Logistics Under Fire:

The Logisticians of 90 Company RASC and the Logistics of Operation Overlord

4th December 2025

Introduction

It's 1430 hrs on 6 June 1944, Captain Foreman, C Platoon (Pl), 90 Company (Coy) Royal Army Service Corps (RASC) just stepped LST 382 onto a beach called Queen. Before him was a war zone clogged with traffic, and struck by intermittent shelling and sniper fire. Only a few hours before, the men of the 8th British Infantry Brigade and the 27th Armoured Brigade (27 Armd Bde) — the latter, their home Brigade — hit the beach, drove off the German defenders and were now proceeding inland. Behind him was 11 of the 36 3-ton Bedford lorries of his platoon.[1] In these lorries was ammunition and other critical supplies urgently needed by the Paras of the 6th Airborne Division who, the night previous, jumped into the flack-filled skies over France to secure the Anglo-American left flank.

As C Pl took their first steps onto France, they would have looked for sign-posts, a Military Policeman, an RAF Airman, or anything else to direct them towards a beach exit, and onto the congested roads that would take them to Colleville-sur-Orne, 3 km away. The trip took some 90 minutes but, when Capt Foreman finally arrived — doubtlessly irritated at the slow state of the roads — he hoped to find his Commanding Officer (CO), Major Cuthbertson, CO 90 Coy RASC who landed earlier that morning at 0925 hours to try to establish contact with elements of the 6th Airborne Division who were eagerly waiting a resupply.[2]

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1. 90 Company RASC War Diary, WO 171/2377, The National Archives UK (TNA), Kew, 31 May 1944 and 6 June 1944 entries both found in June diaries (hereafter cited as TNA WO 171/2377).

2. TNA WO 171/2377, 6 June 1944.

Not far away, Lt Glenny of B Pl was also landing with nine lorries, not with supplies for paras, but with fuel for his colleagues fighting in the tanks of 27 Armd Bde.[3] Unlike the usual dramatis personae of works concerning Overlord however, once these supplies were delivered, they would not take up arms and join the fight but instead, find out what the units they supported required, and return to the beaches to bring more supplies forward.

This paper does not tell the typical story of D-Day and the subsequent capture of Caen. Instead of focusing on the fighting done by the troops or the decisions made by commanders, this paper focuses on the work that enabled the material battle to take place. It is not a story of supply from the factory to the harbour nor from ship to shore. This is a story of supply only a few kilometres from the front lines. It is logistics under fire — an aspect so critical to warfare but so rarely understood. We will look into the logistics of those critical last few miles from the shoreline to the combat zone. Without the work, forethought, and attention paid by soldiers like the men of 90 Coy, the British Army would have ground to a halt. This study thus examines the contribution of these logisticians to the final victory in Normandy, showing, through concrete cases, how the British Army overcame the immense challenge of sustaining an army in the field.

To do so, we will follow Major Cuthbertson and 90 Company RASC as they work their way across the English channel. We will continue to follow the Company as they land in Normandy and follow them as the units they support attempt to capture the city of Caen, and we will examine their role in the closure of the Falaise Pocket in August. Along the way, we will first examine how the British Army structured logistics administratively, before

3. TNA WO 171/2377, 6 June 1944.

joining 90 Coy as they supply the 27 Armoured Brigade as they partake in the Battle for Caen. Along the way, we will look look into the challenges of providing sufficient ammunition, food, and fuel to the British Army. After 27 Armoured Brigade is broken up at the end of July, we will see how 90 Coy integrated into a larger and longer supply column as they support infantry units through Normandy. Following this, we will have a brief discussion on historical methods and how they apply to military logistics.

Historiographical Review

It is of couse impurdent to make any study of Operation Overlord without paying due consideration to the current, vast liturature as Overlord can cardly be considered a poorly studied operation. There are, of course texts like Russel A. Hart's *Clash of Arms* where he argues that the British Army was doctrinally inflexible in facing the new developments requied to meet the challenge of fighting the German Army and that the British Amry's doctrine was fundamentally unsuited fighting the Germans.

