in the UK on 1 June, of whom around 650,000 were ground forces and 450,000 air forces. An interesting figure is that there were another 375,000 in the 'Services of Supply'. They were here to provide all the logistic material and support for the ground and air forces, so a large 'overhead'.

There are some statistics which suggest that, for every one front-line soldier in the Allied forces, there were 14 soldiers behind them providing logistic backup. The same maths done on the German side comes up with 1 to 3, which may suggest why the Germans lost in spite of their prowess on the battlefield. One phrase, perhaps apocryphal, is credited to a German tank commander who said, 'we could knock out 10 of their tanks for every one of ours, but they always had an 11th'.

OPERATIONS BOLERO AND SICKLE

To get those 1,500,000 Americans across the Atlantic, from 1942 there were Operations SICKLE (for Air Forces) and BOLERO (for Ground Forces, which in a short time subsumed SICKLE). A few interesting statistics of BOLERO up to 1st June 1944:

- 1,527,000 men moved.
- 100,000 buildings taken over in 1,100 cities & villages.
- 100 depots set up.
- 21 Divisions (average 35,500 personnel including the Divisional slice) transported.
- 103 Air Force Groups (72 to 96 aircraft/group) transported.
- 1,358 Locomotives & 362 Diesel Shunters moved.
- 57,200 railway wagons required, although only 20,381 were available.
- 5 million tons of cargo moved. (2 million in the last 5 months).
- 160 ships per month crossed the Atlantic during 1944.

The railway locomotives and wagons were modified for the UK as the loading gauge (height and width of rolling stock) is smaller than that in the US or Europe.

The US troops arrived to find that the British field bakeries were so much better than theirs that they immediately bought 52 of them. By 1 June these bakeries were making 500,000 pounds of bread a day, but that met only 60% of the US Forces bread requirement so the British had to produce the balance as well as that needed for their own servicemen.

So how did soldiers get here? The two Queens (Elizabeth and Mary) alone moved 1.6 million soldiers across the Atlantic during the war (although not all for BOLERO). In peacetime, these ships would have around 2,000 passengers and 900 staff. When turned into troop ships, they would normally move from 7,000 to 9,000 men at once and at one stage this went up to 11,500 in one crossing. Many troops came across in much less salubrious vessels in 5-decker bunks, such as the one in Figure 1.

The two Queens were considered to be fast enough to avoid U Boats, and they were allowed to cross the Atlantic at top speed as single runners rather than in a convoy. However, they still took seven to nine days to complete the crossing. Imagine being in those living conditions for that amount of time: not a luxury cruise.



Figure 1 - Troop accommodation crossing the Atlantic. NARA.

EMBARKATION POINTS

Having moved the Americans to the UK to join the native and Canadian troops already here, the planners now needed to decide how we are going to attack the continent. The initial assault will be using the two types of ship shown in Figures 2 & 3.



Figure - 2 Landing Ship Tank (LST) © Wikipedia. 2 Marks of LST - capacity up to 2100 tons

These ships need to be loaded by reversing vehicles onto them because when you land on the far shore, you need to drive out ready to fight, and you can't turn round on board.

Loading on a sandy beach causes rapid erosion, so you need to have a concrete beach, known as a hard. Concrete takes four weeks to cure, so unless you build a coffer dam to protect it, traditional concrete-laying doesn't work against the tides. Enter Major Vassal Charles Steer-Webster[1], a Sapper who invented

1. Colonel Vassal Charles Steer-Webster OBE RE (1898-1970) also designed the Mulberry Harbours supporting the D-Day landings. He oversaw the design and installation of Mulberry Harbour B, at Arromanches which supplied British and Canadian troops. Its 6 miles of steel roadways floating on concrete pontoons were used to land more than 2.5 million troops, 500,000 vehicles and 4 million tons of supplies in the 10 months after D-Day.

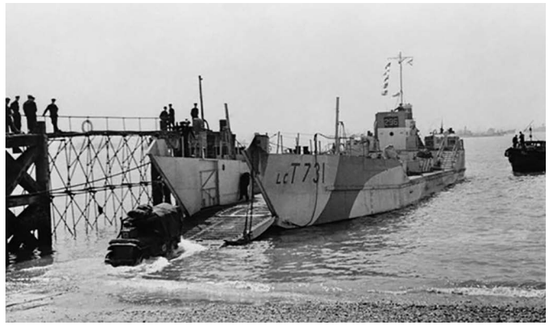


Figure 3 - Landing Craft Tank (LCT) © IWM (A 23673). Vehicle reversing onto an LCT during training for the Normandy Landings.

the solution which is known colloquially as the chocolate block. This is precast concrete with steel hawsers embedded in it, which means it's slightly flexible, and each block can be moved by a couple of soldiers. You can flatten the beach, put it down and you immediately have your hard. Around 70 of these hards were constructed around the coast from East Anglia to South Wales, as at this stage (1942-3) we did not know where the assault would take place.



Figure 4 - Flexible Concrete Mats 'Chocolate Blocks'

Behind each of these hards and ports (known collectively as an Embarkation Area), infrastructure was built to mount the required forces. There were three stages to the Embarkation. Initially troops would be Concentrated and brought up to full war establishment. At this stage they were still self-sustaining. However, for the invasion the planners needed different Arms and Services to be mixed on ships to reduce the risk of catastrophic loss, and to maximize All Arms cooperation on the far shore.

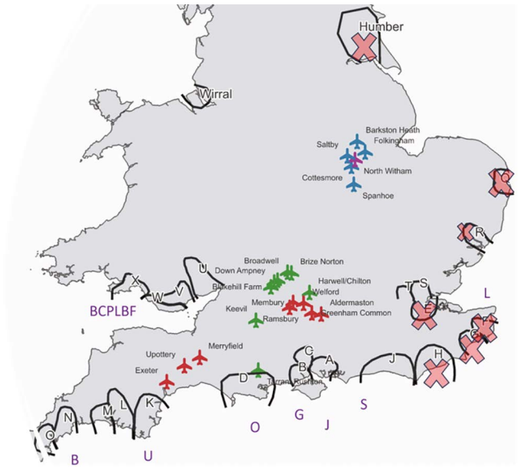
This was achieved in a Marshalling Area, where Residues (around 40% of a unit, including its administrative and support staff who were not required in the Initial Assault) were cast off to holding camps (eg. Larkhill, Aldershot, Southend) until they were needed. Units were broken up into their ship-loads and dispersed to camps within one or more Marshalling Areas. At this point the units were no longer able to sustain themselves, so the camps were manned by 'Hotel Staff'. These were frequently Gunner units in Home Forces, who fed, guarded and made good last minute equipment requests. For those interested in these aspects, there is a good book: *We Planned the Second Front*[2].

2. We Planned the Second Front: The Inside History of How the Second Front Was Planned by Major John Dalgleish. Pub 1945 by Victor Gollanz. Republished as: After Dunkirk. D Day and How we Planned the Second Front': John & Tim Dalgleish. Pub 2017. ISBN: 978-1973992516.

While many Marshalling camps were tents in wooded areas, some were in existing military camps, some in requisitioned buildings (such as the West Ham Dog Track), and some were very rudimentary, such as the Sausage Camps in Cornwall. These were named because they were drawn like sausages on maps. A valley with a road running through it would be closed at both ends and 2500 soldiers would be distributed in 250-person pup-tent encampments within a few hundred metres of the road.

At the appropriate time each ship-load (or serial) was called forward to its Embarkation area for loading. The camps were cleaned by the Hotel Staff, and the next wave of units would arrive for their turn of Marshalling and Embarkation.

Map 2 shows the Marshalling and Embarkation areas plus the airfields used by the Airborne forces. The latter are colour coded in red for 101 US Div, blue for US 82 Div, green for British 6 Div and purple for US Pathfinders. The purple letters show the Naval Task Forces. Forces U, O, G, J and S went to Utah, Omaha, Gold, Juno and Sword respectively. Forces B and L took US and British/Canadian backup forces to their respective beaches. The red crosses show Marshalling areas that were built but not used for the Assault (Area R used only Felixstowe and not, as planned, Ipswich). The BCPLBF was the Bristol Channel Pre-Loaded Buildup Force: 2 US Divisions from South Wales destined for Omaha and Utah.



Map 2 - Marshalling Areas, Airfields and Naval Task Forces © From www.ddaybuildup.info

WATERPROOFING

All vehicles for the first three months of landing were assumed to need to be waterproofed to arrive wet-shod in 4 ½ feet of water (although this was relaxed by mid-July). This was achieved by a mixture of extensions welded on to the vehicles, application of a plasticine-like paste made of Bostik and asbestos to all areas likely to come into contact with water, and removal of fan belts and shrouding with waterproof sheeting.

These three types of protection roughly corresponded with the stages of waterproofing carried out at Concentration, Marshalling and Embarkation areas. Each stage of waterproofing took progressively less time (from 4 days down to 15 minutes) but also reduced the range before engine failure from 200 miles down to half a mile.



Figure 5 - An Infantryman from 1 KOSB waterproofs his Jeep', Denmead, 29 Apr 44 © IWM H37983

These distances therefore dictated how far from the Embarkation points the Concentration and Marshalling camps could be. At Figure 5 is a picture of an infantrymen from 1 KOSB waterproofing their Jeep in a Marshalling camp at Denmead, north of Portsmouth.

PETROL, OIL AND LUBRICANTS (POL)

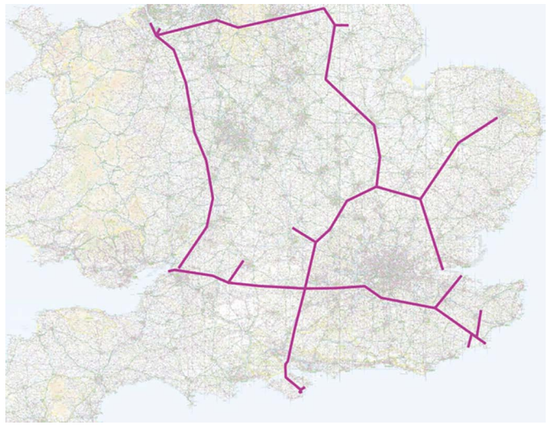
General Patton is claimed to have said: "My guys can eat their belts, but my tanks have gotta have gas." Without POL a modern army cannot move or fight. The Allies built up a stockpile of 250,000 tons of pre-packed fuel before D-Day. If this was filled into the 14 million Jerrycans required, and placed side by side, the line would have stretched from London to Cairo. Figure 6 shows one of the many depots holding this pre-packed fuel.



Figure - 6 Pre-packed fuel at US Depot Q-331, Highbridge, Somerset © NARA 111 SC 333825

The intention was to move from relying on Jerrycans for cross-Channel movement of POL to using bulk transmission, particularly using the PLUTO (Pipeline Under The Ocean) project.

Since 1941 the British had been building an underground pipeline network that enabled fuel to be moved from the Wirral, Avonmouth, Hull and Thameshaven around the country, initially to the bomber airfields in the east of England, but later with spurs to the Isle of Wight and Kent to support the expected invasion. See Map 3.



Map 3 - The UK Strategic Pipeline Network June 1944 © www.ddaybuildup.info. Background mapping - Ordnance Survey OGL-3

The PLUTO pipeline from the Isle of Wight to Cherbourg (known as BAMBI) did not come into operation until mid September, and was shut down by mid October, since by then the front had moved so far north and east. The DUMBO (Dungeness to Boulogne) pipeline started in early October and was still in use for the first year or so of the post war occupation of Germany.

A magnificent technological project, PLUTO only carried 8% of Allied fuel needs between D-Day and VE Day so must be considered a logistic damp squib. Luckily there were back up plans such as TOMBOLA, which allowed small tankers to offload close to the beaches without a harbour, until ports such as Cherbourg and Antwerp could be brought into use. As in the case of the Mulberry harbours, hindsight allows us to say that resources might have been better invested in other projects. However, without the promise of safe and reliable passage of POL (and the men and material through Mulberry), the politicians would have been loath to risk an invasion.

AMMUNITION AND REINFORCEMENTS

The original intention was to hold most ammunition underground in depots such as Corsham, Chilmark, Llanberis and Fauld, but the huge quantities required by the Allies rapidly made ground dumping essential. Large areas of countryside were earmarked as depots, and stacks of ammunition, usually in corrugated iron shelters, were built alongside the roads and lanes. Each group of stacks could hold up to 100 tons of ammunition, and there had to be a quarter of a mile between groups. With up to 70,000 tons of ammunition in a depot this meant depots could easily cover 20 km by 20 km. Normal life went on in the area, although chemical munitions tended to have more restricted access. An example of an underground depot in Figure 7 is at Corsham Quarries, where 300,000 tons were held at the Central Ammunition Depot for the British and Canadian forces. Further details of the underground ammunition depots can be found in *Secret Underground Cities* by Neil McCamley[3].

Map 4 shows the extent of the Marston Magna depot after it was handed over to the US and expanded to a capacity of 45,000 tons:

3. Secret Underground Cities by Neil McCamley. Pub 1998 and 1999 by Leo Cooper. ISBN 0 85052 585 3..

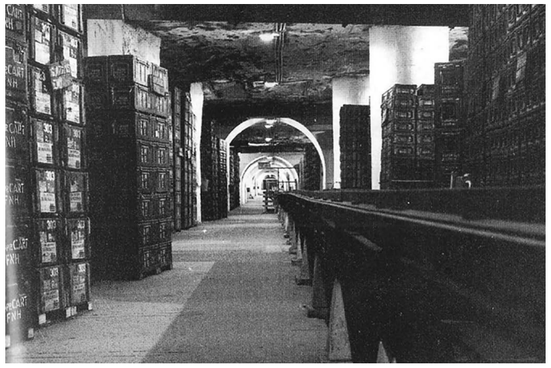
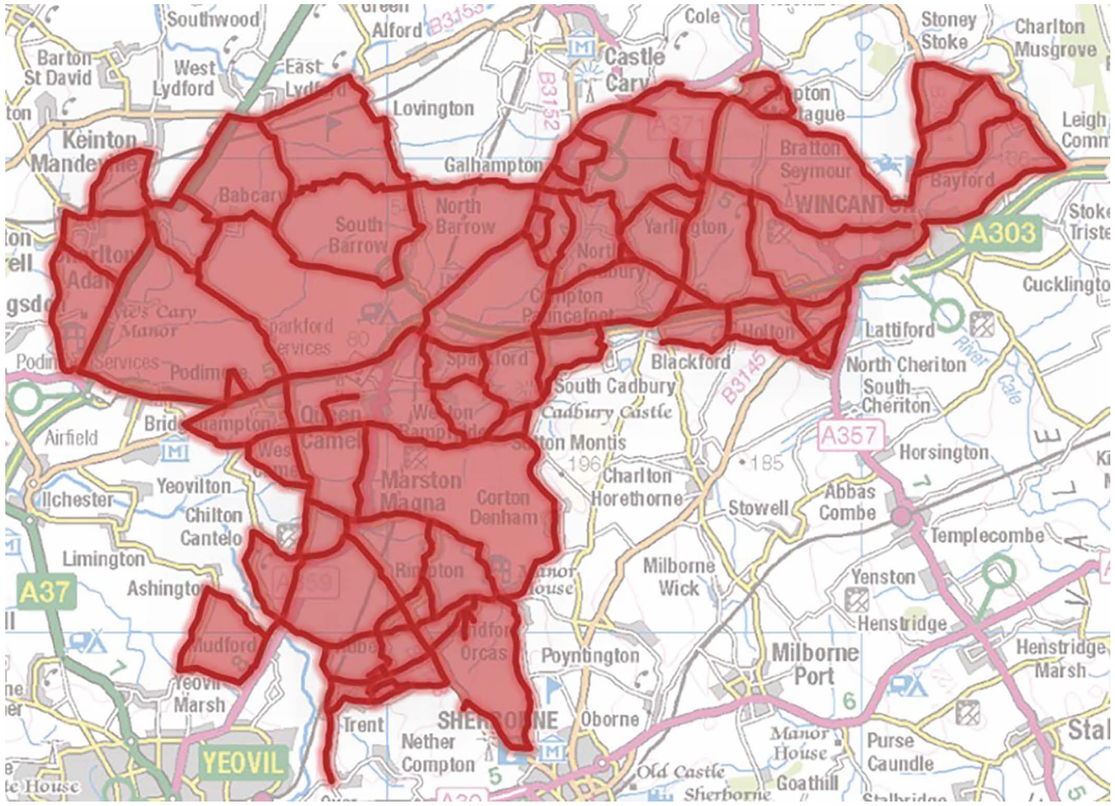


Figure 7 - 25 Pdr ammunition held underground at Corsham Quarry © Folly Books

The outload plan for the depots was carefully constructed, taking into account the loading capacity of the depot, the rail capacity to get the ammunition to a port, and the loading capacity at the port, as well as the expected rate of expenditure, by type, at the front. The initial logistic plan was capable of reasonably swift amendment as Normandy demand fluctuated.



Map 4 - Marston Magna US Depot O-680. From www.ddaybuildup.info. Background mapping Ordnance Survey OGL-3.

A similar process happened for reinforcements. Pre-planned drafts of infantrymen, signallers or gunners, for example, were sent across the Channel most days. If 21 AG said they were losing Gunners at a higher rate than expected then it was possible to adjust the plan within a day or so, changing the draft manpower from the many, cap-badge specific, Reinforcement Holding Units.

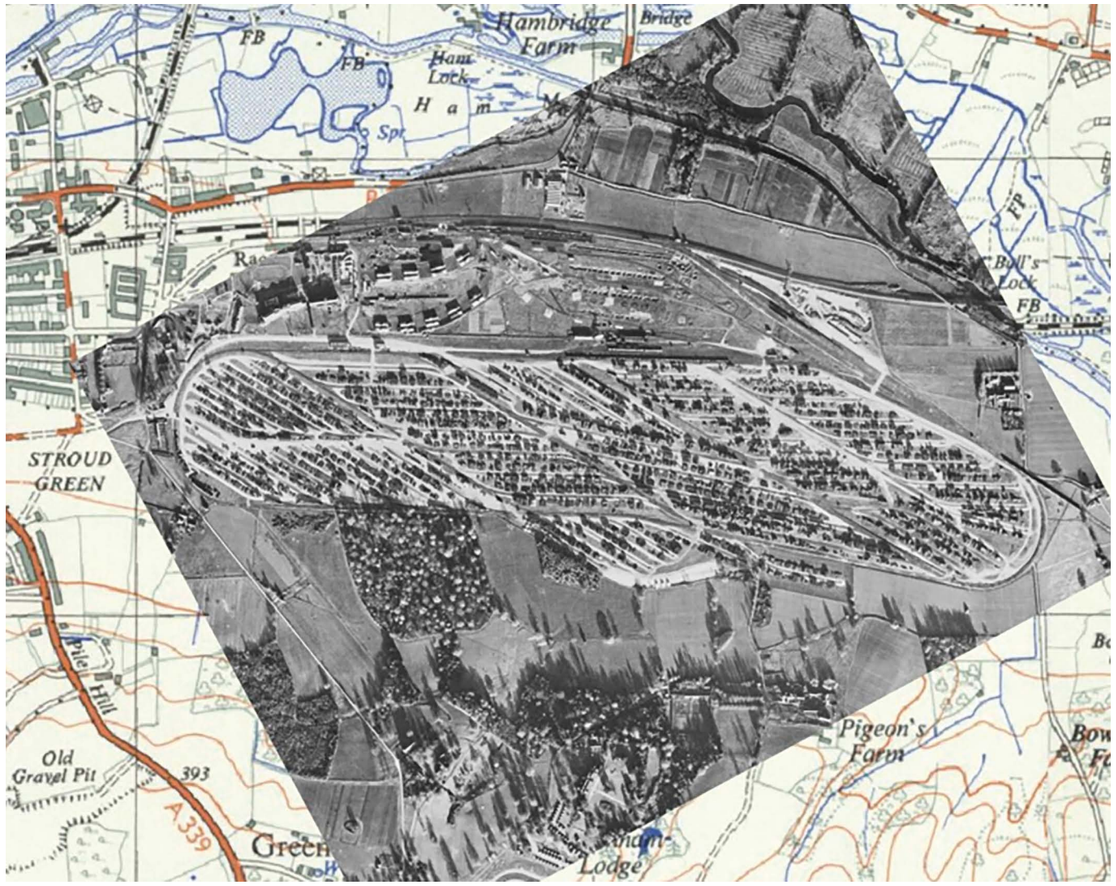
RATIONS AND WATER

I have not yet researched how the invasion force was fed and watered. Some interesting facts that I have uncovered so far include:

- The serving of 19.5 million daily rations between 1 April and 23 June 1944 in Areas A, B and C alone
- Tales of self-heating cans (a can with a thermal core) of which 300 thousand of soup and 87.5 thousand of cocoa were issued for D-Day, were highly regarded by the troops, and were virtually never seen again for the rest of the war
- Many areas, particularly those with extensive Marshalling camps, had insufficient civilian water infrastructure to cope with the influx of troops. US Forces included two dedicated Water Supply Battalions (3 companies in each) and 6 independent companies. Each Company could support a Corps. One company was deployed for the whole of the first half of 1944 in Brighton, presumably to assist British forces as there were few US units in the area. The others were mostly deployed to support the camps in South-West England and South Wales. I have yet to read all the British Sapper war diaries to find out which were providing water points for the remainder of the British/Canadian forces.

These, along with many other important issues, will be researched as time permits.

The Journal of the Royal Artillery
The Logistic Build-up to D-Day



Map 5 - USAAF aerial reconnaissance photograph of Newbury from NCAP. Overlaid onto 1940's Ordnance Survey map courtesy National Library of Scotland.

GENERAL STORES AND VEHICLES

To give some idea of the scale of the 'general' materiel the Allies amassed before the invasion, Map 6 is an aerial photograph of Newbury Racecourse when used as a US Depot (G-45). Note this was a sub-depot of Thatcham, and that was one of around 40 depots of the same size. The British and Canadians required around double that number, although they were also supporting operations in other theatres of war.

I don't yet know how many vehicles were produced for D-Day. What I do know is that 130,000 were reassembled in the UK. These were pre-packed in crates as it saved 40% of the transport capacity. There is a claim the Ashchurch Vehicle Depot at Tewkesbury completed one vehicle every three minutes.

In the late 1930s, Britain started building dual carriageway bypasses around many of its major towns. They were ideal for tank parks because one carriageway could be kept open for two-way civilian traffic, and the other carriageway could be used to store tanks along one lane leaving the fourth lane open for military access.

800 tanks, SP Guns and other armoured vehicles were parked on the Winchester by-pass and similarly at, for example, Crawley, Chertsey, Dorking and Oxford. Taken together, thousands of armoured vehicles were parked up, pre-waterproofed and ready to go. Around 100 stately homes and parks throughout the country were converted to Vehicle Reserve Depots. In each VRD between 2,000 and 5,000 soft skin vehicles were stored, ready for issue; very large numbers.

Multi-engine aircraft were flown across the Atlantic via Iceland or the Azores, while single-engine aircraft were partially stripped, water-proofed, and freighted across as deck-cargo. On arrival they were transported by trailer to airfields near the landing port (Speake, Filton and Prestwick for example) to be re-constituted, tested and flown to operational squadrons.

MEDICAL

A requirement for about 90,000 beds was predicted and the military hospitals could cope with 50,000 or so. The Americans built 40 new hospitals in under two years. Generally, the Americans and Canadians wanted to look after their soldiers in their own military hospitals. The British freed beds in civilian hospitals, earmarking around 21% of the civilian capacity for casualties.

Initially casualties were coming back from Normandy by sea in LSTs. By about D+8 or D+9 air evacuation (AirVac) started for very high priority casualties; brain and chest wounds. When you arrived at a port, if you were very seriously wounded, you would be put into a port hospital nearby. Otherwise, you would be put on a train and taken to an evacuation hospital. For Portsmouth, the port hospital would be Haslar, and the evacuation hospital would be Basingstoke or Winchester. Once you were stable enough to be on a train for 12 or 24 hours, you would then be shipped further north to Malvern or up to the Northwest to a general hospital where you would be kept until you were ready to be discharged or returned to duty.

SUPPLY OF MAPS

Very large numbers of maps were created and printed. The Benson project mapped the whole of France at 1:250,000 and 1:50,000, and the beach areas at 1:12,500. Maps were drawn from First World War maps updated with aerial photography and military intelligence.

For D-Day around 2.5 million maps were printed initially and distributed under very tight levels of security. Military Survey then printed around 380 million maps during the rest of the war, mostly from mobile presses installed in the backs of vehicles.

There were also Bogus maps which were real maps, but with false names. During training, you could for example plan to land at Oslo, go up the Ganges, turn left at Delhi and then assault Bombay from the Northwest. When the troops actually deployed, they found that they were landing at Ouistreham and going up the Caen canal and assaulting Caen. Troops could therefore do all their training on real terrain without knowing where they would be landing on D Day.

ROYAL ARTILLERY ASPECTS OF D DAY

There were specific logistic issues for the RA in the run up to D-Day. Many of those revolved around equipment; its availability, training and support. What is interesting from reading the reports of the time is how much pressure units and staffs were under to manage an equipment programme that was constantly changing, and against a deadline that everyone knew was coming but few knew in detail what it was.

SELF-PROPELLED ARTILLERY

The original plan was for two British/Canadian Divisions in the assault, with 12 Self-Propelled (SP) Regiments required for Assault and Follow-Up divisions. It was intended that these would all be equipped with M-7 Priest 105 mm guns. SP guns were required because planners expected to need to fire from the beach, so towed guns were unsuitable.



Figure 8 - Sexton 25 Pdr in Normandy 1944 © From Wikimedia

The appointment of General Montgomery as land force commander in January 1944 added another British Assault Division. There was a limited availability of M-7 (these were older guns that had limited remaining barrel life, and the US required all available new guns). HQ RA 2nd Army requested 90 reserve M-7 over and above those required for the operational regiments but could only obtain 46. There was a shortage of the alternative Sexton SP 25 Pdr because of a lack of Ram chassis and workshop capacity to convert them. The decision was made to reduce the number of SP regiments to 10, and to have a mix of 7 Priest and 3 Sexton regiments for D-Day. As the Priests were near the end of their life the expectation was that once inland the regiments equipped with them would re-equip (in the middle of a campaign!) with towed 25 Pdr, leaving the Sextons to support the Armoured formations. The fact that commanders were prepared to accept this, with the added complexity of dual ammunition types and 'in action' training, shows how tight matters were.

The next area of concern was the gap between the end of the run-in shoot (see below) and the landing of the SP guns 90 minutes later. To cover this, a temporary unit, the Royal Marines Armoured Support Group was formed, equipped with obsolete Centaur tanks. These had a 90 mm gun that could be used in both direct and indirect roles. Manned by a mixture of RM, RA and RAC manpower, they were unable to administer themselves for any length of time, as they were only planned to exist for a few days before they were withdrawn back to England and re-distributed. They had a mixed level of utility and success, but where they were used as planned, they provided enhanced firepower at a critical moment in the attack.

The last major area of concern for SP artillery was in Medium support. None of the available RA medium or heavy guns were suitable for the initial assault. Besides the general direction of 'tracks only' for the first 2 tides, the larger towed guns had difficulty in exiting landing craft. HQ RA 2nd Army requested the loan of a regiment's worth of SP 155 mm US guns (M-12). Such was the size of the US build-up in UK that they saved the problems of re-training a British unit by allocating the 987th Field Artillery Battalion, which was sub-allocated to 30 Corps for the first month of the campaign. Figure 9 shows them landing on Gold Beach on D+1, the only formed US unit that landed in the Eastern Zone:



987 FA Bn lands on Gold © IWM B5131

ANTI-AIRCRAFT

The direction of 'only tracks' on the first two tides caused equipment problems for Light Anti-Aircraft units. Normally these were equipped with 40 mm Bofors guns, towed by wheeled tractors. To cover this problem, a small number of obsolete Crusader tanks had their turrets removed and replaced with a 40 mm gun in an open-topped turret (Figure 10). These landed towing a second 40 mm to get the greatest number of guns available as quickly as possible.

There was still concern that there would not be enough low-level Anti-Aircraft cover available, so around 160 unused naval 20 mm Polsten cannon were transferred to the RA, and groups of 3 were



Figure 10 - Crusader III AA Mk 1. IWM H28356

mounted on Crusader chassis, each towing a further triple 20 mm mounting on a 40 mm carriage. A picture is at Figure 11. Note that this is different from turreted twin-Oerlikon on Crusader chassis which equipped the AA Troop in Armoured Brigades.



Figure 11 - Crusader with triple 20mm Polsten cannon. IWM B7738

In addition to these, further 40 mm LAA batteries were deployed onboard the Mulberry harbour caissons and blockships, and on 14 converted Thames barges to provide further seaward LAA defence. The crossings were, apparently, very rough for the crews.

ANTI-TANK

Over the build-up period, the RA Anti-Tank regiments were progressively up-gunned as heavier equipment became available. In the Assault Divisions one troop in each battery was issued with self-propelled 3-inch M-10 guns, leaving 2 troops with 4 towed 6 Pdr. With a month to go before D-Day a small number of 17 Pdr Achilles variant M-10 became available, enabling 12 to be issued to each Corps Anti Tank Regiment.

The 6 Pdr was enhanced by the very late arrival of discarding sabot ammunition which increased its penetration considerably. Because the Airborne Anti-Tank batteries only had towed 6 Pdr, the majority of the available APDS ammunition was allocated to them. The logistics of supplying such a mixture of anti-tank ammunition must have caused a lot of headaches.

AIR OBSERVATION POSTS

The Auster IV Air OP (Figure 12) was considered, certainly by the Germans, as a battle winning capability. HQ RA 2nd Army was concerned that these aircraft would not have secure airstrips to operate from and had been exercising in Scotland with the obsolete training carrier HMS Argus (Figure 13). 2nd Army badgered the Admiralty to release Argus to them for the Invasion. The Admiralty refused, but a very short time before the invasion they relented. At this point 2nd Army changed their minds, realising that the carrier couldn't manoeuvre in the available space, that it would be a major target when moored, and would not be able to control its heading; thus causing problems with the landing and take-off of the Austers, which would normally need to be facing into wind. Coupled with this was the inability of the Austers to find the carrier at night or in adverse weather. The carrier was offered to the US who similarly accepted and then rejected it.



Figure 12 - Taylorcraft Auster Air OP © Wikipedia



Figure 13 - HMS Argus © Wikimedia

To counter the loss of a carrier, reconnaissance parties of the Air OP squadrons were landed very early on D-Day, found suitable airstrips, and the aircraft were shepherded across the Channel by a Royal Navy Walrus and a Seafire escort.

It may be of interest that plans were well advanced to use helicopters and/or autogyros for Air OP work in June 1944, but production in the US was delayed so they were not available.

THE RUN-IN SHOOT

To help provide 'drenching' fire, the SP guns of the Assault divisions were programmed to fire a series of serials as the first wave of troops approached from 10,000 to 3,000 yards. Each regiment was embarked in 6 LCTs, 4 guns per LCT. The Regimental Adjutant

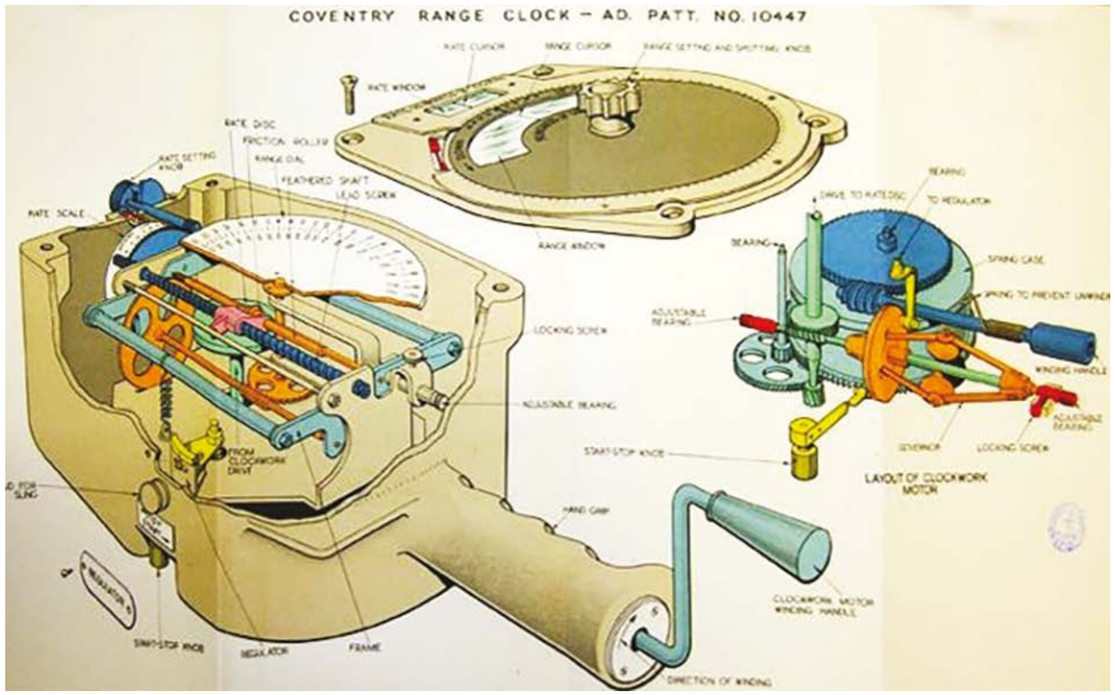


Figure 14 - The Coventry Range Clock from BR 1534. Handbook on Minor Fire Control Instruments

was in a motor launch just ahead of his regimental group, and when he determined the correct range to the shore using a variety of navigation aids, he ordered 'Start Clocks' to the Regiment. The Troop Gun Position Officer on each LCT started his Coventry Clock (Figure 14). This device took into account the speed of the LCT and enabled the elevation of the SP guns to be adjusted as the range decreased.

The guns fired at Rate 3 and had between 100 and 200 rounds per gun (records vary) piled on the deck beside them. The Troop GPO stood on the bridge next to the LCT Captain, and 20 seconds before firing warned him to steer directly towards the shore (rather than where the tide might be pushing the LCT). The layer would fire when the sight bubble was roughly level. It is not clear how effective the fire was on the German positions, but there are many reports from Allied troops of the uplifting morale effects of the artillery fire passing above them and the explosions on the shore as they prepared to land.

When the guns reached 3,000 yards, the ships turned outwards and re-joined the armada so that they landed around 90 minutes after the initial landing craft. One of the reasons they were all SP was to enable them to fire from the beach if required.

THE CONCLUSION

The Logistics and Build-Up to D-Day in the UK has not been well researched and documented. This project, which still has several years to run, seeks to provide an online resource for current and future historians. This has only been a tour d'horizon of some of the logistic issues and more can be found at www.ddaybuildup.info. Comments, corrections and more information are welcome – contact details on the website.

Abbreviations:

- IWM: Imperial War Museum (www.iwm.org.uk)
- NARA: US National Archives and Records Administration (www.archives.gov)
- CARL: Ike Skelton Combined Arms Research Library (https://carlcgsc.libguides.com/home)
- NCAP: National Collection of Aerial Photography (https://www.ncap.org)

The Journal of the Royal Artillery RA in the NZ Wars 1860 - 1865

The Royal Artillery in the New Zealand Wars 1860-1865

By Colonel J Michael Phillips BA MSocSc MA AMA



Michael Phillips studied military history under Professors Sir Michael Howard and Brian Bond. Commissioned into the Royal Artillery, his military service included 16 years in Germany: for his contribution to the understanding of foreign artillery he was awarded the Neville Walford Medal (only the 19th award since 1905). He subsequently served in Jordan as Assistant Defence Attaché, Turkey as Strategic Plans and Special Operations Officer, and Bangladesh as Defence Adviser. Retiring as a Colonel and with a Master's degree in Heritage Management, his second career was in museums and heritage. As Curator of the Museum of Artillery and Regimental Historical Secretary he achieved Designated Status for the Museum of Artillery in the Rotunda. His military museums experience stretches from Curatorial Adviser to the Bangladesh Liberation War Museum to Deputy Chairman of the Royal Marines Museum. A Deacon in the Catholic Church, he was awarded a MA (with Distinction) in Systematic and Philosophical Theology in June 2020. He is currently researching for a PhD on the German artillery of the late 19th Century. He is Programme Secretary for the Royal Artillery Historical Society.

INTRODUCTION

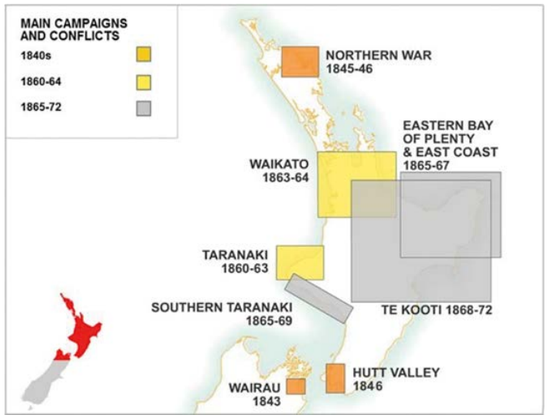
The story I am about to tell is not without controversy today. At the last count (2025) there are currently nine Bills relating to compensation for settlements after the 1863-1867 Wars currently going through the House of Representatives together with a bill for restoring Māori place names. The Principles of the Treaty of Waitangi Bill created such an uproar that twice Māori objectors tore the microphone from the hand of the Government Minister David Seymour on Waitangi Day 2025. The Bill was voted down on its Second Reading in April 2025. The omnibus Māori Purposes Bill which started life in December 2024 is currently awaiting its Second Reading.

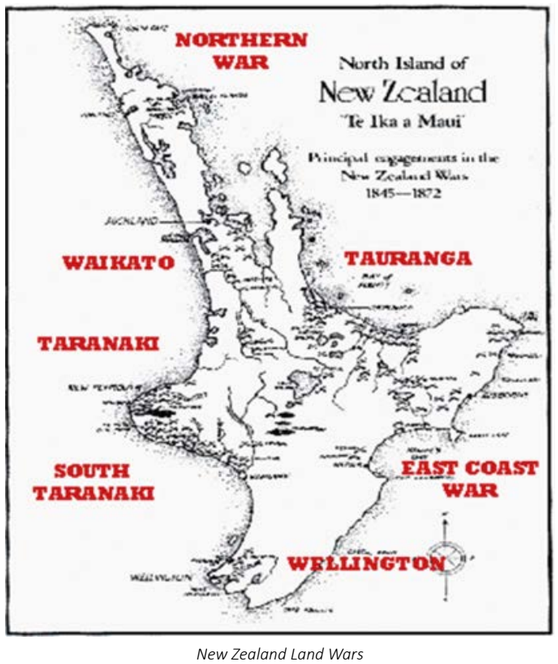
ORBAT

In 1859 the Royal Artillery was remodelled into brigades and batteries. 4 Brigade of ten batteries was a Field brigade and 12 Brigade was a Garrison brigade. All of 4 Brigade was stationed at Woolwich but 12 Brigade had its headquarters in Mauritius and batteries scattered over the world, including 3 Battery at Sydney, Australia. 4 Field Brigade was exceptional in that it had been wholly equipped with the new Armstrong Rifled Breech Loaders (RBL) and thus A and B batteries took them to the China Campaign in 1860, C Battery took them to New Zealand Campaign 1861-64, and D, E, F and G batteries took them to the Canada Confrontation in 1861. When I Battery was sent to New Zealand to reinforce C in 1864 they went with Armstrong RBL guns and also collected those swiftly sold by the Colony of Victoria to the Colony of New Zealand. Thus this one brigade had 100% of the operational experience of the Armstrong RBL.

OFF TO WAR

The several wars are shown in the illustration, but we are concerned only with the 1860-1864 War, after which British Troops were withdrawn and the New Zealand Government used locally raised forces.





New Zealand Land Wars

Following the 1841 Waitangi Treaty between the British settler establishment and a large number of tribal chiefs in North Island, the British considered that the Māori acknowledgment of British overall sovereignty was synonymous with governing the country. The Māori view was that Aotearoa (New Zealand) would continue to be governed internally as it always had been, but now under the benevolent overall dominion of the British who would, inter alia, control their own settlers. By 1860 the difference had become an uncrossable canyon and Māori retaliation for settler expansion was growing, despite certain tribes having come to the defence of the settlers in the earlier decade.

SECOND TARANAKI WAR

The so-called Kingite Movement, wherein the Māoris sought to resist the creeping British governmental, administrative and land purchase encroachments, brought matters to a head. In 1861 Governor Grey sent off an expedition under Major General Pratt to take on the Māoris on the West Coast around the New Plymouth settlement. The only artillery available was 3 Battery, 12 Brigade, a garrison battery under command of Captain H Strover, with a miscellaneous collection of smooth bore muzzle loaders (SBML): a 9 pdr, a 24 pdr howitzer and some mortars. An appeal was sent to England for substantial reinforcements.

On the 4 March 1861 C Battery 4th Brigade, Royal Artillery arrived in Auckland harbour from Woolwich, in the former convict ship but now troopship *Norwood*, after a passage of 99 days, having put down an on-board mutiny on the way. The Battery had experienced gunners who had fought in the Crimean War. The battery horses had not yet arrived from Sydney (New South Wales), the ordinary civilian cart-harness could not be fitted to the gun carriages; so, as the different parts of the carriages were brought on shore, they were packed on carts, taken up to the barracks, and mounted as soon as possible. In four days the six 12 pdr Armstrong RBLs belonging to the battery, and two 10 inch and two 8 inch mortars were ready for service.

On 12 March Capt Mercer and Lt. Pickard, with three 12 pdr Armstrong RBLs and four mortars, were ordered to Taranaki, a settlement on the west coast of New Zealand, where Maj Gen Pratt, in command of about 2,000 men and a few guns, was still engaged in operations against the indigenous Māoris. The battery deployed by sea. Off the mouth of the river in Taranaki the guns, stores, and so on, were lowered into surf boats, rowed ashore, and were taken up by hand or in carts to the camp which was about a mile distant. There were no horses. Bullock-poles were then fitted to the carriages. On 15 March, the guns and mortars, drawn by six bullocks each, started out for the battlefields. On arrival the mortars were handed over to 3 Battery 12 Brigade and used chiefly as harassing fire at night. Captain Strover being ranked as a second Captain, First Captain Mercer assumed command of the artillery. Here is the enemy.

The guns arrived at a redoubt occupied by the 14th Regiment about 800 yards from the Māori position. This position consisted of lines of rifle pits, communicating with one another, cut along the crests of' hills and ridges which extended in a semi-circular form of about a mile from right to left. Behind the position was a dense bush or forest. The artillery laboured under great disadvantages. They were firing up the side of a hill; they were ignorant of the shape of the Māori rifle-pits and could not tell what damage was done after each round. The pits were from 5 to 7 feet deep, about 3 feet wide, and provided with steps to fire from. During the three days that the Armstrongs were in action about 100 rounds were fired from them. The mortars were occasionally used, the small 5½ inch coehorns in an advanced parallel being particularly useful. Lieutenant MacNaghten RA was killed on the 17 March, and the following day Serjeant Christie was wounded near the same spot. An attempt was made to burn the bush and fern with carcasses, but it did not succeed. After the cessation of hostilities Mercer and other officers



Contemporary photographs of Māori re-enactment

carefully examined the native position. As doubts had been raised as to whether the shells burst when fired with percussion fuzes into earth, several were dug out, and it was found that in every case the shell had burst after entering from 6 to 8 feet, though the displacement of earth underground was very small owing to the small amount of powder in the burster.

TRAINING

In the beginning of May 1861, the three Armstrongs being ordered back to Auckland were again taken to pieces and conveyed in surfboats to HMS Fawn which took them to the Auckland harbour. The half-battery was disembarked, put together, and drawn to Auckland by the horses allocated to the battery which had just arrived from Sydney and which were being rapidly trained and broken in to draught. Most of the horses had been driven in from out-stations in New South Wales and were very wild. From this time until December 1862, the battery was employed in paving the stables and stable yard, in assisting to



Storming a stockaded pa

make the Great South Road into the interior of the country, and, as military train, in conveying provisions to the troops employed on the road.

Captain Mercer took advantage of the nearly two year break in the fighting to put the battery through a rigorous training programme. The first task was increasing familiarity with the Armstrong RBLs. Second, it was now clear that the major operational task would be not engaging the enemy in direct fire on a battlefield but reducing Māori pas to enable the infantry to storm or outflank them.

So after consulting with officers who had been engaged in the former New Zealand wars, Captain Mercer constructed sections of pas made according to the descriptions by officers who had seen the pas themselves. Two types were constructed; one similar to the pas constructed on North Island and the other similar to those that were used by the South Island natives in the war of 1860-61.



Examples of Māori pas

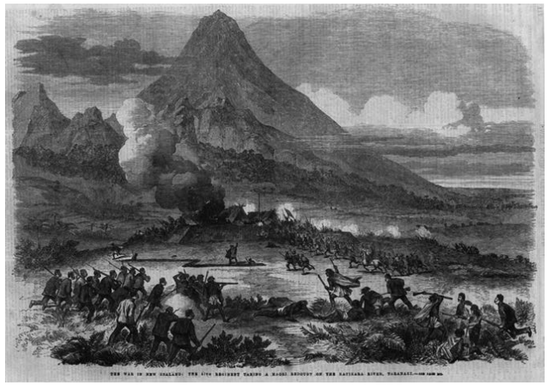
Engaging the Northern type of pa, the battery took up a position 900 yards from the stockade and after rather more than an hour's firing made a breach large enough to allow a section of men to go through abreast. The Southern, and more solidly constructed, variant of pa was more difficult to breach as the stockade gave way more to the shell on bursting; and the debris was most difficult to clear away. With both types of pa salvoes were found most effective; all the guns being laid on the same part of the stockade, until the posts which seemed to afford most support were destroyed. About two hours were employed in making a practicable breach, and percussion fuzes were chiefly used. All well and good, but the Māoris were ingenious engineers, and by 1863 had dispensed with stockades, digging deep trenches, erecting earth parapets, and interspersing the trenches with a maze of access routes and firing positions.

RESUMPTION OF TARANAKI WAR

In March 1863 Captain Mercer was ordered to mount 100 gunners and drivers of his battery and to drill them to act as

cavalry. Each man was armed with a regulation cavalry sword and either carbine (cavalry pattern) or a Dean and Adams revolver. Hostilities were expected to resume at Taranaki. Captain Mercer was ordered to take his cavalry squadron down there by sea; and also to take four Armstrong 12 pdr with harness in case they might be required. There were only four officers with the battery: Capt Mercer, Lt Pickard, Asst.-Surgeon Temple, and Vet.-Surgeon Anderson. The other officers had been previously promoted or exchanged and their reliefs had not yet arrived. Lt Rait arrived soon after the order was given for the formation of the cavalry squadron so he was given command of it. The mounted artillery were continually employed, as patrols during the night, and as orderlies during the day between New Plymouth and the various posts in the province of Taranaki.

By this time the Force Commander, Lieutenant General Sir Duncan Cameron, had assumed command. On the 4 June 1863, after a night march of 15 miles over difficult country, a force of about 600 men accompanied by three 12 pdr Armstrong guns proceeded to attack a position taken up by the natives on the left bank of the Katikara river near the sea coast.



Katikara



Kaitake

As soon as it was light, the three guns were brought into action about 800 yards from the Māori entrenchments, and covered the advance of the 57th Regiment with such success, that hardly a native could show himself to fire until the 57th were quite close to the pa, when the guns ceased firing and the entrenchments were stormed and taken. It was found that the principal entrenchment was made on an entirely new plan to any before constructed by the Māoris. No palisading was used, and the Māoris fired from a traversed ditch in front of the parapet, or over the parapet itself. The Māoris never acknowledged defeat and many relocated elsewhere.

About the end of June 1863, Captain Mercer received instructions to take up a position to shell some native entrenchments at Kaitake, on the lower ranges of Mount Egmont and about seven miles from New Plymouth. Four 12 pdr were accordingly brought into action, after much trouble and hard work, at about 2000 yards from Kaitake. About 50 rounds were fired with time and percussion fuzes. On 1st July, the Armstrongs were sent back to Auckland by sea in the same manner as before, and kept in readiness for an expedition against the Waikato tribes. The mounted artillery followed in a few days, and was reduced from 100 to 50 men. The gunners returned to their guns, and the drivers continued to act as cavalry, un der Lieutenant Rait.

THE WAITAKO WAR



The Waikato Campaign as seen from the start point
Source: New Zealand History on line

Lieutenant General Cameron used the River Waikato to advance, taking two sloops, the Pioneer and the Avon, to provide firepower. The Pioneer had two iron gun turrets mounted. At the beginning of July 1863, Cameron crossed the Mangatawhiri creek, the boundary between the European and native land in Waikato district. Two 12 pdr Armstrongs were marched to the creek, the carriages taken to pieces, put in flat-bottomed boats and landed on a headland near a bend of the creek, about 80 feet high and very steep. The guns were hauled up to the top of this, piecemeal, with tackle. Three round spars about 5 feet long and 3 inches in diameter were carried with each subdivision. One of these spars inserted in the muzzle, another in the breech, and the third lashed across the trunnions, enabled a few gunners to carry the guns wherever they were required, particularly when they had to be mounted inside redoubts, the entrances to which were generally so narrow that the guns had to be taken to pieces to be mounted inside. The gunners were now employed in assisting to build the redoubts and in otherwise fortifying this position on the Koheroa heights. Elements of 3 Battery 12 Brigade were included in the force. About the end of July a night march was made to some native settlements about 15 miles from Koheroa, where a large body of natives were reported to be located. Two 12 pdr Armstrongs, drawn by bullocks and carrying several fascines

and planks for bridge making purposes, accompanied the force. In several places the bullocks had to be taken out and the guns drawn by hand.

In the beginning of August 1863, another position having been taken up at Whanagamarino about six miles south of Koheroa, the gunners were employed in making the track to it practicable for artillery. When that was finished the two 12 pdr Armstrongs were brought up and put in position near a stockade which was built for the troops on a height overlooking the Whangamarino and Waikato rivers. Beyond the former river was a swamp, impassable at this time of the year. The natives had collected in large numbers at the other extremity of the swamp and had built entrenchments to oppose further progress of the troops. The distance from the guns to the native entrenchments at Meremere was about 2000 yards. Another 12 pdr Armstrong was sent to Whangamarino, and the three guns were placed in a small battery having platforms made of large trees sawn in half, with the convex surface sunk in the ground. Two Armstrong 40 pdrs were sent over from Sydney and were sent to Whangamarino to be mounted. The latter was a challenge of great labour and difficulty, as the guns had to be dragged piecemeal up to the top of the eminence on which the stockade was built, and then mounted.

The guns at Whangamarino then disrupted the Māoris at Meremere as much as possible. It was found that the best way to damage canoes at great distance was to fire shells with percussion fuzes to strike rather short of the canoes; the shell burst on striking the water, and the pieces ricocheted forward among the canoes. It was found also that by firing with time fuzes fixed to burst at the extreme range of the fuze, the pieces of the shells all went over 2,600 yards if the gun was laid with about half a degree more elevation than the actual range required. The shells thus fired burst high in the air, and the pieces being propelled forward and downward.



View from Whangamarino gun position



View from Meremere to gun position

Three gunboats were constructed in Auckland from cargo boats, they were plated with iron and capable of carrying a 12 pdr Armstrong and small mortar in each. Two iron-plated steamers were also constructed, and about the end of October 1863 a force was taken up the Waikato past the Meremere position in the steamers and gunboats, and landed at Takapou about five miles in rear of Meremere. Arrangements were then made for attacking the Māoris in the front and rear simultaneously. On the day before the attack was to take place, however, the natives were seen to be evacuating their positions in great numbers. They left behind them three or four old carronades or ship guns which they had fired with little or no effect at the steamers and gunboats as they passed their position.

RANGIRIRI



Rangiri looking South



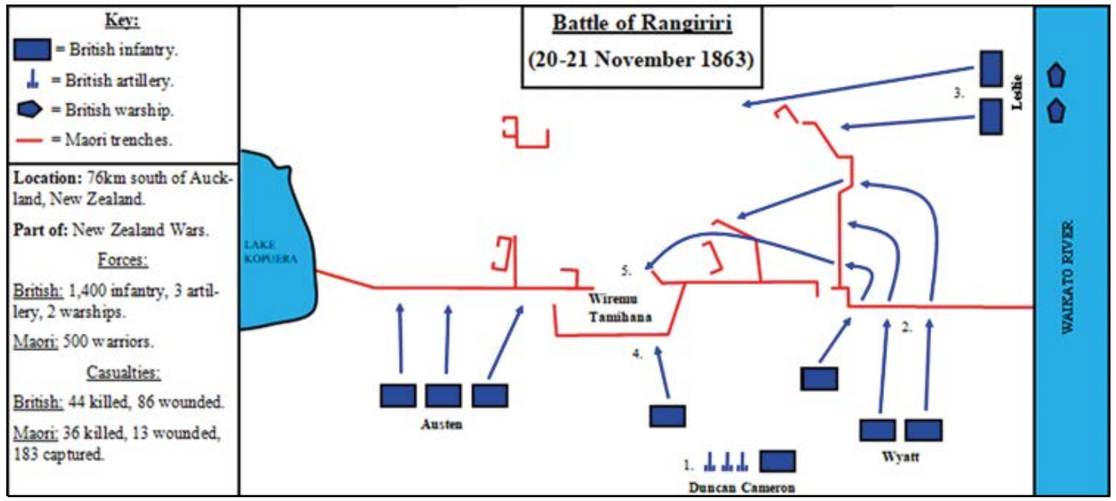
Rangiriri looking North

Work on the Rangiriri line had begun before the fall of Meremere with a 500 metre long double ditch dug between the Waikato River and Lake Kopuera. The front line ran east-west, comprising a long trench, behind which was a parapet of banked-up earth and another trench. The trenches were between 2.7 metre and 4.2 metre deep, with the parapet between 4.2 metre and 6.3 metre from the base of the trench. Another line of defences ran south from the main line at right angles to it, facing the river to protect the line from any river-borne force. In the centre of the main line lay a small but well protected north facing redoubt with several lines of concealed rifle pits at its southern side. A second series of outlying works was located on a spur to the south and east of the main defence line. The defences consisted solely of earthworks, with no palisading, while the redoubt, whose low profile meant it escaped detection by Cameron on river-borne reconnaissance missions on 30 October and 18 November, was deceptively strong. Lieutenant General Cameron commanded a force totalling more than 1,400 men. On the morning of 20 November he left Meremere to march up the bank of the Waikato River with about 850 men to make the frontal assault. See the plan below.