This is contrasted by Stephen Ashley Hart who, in argues that the British Amry's doctrine of *Colssal Cracks* was wholly appropriate given how, unlike the Americans who could afford to take casulaties, the British could not. The British were, by 1944, rapidly running out of troops — casualties simply could not be replaced and over the course of the Normandy campaign, 21st Army Group would have to reorganise several times to make up the shortfall. Moreover, Hart argues that the British had to account for the legacy of the First World War which menant that they understood that the moral of the men would not take kindly to the feeling that their lives were disposible or being spent needlessly. Hart argues that this need to maintain both moral and troop numbers meant that mean that

the set-piece battle, a form of battle that allowed the British to hammer the Germans with immense, preprepaired fire-power before advancing under a curtian of artillery, was wholly appropriate to the practical constraints facing the British Army in 1944. This reliance on firepower was only possible due to the British Army's effective internal logistics — an aspect Hart leaves out.

The literature pertainent to the Second World WAr is not constrained to more general or strategic level histories however. Many do narrow down into more specific aspects of the war. Stephen Napier's *The Armoured Campaign in Normandy* examince 'the performance and deficiencies' of Allied Armour, the intensions of all senior commanders involved, the relationship between Eisenhower and Montgovery, and he does so from the perspective of the Anglo-Canadian-American armoured units fighting in Normandy. Napier gets quite close to the troops with sectiosn discussing aspects of daily live such as the provision of rations and ammunition. Beyond noting that these critical stores arrive in company *harbours* however, Napier is relatively silent on how they get there.

Stig H. Moberg's *Gunfire!* takes a similarly detailed line examining in great detail, the *Queen of Battle* that is the Royal Artillery. Moberg outlines the creation of the British Artillery post First World War and expores the role of the 25-Pounder field gun — a stable of Second World War service. He examines specificities such as the intricacies of gunlaying, the adjustment of fire, barrage plans, and artillery tactics. He notes the British's heavy reliance on artillery to suppress defending enemy troops and the high consumption of artillery, at times exceeding rounds per gun With guns per battery, the British consumption of artillery ammunition was astronomical. Moberg notes the importance of the RASC in stock piling the vast reservces of ammunition requried by the gunlines in advance of any major operation.

Understandably, his study of artillery ammunition does not stray excessively far from the gunlines though, as we will examine later, the transport of artillery ammunition would prove quite a burnden on the British Army's supply and transport resources.

Along similar lines, studies have been made of the Mulburry Harbours — two sets of rather ingenious floating peirs and accompanying breakwaters. was an example of this. He however is mostly concerned with the development and use of the harbours themselves and is less concerned with the supplies that ran over its peirs and what happened to those stores once they made it ashore.

Along similar lines, Christopher A. Yung's *Gators of Normandy* studies the naval aspect ofthe invasion. Yung covers aspects such as shipping space, landing craft, Army-Navy cooperation, and shore bombardment. Whilst he devotes sum attention to naval logistics, he understandably does not spend much time on the Army's.

Despite these modest complaints however, it would be unfair to say that logistics is wholly ignored. Instead, logistics tends to be shifted to the background. However, there are a number of exceptions though they do not always focus squarely on the Second World War. One of the more seminal academic works is Martin Van Creveld's *Supplying War*. As one of the first academic histories of logistics, Van Creveld moves through some 400 years of Western military history to argue that it is impossible to adequately understand wars without understanding the logistical constraints imposed on armies by reality. He looks into the logistics of promenent commanders like Wallenstine, Napoleon, Moltke, Rommel, and indeed Eisenhower by examining the constraints and opportunities logistics imposed on these armies such as the constraints of ammunition, fuel, and fodder; as well as the speed of marching and railways.

Specifically regarding the North-West Europe campaign, Van-Craveld writes less on Normandy and more on the subsequent drive from the beachhead through France, Belgium, and the Neatherlands. In this area, he first does a general analysis of the logistical situation in September 1944 before analysing the logistical feasibilyt of Montgomery's plan to advance teh British Army into Germany through a thin, knife-thrust of some 400 miles. Of the general situation, Van-Creveld notes how Patton's 3rd Amry had a habit of outrunning their supply lines. His logisticians subsequently struggled to keep up with his rapid advance. Van Creveld notes how 3rd Army's logisticians had to take emergency measures such as foregoing the transport of clothing and equipment and prioritizing fuel, ammunition, and rations. This came to a head as units took to scrouncing in order to make up for the shortfall in stores leading to some level of chaos in rear areas.