Rangiriri in 1864

His division comprised members of the 65th Regiment, 14th Regiment, 12th Regiment, Royal Artillery, Royal Navy and Royal Engineers. Eight bullocks drew each gun, and the weight they had to draw was much increased by eight scaling ladders and the extra ammunition box, besides several planks being carried on the guns. A second division of the 40th Regiment under Lieutenant Colonel Arthur Leslie with another 200 seamen and marines as a backup, was transported by barge further south



with the aim of gaining possession of a ridge 500 metres behind the main entrenchment and cutting off any escape. The British assault force assembled about 700 metres north of Rangiriri, with three Armstrong guns, including one six pdr and a 12 pdr. The storming party was equipped with revolvers, Enfield rifles with fixed bayonets and hand grenades. When half way to Rangiriri, thirty of the gunners were supplied with Dean and Adams revolvers, and Captain. Mercer was told that in case there was any serious difficulty in the projected storming of the Māori entrenchments at Rangiriri, his men would be called upon to assist in the assault.



Sketch of the Rangiriri pa with the gun position on the left with Cameron's division, and Leslie's boats bottom right

The defending Māori force comprised about 500 men, mostly armed with double barrelled shotguns and muskets. They were from Ngati Mahuta and other Waikato sub tribes. It appears Wiremu Tamihana was in the pā at the start of the battle but left after the major attacks. He was seen approaching Rangiriri after the surrender, with 400 Māori warriors who were en route to Rangiriri, but turned back after the Māori surrender the next day.

About 3pm on 20 November Cameron ordered the start of a two hour artillery bombardment, with additional fire coming from gunboats Curacoa and Pioneer. At 4.45pm, Leslie's division had still not landed because of strong flood currents and adverse winds but Cameron, concerned about the onset of darkness and the risk that his enemy would again escape, decided to launch his southward frontal attack. It began with two separate groups: 320 men of the 65th Foot under Lieutenant Colonel Wyatt, with Royal Engineers on Cameron's right (the river side) and 290 men of the 12th and 14th Regiments of Foot under Lieutenant Colonel Austen extending the line to the British left. The object




Contemporary reconstruction of part of the Rangiriri pa

of the artillery fire was to engage the attention of the natives while the steamers, which had arrived opposite Rangiriri about the same time as the force under General Cameron, proceeded to disembark troops in rear of the works. The disembarkation took a considerable time. The natives did not show at all, but continued firing as long as the guns did. About an hour after the first assault had been made, a message was brought from General Cameron to Captain Mercer asking for some shells to be sent down to be thrown by hand among the Māoris. Captain Mercer sent back an answer to say that Armstrong shells were unsuited for the purpose and he had no common shell.

British casualties began to mount as they stormed the Māori positions across the 600 metre gap under heavy fire. Two colonels, Austen and Phelps, were both killed as the 12th and 14th headed for the centre of the 500 metre long line, unaware it was the location of the redoubt, its strongest section. The repulse of the assault left about 40 British dead or wounded. Men of the 65th Regiment, meanwhile, were faltering under the withering fire, taking cover before being stirred to resume their advance. They reached the trenches at the river side of the fortification, bridged them with planks and managed to penetrate the Māori line, possibly because much of the garrison had moved to the central redoubt to fend off the attack. About 30 Māori were killed and the surviving defenders abandoned the river-facing trenches and began fleeing south. Cameron ordered the remaining company of reserves to join the 65th Regiment in attacking the central redoubt from the west and south, but the 500 strong force began to come under the same heavy fire from the redoubt and adjacent works that had stopped the 12th and 14th Regiments. One group of British found themselves cut off at the rear entrance to the redoubt.

Leslie's men from the 40th Regiment, having finally landed, were by then arriving on the scene from the south and pressuring the Māori, who were withdrawing to the central redoubt. Cameron ordered a detachment of thirty six Royal Artillery, armed with revolvers and swords, to storm the central redoubt, resulting in more deaths, including Captain Mercer. BSM Hamilton and other battery NCOs were subsequently commended by the Force commander for standing on the top of the parapet to fire their revolvers. A second wave, this time of Royal Navy men armed with rifles and cutlasses, was also cut down, and further assaults were made with hand grenades thrown into the redoubt by seamen. The further losses lifted Cameron's casualties to about 110.

As night fell, the remaining 400 Māori defenders maintained a strong hold on the centre and eastern end of the line. The British, dispirited by the scale of losses, spent the night bivouacked on the wet ground, ready to renew the combat in the morning.

Sgt McKay and Gnr Green obtained some 5½ inch common shell from the gunboats, converted them into ad hoc grenades using Peninsular War fuzes, which had to be lit before throwing. During the night hand grenades were hurled into the redoubt. An attempt to mine the parapet was unsuccessful, so the soldiers continued to undermine it with picks and shovels, while the defenders sang and chanted and returned occasional gunfire. More members of the garrison evacuated during the night, including chief Wiremu Tamihana and possibly King Tāwhiao.

Around 5am the Rangiriri garrison raised a white flag, expecting to talk terms with Cameron. British soldiers advanced on the redoubt and entered, shaking hands with their combatants before surprising the Māori by demanding they surrender all their arms and taking them prisoner. They were transported by boat to the Great South Road, then marched to Auckland.

Although it has been claimed the garrison unconditionally surrendered because they had run out of ammunition, the bulk of evidence shows they still had a plentiful supply in the morning. It is conceivable that the Māori would have been forced to surrender within a short time and the early surrender saved lives on both sides. A reasonable conclusion is that the capture of 183 Māori at Rangiriri was an act of duplicity on the part of the British, as both the British and (since 1860) the Māoris, were perfectly well aware that showing a white flag did not necessarily mean surrender. While Cameron's action was not particularly honourable, it was understandable. He had had eight assaults on the central redoubt bloodily repulsed, and it was not surprising that he should seize his chance rather than risk more of his men, particularly in the case of what he perceived as a redoubtable and determined enemy. The Māoris might conceivably have eventually decided to surrender unconditionally anyway, but they might also have repelled further assaults and escaped



Rangiriri pa after the battle

across the lake. They may have also been gaining time waiting for reinforcements who were almost on the scene. About 35 of the Māori force were killed, along with six women and children. Probably an equal number of injured were evacuated by canoe across Lake Waikare. With the capture of more than 180 warriors, the battle became the costliest Māori defeat in the Waikato wars. The British dead were mainly buried in a small graveyard in the Rangiriri township, which is open to the public.

Two Victoria Crosses were awarded after the battle; to Assistant Surgeon William Temple for disregarding his own welfare in attending to the wounded during the assaults at the end of the day and Lieutenant Arthur Pickard for showing courage in running through enemy fire to reach Cameron and seek help. Captain Mercer having died from the effect of his wound, the command of the artillery devolved on Brevet-Major Strover, of the 12th Brigade RA.

The 183 prisoners were taken by boat to the Great South Road, then marched to Auckland. They were initially held on an old coal hulk in Waitematā Harbour before being moved to Kawau Island, north of Auckland. On the night of 11 September 1864 the 200 prisoners on Kawau seized all boats on the island and paddled to the mainland. They were eventually permitted by the government to make their way back to the Waikato.

Several Waikato chiefs including Te Wharepu expressed a willingness to negotiate. It was arranged that Governor Grey would meet them at the Kingite capital of Ngaruwahia. Grey never



The Author at Rangiriri Cemetry in January 2025

turned up, and on 8 December the Kingite capital at Ngaruwahia was abandoned and then taken by Cameron's troops. But Māori were still opposed to the British demands of submitting to the Queen and surrendering all arms and lands, and began building further defences south of Ngaruwahia. The guns remained at Rangiriri about six weeks after this time, and the men were employed in assisting the engineers to make redoubts, landing places and so on, and afterwards in making a road through a swamp on the right bank of the Waikato. About the end of December four small mortars and another 12 pdr Armstrong gun having arrived at Rangiriri, they and the two 12 pdr were taken to pieces, and embarked on board flat-bottomed boats and later taken up in a steamer to Ngaruawahia.

The other three 12 pdr Armstrongs of the battery were ordered into store in October 1863 and were afterwards issued to the Royal Navy for service in the gunboats. At Ngaruawahia the gunners were employed in building bridges over creeks, and in foraging parties. The mounted artillery under Lieutenant Rait Rait were also sent to Ngaruawahia, where they were continually employed in reconnoitring, foraging, and as orderlies. About 24 January 1864, the guns being required up the Waipa river, and the track being impracticable for artillery the guns and mortars were again taken to pieces and were sent up the river in a steamer. On the 27 January, the three 12 pdr, drawn by six bullocks each, accompanied an expedition which was ordered to Te Rore. The bullock drivers were not very good. There was, of course, no transport for men's personal kit; every man carried his own blanket,carbine and change of clothes. At about 6 pm on the second day's march, the guns arrived at a creek about 30 feet wide, with soft low banks. A large canoe was procured, and the gunners, assisted by a detachment of sailors, took the guns to pieces in the dark, and, the canoe being placed as a bridge, the guns were taken across piecemeal, put together on the opposite side, and taken on about three miles further to the camp.

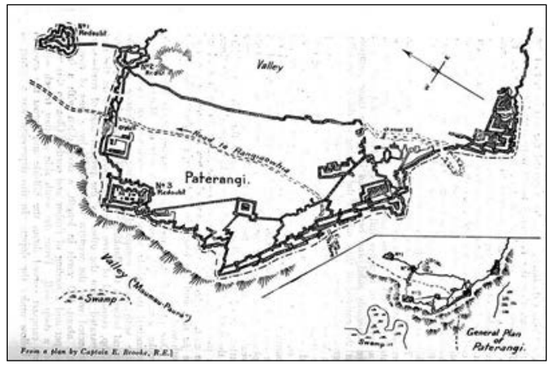
ARTILLERY REINFORCEMENT

Reinforcements were on the way. I Battery 4th Brigade, RA, equipped with six of the latest pattern 12 pdr Armstrongs under Lieutenant Colonel G Barstow, arrived on 27 January 1864. Six 6 pdr Armstrong's also arrived at this time and were consigned to the Principal Military Storekeeper in Auckland. The artillery component was:

- Two batteries of 12 pdr RBLs
- Six RBL 6 pdr guns
- Two 12 inch mortars
- Two 8 inch mortars
- Two 5 1/2 inch mortars
- Two 4 2/5 inch mortars
- Two 32 pdr howitzers
- Two 24 pdr howitzers

It was, by anyone's standard, a nightmare for Battery Sergeant Majors to supply ammunition to the guns.

On the 27 January 1864, Lieutenant Colonel Williams RA arrived to take command of the Royal Artillery in New Zealand. About four miles from Te Rore, inland from the Waipa. river, was a strong Māori position called Paterangi. This was an immensely strong Maori position, far exceeding anything encountered before.



Paterangi pa



The attack on Rangiaowhia

A post was established about 1,500 yards from this pa, and two 12 pdr were sent there under Captain Betty (who was now Battery commander of C Battery) and Lieutenant Carre. The guns were occasionally fired and with good effect. Colonel Barstow with half of I Battery was ordered from Auckland to Ngaruawahia, in charge of three 6 pdr, and three 12 pdr Armstrong RBLs. Cameron assessed that the complexity of the Paterangi position would result in unacceptable casualties and therefore decided to

outflank it. A night march was made by elements of 50th Regiment accompanied by two 6 pdrs of I Battery. They caught unawares the Māori resupply point, largely manned by non-combatants, and assaulted it. The defenders were defeated, buildings set on fire, and those fleeing were shot while escaping or ridden down by cavalry. It was, and still is, considered by the Māoris as a treacherous attack on non-combatants, having understood that non-combatants should be moved away from the scene of operations. From Cameron's view it was a legitimate target, being a supply point and having four defended positions surrounding it.

The immediate result was that the Māoris abandoned the Paterangi position to move to Rangiaowhia and took up a temporary position at Hairini where they were defeated in almost open ground. Cameron had achieved his object. The artillery part was the firing of the 6 pdrs, which set the buildings on fire, and the pursuit of those fleeing by Rait's cavalry and other locally raised cavalry.

TARANAKI DIVERSION

Three new pattern 12 pdr Armstrongs of I Battery were sent, about the beginning of March 1864, to Taranaki, under Captain Martin RA. Lieutenant Larcom was severely wounded, at the time in command of a 24 pdr howitzer which was short of men. The 12 pdr Armstrongs were used with good effect on several occasions while accompanying expeditions into the country.

ORAKAU AND THE CONCLUSION OF THE WAIKATO CAMPAIGN

The Waikato Campaign ended in April 1864 with the final battle at Orakau. Howitzers or mortars would have been most useful at Orakau, but they were all at Pukerimu, and the intervening country was impracticable for artillery. 100 hand grenades were put in boxes, and sent on pack ponies to Orakau, and were very serviceable. The Māori position at Orakau was not well chosen and nor was there agreement among the chiefs where battle should be undertaken. Cameron detailed engineers to sap (covered trench) towards the pa. Sergeant Angus McKay, of C Battery, whose action at Rangiriri has already been mentioned, threw the hand grenades at great personal risk to himself from the sap into the pa, where they were effective. When the sap was within a few yards of the ditch, the Māoris suddenly rushed out of the pa and breaking through a part of the circle of troops which was less strongly guarded than the rest, they made their way, though with the loss of about half their number, to the surrounding swamps, creeks and ravines. They were followed by the mounted corps of artillery drivers, under Lieutenant Rait, and also by the Colonial cavalry, but the difficulties of the country for cavalry operations prevented much damage being done. It spelled the end of the Waikato part of the campaign.

TAURANGA CAMPAIGN

As fast as the guns arrived in Auckland from the Waikato district, they were sent down to Tauranga by sea, manned by detachments from each of the three batteries in New Zealand. On the 27 April a pa was reconnoitred, which had been built by the Māoris about three miles from the camp at Tauranga and, being placed on the boundary between the European and native land and where the Māoris formerly had placed a toll gate, it was known by the name of the Gate pa.

As it was feared that the natives would abandon their position if they saw the batteries being made, these latter were constructed during the night of the 28th and morning of the 29th April, while the 68th Regiment was sent round by a swamp on the right flank of the Pa, to surround the position in the rear, and prevent all escape in that direction. In the attack on the Pa on 29 April was prepared with the most intense artillery preparatory bombardment of the war. When the artillery barrage was lifted the infantry assaulted. The guns were:

- Two 8 inch mortars in a breastwork 800 yards from the pa.
- Two 24 pdr howitzers in a breastwork 600 yards from the pa.
- Six small mortars behind a parapet about 300 yards from the pa.

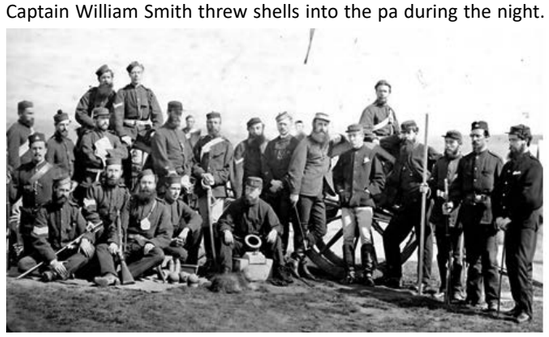
Two 6 pdr Armstrongs were kept ready to be taken to any place they might be afterwards required. There was also a heavy battery of Armstrongs one 110 pdr and two 40 pdrs manned by the Royal Navy. This battery was about 700 yards from the pa. The batteries opened fire soon after daybreak, but the natives hardly returned a shot.

Very little had been seen or heard of the natives during the day, and it was not until the storming party, composed of equal numbers of the 43rd Regiment and Royal Navy, had arrived within a few yards of the breach, that the Māoris opened a heavy fire. The men in the assaulting party could not see the Māoris whose fire was destroying their officers and leading files. Having initially reached the interior of the Pa they panicked and fled. Assistant Surgeon William George Nicholas Manley of I Battery



Gate pa as observed by Lt Gen Cameron

accompanied the storming party and rendered assistance on the spot to the wounded. He was subsequently awarded the Victora Cross, the third to be awarded to the Royal Artillery for this campaign. The storming party was convincingly repulsed. After dusk a breastwork was thrown up about 100 yards from the pa, and two small mortars taken into it, which, under direction of Captain William Smith threw shells into the pa during the night.



Lt Gen Cameron after Gate Pa

At daybreak on the morning of the 30 April it was found that the natives had evacuated the pa during the night, leaving several wounded behind them. On examining the pa afterwards it was found that the breach was perfectly practicable, but the natives had fired from underground pits almost completely covered by roofs of flax and earth, They had also fired from traversed pits in front of the parapet, between the latter and the palisading.

Several expeditions were afterwards made to different native settlements in the Tauranga district, and they were generally accompanied by a 6 pdr Armstrong, drawn by one or two horses. The last occasion on which artillery was used in action during the campaign was at the engagement at Te Ranga, a few miles inland from Tauranga and the Gate Pa. One 6 pdr Armstrong was used with great effect under Lieutenant Grubb RA, manned by a detachment of I Battery, 4 Brigade.

In 1866 all Royal Artillery (C and I Batteries 4 Brigade and an expanded battery of 12 Brigade) were withdrawn and left New Zealand. Some guns were left in Auckland, but the personnel returned to England.

WHAT BECAME OF THE THREE VCs?



Lt Pickard VC *Asst Surgeon Temple VC* *Asst Surgeon Manley*

Lt Alfred Frederick Pickard was only 19 at the time of Rangiriri. In 1877 the Queen appointed him a Groom-in-Waiting and he was promoted lieutenant colonel in 1878. In 1878 he was appointed Assistant Keeper of the Queen's Privy Purse and assistant Private Secretary to the Queen. He was appointed a Companion of the Bath. He died in 1880 and is buried in Cannes. Born in Forest Hill, Worksop, Nottinghamshire, a memorial to him was raised in a memorial to him was raised in Worksop Memorial Gardens, and the entire Battery attended the ceremony, as did I. Worksop Memorial Gardens, and the entire Battery attended the ceremony, as did I.

Assistant Surgeon William Temple was 30 at the time of Rangiriri. He served in India as a lieutenant colonel and secretary to the surgeon-general of the Indian Medical service. He became a brigade surgeon and later Honorary Surgeon to the Viceroy of India. He died in 1919 and is buried in the Highland Road Cemetery in Portsmouth.

Assistant Surgeon William George Nicholas Manley had served with I Battery in Crimea and accompanied it to New Zealand. He was recommended for the Victoria Cross by the naval commander for his saving of the wounded at the assault on Gate Pa. He served with the British Ambulance Corps in the Franco-German War of 1870-71 and awarded the Iron Cross. He was awarded the honorary rank of Surgeon General and retired a Companion of the Bath. He is buried in Cheltenham. Awarded 18 medals by several countries, in New Zealand he was awarded the Royal Humane Society bronze medal for rescuing a drowning man.

Captain Mercer is commemorated in that the township of Mercer was named after him. One of the turrets of the HMS



Captain Mercer

Pioneer was placed on the green in front of the new Mercer Museum, and was declared a War Memorial. The soldier on the top is from the Great War.



The Mercer Memorial

In 1934 the former C Battery 4 Brigade RA was awarded the Honour Title New Zealand. Here is summary of the achievements of this single battery.

- Furthest ever Royal Artillery operational deployment, from Woolwich to Auckland.
- First operational use of RBL Armstrong guns.
- First artillery experience of bombarding deep trenches.
- Simultaneous employment as cavalry, infantry, and artillery.
- Lead unit of artillery in New Zealand.
- Built the road for the advance.
- Provided communications for the Force Commander.
- Picketed the Force logistics route.
- Provided standby infantry assault group.
- Awarded two Victoria Crosses.
- Only battery to have a township named after a BC.
- Only battery to have a country name as an Honour Title

THE UNITS INVOLVED

C Battery 4 Brigade is now 94 (New Zealand) Battery.

I Battery, 4 Brigade became 229 Battery and was placed in suspended animation and was later disbanded in 1962.

3 Battery 12 Brigade.

Illustrations. 19th Century photographs and engravings are out of copyright. Contemporary photographs were taken by the author in 2025. The route of the Waikato Campaign is taken from open-source New Zealand On-Line.

Major General William Mudge and the Ordnance Survey

By Colonel Nick Quarrelle



Colonel Nick Quarrrelle was commissioned in 1969 and served in BAOR, UK and Hong Kong with 27 and 20 Regiments before being posted to 16 Regiment where he was Troop Commander, BK and Adjutant. After attending Division III of the Army Staff Course at Camberley in 1982 he spent the next two years in the Ministry of Defence in the Directorate of Army Staff Duties before joining 12 Regiment in Germany to command T Battery Royal Artillery (Shah Sujah's Troop) as the first Battery equipped with Tracked Rapier.
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His final appointment was Colonel Individual Training Policy at Upavon before leaving the Army in 2000. Subsequently he became Regimental Secretary and Staff Officer to the Master Gunner St James's Park on the move of the Regimental Headquarters to Larkhill in December 2005, from which he retired in 2015.
He is a keen reader of military history and a volunteer in the library and archive at the RA Museum.

If you look at the Ordnance Survey 1:25,000 map sheet covering Salisbury and the surrounding area[1], about 300 metres south of the Beehive Roundabout on the A345 you will find the annotation 'Gun End of Base'. If you visit the area in the winter when crops are dormant you will find, on the edge of the field, what is clearly the muzzle of a cannon which has been buried vertically in the ground. There is a monument close by and although the inscription is not easy to read, it states: 'In 1794 a line from this site to Beacon Hill was measured by Capt W Mudge of the Ordnance Survey as a base for the triangulation of Great Britian.'

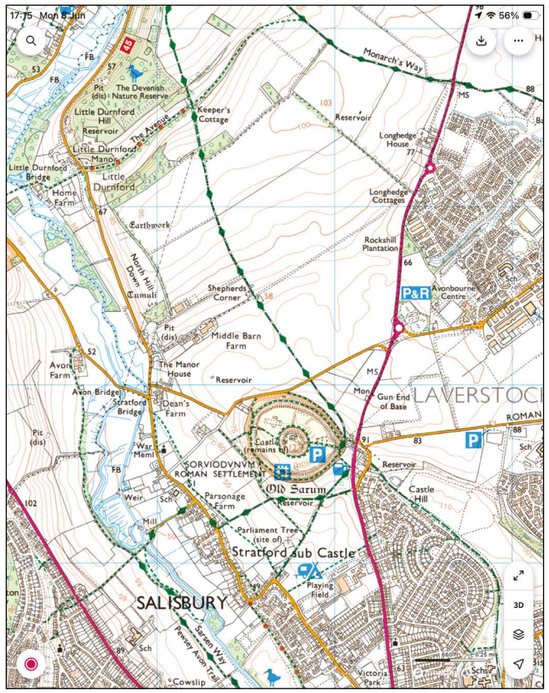
The Ordnance Survey had been established in 1791 to meet the military requirement of producing maps of Scotland following the Jacobite uprising of 1745. Much of that work had been led by William Roy, a Scottish surveyor and antiquarian, who held no military rank at the outset but was to become a Major General in the Royal Engineers. Although he died on 1 July 1790, William Roy is credited with being the founder of the Ordnance Survey

William Mudge was born in Plymouth on 1st December 1762 the son of Doctor John Mudge and his second wife Mary (née Bulteel). The family were high achievers numbering Joshua Reynolds and Samuel Johnson (who was William's godfather) among their acquaintances. His uncle Thomas Mudge was a renowned horologist and member of the Board of Longitude. Mudge entered the Royal Military Academy, Woolwich on 17th April 1777 and was commissioned into the Royal Artillery on 9th July 1779[2] . He was sent to South Carolina to join the army under Charles Cornwallis, 1st Marquess Cornwallis to fight in the American War of Independence.



Gun End of Base - The Cannon marking the Southern end of Mudge's Salisbury Baseline

On his return to England in 1783 at the age of 21 he was sent for training in the Drawing Room of the Tower of London amongst the Board of Ordnance's surveyors while studying higher mathematics under Charles Hutton FRS (1737-1823), who had been Professor of Mathematics at RMA Woolwich. Hutton was



Salisbury Baseline - Southern End, Old Sarum



Mudge's Monument situated on the Eastern Side of A345 near Old Sarum

an eminent mathematician and a fellow of the Royal Society who had been asked to perform the calculations necessary to determine the mass and density of the earth from the results of the Schiehallion Experiment, a set of observations of the gravitational pull of that mountain in Perthshire undertaken by the Astronomer Royal, Nevill Maskelyne in 1774. In 1791, fear of French invasion of England had highlighted the urgent requirement for accurate mapping and the need for a survey of the country starting with the south of England. The Master General of the Ordnance, Charles Lennox, 3rd Duke of Richmond (1735-1806) sought advice from Charles Hutton on successors to William Roy as Directors of the Ordnance Survey and he recommended Major Edward Williams[3] and Lieutenant William Mudge, both Gunner officers, to be co-directors. Edward Williams does not play a major part in this story since, 'Williams readily adopted a role as the Ordnance Survey's figurehead, and he largely eschewed its practical day-to-day activities. This substitution of celebrity for surveying did not endear him to his closest colleagues. The Ordnance Survey's first assistant, Isaac Dalby, described how Williams "never made an observation or calculation" and "proved a deadweight in the undertaking by frequently retarding its progress, and the only time he benefited the service, was when he took his departure to the next world".[4]

Mudge began work on the Ordnance Trigonometrical Survey on 23 July 1791, supported by William Dalby and eleven soldiers from the Royal Artillery. The process of trigonometrical survey relied on the establishment of a baseline requiring rigorous and painstaking measurement using a 100-foot steel measuring chain. A second chain was kept unused as a reference against which any stretching of the first would be

1. Ordnance Survey 1:25,000 scale, Explorer 130, Salisbury and Stonehenge, GR ST 142329.

2. Kane's List No:584.
3. Kane's List No:268.
4. Map of a Nation, A Biography of the Ordnance Survey by Rachel Hewitt (London, Granta Publications, 2010) P.115.



Mudge Portrait

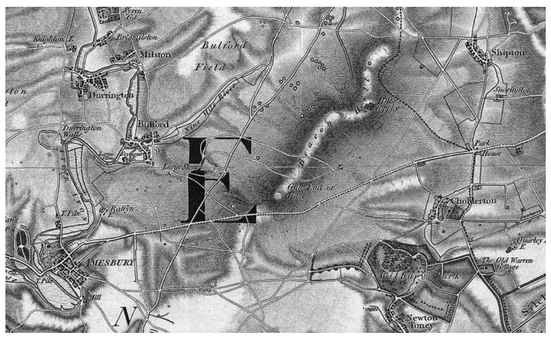
detected. The chain was constrained in a perfectly straight line at a tension of 56 pounds. Since the temperature varied each day possibly resulting in thermal expansion of the chain, each measurement was corrected to the length that a chain would take at 62°F (17°C). Finally, the length of the base was reduced to its projection at sea level. Mudge also needed to determine the relative heights of the baseline points which he did by a process known as levelling, using a levelling rod (marked with measurements of length) to determine height difference when viewed through the telescope on the theodolite.



Ordnance Survey Benchmark at St Andrew's Church, Wootton Rivers, Wiltshire

Locations where altitude above Ordnance Datum had been measured were marked by carved datum points or benchmarks, these consist of a broad arrow with a horizontal line above which was chiselled out to allow an angle iron to be placed as a level base for the levelling rod. There are over 500,000 benchmarks in the United Kingdom.[5] From each end of the baseline, angles were measured with a theodolite to a distant object the location of which was known. By trigonometry the distance between those two points, known as Trig Points, could then be calculated with great accuracy. The survey started by reviewing and checking the accuracy of the starting point on Hounslow Heath for William Roy's earlier survey, close to what is now the site of Heathrow Airport. From there the survey moved south through Sussex to the south coast. Observations were taken in the morning and evening when the air was clear, with Mudge himself recording in a small bound notebook the angles of his horizontal and vertical observations, the exact time and the temperature of the air. The surveying teams spent the late spring, summer and early autumn in the field, the remaining months being spent at the Tower of London processing the calculations.

In 1794 Mudge, who had been promoted to the rank of Captain-Lieutenant on 17th January 1793, began the survey from the Salisbury baseline which he intended to use to check the accuracy of Roy's original Hounslow baseline. From the spot close to Old Sarum, they measured the precise distance, 36,574 feet, to Beacon Hill,[6] east of Amesbury. With the baseline established, Mudge took bearings from each end to the Four Mile Stone[7] on the Devizes Road in Salisbury and, knowing the distance of the base could triangulate and find the position of that location. The work was completed in around seven weeks and difference between the distance calculated by triangulation and that established by measurement was less than one inch, over a length of more than seven miles. From the baseline the process could be repeated in due course mapping the whole of the entire United Kingdom.



Gun end of North base

Mudge had use of an updated version of the world's largest theodolite which had been made by a renowned instrument maker in London, Jesse Ramsden FRS (1735-1800). Ramsden was a brilliant craftsman, but a perfectionist who continually refined his designs when the slightest shortcomings were revealed. This led to delays in the completion of the order and significant increases in costs, much to the frustration of his clients. Ramsden's great theodolite which had been built

5. The OS Benchmark archive is at https://www.ordnancesurvey.co.uk/geodesy-positioning/legacy-data/benchmark-search https://www.ordnancesurvey.co.uk/geodesy-positioning/legacy-data/benchmark-search.

6. The cannon which was buried at the end of the baseline on Beacon Hill has now been hidden beneath the familiar trig point pillar which was subsequently erected on the site.

7. The milestone, which has lost its information plate, was erected by the Fisherton, Wilton, Heytesbury Willoughby Hedge & Redhone Turnpike Trust and is situated on the Western side of the road opposite No 224 Devizes Road, In Bemerton, Salisbury.



Ramsden's Great Theodolite

for the requirements of the Royal Society and paid for by King George III was large and cumbersome, some 36 inches across and normally mounted on a stand which raised the sighting telescope between 5 and 6 feet high. A second, similar, theodolite had been ordered by the Honourable East India Company which Ramsden completed in 1791, but the East India Company baulked at Ramsden's increased price resulting from manufacturing delays and the Board of Ordnance were able to acquire it for Mudge to use in the Trigonometrical Survey[8]. It weighed around 200 pounds and the accessories and cases weighed as much again. It had its own sprung carriage in which it travelled around Britain for a number of years to locations where it was then hauled (by the efforts of the eleven soldiers from the Royal Artillery) up mountains, church towers and even (with the addition of scaffolding) to the tops of church steeples. As well as the process of triangulation a second team of surveyors was involved, these were the draughtmen of the Ordnance Survey, based in the Tower of London who completed the Topographical or Interior Survey, fleshing out the initial survey with topographical detail: roads (using a surveyor's wheel or perambulator and compass), rivers and physical features into what we would recognize as a map. The term Ordnance Survey map did not appear until 1801 with the publication of the map of Kent. Initially relief was represented by the process known as hachuring, tiny parallel lines drawn in fine black ink, whose density and darkness increased according to steepness. Contour lines were not adopted as an indication of height until the latter part of the nineteenth century. Curiously however, in his work following the Schiehallion Experiment, the mathematician Charles Hutton had used isopleths or contours to assist him in his calculation of the volume of the mountain.

The survey was initially conducted on a scale of 6 inches to the mile and details were etched onto on a series of finely polished copper plates; first the trig points were marked before the plates were covered in wax which was left to set. The interior survey details were then traced on to paper and cut in reverse onto the wax. Place names were then engraved and finally the hachuring was added which called for significant engraving skill, and a steady hand. Finally, the plate was inked and carefully wiped so that the ink only adhered to the indented lines. As the initial maps were monochrome, only one plate was required for each sheet. Upon the production of proof copies, Mudge turned his attention to the place names shown. This often proved to be difficult, particularly when the survey moved to Wales and subsequently to Ireland where language and pronunciation produced further difficulties and the surveyors generally relied on answers given by local landowners or clergymen. Subsequently the scale was reduced to 1:63,360 or 1 inch to 1 mile.

The survey attracted considerable public attention and was widely reported in the local press. In early 1794 Edward Williams sought the advice of Sir Joseph Banks[9], President of the Royal Society about capitalising on the keen public interest. As a consequence, Mudge was to write accounts of the progress of the Trigonometrical Survey for the Royal Society's journal Philosophical Transactions, the first of which was published in 1795, and he subsequently presented a bound copy of the report to HM King George III.

On 10 October 1795 Mudge was promoted to the rank of Captain and appointed to command a company of artillery[10] although it is unclear how much time he actually spent with the Company rather than on the Trigonometrical Survey. By August 1797 he had completed the triangulation of the whole of the south coast of England, from Kent all the way to Land's End, and up the coast of North Cornwall to Bristol.

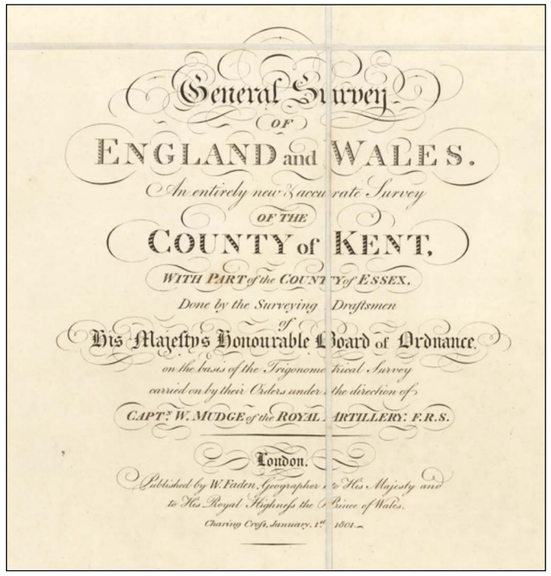
On 16 January 1798, Lieutenant Colonel Edward Williams died in London and William Mudge was confirmed as Superintendent and Director of the Trigonometrical Survey and on 30th April he was presented by Charles Cornwallis, 1st Marquess (who had succeeded the Duke of Richmond as Master General of the Ordnance) to HM King George III and had the honour of kissing His Majesty's hand on the occasion of his appointment. On 28th June the same year Captain William Mudge was elected for Fellowship of the Royal Society. He was the fourth member of the Royal Regiment to be appointed a Fellow of the Royal Society.

In March 1799 Cornwallis directed Mudge to head for the uncharted part of Essex which he designated the Ordnance Survey's highest priority given the continuing threat of French invasion and the vulnerability of the Thames Estuary, and Mudge spent the spring and summer triangulating London and the environs to the north and east, at one stage hoisting both himself and the Great Theodolite to the peak of the cross and ball atop the dome of St Paul's Cathedral. By the end of that season some 5,000 square miles had been covered stretching as far north as Coventry and to Gloucestershire in the west.

8. The first (or Royal Society) Theodolite was kept by Ordnance Survey at its headquarters in Southampton where it was destroyed during WW2 in an enemy bombing raid in 1941. The second (or Board of Ordnance) Theodolite was in use until the end of the Principal Triangulation of Great Britain and is now in the Science Museum in London.

9. Sir Joseph Banks Bt GCB FRS (1743-1820) was a naturalist, botanist and natural scientist. He took part in Capt Cook's first great voyage, was President of the Royal Society for over 41 years and advised HM King George III on the establishment of the Royal Botanic Gardens, Kew.

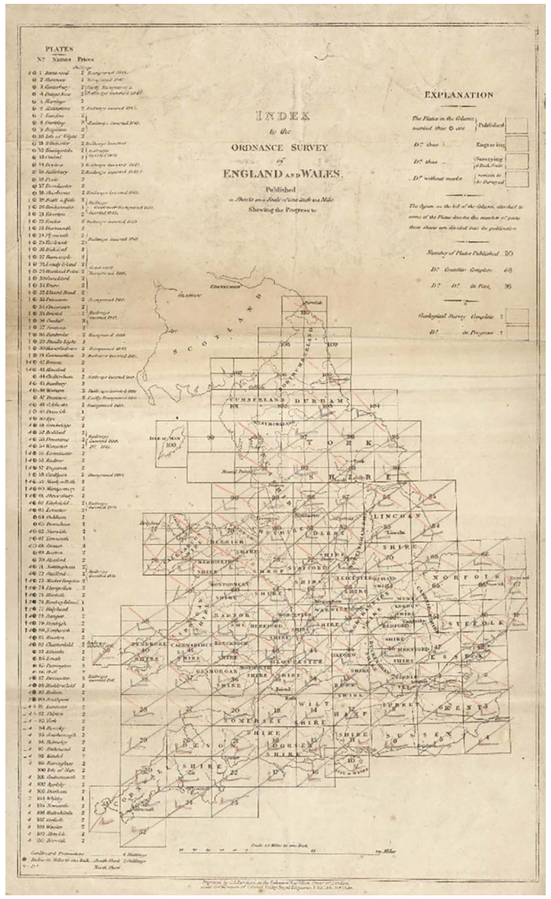
10. Capt W Mudge's Company, Law's Battery Records of the Royal Artillery 1716-1859, Serial No:20, formed 1 Apr 1756 as Capt J Brome's Company, Disbanded 31 Jan 1819. During his time in command the Company was based on the East Coast of England (Great Yarmouth, Lowestoft) and Colchester and Woolwich.


General Survey
OF
ENGLAND and WALES.
An entirely new & accurate Survey
OF THE
COUNTY of KENT,
WITH PART of the COUNTY of ESSEX,
Done by the Surveying Draftsmen
of
His Majesty's Honourable Board of Ordnance,
on the basis of the Trigonometrical Survey
carried on by their Orders under the direction of
CAPTN W. MUDGE of the ROYAL ARTILLERY: F.R.S.
London.
Published by W. Faden, Geographer to His Majesty and
to His Royal Highness the Prince of Wales,
Charing Cross, January 1st 1801.

1801 Map of Kent

Despite the underlying reason for the survey being military and it being overseen by the Board of Ordnance, Mudge and the Ordnance Survey had always been clear that the product of their surveying should be available to the general public. The first Ordnance Survey map of Kent was published on 1 January 1801 and was available for purchase at the price of 3 Guineas (a not inconsiderable sum - approximately 21 days wages for a skilled tradesman) from the Ordnance Survey's headquarters at the Tower of London or from the engraver William Faden[11] whose premises were at 6 Charing Cross. The map of Kent was a standalone product but subsequent maps, the Ordnance Survey's first series, which began with the publication of the Essex sheet in 1805 was the first of a series of adjoining, overlapping map sheets which would eventually cover the entire country.

On 1st September 1801 William Mudge had been awarded the Brevet Rank[12] of Major with substantive rank following on 14th September 1803 and was promoted to the rank of Lieutenant Colonel on 20th July 1804 (at the age of 41). Mudge was extremely busy, undertaking a significant amount of work personally leading the Trigonometrical Survey, managing the Interior Survey (particularly the toponomy, or place naming) and supervising the engraving process. In 1801, Mudge was beginning to find the work of the trigonometrical survey particularly arduous and he travelled to the RMA Woolwich to recruit an assistant. A young man named Thomas Colby fitted the bill, and he was immediately commissioned into the Royal Engineers. Colby, who was to achieve the rank of Major General and become a Fellow of both the Royal Society and the Royal Astronomical Society, was to spend most of his working life in the Ordnance Survey where his most important work was the Survey of Ireland which he began planning in 1824 and he personally directed until 1846.



OS Map Edition 1 Coverage

By the middle of the first decade of the 1800s Mudge realised that he needed a break from the demands of the survey process and in 1804 he took some time out to have his portrait painted by James Northcote, a protégé of Sir Joshua Reynolds. That portrait, which was in the possession of his granddaughter Sophia Elizabeth, widow of the Rev John Bogue now appears to have been lost.[13] A number of other portraits originally belonging to the Mudge family, including two portraits by Sir Johua Reynolds and four by James Northcote are now in the possession of the Galsworthy family in their house at Trewithen, near Truro including the portrait of William Mudge (apparently copied from Northcote's original) painted by Cyrus Johnson in 1829.[14]

In 1804 Mudge and Colby moved on with the Trigonometrical Survey into Wales reaching Trellech Beacon in Monmouthshire by the end of the surveying season and in the following year moving on via Aberystwyth to Rhuddlan, in Denbighshire (near Rhyl) in 1806. However, the survey of Wales would not be completed until 1811. On 29th July 1809 William Mudge

11. William Faden (1749-1836) was a cartographer, engraver and publisher who was Royal Geographer to King George III. His surname is derived from his father's wish to make the family's original name McFadden appear less Scottish in view of perceived English prejudice against the Scots after the Jacobite rebellion of 1745

12. Brevet rank was granted for a particular achievement or conspicuous bravery and officially both titles were used eg. Captain and Brevet Major. The brevet conferred rank in the British Army overall, but importantly, not in the Regiment. While serving on the staff or undertaking work such as the trigonometrical Survey on behalf of the Board of Ordnance, brevet rank could be used.

13. Dictionary of National Biography, 1885-1900/Mudge, William (1762-1820).

14. Martin Postle, "Patrons and Painters: Portraits by Joshua Reynolds and James Northcote at Trewithen", Art and the Country House, https://doi.org/10.17658/ACH/TNE504

The Journal of the Royal Artillery

Major General William Mudge and the Ordnance Survey


General Survey
ENGLAND and WALES.
COUNTY of KENT.
CHARLES MARQUIS CORNWALLIS

1801 Map of Kent

was appointed Lieutenant Governor of the Royal Military Academy, Woolwich by John Pitt, 2nd Earl of Chatham who had succeeded Cornwallis as Master General of the Ordnance. At the same time, Thomas Colby became chief executive of the Ordnance Survey. In 1810 the Honourable East India Company set up its Military Seminary at Addiscombe (near Croydon) to train officers for the Presidency Armies (Bengal, Bombay and Madras) and Mudge was appointed examiner to the new college. He took great pains to see that both the Woolwich and Addiscombe cadets were well trained in surveying and topographical drawing. His management of the cadets was so successful that in 1817 Lord Chatham wrote to express his high satisfaction at the result.

In 1813 Mudge was to assist Colby in an Anglo-French exercise to extend the English arc of the Meridian into Scotland and Mudge, assisted by his son Zachariah took many of the actual measurements and the arc was subsequently extended to Uist in the Outer Hebrides. Mudge's work in this operation has been immortalised by William Wordsworth in his poem Written with a Slate Pencil on a Stone, on the Side of a Mountain on Black Comb where the surveyor (William Mudge) on top of Black Combe, noted for its views in all directions, was not able to see even the map in front of him when fog or darkness closed in.

On 4th June 1813, Mudge was promoted Brevet-Colonel with substantive rank following on 20th December 1814. In 1817 he received a degree of LL.D from the University of Edinburgh and in 1818 was appointed a commissioner of the Board of Longitude. He was promoted to the rank of Major General on 12th August 1819 and died in London on 16th April 1820 at the age of fifty-seven. He was survived by his wife Margaret Jane (the fourth daughter of Major General Williamson [himself a Gunner]) and left a daughter and 4 sons – two Sappers, a Gunner and one who joined the Royal Navy. Undoubtedly his finest legacy is in the coverage of the United Kingdom by the mapping of the Ordnance Survey, the first edition of which was not completed until 1844[15].

15. The Ordnance Survey 1st Edition can be viewed online at the National Library of Scotland website: www.maps.nls.uk

The Journal of the Royal Artillery General Sir Edward Sabine

General Sir Edward Sabine KCB FRS FRSE FRAS (1788-1883) Soldier, Physicist, Geodesist, Astronomer, Ornithologist, Polar Explorer

By Colonel Nick Quarrelle

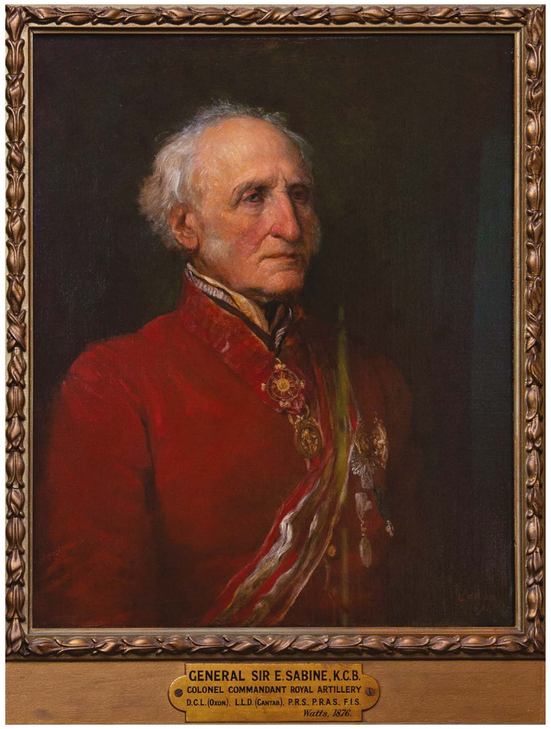


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He is a keen reader of military history and a volunteer in the library and archive at the RA Museum.

One of the finest pictures in the Regiment's collection is the portrait of General Sir Edward Sabine by the artist George Frederick Watts, which is hanging in the Alanbrooke Room of the Royal Artillery Mess, Larkhill. It was painted in 1874, when Sabine would have been in his eighties, and was presented to the Regiment in 1877 by the artist. The painting was exhibited at the Royal Academy in 1875 and again in 1905.
George Frederick Watts (1817-1904) was a British artist and sculptor associated with the *symbolist* movement, famous for his allegorical works as well as his portraits of eminent Victorians, first exhibiting at the Royal Academy Exhibition in 1837. From the late 1840s, Watts began (at his own expense) to paint portraits of leading politicians, writers, artists and thinkers for a series that became known as the *'Hall of Fame'.* Watts intended this series to memorialise those who had had the biggest impact on Victorian society. He called the subjects of these portraits *'the men who make England - the prominent men who may hereafter be found to have made or marred their country'.* He gifted over 50 works to the National Portrait Gallery, London, as part of his bequest to the nation. He settled near Compton, south of Guildford, where he built the Watts Gallery, the only purpose-built gallery in England devoted to a single artist.[1]

1. www.wattsgallery.org.uk

Edward Sabine was born in Dublin on 14th October 1788 where his father, a member of a prominent Anglo-Irish family was visiting relatives, but returned to the family home, Tewin in Hertfordshire, shortly after the birth. His mother Sarah (née Hunt) died a month after his birth – he was the couple's fifth son and ninth child. He grew up close to his brother, the naturalist Joseph Sabine who is said to have fostered Edward's love of science.



General Sabine portrait

He was educated at Marlow before joining the Royal Military Academy, Woolwich on 25th January 1803 from where he was commissioned into the Royal Artillery on 22nd December the same year, at the age of 15 years and 2 months. The course at Woolwich had been shortened to meet the requirement of providing officers to man the ten additional companies of artillery raised at Woolwich between September and December 1803.[2] He was sent to Gibraltar in 1804 and was awarded his jacket in 1807 and served with M Troop and G Troop Royal Horse Artillery in various home stations until the end of 1812. The Troop Captain of G Troop RHA at the time was Augustus Frazer who would later command the Horse Artillery in the Peninsular War and at Waterloo, and Sabine subsequently edited Frazer's letters for publication in 1859.[3]

During the War of 1812 on posting to a company in Canada in January 1813 he was sailing to Halifax, Nova Scotia in the *Manchester,* a Falmouth packet[4] when, eight days out she was attacked by an American privateer the *York Town.* During a running engagement which lasted almost twenty hours, Sabine and a fellow passenger manned the stern-chaser gun inflicting significant damage on their attacker, with the *Manchester* only striking her colours when their ammunition was virtually exhausted. The Packet's captain and passengers were on their way to New York as prisoners under a prize crew when they encountered a British frigate *HMS Maidstone,* which recaptured the *Manchester* and allowed their voyage to Halifax to be resumed.
As a Second Captain in Captain W Holcroft's Company[5], Sabine served on the Quebec front in the winter of 1813-14 and was involved in the capture of Fort Niagara on 19th December 1813. He was also involved in the Siege of Fort Erie between 4th August and 21st September 1814[6] and during the campaign was twice Mentioned in Despatches. In recognition of their service throughout the war of 1812, Holcroft's Company was entitled to bear the word *Niagara* on its appointments until the Battle Honour *Ubique* was bestowed on the Regiment by HM King William IV in 1833.
Having returned to the UK, Sabine was elected a Fellow of the Royal Society on 16th April 1818. He was nominated by the President and Council of the Royal Society for the appointment of Astronomer and Scientific Officer to accompany the 1818 expedition under Commander John Ross to attempt to discover the North-West Passage; the sea way through the Arctic linking the Atlantic and Pacific Oceans. John Barrow, Second Secretary of the Admiralty, had heard reports from whalers that the ice to the east of Greenland had been breaking up and there was speculation that if the general level of arctic ice had diminished a sea passage might be possible. The expedition had 2 ships: the *Isabella* commanded by Ross (on which Sabine was based) and the *Alexander* captained by William Parry. The expedition



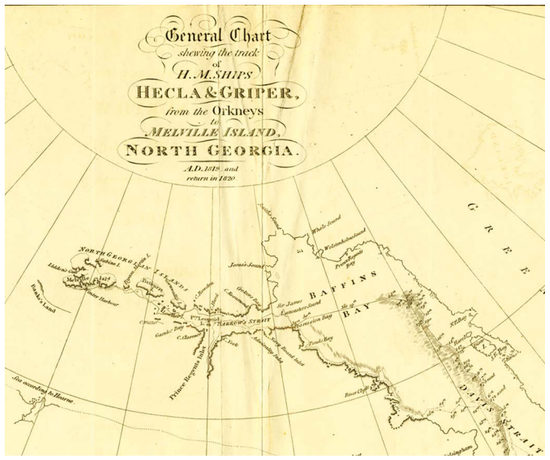
Map of the North West Passage

sailed counter-clockwise around Baffin Bay before attempting to enter Lancaster Sound. However, Ross decided to terminate

2. Battery Records of the Royal Artillery 1716-1859 by Lt Col (Retd) M E S Laws OBE MC (Woolwich, RA Institution, 1952), Pp.117-119, Note A.
3. Letters of Colonel Sir Augustus Simon Frazer KCB Edited by Major General Edward Sabine, (London, Longman, Brown, Green, Longman & Roberts, 1859). Facsimile Edition republished by The Naval and Military Press, Uckfield, East Sussex, 2001.
4. The Packet Service to carry official State letters and despatches was a department of the General Post Office with Falmouth appointed its Station in 1688. The packet service was a key strategic role carrying mail and messages to and from the far reaches of the expanding British Empire. The ships were lightly armed and relied on speed for their security. As well as despatches they carried bullion, private goods and passengers. The packet service made Falmouth wealthy and a significant information hub, second only to London for knowing the news of the day.
5. Battery Records of the Royal Artillery 1716-1859 by Lt Col (Retd) M E S Laws OBE MC (Woolwich, RA Institution, 1952), Serial 58, Capt W Holcroft's Coy, subsequently 17 Siege Coy RGA, 19 Med Bty RA, 1947 - 52 Med Bty RA/ 52 (Niagara) Bty RA
6. For more detail about the Siege of Fort Erie see: William Drummond and the Battle of Fort Erie by Donald E Graves, Canadian Military History, Volume 1, Issue 1, Article No 4 at www.scispace.com

the expedition having seen a range of mountains which he believed would make the existence of a sea channel impossible. Parry did not believe the mountains were real and wished to continue with the expedition which led to controversy between the two Naval officers. Subsequently there was also friction between Sabine and Ross over the latter claiming credit for the scientific reports produced on the expedition which included measurement of tides and currents and magnetic properties. Sabine also produced a biological report which included a new bird species named *Larus Sabini* after him.