Van Creveld notes how this problem was not duplicated in British areas. The British tended to operate loser to the Channel ports greatly simplifying their supply lines and thus, reducing shortages. This lead to the British generally having tighter supply discipline than the Americans. This general availabilty of prots also meant that, for the British, the capture of Antwerp — a major Belgian port and one of the largest in Europe — was not strictly nessessary. Van Creveld notes how if Eisenhower was willing to support Montgomery's plans for a major thrust into Germany, this attack could have been logistically supported — though only just.

Where Van Creveld falls short however is that he writes as if the logistical system was designed for the North-West Europe campaign. He notes how the Allies had a complex method for requisitioning supplies — what the British called 'indenting' — without considering how oridinary the act of submitting paperowkr for recieving supplies was a tt eh user

level. Armies not only *fight*, but *live* on their supply lines. Thus, for an end user, the need to submit paperwork to get stores would likely have looked reasonably similar to normality with much of the complexities of meeting such requistions being absorbed by Quartermaster staff. Even in garrison, it is common for paperwork to aquire such vast array of stores ranging from rations to tent pegs. In a sense, the pen is mighter than the sword not merely for it's ability to express complex and profound ideas, but also because the pen completes the paperwork. The pen can order swords but without the pen, those who hold the sword will starve. In this paper, I will therefore examine those more mundane day-to-day aspects of logistics. Whereas Van Creveld is concerned with logistics stratigy, I will look into the metaphorical — and occasionally literal — mechinery of logistics.

Julian Thompson's *The Lifeblood of War* expands on Van Creveld's work, using the same methodlology to study more conflicts such as the and Vietname. Neither of these books concentrate purely on the Second Word War though both draw examples from it.

This is not the case with *Supplying the Troops* which is essentially a biography of American General Sommerville who was *Supplying the Troops* provides a decent overview on strategic level logistics and the military-industrial complex but it lacks the same *boots on the ground*, practical perpective of Van Creveld or Thompson.

War of Supply by David D. Dworak solves this defficiency. Dworak aruges that the allies learnt the finer parts of logistics in the Mediterrainian — skills they would later need in the North-West Europe campaign.[4] Dworak goes into great detail on specificiites such as the

4. David D. Dworak, *War of Supply: World War II Allied Logistics in the Mediterranean* (University Press of Kentucky, 2022), 2, accessed 3 November 2023, https://doi.org/10.2307/j.ctv2g7v1b0, https://www.jstor.org/stable/j.ctv2g7v1b0.

labeling of boxes, the coordination of landing craft, and the organization of beach groups. Alas, he takes a very American perspective. Whenever the Americans learn something from the British, on feels as if one reads it as if it is advice taken from outside of the hypothetical reader's in-group. In a sense, this book is very much not about the Allies per se as much as it is about the Americans. Nevertheless, I draw much from Dworak's methods and content.

A highly American focus is common on treatments on Second World European logistics such as

The role of logistics to the campaign in Normandy was not confiened to the Allies of course, the Germans were also highly dependant on their supply chains. Ulike the Anglo-American forces however, the Gemrans, as the defender, had the luxury of being able to preposition resources and to intricately plan their supply lines to effectively resist an invasion. Unfortunately for the Germans, that also made them a target. Russel Hart looks into this in *Feeding Mars: The Role of Logistics in the German Defeat in Normandy 1944* Where he argues that the Allied areal bombing campaing to destroy Gmeran logistics in Normandy was absolutely critical to teh eventual German defeat in theatre. The Germans were simply never able to maintain adaquate stocks of ammunition and fuel make up for expediture in Normandy. This, Hart argues, is a major factor in the effective collaps of German resistance during Operation Cobra — it was simply impossible for the Germans to keep fighting when they only had of the fuel they consumed and of the ammunition. Conversely, it was this eventuality of having to fight in a theatre without the supplies to fight a war that the logisticians of the Anglo-American armies had to avoid — something the presence of the English channel and the shortage of sealift certainly did not help.