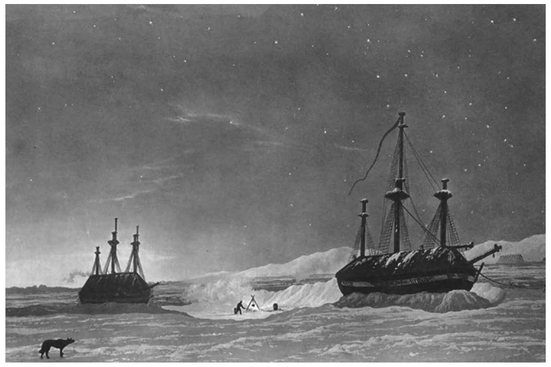
In 1819 Sabine accompanied Parry on the second expedition to try to find the North-West Passage where it was discovered that there was a westward route through Lancaster Sound and that the mountain range apparently seen by Ross did not exist. The expedition pressed on west through Barrow Strait



General Chart showing the track of HM Ships Hecla and Griper to Melville Island

to Melville Island, in doing so earning a £5,000 prize offered by Parliament for anyone crossing the Longitude of 110° West. However, the sea froze and the expedition spent the winter in the appropriately named Winter Harbour on the south coast of Melville Island where the sun spent 96 days below the horizon. Parry was an excellent commander and kept the crew occupied throughout with pastimes and entertainments. In addition to conducting a magnetic survey of the island, Sabine edited a humorous weekly publication *The North Georgia Gazette and Winter Chronicle* which ran to 21 editions and was subsequently published (to Sabine's surprise) on the expedition's return to the United Kingdom.[7]

When the ice finally broke up Parry attempted to push on westwards, but progress was extremely slow and rather than spend a second winter in the ice the expedition returned home. For his various communications to the Royal Society relating to this expedition, in particular the changes in magnetic intensity which had occurred between the two expeditions, which he attributed to either a fluctuation in the Earth's magnetic intensity or the shifting positions of the terrestrial magnetic poles, Edward Sabine was awarded the Society's



HM Ships Hecla and Griper in Winter Harbour drawn and engraved by W Westfall from a sketch by Frederick William Beechey

most prestigious award the Copley Medal. Parry also named a peninsula on Melville Island *Sabine Peninsula.*

Sabine had become increasingly interested in the science of *geodetics or geodesy,* a branch of applied mathematics concerned with the determination of the size and shape of the earth and the exact position of points on its surface and with the description of variations of its gravity field made by observation of a second's pendulum at different latitudes. Between 1821 and 1823 he travelled halfway across the world making innumerable pendulum observations. He even returned to the Arctic travelling up the eastern coast of Greenland where experiments took place on the Pendulum Islands one of which was renamed *Sabine Island* in his honour. He published the results in 1825, which were described as the most accurate assessment of the Earth's figure then available. In the same year he took part with Sir John Herschel in a Commission with the French government to determine the precise difference of Longitude between the observatories of Paris and Greenwich.

In 1826 he married Elizabeth Juliana Leeves (1807-1879) who assisted her husband in his scientific endeavours and translated a number of works by the German scientist Alexander von Humboldt into English. In 1827 the Duke of Wellington, who was then Master General of the Ordnance, granted Sabine general leave of absence from the Army provided that 'he was usefully employed in scientific pursuits' and acted as one of the Secretaries to the Royal Society, and became a scientific adviser to the Admiralty following the abolition of the Board of Longitude. He maintained his interest in military matters during this leave of absence; writing a lengthy critique for the *Quarterly Journal of Science* contrasting the innovative ways of French artillery with the inertia that, in the austerity following the Napoleonic Wars, bedevilled the Board of Ordnance and the Royal Artillery.[8]

He was promoted to the rank of Captain on 31st December 1827 and was nominally in command of 2nd Company, 6th Battalion Royal Artillery[9] from that date. The Company was initially at Woolwich but moved to Ireland in November 1828 and was based at Island Bridge Barracks in Dublin.[10] In 1830, conditions in Ireland had become critical: a wet summer had resulted in the failure of the potato crop with local famine reported and political agitation and civil disturbance on the

7. The North Georgia Gazette and Winter Chronicle Edited by Sir Edward Sabine (London, John Murray, 1819) available online at www.archive.org

8. Memoir of General Sir E Sabine, in the Proceedings of the Royal Artillery Institution, Volume XII, 1884, P. 389.

9. 2nd Company, 6th Battalion RA, Battery Records of the Royal Artillery 1716-1859 by Lt Col (Retd) M E S Laws OBE MC (Woolwich, RA Institution, 1952), Serial 63, later 40 Coy RGA, 19 Hy Bty RA, 1947 – 60 Coast Bty RA/60 Hy AD Bty RA, Suspended Animation Mar 1968, Disbanded 2023.

10. Island Bridge Barracks constructed in 1798 was situated on the River Liffey, 1¾ miles West of Dublin Castle and between the Eastern corner of Phoenix Park and Kilmainham Hospital. Subsequently (in 1942) named Clancy Barracks after Peader Clancy (killed in 1920 during the War of Independence) and disposed of in 2001.

increase, resulting in Sabine being recalled to join his Company. He did not accompany the Company when it moved to Jamaica in 1833 but remained in Ireland on the staff of the Quarter-Master General, serving there until 1837. He continued his pendulum investigations during this time and, in 1834, began a systematic magnetic survey of Ireland which he extended to Scotland and England in subsequent years.

For some time, the Royal Navy and the Royal Society had been considering the question of magnetic variation and the fact that the Earth's magnetic field was changing over time, interfering with compass readings and navigation, and a number of physicists were of the view that a global magnetic survey should be conducted. In 1836 the German scientist Alexander von Humboldt wrote to the Duke of Sussex, the President of the Royal Society, urging the establishment of magnetic observatories throughout the British Empire. A committee was established with Sabine as a member which recommended long-term simultaneous observations from stations on land and sea. The land stations were to be manned by the Royal Artillery at observatories at St Helena, the Cape of Good Hope and Toronto for a period of 3 years. The officers selected were Lt (Later Lt-Gen Sir) John Henry Lefroy, Lt (later Maj-Gen) Frederick Marow Eardley-Wilmot and Lt (later Maj-Gen) Charles James Buchanan Riddell. These three officers formed the first Magnetical Staff under Major Sabine's direction, and it will not have escaped the readers' attention that the first two of these officers were the founders of the Royal Artillery Institution in 1838.

Lefroy was initially sent to St Helena but in 1842 moved to Toronto to replace Riddell who was invalided home. Of the seven junior officers who were employed in this role over a number of years, all but one became Fellows of the Royal Society. The Observatory founded in Toronto in 1840 is still in existence. Originally housed in a modest building at the newly established University of Toronto it was named the Toronto Magnetic and Meteorological Observatory and was the first scientific institution in the country. Sabine was active



The Surveyor - Portrait of Captain John Henry Lefroy circa 1885 by Paul Kane

in promoting magnetic observations in Canada and Lefroy was active in this work, travelling over 5,000 miles in Canada's North West Territories between May 1843 and November 1844; taking measurements at over 300 stations to map the geo-magnetic activity of British North America from Montreal to the Arctic Circle and to locate the North Magnetic Pole. On 9th June 1848 Lefroy was elected a fellow of the Royal Society.

By the 1940s and 1850s, Sabine's role involved analysis of long-time patterns in magnetic variation, and he was able to distinguish a regular daily cycle and an irregular component, part of the latter being the result of the sunspot cycle. He continued to see a close link between magnetic activity and meteorology, and his research programmes were based on the view that the different geophysical phenomena were interrelated. In 1840 he commenced a series entitled *Contributions to Terrestrial Magnetism* which comprised fifteen papers in the *Philosophical Transactions* of the Royal Society spread over 36 years and was a survey of the general distribution of magnetism over the globe. In all he wrote over a hundred scholarly papers and in 1849 he was awarded the Royal Society's Royal (or King's) Medal.

The nature of his interests kept Sabine closely involved with numerous scientific institutions. He was President of the British Association for the Advancement of Science in 1852, Foreign Secretary of the Royal Society in 1845, its Vice-president and Treasurer in 1850 and President from 1861 to; the only person ever to have held all senior officer appointments in the Royal Society. He was also a Fellow of the Royal Society of Edinburgh (FRSE) and a Fellow of the Linnean Society and the Royal Astronomical Society (FRAS). He was awarded honorary degrees by the Universities of Oxford and Cambridge and received the Lalande Medal of the *Institut de France.*

He was promoted to the rank of Colonel on 11th November 1851 and to General on 7th February 1870. He was appointed a Colonel Commandant Royal Artillery on 9th February 1865. He was awarded a KCB in 1869. General Sir Edward Sabine retired from the Army on full pay in October 1877. He died at Richmond aged 94 on 26th June 1883 and is buried alongside his wife Elizabeth, who pre-deceased him, in the family vault in Tewin in Hertfordshire.

Geographical features named after him include *Sabine Land,* the *Sabine Islands* and *Sabinebukta* (all in Svalbard), Mount Sabine in Antarctica's Admiralty Mountains, *Sabine Island* on Greenland's east coast and the *Sabine Peninsula* on Melville Island, and the lunar *Sabine Crater.*

Species of bird bearing his name include *Sabine's Gull* (*Larus Sabini* – although now placed in the genus *Xema*), *Sabine's Puffback (Dryoscopus Sabini)* and *Sabine's Spinetail (Rhaphidura Sabini* – a species of swift).

A true polymath - it was reported that his scientific capacity was combined with an attractive personality. His grace and cheerfulness rendered him universally popular.[11]

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The Journal of the Royal Artillery
Short Story

World's Best Dad?

By Major David Hainsworth



John kills people for a living from a spare bedroom in suburban Britain. Between school runs, dentist appointments and helping with maths homework, he spends his days guiding explosive drones into strangers thousands of miles away. As the war drags on, the distance between ordinary family life and industrialised killing begins to collapse.
This short story is written by Major Dave Hainsworth RA currently commands 159 (Colenso) Battery, 26th Regiment Royal Artillery. He previously served at 3 DRS X Headquarters as SO2 G57, where he contributed to the delivery of large-scale training exercises and the development of deep battle concepts. Prior to attending ICSC(L), he worked within the Ground Manoeuvre Experimentation Team at 3rd (UK) Division Headquarters. Earlier in his career, Major Hainsworth held several appointments: Adjutant of the Young Officers' Branch at the Royal School of Artillery, FST Commander with 1RHA, and Troop Commander at 39th Regiment Royal Artillery. This essay won the Innovation Award in the Duncan Essay 2025 competition.



John placed the coffee pod into the machine, closing the lid with a clunk that drew his wife's attention from packing a lunch box. The machine brought itself to a low hum, adding further background noise to an already bustling family kitchen. Footsteps stampeded down the stairs, a washing machine spun, a radio conversation continued in the background that no-one was listening to. John picked up his 'World's Best Dad' mug and kissed the kids goodbye as they bustled out the door with his wife.
"Make sure you book a dentist appointment today, don't forget!" she called standing half out the door, her black hair tied in a hasty ponytail.
"I won't" he called back.
Sipping his coffee, he made his way upstairs to the office, slippers nearly stepping on a small toy dinosaur, menacingly guarding the staircase.
There was nothing military about this place; his office was plain, a desk, an ergonomic chair, a box of files and a tall, but thin bookshelf containing everything a family collection could imagine. The Harry Potter series in the wrong order, baby books, sports autobiographies.
He sat on his work chair balancing the coffee mug in one hand as the other reached to switch on the computer that had been provided for his role. John nonchalantly placed the mug down as his screen turned on, black with small lines of code rapidly appearing and disappearing as it connected. The drone-swarm logo was the only inclination an observer could have that John was not an accountant sat in his home office.
Ritualistically he adjusted his headset and waited. Some days there were no targets. Today probably wouldn't be one of them. The Army had been recruiting more drone operators. Supply and demand, there were always more targets.
He took a gentle sip of his hot coffee, cautiously checking the temperature before putting it to his mouth.
His phone buzzed. A message appeared on the screen.
"Here we go." he said to himself, placing the mug back down again and pulling his joystick across the desk. He clicked through a few mandatory mission notes, authorised himself to the system and connected to the drone.
The first view was always the same; his point of view was ground level, the drone he was about to control, his drone, was still harnessed to the side of an unmanned ground launcher – simple six-wheeled robots that transported a cargo of FPVs to the front, and, in most cases performed as the communications relay back to the drone operators. Most, like John were back in the UK.
A small wobble as the rotors started and he was in the air. A rolling summer landscape came into clear view as the drone stretched into the air. Heat blurred the horizon where hills merged into trees and distant buildings. Somewhere out there was the war.
His mission briefing was standard, they received bearings and distances from launch, no intelligence, no scenario, no context.
Go here and kill something.
He did just that. Pushing the joystick forward the drone tilted and snapped through the air.
The drone was one of the smaller, anti-personnel versions. Fast, manoeuvrable and deadly. Only a few seconds passed before he spotted the first target. He flicked video to IR and back again to confirm. An infantryman sat on the edge of a small clump of trees. John elevated the drone to an altitude that couldn't be heard or seen easily, zoomed in the camera and waited. The target was unaware, he was rolling tobacco into a scruffy cigarette, his helmet was on the floor on top of a daysack, his rifle slung uncomfortably across his back. Even from this range, John could see the features on the man's face – he looked exhausted.
John opened another tab. Snapped a screenshot and sent it through the system.
"Operator 58 requesting clearance to engage target" he said into the mic.
"Operator 58 this is Control. Clearance granted. Engage," a voice in his earpiece responded.
He shuffled forward in his chair, took a quick sip of the quickly cooling coffee, snapped his knuckles and proceeded. He pushed the joystick forward into a dive, the target image growing closer each second. The target stared blankly across the field in front of him, taking a long drag on his cigarette he leaned forward, elbows rested on his knees. The drone accelerated and only in the last moment did the target look up into the lens.
It was too late.
The screen went black.
Connection lost.
John reclined in his chair and took another sip of coffee and waited for another mission to appear.
By lunch, he had killed two more people and booked a dentist appointment.

The therapist's office overlooked a supermarket car park a few floors up. John had spent the first ten minutes of the session watching, through the narrow gap between the blinds, people return shopping trolleys. The therapist noticed eventually and adjusted her notebook slightly higher on her knee.
"You said on the intake form you've been having recurring dreams," she said.
John nodded once. "Yeah."
"About work?"
He gave a small shrug. "Sort of."
She waited. Silence was part of the technique. Most people rushed to fill it. John didn't. He kept looking through the dirty plastic blinds at an older man in burgundy trousers struggling to fit bottled water into the back of a hatchback. Bold colour, he thought to himself.
Eventually, he said, "I don't dream about watching it."
"The strikes?"
"Yeah."
"What do you dream about John?"
He flicked at the skin around his thumb, pushing the cuticle back with his fingernail.
"Flying."
The therapist made a note. "Can you describe that?" She poked her glasses further up her nose.
Another long pause.
"At first it just feels normal," he said quietly. "Like, I've had flying dreams before, falling dreams, you know. But these, I dunno, I feel… movement. Fast movement. I can feel the corrections happening before I make them. Wind pushing against me. Signal jitter. Sometimes I know where I'm going and sometimes I don't."
He swallowed.
"But there's always somebody at the end."
The therapist looked up from the notebook.
"What do you mean?"
"I mean I hit them."
"You're controlling the drone in the dream."
"No." He shook his head. "That's the problem."
Outside, someone leaned on a car horn for two sharp bursts. John flinched hard enough that the therapist noticed.
"In the dream," he said, staring at the carpet now, "I am the drone."
"I can feel the motor vibrating, in the same way that I feel myself breathing. I can hear the propellers changing pitch when I turn. I feel the force when I accelerate right before…"
He stopped.
"Right before what?"
"I explode."
The room settled into quiet again.
The therapist had spent years talking to soldiers who dreamed of explosions, gunfire, screaming, ambushes. This was different. There was no fear in John's voice when he described it. Fear would have sounded healthier somehow. What unsettled her was the certainty.
"Do you feel guilty about the people you've killed?" she asked carefully.
John frowned a little, as if the question was too simple.
"I don't know," he admitted.
"You don't know?"
"I know I should." He let out a short breath that almost became a laugh. "That's usually what this is, right? Guilt. Remorse. Trauma." He glanced toward her notebook. "You've probably got categories for all of it."
She said nothing.
"When I started, I mean, when we did our training, we all joked we were like tech-support with explosives." he made another half laugh, expecting her to be party to the joke he had shared with the other trainee drone operators. She wrote another note.
"But it's feeling different now, it's not really about the people I hit."
That made her look up again.
"What is it then?"

John's eyes drifted back toward the supermarket outside.
"It's how fast it disappears." He paused. "In the dream I fly into someone, and I wake up and I'm in bed" he said. "That's the part I can't…"
He stopped; he hadn't noticed that he was flicking the skin around his thumb now. "I killed a man on Tuesday morning and then I spent twenty minutes deciding what colour to paint my daughter's bedroom."
The therapist remained still.
John looked at her then for the first time since entering the room.
"I don't think my brain understands that those things are allowed to exist in the same day."

John leaned over the kitchen counter. Softly sliding the Best Dad mug to one side, he pointed at the numbers written in the small notebook.
"Ok so put them together. What's five add three?" he said gently.
"Eight," his daughter replied writing the digit with her purple unicorn pen.
"Nice and then if five add three is eight, what's one add four?"
"Five!" she exclaimed. "So, fifteen add forty-three is," she thought, looking at the numbers "fifty-eight?"
"Yes! Well done!" He gave a big smile back to her and took another sip of coffee. He glanced at the screen of his phone, nothing today. Good. He could get some normal things done.
It hadn't rained for days. The street felt quiet in the heat.
John wondered whether this was true, or just imagined, but since the call-up, his hometown had an air of emptiness to it. How long ago was that he thought. A year? Must be a year by now. It felt like the world had stopped paying attention, apart from those families with loved ones away. The news was the same, a small irrelevant town was captured, a ship sunk, more rhetoric from politicians about this being a "national effort".
The war felt enormous, but so far away.
A noise startled him.
He recoiled, looked around frantically.
Without noticing he had dropped to a low crouch, holding onto the small brick wall of someone's front garden.
He frowned, confused. It was a hedge strimmer, an old man down the road trimming his front lawn. John stood slowly, perplexed at his reaction. He checked his palms, flexed his fingers. He looked to the sky; there was nothing watching him.
He continued his meander towards the supermarket. At a glance you wouldn't notice anything different, maybe the shelf stackers in Tesco were a lot older than they used to be, or the posters on buses were no longer about the latest Marvel movie. Apart from that, it was much the same.
Pausing at the zebra crossing John clocked yet another forces charity stand across the road. A pair of old ladies rattled buckets, hopeful for donations from shoppers.
He didn't notice the man at first, the figure was sat on a small wall at the edge of the carpark.
John stared, transfixed.
He watched the man pull a small pouch from his pocket and started rolling himself a cigarette.
John froze.
"It's not him" he told himself.
But the posture was identical.
Elbows on knees. Staring into nothing.
The same exhausted face.
The world seemed to narrow around him.
John blinked, trying to break his focus.
He looked away. Blinked. Looked back.
The man on the wall had stood up and was walking away, back turned down the street. A car honked their horn, and he snapped back to the world, realising too slowly that he was just stood, idly waiting at the crossing.

"John."
"John!"
He stopped staring out the window and looked at the therapist.
"Sorry, I…what were you saying?" he looked at the floor, picking at his finger skin again.
"You said the dreams are getting more frequent?"
"It's every night now," he exhaled, it wasn't something he told anyone. He had lied to his wife about why he kept waking up.
"John, you're not the first soldier to suffer from nightmares. It's part of the brain's way of processing traumatic experiences."
"But I'm not a soldier", he said sharply. "I kill people in my pyjamas. I kill f…ing human beings wearing novelty shark slippers that my kids got me for Christmas."
For the first time since they had met, the therapist looked uncomfortable.
"That's why these sessions are important John, I'm here so you have someone to talk to."
"Yesterday I flew into a truck."
John rubbed his thumb against the edge of his knee.
"It was moving down some dirt track. Fast. I hit the cab dead on. Heavy drone, big payload. So… yeah. The whole thing would've gone. Completely gone."
The therapist nodded for him to continue.
"The feed usually cuts straight away after impact." He frowned. "Well, not cuts. You know what I mean. It just… ends."
He searched for the right words.
"This time it froze."
His foot had started tapping against the carpet.
"There was this bloke staring into the camera. Screaming. This guy I don't know. I couldn't hear him, obviously, but you could tell. Mouth open. Eyes wide. Just…silently screaming at me…" He stopped and shook his head. "Doesn't matter."
The therapist glanced down at her notes.
"And these…experiences, how are they affecting you. It sounds like you are struggling to process what you do?" she stuttered halfway through, uncertain about what to say. It was as if the guidebook had run out of answers.
He laughed once.
"Doc, that image isn't what's f…ing me up."
"When I sat there, staring at someone I had just killed, the door opened and my wife brought me a cheese and pickle sandwich."
Silence.
He looked straight into her eyes.
She stared back.
He looked at the floor.
Silence settled between them.
Not therapeutic silence.
Just silence.
"Did I tell you that a friend from school died?" he changed the subject.
She shifted slightly in her chair.
"No?"
"Two weeks ago. His wife knows my wife. His kids go to the same school as mine. He went over there after the call-up. Died in some place no one has ever heard of." He shuffled again.
"I'm sorry to hear that John."
She carefully leaned forward, hands gently held together.
"It's important to know that you are also contributing, even though you aren't physically there."
"I'd rather be there."
The words came out quietly.
"I mean, I know I can't," he slapped his hand onto his knee "this old thing is half-Robocop," he tried to joke. It was a football injury long ago; he'd fail any medical.
"Are you feeling guilty that others are away, fighting, and you can't be?"
"No…" he paused again, trying to find the words.
"I feel guilty that I feel like this and I'm not even dirty."
He stared at his hands.
"I've never held a rifle. No one is shooting at me, I sit at home, my wife telling me about what flowers she is going to plant, my son talking about a goal he scored at football, but in my mind, I'm flying head-first into people and exploding."
She nodded, knowingly.
John was not her first or only Drone Operator patient.
'John,' his name was soft, but her voice firm, as she asked, '"John. I want you to answer me honestly, have you ever thought about dying?"
"Doc, every dream ends with me dying. Every day, every target I hit, I kill myself."

John flew through the sky.
His rotors responding instantly to his wishes.
Wind buffeted against the frame. The battery whined softly beneath him.
Below, another target appeared. The camera zoomed in.
A man. An older man. He was loading water bottles into the back of a car.
John felt the weapon system arm.
He went into a dive.
The target grew clearer. Larger.
Burgandy trousers. Bold colour.
Closer.
Clearer.
The image froze.
Impact.
John exhaled sharply as he jolted himself awake. His breathing was fast, random, trying to catch up. He lifted a hand to his brow, sweat, more sweat. Spinning his legs off the bed he rubbed his eyes. Just another dream, just another dream. He got up, his feet sliding into the mouth of his novelty shark-slippers, moving softly he left the bedroom quietly so he wouldn't wake his wife.
Downstairs was dark; a cold quiet. Of course it was, everyone in the country is asleep. The glow from the oven clock read 0237, a pale green hue hummed around the kitchen from the appliances and all their different clocks. He took a sip of water and sat on the kitchen stool, just listening to the silence. His eyes slowly took in the room. Adjusting to the low light.
Small, muddy football boots by the back door, a gardening magazine on the work-surface, the toy dinosaur; promoted from guarding the stairs now fiercely sat on top of the microwave. He smiled and let out the smallest of exhaled laughs. Then his phone buzzed.
Before he knew it, he was sat in his ergonomic chair upstairs.
The view was daylight, dawn. He flew again through the air, scanning the ground as he went. He had already identified the target.
He accelerated once more, covering the ground rapidly, the image growing and becoming clearer and clearer. A woman this time. Black hair. Ponytail.
He stopped the drone abruptly.
Barely a metre away.
The face filled his screen as clear as day.
She looked straight into his lens. Green eyes.
"JOHN!" his wife shouted at the camera.
"JOHN!"
He woke again, hyperventilating. His wife was shaking him awake; his eyes met the same green eyes he had seen only a moment ago. He screamed and rolled onto the floor, clipping his head on the bedside table.
"John, darling, are you ok?" she was already on the floor with him, her arms trying to pull him up from his foetal ball, his hands covering his face. The sweat and tears combining together.

"The house knows what I do," he said. Once again staring out the window.
A white van drove past at ground level. High explosive, driver's side, low angle.
"I'm sorry John, what do you mean?" She had brought a camera to this session; new policy - she had apologised to him.
"I emptied the office."
He scratched the skin around his thumb again.
"Couldn't have anything in there."
"It's healthy to separate the space from the rest of your home."
She was softer today, a kinder tone.
"Can't let Harry Potter distract you from your work." John looked at her, she had made a joke. She'd never made a joke before. He remembered he had told her about the bookshelf; it was empty now. The books were in his son's room.
A car had stopped outside the supermarket, an older lady got out and waved goodbye to the driver.
She went inside.
Fibre-optic, slow approach, rear impact.
John blinked hard.
"How are things at home?"
He didn't answer immediately. He had heard her, but the words arrived late, like they slowed once they reached his ears.
"Good."
He looked at her. She had closed her notebook.
"Yeah… great actually." A small nod, as if confirming the memory to himself. "We had a barbecue at the weekend."
"Lovely weather for it," she said gently.
His expression shifted before the words did. Like his face found the place before his voice did.
"I put one of those sprinkler things under the trampoline," he said. "The kids were going mad. Just jumping through it, getting absolutely soaked."
He let out a huff of breath that might have been a laugh.
"My wife was trying to set the table outside, but she gave up because everything kept getting drenched. She was laughing though. Shouting at us to stop and then laughing again."
A pause.
"I always do this thing where I pretend to be a dinosaur."
He smiled properly now, briefly lost in it.
"Chase them round the garden. They love it."
"Sounds nice," the therapist said.
"Yeah."
The word lingered longer than it should have.
For a moment, the room held him differently. Not better. Just further away.
Then John's eyes drifted back to the window.
Three women were waiting at the crossing outside the supermarket. Talking. Not looking at anything in particular.
His expression changed before he spoke. Not dramatically. Just a quiet reduction, like something being turned down.
"Fragmentation," he said lightly. Almost conversational. "Probably mortar. Or something like that."

DUNCAN ESSAY 2026

From Port Arthur to Donbas Compare and contrast the Russo-Japanese War of 1904-05 with the Russo Ukrainian War of 2022 to the present: What has changed in the Russian approach to warfight, including economic and diplomatic means, and what lessons should the Royal Artillery be identifying this time round?

By Captain Jake Morris



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INTRODUCTION

The Russo-Japanese War (1904–1905) and the ongoing Russo-Ukrainian War (2022–present) provide two particularly valuable case studies when analysing both continuity and change in Russian warfighting. Despite being separated by more than a century, both conflicts expose recurring structural and cultural issues within Russian military practice, particularly in relation to strategic assumptions, logistics, command and control, and the integration of combat power. At the same time, technological, economic, and geopolitical developments have transformed the broader character of war, fundamentally altering how these conflicts are fought.

It is important to recognise that the geopolitical contexts of these wars differ substantially. The Russo-Japanese War emerged from imperial competition in East Asia, while the war in Ukraine is embedded within a post-Cold War European security crisis and wider global power competition. However, the similarities in Russian planning assumptions are striking. In both cases, Russian leadership entered the conflict expecting a rapid and decisive victory against what was perceived as an inferior adversary. As Freedman (2022) argues in relation to Ukraine, Russian planning reflected "a political fantasy rather than a realistic military appreciation." This observation is equally applicable to 1904, where Russia underestimated Japan's capabilities and overestimated the effectiveness of its own military system (Lieven, 2015).

This essay compares and contrasts Russian warfighting across both conflicts, focusing on operational approach, economic and industrial capacity, diplomatic positioning, and command structures. It assesses what has changed and what has remained constant, before identifying key lessons for the Royal Artillery (RA). The central argument is that while Russian capabilities have evolved significantly, particularly in technology and industrial resilience, its underlying and continuous approach to war is characterised by centralisation, reliance on mass, and flawed strategic assumptions. This has direct implications for modern artillery employment in high-intensity conflict.

CONTEXT

The Russo-Japanese War took place in the context of late imperial rivalry, with Russia seeking to expand its influence into Manchuria and Korea. Russia's strategic aim was relatively straightforward: secure regional dominance and expand its geopolitical reach. However, the execution of this strategy was deeply flawed. Russian leadership assumed that geographic depth, numerical superiority, and industrial resources would compensate for organisational inefficiencies. As Lieven (2015) notes, Russia "overestimated its ability to sustain offensive military operations at extreme range," highlighting a disconnect between strategic ambition and logistical reality.

The war ultimately exposed fundamental weaknesses within the Russian system, including poor staff work, ineffective command coordination, and overstretched lines of communication; most notably reliance on the single-track Trans-Siberian Railway (Menning, 1992). These factors contributed directly to Russia's defeat, culminating in the Treaty of Portsmouth in 1905.

In contrast, the Russo-Ukrainian War is shaped by a far more complex geopolitical environment, involving NATO, EU dynamics, and broader global competition between major powers.
Nevertheless, Russian strategic assumptions at the outset of the 2022 invasion mirrored those of 1904. Ukraine was expected to collapse rapidly, its government to be replaced, and Western intervention to remain limited or fragmented (Kofman and Lee, 2022).

When these assumptions proved incorrect, Russia was forced into a protracted war of attrition. The transition from manoeuvre warfare, seen in the initial push toward Kyiv, to positional and artillery-dominated conflict in eastern Ukraine reflects both the failure of initial planning and the persistence of traditional Russian operational methods.

The key analytical point is that in both cases, Russian strategic failure occurred before the conflict fully unfolded. Misjudgements at the political level created conditions that military capability could not compensate for. This demonstrates the critical importance of aligning strategic objectives with realistic assessments of capability and environment.

RUSSIAN OPERATIONAL APPROACH TO WARFIGHTING

In the Russo-Japanese War, Russian operations were characterised by attrition, massed formations, and limited operational flexibility. Artillery played a central role, particularly during engagements such as the Siege of Port Arthur, where heavy guns were employed extensively. However, despite possessing considerable firepower, Russian forces struggled to use it effectively. Kowner (2006) argues that "firepower was abundant, but its application was frequently ineffective due to poor coordination," reflecting a systemic inability to integrate fires with manoeuvre and intelligence.

Operational rigidity was a defining feature of Russian performance. Commanders were often unable to adapt to rapidly changing battlefield conditions, resulting in predictable and costly offensives. This lack of adaptability was compounded by poor communication and limited delegation of authority.

In Ukraine, Russian warfighting appears significantly more advanced in terms of technology and capability. The integration of unmanned aerial vehicles (UAVs), electronic warfare, and precision-guided munitions suggests a modernised force capable of conducting complex operations whilst Artillery continues to remain central to Russian doctrine and worthy of its moniker "God of War" (Grau and Bartles, 2016). This emphasis has been clearly demonstrated in Ukraine, where Russian forces have relied heavily on massed fires to shape the present-day battlefield.
However, closer analysis reveals a substantial continuity with earlier practices as seen in during the Russo-Japanese War. Russian operations have frequently prioritised volume of fire over precision, particularly during the battles for cities such as Severodonetsk and Bakhmut. While this approach can achieve tactical gains, it often comes at significant cost and lacks operational finesse.

Moreover, as Kofman (2023) notes, Russia's advantages in artillery have been "offset by weaknesses in targeting and integration," particularly during the early phases of the war.

Failures in coordination between reconnaissance and strike systems limited the effectiveness of fires, highlighting the persistence of systemic issues identified in 1904.

The key difference lies not in the principle of artillery dominance, but in the potential for its application. Modern technology enables rapid, networked targeting cycles, yet Russian forces have struggled to fully exploit these capabilities. Instead, they have often reverted to traditional, attritional methods.

The analytical takeaway is that while Russian operational capabilities have advanced significantly, its doctrinal mindset has not evolved at the same pace. The gap between capability and effective application remains a defining weakness.

ECONOMIC AND INDUSTRIAL ASPECTS OF WARFIGHTING

The economic dimension reveals substantial change between the two conflicts. During the Russo-Japanese War, Russia's industrial base was insufficient to sustain prolonged high-intensity operations. Logistics were severely constrained, particularly by dependence on the Trans-Siberian Railway, which limited the volume and speed of troop and material movement (Menning, 1992). As a result, Russia was unable to effectively reinforce or resupply its forces in theatre.

By contrast, modern Russia has demonstrated a significantly greater capacity for economic adaptation and resilience. Despite facing extensive Western sanctions following the 2022 invasion, Russia has maintained defence production and continued military operations. Connolly (2023) argues that Russia has shown "a capacity for adaptation under pressure," particularly in reconfiguring supply chains and increasing domestic production of military materiel.

However, this resilience should not be overstated. The war in Ukraine has highlighted the immense resource demands of modern industrial warfare, particularly in relation to artillery ammunition. Estimates suggest that both Russia and Ukraine have expended thousands of shells per day at peak intensity, placing enormous strain on production systems (Watling and Reynolds, 2023).

The key difference between the two periods is therefore not the absence of constraints, but Russia's improved ability to manage and mitigate them. Modern industrial infrastructure, combined with a more flexible economic system, has enabled sustained operations.

Nevertheless, the war reinforces the fundamentally industrial nature of high-intensity conflict, particularly where artillery is central.

DIPLOMATIC AND GEOPOLITICAL DIMENSIONS

The diplomatic environments of the two wars differ significantly. In 1904–05, Russia operated in relative diplomatic isolation, while Japan benefited from its alliance with the United Kingdom.

This imbalance provided Japan with both strategic confidence and indirect support, contributing to its eventual victory (Steinberg et al., 2005).

In contrast, the Russo-Ukrainian War takes place within a highly interconnected and politically complex international system. Russia faces significant isolation from Western powers, including economic sanctions and military support to Ukraine. However, it has partially mitigated this isolation through relationships with states such as China, Iran, and North Korea.

As Lo (2022) suggests, Russia positions itself as a "challenger to the Western-led international system," reflecting a broader shift toward multipolarity. This dynamic has contributed to the longevity of the conflict, as external support continues to sustain both Ukrainian resistance and Russian warfighting capacity.

The key analytical point is that diplomacy now plays a more continuous and multifaceted role in warfare. Unlike 1905, where international pressure contributed to a relatively clear resolution, the Ukraine conflict is embedded within a wider geopolitical contest. This makes termination conditions more uncertain and prolongs the conflict.

COMMAND AND CONTROL

Command and control (C2) represents one of the strongest areas of continuity between the two conflicts. In both the Russo-Japanese War and the current war in Ukraine, Russian command structures are characterised by centralisation and limited delegation.

In 1904–05, this resulted in slow decision-making and an inability to respond effectively to changing battlefield conditions. Junior commanders lacked the authority to exploit opportunities or adapt plans, leading to operational stagnation.

Despite technological advancements, similar issues have been observed in Ukraine. While modern communication systems offer the potential for decentralised operations, Russian command culture continues to prioritise control over initiative. Freedman (2022) highlights that Russian command structures remain "rigid and hierarchical," limiting flexibility at lower levels.

This has had direct operational consequences. Units have often been unable to respond dynamically to Ukrainian actions, particularly in fast-moving engagements. The persistence of centralised command reflects a deeper cultural and institutional continuity that technology alone cannot overcome.

TECHNOLOGY AND THE CHANGING CHARACTER OF WAR

The most significant difference between the two conflicts is the role of technology. The Russo-Japanese War marked an early stage in the development of modern warfare, featuring elements such as machine guns and indirect artillery fire. However, these technologies were not fully integrated into a cohesive system.

In contrast, the war in Ukraine is characterised by:

- Persistent ISTAR capabilities
- UAV-enabled targeting
- Electronic warfare
- Precision-guided munitions

These capabilities have created what is often described as a "transparent battlefield," in which

forces are continuously observed and targeted (Watling and Reynolds, 2023).

However, technology alone does not guarantee success. Ukraine has demonstrated effective integration of these systems, achieving rapid targeting cycles and high levels of operational coordination. Russia, by comparison, has struggled to consistently integrate its capabilities, particularly in the early stages of the war.

This reinforces a critical point: modern warfare is defined less by the possession of advanced systems and more by their integration into a coherent operational framework.

LESSONS FOR THE ROYAL ARTILLERY

Several key lessons emerge from this comparison for the Royal Artillery, particularly within a NATO context.

1. Integration of ISTAR and Fires

The ability to rapidly link sensors to shooters is fundamental to success in modern artillery warfare. The conflict in Ukraine has demonstrated that the speed and efficiency of the targeting cycle, "sensor-to-shooter", can be decisive in determining battlefield outcomes. Forces that are able to find, identify, and engage targets quickly gain a significant advantage, particularly in a highly contested and dynamic environment where targets are fleeting and survivability is closely tied to speed of action.

For the Royal Artillery, this has direct implications for both current capabilities, such as MLRS, and future deep fires systems. The effectiveness of these platforms is not determined solely by range or accuracy, but by their integration within a wider network of sensors, command systems, and decision-making processes. Achieving this requires investment not only in technology, but also in doctrine, training, and organisational structures that enable rapid information flow and decentralised decision-making.

Ultimately, the lesson is clear: firepower alone is insufficient without speed and integration. The ability to compress the targeting cycle by finding, fixing and striking faster than the adversary will continue to be a defining factor in future high-intensity conflict.

2. Survivability and Mobility

The modern battlefield is increasingly transparent, with advances in target acquisition and "find" capabilities making static positions highly vulnerable to counter-battery fire. As a result, mobility is no longer simply desirable but essential to artillery survivability. However, the lessons from Ukraine suggest that this should not be interpreted as an absolute shift away from defensive postures. Instead, artillery units must strike a deliberate balance between manoeuvre and the selective use of fortified positions, depending on the threat and operational context.

Central to this balance is effective signature management. The ability to reduce detectability across visual, thermal, electromagnetic, and acoustic signatures is critical if units are to survive in a contested environment. Survivability must therefore be treated as a core priority across all Royal Artillery subunits.

Achieving this requires continuous and rigorous training. The interplay between mobility, dispersion, concealment, and signature management must be repeatedly tested and refined under realistic conditions. Only through this iterative process can artillery units develop the discipline and adaptability required to operate effectively on a modern, highly contested battlefield.

3. **Ammunition Sustainability**

High-intensity conflict places exceptional demands on ammunition stockpiles, rapidly depleting reserves at a rate that challenges both logistics and industrial capacity. The experience of Ukraine demonstrates that sustaining large-scale artillery operations requires not only sufficient stockpiles, but a resilient and responsive system capable of maintaining supply over prolonged periods.

For the Royal Artillery, this necessitates a more integrated approach to sustainment. Logistical systems must be closely aligned with operational planning, ensuring that ammunition supply keeps pace with the tempo of operations. This integration cannot remain theoretical. Greater emphasis must be placed on exercising alongside the relevant G4 echelons and non-RA units, ensuring that sustainment is rehearsed in realistic conditions rather than simply simulated. At its core, however, the problem is one of cost, and how financial and industrial limits shape the availability of artillery fires. In recent times, the RA has relied on Precision munitions such as the 155mm Excalibur round which has proven to be a highly effective but costly and complex munition to manufacture resulting in constraints to both stockpiles and resupply. In contrast, Russian artillery emphasises the mass production of simpler, unguided rounds that are cheap, scalable, and available in volume. This creates an imbalance: Western forces rely on precision but are limited by cost, while Russia sustains combat power through quantity and persistence.

If the requirement is suppression rather than destruction, this highlights a critical issue. Suppression depends on volume and continuity, not precision alone, meaning lower-cost, easier-to-produce ammunition may be more effective overall. Cheaper munitions enable larger stockpiles, higher rates of fire, and sustained operations at reduced financial burden, making cost a decisive factor in tactical freedom.

These significant costs have direct implications for training. Expensive ammunition restricts live-fire opportunities, increasing reliance on simulation and reducing realism. By contrast, cheaper and more available rounds would enhance units' overall combat effectiveness. These cheaper rounds would allow for more frequent live firing leading to greater gunnery proficiency, fire discipline, and the ability to sustain fires under pressure for sustained and realistic periods for less cost than over reliance on more expensive ammunition.

Only through repeated, practical integration can friction points be identified and resolved. This will enable a more robust understanding of the challenges associated with sustaining high-intensity fires, ensuring that logistical support and cost is not a limiting factor in future operations.

4. Balance Between Precision and Mass

While Western doctrine has increasingly emphasised precision fires, enabled by advanced targeting systems and precision-guided munitions, the war in Ukraine has demonstrated that volume of fire remains highly relevant in high-intensity conflict. Precision offers efficiency and reduces logistical burden per effect, but it is not always sufficient on its own, particularly when facing dispersed targets, hardened positions, or when operating in degraded ISR environments.

Russian forces have consistently employed massed artillery fires to compensate for limitations in targeting and integration, achieving effects through weight of fire rather than accuracy. At the same time, Ukrainian forces have demonstrated the effectiveness of precision systems such as HIMARS in striking high-value targets, logistics nodes, and command infrastructure. The coexistence of these approaches illustrates that modern artillery warfare requires both precision and mass, applied selectively according to the tactical and operational context.

For the Royal Artillery, this reinforces the need to maintain a balanced capability. Over-reliance on precision alone risks vulnerability in scenarios where targeting data is limited, contested, or denied. Conversely, an exclusive dependence on mass fires would impose unsustainable logistical demands and reduce operational agility. The challenge, therefore, lies in integrating both approaches within a coherent fires system.

This requires a flexible mindset and appropriate force structure. Commanders must be able to determine when precision fires are best employed whilst ensuring that achieving this balance between mass and precision effects have vast implications for ammunition stockpiling, training, and doctrine. Success will depend on the ability to transition seamlessly and manage this balance. The lesson from Ukraine is clear: neither approach is sufficient in isolation, but together they provide a complementary and adaptable framework for modern artillery operations.

5. Mission Command

Decentralised command structures are essential for operating effectively in complex, fast-moving, and degraded battlespaces. Modern conflict, particularly as demonstrated in Ukraine, is characterised by contested communications, rapidly changing tactical situations, and fleeting opportunities that require immediate exploitation. In such an environment, the ability of junior commanders to exercise initiative within a clear intent is critical to maintaining tempo and achieving effective battlefield outcomes.

Russian performance throughout the conflict and during the Russo-Japanese War has consistently highlighted the limitations inherent in a highly centralised command model.

For the Royal Artillery, this reinforces the enduring importance of mission command. Empowering subordinate commanders to act decisively within the framework of the commander's intent enables greater responsiveness and resilience, particularly when communications are disrupted or degraded. This approach to mission command approach greatly enhances survivability and adaptability.

Ultimately, the lesson from both conflicts stated in this essay is clear: command philosophy is as important as capability. While technology can enable faster communication and coordination, it cannot compensate for a lack of initiative at lower levels. A balanced approach combining robust command intent with decentralised execution provides the flexibility required to operate effectively in modern high-intensity conflict.

CONCLUSION

The comparison between the Russo-Japanese War and the Russo-Ukrainian War highlights both enduring continuity and significant change in Russian warfighting. While Russian military capability has evolved markedly particularly in terms of technology, range, and industrial resilience, the underlying characteristics of its approach to warfare have demonstrated far greater persistence. Structural issues such as overcentralisation, flawed strategic assumptions, and inconsistent integration of combat power continue to shape Russian performance across both conflicts.

In each case, Russian forces entered the conflict with an expectation of rapid success, grounded more in political ambition than realistic military assessment. When these assumptions proved incorrect, operations were forced to adapt, often, reverting to attritional methods centred on massed artillery fires. This reliance on volume has enabled Russia to generate tactical effects and sustain battlefield pressure, but it has frequently come at the expense of operational flexibility and efficiency, particularly in complex and dynamic environments.

The critical issue, therefore, is not an absence of capability, but a persistent inability to apply that capability in a coherent and integrated manner. Advances in technology, whether in the form of modern ISR, precision munitions, or electronic warfare, offer significant potential advantage. However, without effective coordination between sensors, decision-makers, and shooters, these capabilities are often underutilised. This enduring gap between potential and performance, evident in both 1904 and 2022, remains a defining feature of Russian warfighting.

For the Royal Artillery, the implications are clear and highly relevant. Artillery continues to play a central role in high-intensity conflict, but its effectiveness is no longer determined solely by the weight of fire delivered. Instead, success depends on integration within a wider system that combines intelligence, manoeuvre, and command. The ability to deliver accurate, timely, and survivable fires, while operating in a contested and transparent battlespace, is now the decisive factor.

This requires a balanced approach: integrating precision and mass, enabling rapid sensor-to-shooter linkages, ensuring logistical sustainability, and operating within a mission command framework that empowers lower-level initiative. It also demands a cultural emphasis on adaptability, training, and the realistic testing of systems under operational conditions.

Ultimately, the lessons of the Russo-Japanese War and the war in Ukraine converge on a consistent conclusion. Firepower remains a decisive element of warfare, but it is only effective when applied intelligently, coherently, and in accordance with the demands of the operational environment. Capability alone is insufficient; it is the application of that capability through integration, adaptability, and sound command, that determines success on the modern battlefield.

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DUNCAN ESSAY 2026

'From Tubes to Drones' Discuss the shift from Artillery to UAS in Ukraine as the preferred method to SUPPRESS

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INTRODUCTION

'The report of my death was an exaggeration'

Much like Mark Twain's oft-quoted response to erroneous newspaper reports of his 'premature' death in 1897, numerous theorists and amateur commentators on contemporary conflict have declared that traditional tubed artillery, as the preferred method of suppression, has become obsolete with the advent of the drone-enabled uncrewed aerial systems (UAS) 'revolution'.[1] Indeed, as Dr Andrew Sharpe observed in the Spring 2026 edition of the British Army Review, 'I have been struck, over the last year or so, by the number of Ukrainian and Russian video clips from the front depicting the destruction of their enemies'.[2] Such short, first-person video clips are both striking and easily consumed, and 'it is not surprising, therefore, that so much of our impression of this conflict is dronecentric [sic]'.[3]

This paper will argue that the reality is considerably more nuanced. Rather than supplanting artillery, UAS and conventional artillery systems each retain vital and complementary roles as methods of suppression on the contemporary battlefield. First, the paper will examine the apparent statistical shift from traditional artillery to UAS as the preferred means of suppression between 2022 and 2026. It then assesses the comparative effectiveness of each capability before concluding with reflections on their complementary utility in future conflict.

Prior to undertaking further examination of the statement at hand, it is pertinent to define the key factors of the question.

1. Salinas, Antonio and Levay, Jason (2025). Military Revolutions from the Spanish Tercio to FPV Drones.
2. Sharpe, Andrew (2026). The British Army Review: A Look Up, p.3.
3. Ibid.
4. Planning and Execution Handbook, p.25-17.

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For the purposes of this paper, 'SUPPRESS' will be taken to mean the ability to 'temporarily degrade an enemy capability to enable a friendly action'.[4] UAS, interchangeable with 'drones', will be defined in accordance with NATO doctrine as 'a system whose components include the uncrewed aerial vehicle, the control station, the data links, and any other equipment necessary for the operation of the system'.[5] 'Tubes' and 'artillery' will refer to gun, howitzer and rocket systems that deliver indirect fires by projecting munitions through a barrel or pod. Finally, pertaining to 'Ukraine', analysis will draw on evidence available from the outset of 2014 to the present day, predominantly focusing on observations from February 2022 onwards.

STATISTICAL SHIFT

From the advent of the bombard at Crécy in 1346, to the employment of GPS guided munitions, artillery, comprising both tube and rocket systems, has long been regarded as the 'King of Battle' and the principal means of suppression. The successful provision and application of systems to deliver suppressive fires formed the foundation of success on the industrial battlefields of the 20th century, especially when efficiently employed in the combined arms battle; a trend evident from the early days of prototypical combined arms warfare during the First World War.[6] Throughout the great struggles of the 20th century, artillery fire was estimated to account for the majority of casualties; some studies suggesting 65-75 percent of combat casualties being caused by artillery, far exceeding those inflicted by small arms, armour or airpower.[7] This enduring dominance reflected artillery's capacity to deliver sustained, high-volume fire across wide areas, generating both destructive and suppressive effects, thereby rendering it indispensable to commanders and their preferred method of suppression.

Consistent with this paradigm, at the outset of the full-scale Russian invasion in February 2022, artillery constituted the principal component of both Russian and Ukrainian firepower, albeit with a marked quantitative disparity. Russia entered the conflict with an estimated 4,500–5,500 tube artillery systems (towed and self-propelled) and 1,500–2,000 multiple launch rocket systems (MLRS) in active service, amounting to approximately 6,000–7,000 operational systems.[8] Additionally, Russia maintained substantial reserve holdings, reportedly exceeding 10,000 legacy artillery systems in storage, thus (theoretically) providing depth for sustained operations.[9] As Sam Cranny-Evans writes, 'artillery (was) central to the Russian way of war'.[10] This importance was further embedded doctrinally; whereas Western forces fire to manoeuvre, Russian forces manoeuvre to fire with the belief of artillery as the God of War and the decisive arm.[11]

By comparison, Ukraine possessed a significantly smaller artillery capability at the time of the invasion, with approximately 1,000-1,500 tube systems and 300-500 MLRS, totalling 1,300-2,000 systems.[12] These were, however, predominantly Soviet-era platforms—such as the 2S1 Gvozdika, 2S3 Akatsiya, D-30 howitzer, and BM-21 Grad—and were constrained by limited stocks of spares, munitions and advanced precision-guided munitions.[13]

During the early phases of the war, the dominance of artillery as the means of suppression was thus evident with high rates of fire, some estimates indicating the employment of tens of thousands of shells per day.[14] Russian operations, particularly along the axes of advance toward Kharkiv, Kyiv, and in the Donbas, relied heavily on massed artillery fires to compensate for manoeuvre shortfalls and resistance from Ukrainian forces. For example, during the battles for Sievierodonetsk and Lysychansk in May–June 2022, Russian forces employed overwhelming volumes of tube and rocket artillery, firing thousands of shells per day to systematically destroy urban terrain and compel Ukrainian withdrawals through attrition rather than manoeuvre. [15] Similarly, in the early stages of the war around Kharkiv, Ukrainian forces leveraged their more limited artillery assets systems to disrupt Russian logistics and blunt advances, demonstrating that even in a quantitatively inferior position, effective artillery employment remained decisive.[16] Across these engagements, the scale of artillery use was unprecedented in recent conflicts, with estimates suggesting that Russian forces were expending up to 50,000 shells per day at peak intensity, reinforcing assessments that artillery accounted for the majority of casualties and battlefield suppressive effects in the initial months of the war.

Over the ensuing 4 years of conflict however, there has been a marked shift towards UAS seemingly constituting the preferred means of suppression. Statistical analyses suggest that drones are now responsible for approximately 70–80 percent of casualties, indicating a significant reversal of historical trends.[17] This drastic statistical shift can be attributed to several interrelated factors within the Russo-Ukrainian conflict. Logistically, the adoption of UAS has been driven in part by necessity, reflecting a global shortage of artillery systems and munitions affecting both combatants, particularly the Armed Forces of Ukraine.[18] The International Institute for Strategic Studies calculates that between 200,000 and 250,000 shells per month are required to sustain major offensive operations, and between 75,000 and 90,000 shells to maintain defensive operations.[19] In reality, both the Ukrainian and Russian economies have struggled to reorientate and sustain artillery ammunition production to support such expenditure rates.[20]

Even where artillery munitions have been available, the persistent intelligence, surveillance, and reconnaissance (ISR) capabilities enabled by UAS complicate the movement and sustainment of the substantial logistical infrastructure required for massed fires. Consequently, Ukraine, constrained by a relatively limited industrial base and a heterogeneous mix of donated systems, has come to rely on comparatively inexpensive and 'logistics-light' UAS to conduct suppression tasks and enable friendly actions. Moreover, UAS does not require the same extensive logistical chain as artillery; whereas sustained artillery fire demands large quantities of ammunition, transport vehicles, and resupply infrastructure, UAS can be deployed by small teams with comparatively minimal support.

Conventional artillery systems, while highly destructive and effective for suppression, are relatively expensive in both procurement and sustainment. Therefore, cost differentials further incentivised this shift. A standard 155mm shell typically costs between $3,000 – $8,000, while precision-guided munitions (PGM) such as Excalibur can exceed $70,000 – $100,000 per round.[21] In contrast, FPV drones, the most common form of UAS suppression, are significantly cheaper to produce, costing $400 - $600 per unit, with some Ukrainian systems reported to cost even less.[22] This disparity allows forces employing UAS to generate a sustained tempo of tactical actions at comparatively low financial cost. As Jack Watling and Nick Reynolds note, both sides have leveraged 'relatively inexpensive strike drones to offset shortages in conventional artillery ammunition'.[23] Moreover, the employment of UAS during Ukraine's Operation SPIDERWEB, a June 2025 strike against Russian strategic long-range aviation assets, demonstrated their evolving role as strategic, rather than merely tactical, systems, with over 100 explosive-laden drones striking multiple Russian airfields and strategic bombers across five time zones.

Some commentators argue that these developments demonstrate the eclipse of traditional artillery as the preferred method of suppression. Ilya Serkin contends that 'the drone has become so dominant that it has relegated all competing weapon systems away from the kill zone. What remains at the front are only dispersed, concealed and sparsely manned infantry positions'.[24] He further asserts that 'the drone is no longer a peer of artillery, armour, army aviation or mass infantry. It has defeated these systems, pushed them away from the front line, and reduced their role to niche applications where they can still function'.[25] This perspective is seemingly reinforced by several operational advantages of UAS. Drones offer greater precision and faster (in some cases) response times. FPV drones generate both physical and psychological suppression by preventing movement under observation. Critically, they appear to shorten the sensor-to-shooter chain, enabling operators to detect and strike targets without the need for intermediary coordination.

UAS LIMITATIONS

Evidence shows, however, that it is premature to conclude that UAS have replaced artillery as the preferred means of suppression, with several enduring limitations constraining their effectiveness. First, electronic warfare (EW) capabilities are rapidly evolving, and effective counter-UAS measures can disrupt or disable drone operations, accounting for some 31% of sorties in a particular FPV unit.[26] Although fibre-optic guided systems mitigate jamming, they do so at the expense of manoeuvrability and range. Second, UAS performance is degraded by high winds, heavy precipitation, and poor visibility, whereas artillery remains an all-weather capability capable of sustained employment.[27] Without 24-hour, all-weather options, militaries become increasingly fragile and thus prone to surprise, shock, and being entirely overwhelmed.[28] Third, payload limitations constrain the destructive effect of drones; a typical UAS carries significantly less explosive than a standard 155 mm shell, limiting its effectiveness in area suppression and denial. In summary, as Bill Murray identifies, the proliferation of FPVs compensates for a critical shortage of artillery shells and speaks more to 'finding a gap rather than offering a fundamentally better solution'.[29]

Reinforcing such limitations from a first-hand perspective, Jakub Jajcay, a former FPV pilot serving with Ukraine in 2024 and 2025 writes

'They are finicky, unreliable, hard to use, and susceptible to electronic interference. Few first-person view drones have night-vision capability. Those that do are in short supply and cost twice as much as the base model. In Ukraine, in the winter, it's dark for 14 hours a day. Wind, rain, snow, and fog all mean a drone cannot fly'.[30]

COMPLEMENTARY IN PRACTICE

'A careful and historically informed examination of the conflict in Ukraine, coupled with an understanding of the fundamental principles of warfare, reveals a fundamental truth: unmanned aerial vehicles (UAVs) can enhance fire support, improve situational awareness, and provide tactical advantages, but they are not, and won't be in the foreseeable future, a replacement for the range, volume, destructive power, and all-weather operability of traditional artillery.'[31]

Evidence indicates that UAS employed in isolation are subject to high failure rates, with estimates suggesting that 60–80 percent of Ukrainian FPVs fail to reach their intended targets.[32] Consequently, case studies consistently appear to demonstrate that UAS are most effective when integrated with artillery and other arms. Combined operations have proven particularly successful, for example where FPV drones immobilise vehicles, enabling artillery to engage dismounted personnel.[33] Indeed, one Ukrainian observer noted the hours of planning it had taken to immobilise one Russian tank using FPVs, compared to a meeting engagement with a troop of Russian armour where having located them with a drone he fired BONUS (anti-armour artillery shells) at them knocking out all of the platforms within two minutes.[34] Furthermore, drones will never replicate the overwhelming suppression and deep interdiction effects of artillery. The ability to saturate an enemy position with high-explosive rounds remains a critical capability for breaking defences and achieving decisive breakthroughs.[35]

5. NATO Standardization Office, AAP-06: NATO Glossary of Terms and Definitions.
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The fighting in Ukraine has also further underscored the extant importance of artillery in high intensity warfare where precision, range and volume of fire are all decisive factors.[36] As Elio Calcagno and Alessandro Marrone write, 'artillery munitions, including rockets, both conventional and guided, have consistently been at the top of Kyiv's needs list' and their shortage degrades Ukraine's ability to defend itself effectively.[37] Systems such as the M270 Multiple Launch Rocket System (MLRS) and M142 High Mobility Artillery Rocket System (HIMARS) alongside traditional tube artillery have enabled formations to strike targets accurately in both the deep and close battle at increased ranges. PGM like the Excalibur shell or M31A1 unitary missile have further enhanced effectiveness by reducing collateral damage and facilitating the more precise prosecution of targets.

Indeed, as Mykhaylo Zabrodskyi et al identify it was the introduction of HIMARS, M270 and PGMs targeting command posts, logistic nodes and troop concentrations deep behind the forward lines of troops which helped to stall the Russian offensive in the Donbas and herald a new phase for operations.[38] Artillery retains distinct advantages in delivering all-weather, massed, high-explosive fire capable of saturating enemy positions and enabling breakthroughs. As Ukrainian commanders have noted, such systems remain far more responsive and more reliably able to knock out vehicles and suppress massing infantry than FPV drones. In this sense, UAS function most effectively as enablers within a broader system of fires, delivering small-scale strike and facilitating targeting, reconnaissance, and battle damage assessment.

CONCLUSION

As identified throughout the paper, the increased reliance on drones as the means of suppression by both Ukraine and Russia reflects the specific conditions of the conflict, namely resource constraints, industrial limitations, and the adaptive responses of both combatants, rather than a definitive transformation in the character of suppression and warfare. While UAS has assumed a significant role in the day-to-day conduct of suppression due to their cost-effectiveness and accessibility, both sides continue to prioritise the regeneration of artillery capabilities.[39]

The broader literature remains divided, with some commentators portraying drones as decisive and others dismissing them as transient. As William Owen observes, contemporary military discourse is increasingly fragmented, shaped by the proliferation of social media and the resulting dilution of informed debate.[40] Consequently, caution is required when drawing generalised conclusions from the Ukrainian case. As noted by Calcagno and Marrone, any recommendations or conclusions concerning artillery's employment should avoid falling into the trap of viewing the war in Ukraine as a 'universally relevant case study that is equally applicable to all armed forces'.[41] Crucially, Justin Bronk also writes that 'Ukraine has achieved very impressive defensive results against larger Russian forces, but has not managed to retain the strategic initiative or operational momentum despite deploying millions of UAS that are constantly iteratively developed by a system honed by multiple years of desperate fighting'.[42]

Ultimately, while UAS represent a significant and enduring development in modern warfare, they do not independently deliver decisive outcomes. Rather, their greatest value lies in complementing traditional systems. The dominance of the near-surface battlespace will remain a prerequisite for successful manoeuvre, and the integration of UAS with artillery will be central to achieving success on the future battlefield. Drones will play an important role in this process, and they will help set those conditions, but despite being revolutionary and game-changing technology, they will not provide decisive outcomes on their own.[43]

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"Woolwich" - The Story of a Gunner Locomotive

By Jimmy James



Jimmy James is a professional fundraising consultant. He is Principal at Minerva Fundraising Consultancy, the company he founded in 1997.
Throughout a wide-ranging career, he has worked in the public, private and Third sectors in the UK and overseas, as well as holding a variety of non-executive directorships. His public sector experience includes service in both the Australian and British Armies.
Minerva Fundraising has carried out a large number of major assignments with clients throughout the United Kingdom and overseas. These have included capital fundraising appeals, feasibility studies, start-up projects and strategic consultancies, as well as continuity fundraising over longer periods. Former clients include Oxford Brookes University; the Anglican Diocese in Europe; and the Faraday Institute for Science and Religion at the University of Cambridge.
Jimmy James has written extensively on fundraising and other charity issues: the 2nd Edition of his book The Volunteer Fundraiser's Handbook will be published by Routledge in early 2027. He is married to Jane, and they have 3 daughters. In September 2026 he took part in the Chiltern 50 Ultra Challenge in aid of RTSUK, the charity which supports his youngest daughter Imogen.

Woolwich is an 18" gauge 0-4-0 steam locomotive originally built in 1916 by the Avonside Engine Company of Bristol for the Royal Arsenal at Woolwich. She weighs 11.25 tons. 18" gauge railways are rare, and almost all the original lines were laid by the War Office which chose this gauge for a variety of reasons, including relatively low cost and ease of use in confined spaces.

Owing to the dangers that sparks from a conventional steam engine would cause in an environment replete with explosives, Woolwich was oil fired, rather than coal fired, and in addition was equipped with a spark arresting funnel. She served at the Royal Arsenal for some 40 years before being sold off and replaced by a diesel locomotive, Carnegie. By this time the Avonside Engine Company had been merged with the Hunslet Engine Company of Leeds, and it was this amalgamated company that built Carnegie.

In 1961, Woolwich was discovered in a scrapyard near Brackley in Northamptonshire, from where she was rescued by Clinton Devon Estates, one of the West Country's largest estates, then owned by Gerard Fane Trefusis (later 22nd Baron Clinton). The Estates had come under new management in 1961 when the distinguished forester and Agent for the Oxford University Chest, Noel (Jimmy) James MC, a former TA Gunner before and during the Second World War, was head hunted to the chief executive role.

One of the early challenges facing Mr James was Bicton Gardens near Budleigh Salterton, the beautiful but neglected formal gardens laid out in the 18th Century under the direction of the then owner, Henry, Baron Rolle of Stevenstone. Bicton House and the adjoining Home Farm had been sold to Devon County Council in 1957. Mr James was clear that, without a stately home to complement the Gardens, an additional attraction was needed if the Gardens were to be opened to the public as a successful venture.



20 THE GUARDIAN Wednesday March 27 1963

MAIL DIARY

Religious drama at Great Tew
• Laying eggs to Order • New line in the Beeching era

THE production of Henri Gheon's religious masterpiece, The Fay of the Cross, by beatre Group Productions—the first in the istory of the West End e licensed for performance the Lord Chamberlain will be presented at Great Tew Church on its way to London.

The French dramatist's play will be performed there next Saturday and Sunday as part of preparations for an old-time Mystery Play to be staged from the Vicar of Great Tew's pulpit on Whit Monday. Mr. Griffiths said his wife has been both interested for many years in the presentation of religious drama because she is a professional actress and actress, and a director of the company. "We have been doing it for some time now which we hold in Cornwall.

"Since then, they have done it in Oxford and in the country in devotion, and in the last three years have invited a performance a number of the Oxford University Dramatic Society. The present production, which is directed by William Gaskill, is going to be the story of the events in the Holy Week through the eyes of a group of ordinary people.

"It is a cast of five who—in the stage manager—will be staying with Mr. and Mrs. Griffiths overnight.

Eggs to Order

I TALK about keeping your poultry to our poultry farmer friends, we print excerpts from the Eggs and Poultry Guide which is issued by the Minister of Agriculture, Fisheries and Food and the Secretaries of State respectively concerned with agriculture in England and Northern Ireland acting jointly in exercise of the powers conferred upon them by

"In this order, unless the context otherwise requires, 'producer' means a person who produces eggs in the United Kingdom . . . 'retailer' means a person who sells eggs by retail . . . 'wholesaler' means a person who sells eggs by wholesale . . . 'week' means a period of seven days beginning with the first Monday in any calendar year . . .

The order, which came into force on March 25, 1963, was made on March 20, 1963, and "before Parliament on the 25th day of March."

Mayo [not we would have liked to have seen.

Birth of a railway

THE Bombay we may fall. I [illegible] to Devon Mr. D. G. James, Oxford University's Land Agent from 1950-67, has had a hand in the railway business.

The railway in question is a 15in. gauge line in the grounds of Bicton Gardens, near Budleigh Salterton, which opens to the public on Saturday, and will take them on a mile-long journey in the 0-4-0 engine which was built new by the famous French locomotive engineer, André de Dion, in 1898.

It was the inspiration of Mr. James, who is now Agent to the Clinton Devon Estates.

He bought the engine, built in 1916, from the Woolwich Arsenal, where it was named Woolwich, and the Air Ministry, unwanted signal box and a quantity of track from a London engineering firm.

A distinguished forester, Mr. James is this year's President of the Royal Forestry Society, responsible

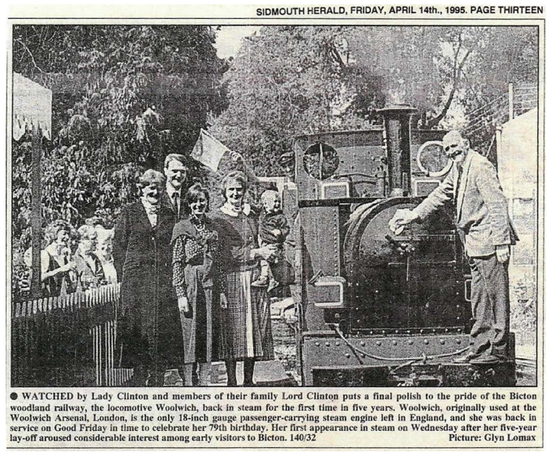
Fishing on the air

WHEN Oxford meets Cambridge on the banks of the Thames at Henley on Saturday, Dr. Jack Rashbrook and Peter Thomas, Oxford, Dr. Rashbrook and Peter Thomas, Oxford, Dr. Rashbrook and Peter Thomas, Oxford, Dr.

A railway was the obvious choice, and the War Office 18” gauge was chosen. The reasons for this were the specific challenges created by the terrain which involved curves of a very restricted radius and comparatively heavy gradients. As a result, a narrow gauge was deemed necessary, together with a locomotive with the necessary tractive effort to negotiate the terrain with 4 or more carriages full of passengers.

Clinton Devon Estates acquired rolling stock both from the Royal Arsenal and the Royal Air Force; and, ultimately, the locomotive Carnegie when it was no longer required at the Royal Arsenal. Apart from one goods wagon, all the rolling stock from the Royal Arsenal had been burnt to prevent explosive contamination. Open and closed carriages were therefore built onto the underframes, and these were added to the one complete carriage acquired from Royal Air Force sources.

Track laying started in May 1962, and Woolwich was fully restored, with a more conventional funnel replacing the original. The Bicton Woodland Railway (BWR) opened to the public in Spring 1963, with Woolwich and its open and closed carriages resplendent in Gunner colours.


SIDMOUTH HERALD, FRIDAY, APRIL 14th., 1995. PAGE THIRTEEN

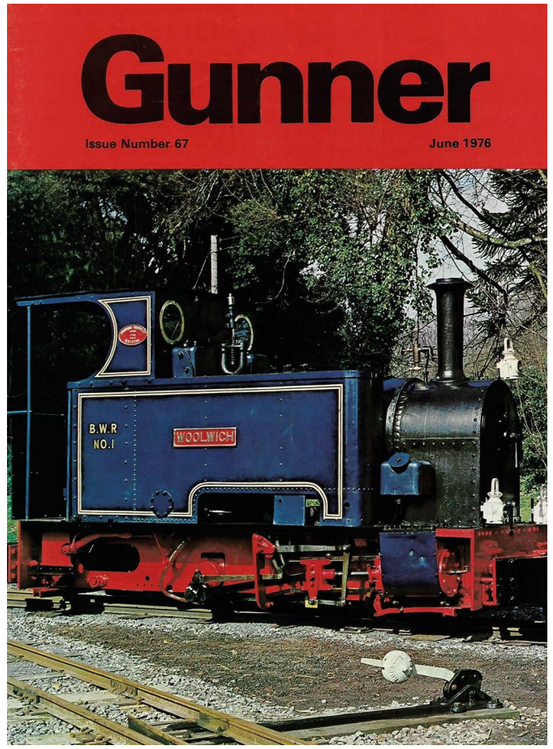
● WATCHED by Lady Clinton and members of their family Lord Clinton puts a final polish to the pride of the Bicton woodland railway, the locomotive Woolwich, back in steam for the first time in five years. Woolwich, originally used at the Woolwich Arsenal, London, is the only 18-inch gauge passenger-carrying steam engine left in England, and she was back in service on Good Friday in time to celebrate her 79th birthday. Her first appearance in steam on Wednesday after her five-year lay-off aroused considerable interest among early visitors to Bicton. 140/32 Picture: Glyn Lomax

In 1998 Clinton Devon Estates sold Bicton Gardens, including the Bicton Woodland Railway, to the Lister Family. Following this in 2000 the Listers sold Woolwich, Carnegie and other rolling stock to the Waltham Abbey Royal Gunpowder Mills Company, a charitable trust. The Mills already owned a 2’6” narrow gauge railway; but they had decided to lay an 18” gauge heritage railway on part of their site, featuring the BWR locomotives and rolling stock. For various reasons, this project did not come to fruition, and the Mills decided to concentrate on the 2’6” railway which comprises an extension collection of rare RNAD (Royal Naval Armament Depot) and ROF (Royal Ordnance Factory) stock and locomotives.

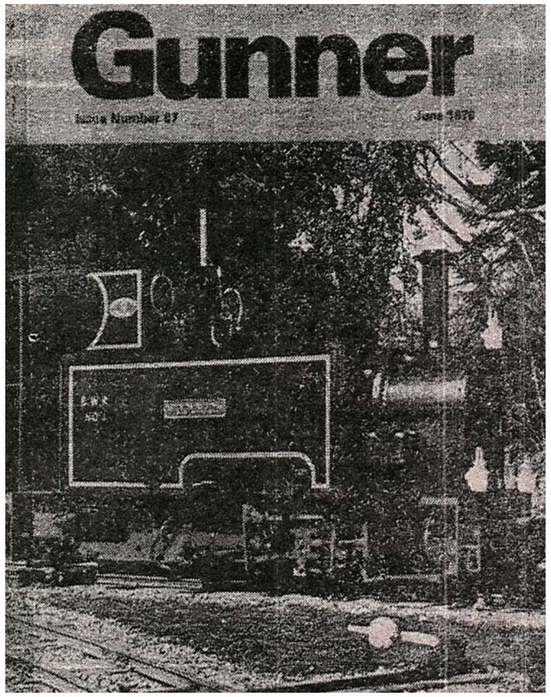
In 2016 a group of volunteers from Crossness Pumping Station approached the Mills with a proposal to rebuild Woolwich fully to operational condition; on the basis they could then have the locomotive on museum loan to operate a short line they were proposing on the Crossness site. Woolwich was duly moved to Crossness and stripped down, but again the project stalled and it remained dismantled until Statfold Narrow Gauge Museum Trust near Tamworth enquired about the availability of the 18-inch gauge stock in 2018.

As a result of this enquiry, the Statfold Narrow Gauge Museum Trust acquired Woolwich, Carnegie, 5 carriages and an 18” powder waggon in 2019. Woolwich went to Statfold directly from Crossness and the remaining 18” gauge stock remained at Waltham Abbey until early 2026. It was then purchased by the Steeple Grange Light Railway for restoration and use on their 18” gauge railway at Matlock in Derbyshire.

Since 1963, Woolwich has featured on many occasions in the media and in a variety of other guides and brochures. She appeared on the front cover of GUNNER in June 1976, together with a short piece featuring Sidney Hinchelwood, one of her drivers when she was at the Royal Arsenal. She also appeared in a BBC South West Christmas television programme for children in the early 1970s.



Today, repainted in the Statfold Museum Trust colours of dark green and red, she has taken on yet another lease of life as a museum exhibit within their extensive collection.



Gunners past and present wishing to see Woolwich, and Carnegie, will receive a warm welcome at Statfold Country Park, home of the Statfold Narrow Gauge Museum Trust.



The author is grateful to the following organisations and individuals for their help in preparing this article:

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- Statfold Narrow Gauge Museum Trust Ltd, in particular Diane Ward, James Gorton and Kirstie-Marie Morris

Observation, Denial and the Collapse of Depth

By Captain Jacob Day RA

There will be imitators – crude at first – but better and better, and while reasonable people can disagree on how long it will take for terrorists, insurgents and other rogue groups to build or acquire weaponised drones that can be guided by video straight into a target, there is really no dispute that it is a question of when and not if. The day will come when such drones are available to almost anyone who wants them badly enough. (John Villasenor, 2011).

Mosul 2016. The Al Baraa bin Malek Brigade, an ISIS unit originally formed to plan suicide attacks, disproportionately supports the holding of Mosul against the Western-coalition backed Iraqi Security Forces. For the past two years ISIS has employed low-cost commercially available UAS for propaganda, internal security, and basic ISTAR. In Mosul, it has weaponised them projecting terror, precision strike anti-personnel and even anti-armour in the right conditions up to 5km forward of the forward line of own troops (FLOT).

Between 2014 and 2016, drones designed for photographers and recreational users were adapted for war. Driven by necessity, innovation and overwhelming battlefield odds, this development made drone warfare more accessible and began its evolution on an industrial scale. Dropping weapons from the air was not a new concept.As early as 1911, Italian pilots lacking more sophisticated means had dropped grenades on Ottoman troops in Libya.

Dropper drones were not a technological innovation, although advancements in a range of technologies undoubtedly played a part. The change lay in adapting and refining existing concepts using consumer-grade and home-built components.



Screen capture from Islamic State video showing a drone munition drop targeting an Abrams MBT

Low-cost commercial (COTS (Commercial off the Shelf)) UAS have proliferated across the Ukrainian battlefield, replacing indirect fires as the principal cause of casualties and collapsing depth in the Close Battle. The 'Drone War' has been a media lure, with them honing-in largely on the human story.

Rapid technological advancement, evolving tactics, techniques and procedures (TTPs), and an increasingly complex information environment, coupled with a peacetime regulated training requirement make it difficult to keep pace with the changing threat landscape.

This article therefore does not presume to provide the solution, the next step or predict the future. The intention is, rather, to offer a concise drone warfare check-pace in a rapidly evolving environment. It seeks to clarify how the interaction of drones and EW has altered the geometry of the battlefield itself. In doing so, the aim is to bridge the gap between the images many will have seen and the operational reality those images only partially reveal.

The situation kept changing during drafting, reinforcing the 'as at' caveat in every intelligence report. The information draws on a wide range of open sources, each with its own biases, interests and blind spots.

Therefore, the following assessment reflects the situation as at Sept 26….

The Bottom Line

The low-value drone war no longer extends 0-5km beyond the FLOT. The 'kill zone'; a strip of ground straddling the Forward Edge of the Battle Area (FEBA) in which mostly COTS ISTAR and armed UAS dominate, has tripled to around 30km2. To say that movement has become difficult within the kill zone is an understatement. Armed UAS saturation has made movement near-impossible, leaving some positions unrelieved for prolonged periods.

The human story is compelling, but the effect on the 'conceptual component' is profound. How can an army sustain its personnel and armour when personnel cannot be relieved from forward positions for extended periods? It will hopefully not escape the notice of the reader that 0-15km from the FLOT is also where doctrinally most Combat and Combat Support assets want to be: guns, radar, UAS, EW, Engineers and so on. In Ukraine, an army massed at the front is not viable.

Secondly, Electronic Warfare (EW), still too often viewed as an intermittent constraint, has become a defining condition of the kill zone. Electronic Jamming in the kill zone is persistent and broadband. Battlespace is characterised by overlapping layers of observation and denial, in which visibility is transient, survivability is conditional, and depth offers less protection than commonly assumed. Target acquisition, battle tracking, survivability of sensor, and the integrity of the wider recce–strike system are all impacted.

As depth increases, military grade ISTAR UAS still have a role, though they must operate in a heavily contested environment without the assumption of survivability. The rise of one-way effectors will fall outside of the scope of this article.



Kill Zone - The remains of the Donestsk region city of Kostyantynivka

Electronic Warfare

From the height of ISIS to the first years of the Ukraine war, the seesaw of measures and countermeasures largely favoured the radio frequency drone operator over the EW counter. As EW struggled to keep pace with the emergent threat, the employment of frequency hopping, GPS hardening and reducing the UAS's emissions whilst in transit helped to maintaining this advantage. However, over the past two years the balance has tipped. Integration of AI into software-driven EW suits can now detect frequency-hopping UAS and adjust the jamming signal with the UAS in microseconds. Advanced spoofing can disrupt ground control stations, affecting UAS navigation, control and flight safety.

Broadband jamming; as to be defined from traditional jamming where only a selected number of frequencies are targeted, is the 'brute force and ignorance' approach. It denies a vast portion of the radio and microwave spectrum. In Ukraine, the result is near continuous denial of communication systems (including those between UAS and their Ground Control Stations (GCS)) within 15-20km of the FLOT and has significantly constrained the use of RF controlled UAS.

Critically, it is as much the ubiquity as the efficacy of EW systems that is having a decisive effect. Like many disciplines in the Ukraine War, EW has been forced into the hand of the generalist. EW is integrated and layered from the trench to the specialist. Jamming at the trench level lacks the sophistication of the specialist but provides soldiers at the front with a tool that is as much a morale boost as an effective countermeasure. RF controlled UAS may approach enemy positions following a planned route that avoids the worst large coverage EW but upon arrival at their target, they can expect to receive a barrage of low-sophistication jamming and spoofing from EW suites sited at the trench or vehicle level.

The lack of sophistication at the lowest level is more than offset by the inverse-square problem faced by prestige jamming arrays; signal strength is reduced by the square of the distance from the emitter. A 50W trench jammer is cheap but will produce a stronger jamming signal to a drone at 200m than a prestige 50kW jammer at 7km. The closer they get to their target, the more intense the jamming signal becomes. Since COTS UAS carry relatively small payloads and troops are typically in hard cover, even a short loss of terminal control can protect troops.

Fibre Optics

If you are someone who regularly sees UAS footage from Ukraine, you may have noticed they've recently bought the HD package. Fibreoptic UAS exists to solve a single problem – electronic countermeasures. They are un-jammable and undetectable to EW. Leaving an eerie mess of fine white fibres across the battlefield, they have proved irresistible to journalists.

The technological advancement is fairly simple: the gauge of the 'wire' has become thinner4. Thinner means lighter, critically to the point that it falls within an acceptable percentage (around 50%) of the UAS's total payload capacity. This has enabled UAS to be controlled up to 26km from the operator, though more commonly 15km.

The threat is game-changing and requires thought. EW is not able to detect or effect these systems. For FPV systems, they also are not prone to the loss of communication routinely experienced by their RF counterparts as they approach their targets, losing line of sight to the GCS. Furthermore, the quality of video feed is far higher and transmitted at a much lower energy cost. This makes fibreoptic UAS better for identification of targets and ideally suited to ambush tactics, in which the UAS may sit idly at a roadside for a protracted period awaiting a target.

In one video, a Ukrainian soldier claimed that a rudimentary device rotating a length of razor wire with an electric motor would snag and snap cables as they fall to the ground. This method remains far from confirmed but does highlight the possibility of future passive and active targeting the cable. For the time being, radar, acoustic and optical sensors linked to kinetic effectors are the only proven active countermeasures, whilst anti-drone netting is used to protect key routes and positions.



Ukrainian soldier employing a shotgun in an anti-UAS role

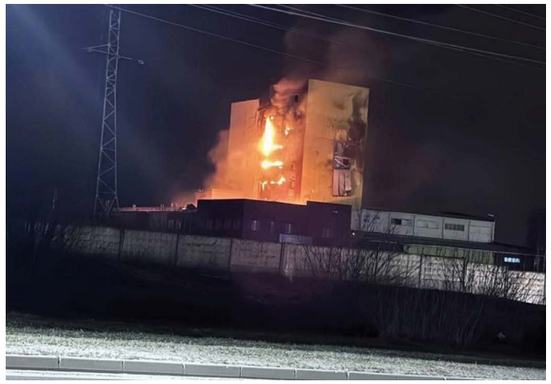
Fibreoptics present several drawbacks. Firstly, manoeuvrability is limited by both the weight and integrity of the cable. Manoeuvre around trees, powerlines, buildings and battlefield detritus all present a genuine risk of snapping it1. The high-speed aerobatic chase-down of BTRs (Russian APC) and motorbikes, that was so common a year ago, is not currently possible with a fibreoptic drone. Some observers have therefore suggested that they may be unsuitable to dense urban environments.

Fibreoptic cables have also dramatically increased in price over the past two years. AI datacentres, consuming 5% of the global production in 2024 rose to 76% in 2025, with technology companies buying much of 2027's production in advance3. Compounding the problem, Russia's only reported factory capable of producing the standard of cable required for UAS use was severely damaged by

Ukrainian UAS strikes in spring 2026. This has led Russia to rely on Chinese imports1 and placed greater strain on the global market.

In May 26, Dimko Zhluktenko, co-founder of the Dzyga's Paw charity fund and now serving with Ukraine's Unmanned Systems Forces, stated that 50km of fibreoptic cable had jumped from $300 to $25005. It is difficult to predict how and when global markets will respond to the surge in demand. For the time being, however, fibreoptic UAS cost around three times as much as their RF counterparts and there remains a real risk that global production of fibreoptic cables will not meet the rising demand in the short term.

This increase in price is significant when compared with RF UAS. In permissive electronic environments, RF UAS remain easier to scale. However, when viewed in the context of alternative precision strike assets with ranges proven at 26km and being prototyped out to 50km, fibreoptic UAS continue to abound.



Fire at the Optical Fiber Systems plant, Russia

Fire Control

Observation is only valuable if it can be translated into battlefield effects. For the RA that means fire control. Only a few years ago, the use of COTS UAS for fire control seemed to be the cutting edge; no laser range finder (LRF), or reliable GPS; just a trained observer and dead reckoning. But with just a little hindsight, it seems blindingly obvious. Indeed, it is the very origin of UAS Regiments within the Royal Artillery.

The Taylorcraft Auster, an aircraft used by the RA as an Air Observation Post during the Second World War bears striking similarities. It was an inexpensive, slow-flying, civilian derived aircraft with little military technology beyond a radio. Just dead-reckoning and a trained observer.

Some headlines may lead one to believe that artillery is being phased out by armed UAS. In April 2026, Al Jazeera published that 96% of Russian casualties the previous month (a devastating 34,000 people) were a result of Ukrainian UAS, with artillery specifically accounted for separately. This is a surprisingly high figure but if accurate only representative of one month.

More generally the figure is considered in the region of 70-80%. Human casualties though, are not the only indicator of battlefield importance. The weight, coverage and reliability in poor weather that traditional artillery provides remains crucial to the fighting power of both sides.

In fire control, COTS UAS have an undoubtable place. Fire Support Teams (FSTs) are largely limited in range by line of sight: terrain features are often the defining line between what an FST can and cannot prosecute. The suppression of movement, requirement for hard cover, and concealment in the kill zone has seen Ukrainian and Russian fire controllers shift their view of COTS UAS from a combat multiplier in 2022 to a non-negotiable requirement in 2026.

Whether fire controllers fighting a static, heavily suppressed war such as that in Ukraine today, or in a more traditional environment, it is clear that the modification to an FST's TTPs and equipment are near insignificant in comparison to the benefit brought about by the addition of a UAS.

In Depth

COTS UAS dominate a 30km strip straddling the FEBA, but much of Ukraine's dependence on COTS UAS is desperation, not design. The significance of which extends beyond the tactical fight. If UAS observation and strike have changed the geometry of the battlefield, then they must also change where and how we employ our higher-level ISTAR assets.

The implications for force design, targeting and brigaded ISTAR merit an article in their own right. For the purposes of this discussion, three observations are sufficient. First and foremost, it spells the overdue demise of 32RA operating in support of the company and possibly even battlegroup HQ level. Attempting to compete against systems costing hundreds of pounds and fielded in the thousands is neither economically nor operationally sensible.

With cheap drones providing ISTAR at the lower levels, 32RA are freed to be dedicated Brigade ISTAR. Brigade level UAS will be required to fly beyond 15km for protracted periods to seek and enable strikes on high value and high payoff targets. We should take note that Russia has a significant ISTAR advantage beyond the close battle as it is able to field far more military grade UAS and to provide precise target information and enable high tech military hardware to deliver destructive effects far more devastating than an FPV drone1.

Secondly, the electronic threat to military UAS is not insignificant, but it is a lesser problem than FPV and dropper drones contend with. Directional antennas, stand-off, altitude, and a larger area of ground to operate, whilst avoiding the highest concentration of EW in the kill zone allow Russian and Ukrainian military grade ISTAR UAS (such as the Orlan 10, Orlan 30) to operate in their traditional capacity – targeting and intelligence collection.

Finally, on the horizon, inertial navigation systems with integrated mapping and AI navigation are coming onto the scene. Ukraine may have fielded a UAS of this type earlier in 2026.

AI allows the system to continue on task during periods of jamming or conduct entire missions autonomously. Whilst continuous contact between the UAS and operator is of benefit to relay time sensitive information and capitalise on emergent opportunities, limited contact may be the cost of survivability for both the air vehicle and the detachment.

As early as 2025, AI enabled UAS could decide autonomously when to regain contact with the GCS. Furthermore, AI is already conducting target recognition and 'cognitive data link management', automatically changing how and when it talks to its ground crew based on the battlefield around it. These advancements are not fanciful. They are here now in prototype.



Russian Zoopark-1 Counter-Battery radar found by Ukrainian UAS and prioritised for precision strike

Sub-Threshold Conflict

It would be easy to dismiss these observations as unique to a large-scale inter-state war, or even as unique to Ukraine. That would be a mistake. HMG considers the risk of full-scale war in Europe to be the most critical threat at the time of writing, however, it is perhaps more likely (if not more impactful) that the next conflict you, reader, are deployed to bears more similarity to the myriad of sub-threshold operations undertaken by the British Army since the end of the Korean War. Then you might rightly ask: how does the above translate?

I would point you to the core arguments made in the introduction: the barrier to entry (for UAS in a ISTAR and Strike capacity) collapsed over a decade ago. This is not multi-million-pound fighters or guidance systems. It is hundreds to thousands of pounds of commercially available technology combined with new doctrine.

Ukraine's Security Service have reportedly investigated Mexican and Colombian nationals in Ukraine's International Legion seeking to be employed in drone manufacturing, electronic warfare resistance, thermal avoidance, and coordinated strike employment. In some cases, individuals were found to be in possession of forged identity documents and had strong links to insurgent, military and criminal organisations in South America.

It is not surprising then that in South America, FPV and dropper drone tactics are being increasingly used in inter-cartel warfare and against security forces. Closer to home, Houthi, Hamas and Hezbollah are employing and continuously improving their use of low value UAS for ISTAR and strike against their adversaries. A similar story plays out among irregular groups operating the Sahel and Far East.

Often, we are prisoners of our cultural assumptions and perception. To the British reader, the Russo-Ukraine War is framed as full scale, conventional, inter-state warfare in Europe. This is a combination of words that piques our attention more than almost any other. But others are watching and instead seeing something different: a war characterised by profound military imbalance where the military powerhouse is not winning and the underdog not losing.

Diminishing Marginal Utility will endow the militarily poor with a far greater benefit than the military rich. We must expect that the same tactics being employed and developed by Ukraine and Russia both now and in the future will be used by irregular groups, criminal organisations and other state and non-state actors in our area of operations, wherever they may be.



Explosive attack drone used by a Mexican Drug cartel

Der Alte würfelt nicht - the Old One does not play dice. (Einstein, 1926).

The purpose of this article has not been to precisely predict the future of warfare. The experience of writing it has reinforced how quickly predictions become obsolete. The technology discussed here will change. Some systems will prove dead-ends, others will evolve beyond recognition.

Yet the broader trend appears clear: low-cost UAS and pervasive electronic warfare have altered the geometry of the battlefield. Observation has become more persistent, movement more hazardous, and assumptions about depth, survivability and mass increasingly difficult to sustain.

For the Royal Artillery, and for the wider British Army, that reality presents neither cause for despair nor excitement. It is simply a condition that must be understood. The challenge is not to predict precisely what the next war will look like, but to recognise that many of the assumptions we carried into 2022 are being overtaken by events.

Albert Einstein, one of the greatest minds of history, famously rejected Bohr's work on Quantum Mechanics: God does not play dice with the universe. It is unlikely that Einstein lacked the intellect to understand the theory or had sufficient rational evidence against it. He simply did not like where it led.

The drone war, perhaps our next war, does not look appetising. That may sound crass but recall that we volunteered for this profession and many of us enjoy its traditional challenges and concepts. It is therefore crucial for us to recognise our own biases. Psychology is littered with examples of people favouring evidence that supports the world as they would like it to be.

Richard Feynman; awarded the Nobel Prize in 1965 for his contribution to Quantum Electrodynamics took a view contrary to Einstein: 'You don't like it? Go somewhere else, to another universe where the rules are simpler, philosophically more pleasing, more psychologically easy.'

Like nature, the battlefield will be indifferent to our preferences.

The Journal of the Royal Artillery Royal Artillery Afghanistan Veterans

Royal Artillery Afghanistan Veterans

Are you an Afghanistan veteran? If so, the latest branch of the Royal Artillery Association may well be for you. In its inaugural year, the RAAV has hosted its first public events and widened its membership to more than 200 veterans; a figure that continues to grow daily.

RAAV Mission Statement

Our mission is to bring together Royal Artillery veterans of the conflict in Afghanistan into a supportive community. We exist to share experiences of Operations HERRICK, TORAL and PITTING, and to honour the sacrifices made by our service personnel and their families.

Through mutual support and remembrance, we provide a space where veterans can speak openly and maintain the bond forged on operations. We are committed to upholding the legacy of those who served and those who did not return.

As a lasting act of remembrance, we commit to services and gatherings on an enduring basis, in honour of those who paid the ultimate sacrifice because of their service in Afghanistan.

Larkhill Service

The first significant milestone for the RAAV, and what was, in effect, the laying of the foundations for an organisation which is expected to gain more prominence in the lives of Afghanistan veterans year on year, was a gathering at the Larkhill Garrison Church, and subsequent refreshments at The Packhorse on 20 June. All those who attended and contributed to the day's events are thanked, with a special mention to Reverend Nathan King who led proceedings; and the Salisbury Plain Military Wives Choir, Pipe Major Grant from 19 RA, and bugler Gunner Ross-Russel from King's Troop RHA, who all added a poignant musical touch.

FOB HERRICK

In relatively quick succession, RAAV members were also involved in the FOB HERRICK project, a first for the Capel Military Show which draws in over 20,000 visitors annually. Among the exhibits within the Hesco Bastion walls of the replica Forward Operating Base, were a Desert Hawk 3 drone and a L118 Light Gun on loan from the RA Museum, additionally, the mock-up Ops Room, Fire Support Team insights, and war artist stands were also hosted by serving and former RA personnel.
As a measure of success, and despite some stiff competition across a vast site, FOB HERRICK was deservedly awarded the Best Living History Exhibit at this year's show. It will be back next July, with ambitions to grow further in scale. If you are interested in being involved in this hugely rewarding project with a great bunch of all arms veterans, please reach out via the contact details below.

What next?

The RAAV is committed to building a network and community, to host and be involved in a wide range of remembrance and Afghanistan related events on an enduring basis. In 2027 we will join the Afghanistan Veterans service at the Royal British Legion National Remembrance Gardens (formerly the National Memorial Arboretum) in Staffordshire, an RAA service also at the RBLNRG, and the Capel Military Show.

If you too have served in Afghanistan and would like to find out more about the RAAV, please reach out to Maj Alex Biddulph or WO2 Abe Day at raafghanveterans@outlook.com, or visit our Facebook page via the QR code.



RAAV stand within FOB HERRICK at the Capel Military Show


President RAAV Maj AB Biddulph RA addresses the congregation


Chairman RAAV WO2 Day reads a poem to the assembled veterans and families


RAAV members introduce RA equipment from Op HERRICK





The Journal of the Royal Artillery

RJ

Rick Jennings
Independent Silver Consultant

Tel: 07970 712 852
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Firstly, by means of introduction I am Rick Jennings an Independent Silver Consultant based in South Yorkshire.

I offer a wide range of services that stem from providing accurate valuations for bespoke military centrepieces, through to sporting trophies and numerous other pieces of silverware that I know often provide organisations with a unique link to their heritage.

I have a wealth of experience in the silver trade and understand the historic significance attached to Corps/Regimental Silver, some of which is irreplaceable, hence the importance of an accurate insurance valuation. I have specialised in providing insurance valuations and with over 20 years' experience working with over 100 Army Regiments, the Army Sports Control Board, The RAF, Sports Clubs, Manor Houses and Museums I am uniquely placed to provide Specialist insurance valuations which includes a full and comprehensive database and corresponding images of all pieces valued.





What Our Clients Say

If you want the best look no further than Rick Jennings, an Independent Silver Consultant who continues to exceed our expectations on all levels. In addition to his in-depth expertise as a highly experienced individual, his prompt response to queries, his thoughtful advice and guidance and, the speedy delivery of a perfectly laid-out valuation report neatly summarise the outstanding service he provides to his customers. The Regimental Headquarters of the Royal Logistic Corps appreciates the work to date, would have no hesitation in recommending your services to others and looks forward to working with you in the future.

Stephen Yafai,
The RLC Regimental Secretary, RHQ The RLC

If you are interested in finding out more about our services, please get in touch for a chat and a free independent consultation by emailing rick@rickjenningsconsultant.co.uk or call me on 07970 712 852

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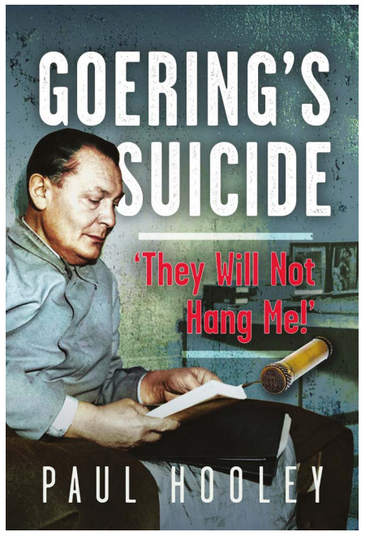


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Book Reviews



Goering's Suicide "They Will Not Hang Me!"
By Paul Hooley MBE
Published by Pen & Sword Military
ISBN 978 1 03618 366 0

At 2245hrs, give or take a minute or two on an inaccurate watch, on the night of the 15th of October 1946, an 'incident' occurred that would become one, and has remained one of history's mysteries: An 'incident' that was the cause of international embarrassment to the Allied nations and perhaps a last source of pride, for a defeated Axis one.

It spawned countless theories, claims and counter claims and has remained an unresolved mystery for more than 80 years.

The 'incident' was a death in custody; the suicide of the second most senior Nazi in the Third Reich; Reichsmarschall Hermann Goering.

Goering was given a death sentence by the International Military Tribunal (IMT) at the end of the Nuremberg Trials. He was due to be hanged at night with 10 other leading Nazis in the early hours of the 16th of October 1946.

The intention of the Court was that Goering would 'lead' the sequence of the condemned and be the first to hang on the double gallows, witnessed by chosen Allied military representatives and members of the Allied civil press.

However, Goering, true to his self-declaration "they will not hang me", committed suicide by biting a glass capsule containing potassium cyanide, thus at the 11th hour, confounding the Courts (the Allies) and robbing them of their spectacle and cheating the hangman.

The mystery is not so much how he died but how an individual who was subjected to daily cell and body searches as a prisoner for 17 months, and was on a 24hr suicide watch particularly in the last eight weeks of the trial, obtained the poison capsule?

'Goering's Suicide' by Paul Hooley, is his third covering the immediate post-war period and the Nuremberg Trials. In this book the author sets out to resolve this mystery of how Goering obtained the cyanide.

At the outset he declares his methodology is similar to an inverted detective novel; he has the 'crime', he has six key individuals/suspects (British and US interrogators and guards), who had the very closest dealings with Goering over the eight weeks of the Trials, and he had not only past detailed research from his previous two books but he had also come across some hitherto unpublished evidence that potentially provides the answer to the cyanide mystery.

Numerous accounts and films have been written on the IMT at Nuremberg and at the outset the author acknowledges this and declares that he doesn't intend challenging known facts or eminent authors and historians. However, like many accounts of major historical or military events, they often must, for the sake of space and brevity, be truncated; with smaller details being considered too low-level to be included in the greater picture.

What the author has chosen to do based on his prior, extensive research and his newly discovered evidence, is to identify six key Allied individuals as mentioned above who were physically closest to Goering during his incarceration and trial.

These six key individuals range from US Major General W Donovan, founder and Commander of the wartime Office of Strategic Services (OSS), the US equivalent to the British Special Operations Executive (SOE), and his 'Adjutant' Lieutenant E Putzell OSS; two British Officers, Major Airey Neave DSO RA/MI9 (Colditz escapee, IMT Lawyer/Investigator) and Captain Wolfe Frank NF (IMT Simultaneous Translator/Investigator); and two US Army close escort guards for Goering, a Lieutenant J Wheelis and a Sergeant H Shotwell.

The author also weaves other individuals into his account of the day-to-day running of the IMT, Jail, Courtroom and Trial so the reader is left with a very good explanation of the machinations of the key eight-week Trial.

Also included are some useful photographs of key individuals, locations and documents that further help to set the scene for the reader[1]. Of additional interest are briefs on the careers, characters and crimes of some of the defendants and thus unbelievably, the plea bargaining that was permitted, allowing an SS General, directly responsible for mass murder in Eastern Europe amongst other crimes, to escape prosecution in exchange for becoming a prosecution witness.

There is no doubt the author has carried out a considerable amount of research to produce this book and to arrive at his conclusions. He has gathered some interesting and if true, compelling evidence in his quest to solve the cyanide mystery, which if accepted, will finally lay to rest the 80 year mystery.

To aid himself, and to support his reasoning to the reader or fellow historians, the author has created a scoring table against which to weigh his evidence. He methodically presents his various strands of evidence, examines its reliability and likelihood of being true against the reliability of the source and then allocates it to one of the relevant 'suspect(s)' to arrive at his conclusions.

The book overall is very readable with relatively short and snappy chapters. It provides the reader with a most interesting overview of activities at the end of the war and the capture of leading Nazis.

It gives a comprehensive account of how the British War Crimes Executive was set up to gather evidence, and a detailed account of how the IMT was formed and who the main judiciary comprised of. It also explains why Nuremberg was chosen.

The author researches and lays out in detail how the adjacent jail system was run and how the key prisoners (Goering and others) were handled daily. This detailed look at key individuals and the understanding gained by the reader of the low-level daily routines give a firm understanding of the background against which the subsequent evidence produced by the author can be applied and to allow the reader to agree or disagree with the author's conclusions.

As a reviewer, but without wishing to reveal the author's conclusions, I feel that he has allocated too much effort in emphasising the good character, high standing and esteem that individuals/sources were held, in their post war civil careers, no matter what job they held. There is little mention of any negative characteristics, which is unusual.

While it is understandable as part of allocating reliability to a source and therefore validating a statement, the sole emphasis on a source's positive characteristics was slightly too much and bordered at times on the irrelevant. The emphasising of a source's positive characteristics with little reference to negative ones could question the validity of the statements, in a reader's mind.

Further, I felt the author accepts the word of Intelligence officers too easily; they tend to manipulate or obscure the truth and that habit remains with them, for life.

A final observation would be that there is too much repetition of facts already covered in earlier chapters.

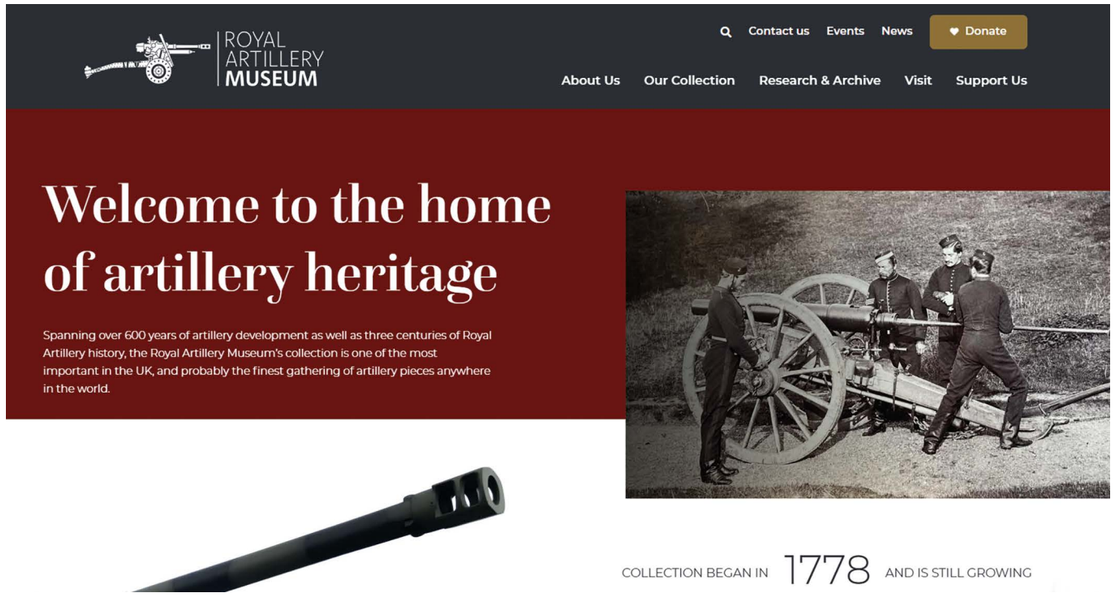
While the author himself recognises this and declares its purpose as an aid to the reader to save turning back a few chapters, it seemed to occur too often.

In summary though, the book is very readable and of historical interest, with sufficient information that will keep the reader turning the pages. It is fair to say that with the information both previously known and the new information discovered and examined by the author, he has achieved his goal and arrived at a feasible solution to the eight-decade mystery of who provided the cyanide to Goering.

As ever though, the reader must weigh up the evidence presented to either support the author's conclusion, or not.

By Major Bob Begbie

1. Reviewer's footnote: If purchasing this book, ensure that photographic plates 1-8 incl. are present. The review copy had these missing. Waterstones copies do have Plates 1-8.



Letters to the Editor

Sir

I much enjoyed the Autumn Journal especially Nick Quarrelle's appreciation of General Lewis Pugh. It is surprising that such sustained gallantry by a Gunner should have passed almost unremarked for 80 years. VJ Day was 25 Aug 45 so it must have been disappointing , having fought to a successful conclusion in Burma, to be dispatched to Java in October to sort out well armed Indonesians fighting for Independence in the Dutch East Indies.

My interest was picqued because my father Hugh acting CO 3 Indian Field Regiment aged 29 was involved in a fierce battle 2 days after arriving in Surabaya. His citation for an immediate award of the MC was written by Brig Pugh as Brigade Commander.

It makes compelling reading for, not only was the battle of tactical importance, but the lives of an estimated 1500 Dutch women and children were saved. Hugh's award was rapidly endorsed by the Chain of Command.

I've played a lot of golf in Holland and rarely have to buy a drink!

Sincerely

Mike Tennant

Letters and Submissions

The correspondence page of any professional journal is extremely important allowing, as it does, readers to air their views, comment on articles and correct any mistakes. The Editor therefore invites letters and emails from readers. A guide on the submission of letters and articles is given below.

Letters to the Editor

The Editor welcomes correspondence from readers on articles or book reviews and other matters arising from discussions in The Journal of the Royal Artillery.

Please mark all letters for the attention of the Editor, and send either by email to: RARHQ-RAJ@artycen.ra.mod.uk or by post to: The Journal of the Royal Artillery, RHQ RA, Royal Artillery Barracks, Larkhill, Salisbury SP4 8QT.

Letters should be no more than 700 words.

Publication in the Journal is at the discretion of the Editor. Offensive or anonymous letters will not be considered.

Submissions

The Editor invites the submission of unpublished manuscripts on all topics related to national and international defence and to the organisation, application and future development of artillery in all its forms, and military history with an artillery slant. Published articles will become the copyright of the RAI.

Guidelines for submissions are:

- Articles should be the author's original work. Where the work of other authors is quoted this must be clearly stipulated either within the text or as an endnote.
- Articles should be relevant to the Journal's defence and artillery focus.
- Submissions should be between 2,000 and 6,000 words and should be fully referenced by endnotes. Responsibility for factual accuracy lies with the author.
- Pictures, tables or artwork should be supplied separately in high-resolution (minimum 300dpi) and not embedded in the text. Authors must ensure they have permission to use any supplied imagery. If asked, the Editor may be able to help with copyright issues.
- Submissions should be sent electronically by email as Microsoft Word files. Please include a brief biography and contact details and send to: RARHQ-RAJ@artycen.ra.mod.uk
- If accepted for publication articles will be edited to meet the Journal's house style. The Editor reserves the right to make alterations for space and clarity.
- Anonymous articles will be accepted under a pen name, but the author must disclose his or her identity, in confidence, to the Editor.
- Authors are not paid. However, they will receive complimentary copies of the issue in which they are published.

Book Reviews

The Editor welcomes the submission of unpublished reviews of important or useful new books on all aspects of defence and artillery. Reviews should be submitted in line with the guidelines for articles above and should be between 700 to 1,000 words. Wherever possible a high resolution picture of the book's cover should be submitted, as should details of the publisher and where it can be purchased. If you would like to suggest yourself as a reviewer for a newly published book please contact the Editor. Book reviewers are not paid, but where appropriate will be allowed to keep the copy of any book they are sent.

The Journal of the Royal Artillery

Royal Artillery Historical Society Shrapnel Lectures 2027

Date and Timings	Event	Subject	Lecturer/Lead
2027	**LECTURE THEME**	**REINFORCEMENTS AND RESERVISTS**	
Tuesday January 19 or 26 1930 hrs	Webinar	The Elswick Battery in the Boer War and beyond	To be notified
Tuesday 23 February 1930 hrs	Webinar	'If you organise the British Army, you'll ruin it': Haldane and the reconstruction of the Army 1906-12	Dr Spencer Jones RA Regimental Historian
Tuesday 20 April Congreve Lecture Day, Royal School of Artillery, Larkhill	Lunch and AGM Newcome Hall & RA Mess	Britain's German Reinforcements: The Hessians in The American War of Independence New Engines of War: The Impact of Railways on Reinforcement and Resupply	Dr Rodney Atwood Dr Michael Phillips

Please book places with the RA Historical Society Secretary:
Lt Col R S (Dick) Clayton, 10 Harnwood Road, Salisbury, Wiltshire SP2 8DD

Email: richard.clayton312@gmail.com