The challenge of obtaining and maintaining sufficient sealift was a major theme in *Neptue* by *Craig Symonds*. He looks into Operation Neptune, the seaborne component of Overlord, arguing that we ougt to not look at Operation Neptune as if success was assured. Instead, to understand Neptune, it is nessessary to understand the enormous amount of work done to prepare for the operation. This ranges from high-level planning at COSSAC, to the shortage of LSTs, and some notes on the actual operation in practice. Unlike many books on Normandy, Symonds pays a reasonable amount of attention to logistics, mostly highlevel logistics. This is quite reasonable for a book more concerned on the operaitonal and strategic levels of war. Nevertheless, Symonds tends to keep his attention closer to the sea with most of his forays ashore being kept relatively near the coastline.

Finally, of particular importance to this study of the Briitsh Army's logistics is Clem Maginis's *A Great Feat of Improvisation* where he argues that the logisticians of the British Expeditionary Force (BEF) effectively saved the BEF in the 1940 campaign in France.[5] As part of this, Maginis spends a good deal of time discussing the interwar periods. Here, he examines the role of the post Frist World War disarmament, the remarament in the 1930s, and the shift in the British Army from being a mostly horse-drawn army, to being a fully motorized army when they returned to French soil in 1939. Maginis's work is quite excellent but, alas, his study effectively terminates in 1940 after the arrival of the shattered BEF in the UK and the movement of those troops back to their UK garrisons. He makes breif mention of the challenge of rearming the shattered army but, quite frankly, he makes

5. Clem Maginnis, *A Great Feat of Improvisation: Logistics and the British Expeditionary Force in France 1939-1940*, in collab. with Gary Sheffield (Warwick, England: Helion / Company Limited, 2021), 1.

almost no mention of the British return to France four years, less two days, later. It is from here that we will return to Q Sector, Sword Beach, km North of Caen.

On WW2

Britain's Other Army: The Story of the ATS
Why the Allies Won

On Normandy

Clash of Arms
Overlord
Fields of Fire: Canadians in Normandy
Montgomery and 'Colossal Cracks': The 21st Army Group in Northwest Europe, 1944-45
The Normandy Campaign 1944
Gators of Neptune: Naval Amphibious Planning for the Normandy Invasions
Neptune: the Allied Invasion of Europe and the D-Day Landings
From the Normandy Beaches to the Baltic Sea: The North West Europe Campaign 1944-1945
Feeding Mars: The Role of Logistics in the German Defeat in Normandy, 1944

On Logistics

Supplying War: Logistics from Wallenstein to Patton
The Lifeblood of War: Logistics in Armed Conflict
A Great Feat of Improvisation
War of Supply: World War II Allied Logistics in the Mediterranean
Supplying the Troops: General Somervell and American Logistics in WWII
Military Logistics and Strategic Performance
The Story of the Royal Army Service Corps
Logistics and Modern War
Logistics Diplomacy at Casablanca: The Anglo-American Failure to Integrate Shipping and Military Strategy
Strategy and Logistics: Allied Allocation of Assault Shipping in the Second World War
The Science of the Soldier's Food
D Day to VE Day with the RASC

Tools of the Trade

A Note on My Sources

Overlord as Planned

Op Overlord was made up of a number of smaller operations. The seaborne landings were a part of Op Neptune. This was the operation that established a 50 km wide beachhead in Normandy. Neptune divided this section of Normandy coastline into five discontinuous

beaches. The Allied right was anchored by Utah beach on the Cotentin Peninsula and the Allied left was anchored by the River Orne and the Caen Canal at Sword beach. Between these flank beaches were Omaha, Gold, and Juno beach. The Americans were responsible for Utah and Omaha, whilst Anglo-Canadian forces were responsible for Gold, Juno, and Sword beaches. Each beach was subdivided into a 2 – 4 sub-beaches and assigned a letter from A to R. 90 Coy, the subject of this study, primarily supported the troops of the 3rd British Infantry Division and 27 Armoured Bde who landed on Sword beach; specifically, Queen beach — a stretch of smooth firm beach 400 yds deep at the low water mark, 30 yds deep at high water, and nearly 3 km wide stretching from Lion-sur-Mer to La Brèche d'Hermanville.[6]

Immediately inland of Queen ran 'a strip scattered with seaside houses and gardens, to a depth of 200 yards'.[7] Along this strip were two roads that ran parallel to the beach, and 4 – 5 roads running inland. Three of these roads converge around 1000m inland just North of the town of Hermanville-sur-Mer. The road runs south through the town. On the south side of Hermanville, 2000 m inland, is a road that runs parallel to the coast. Turn right, and head West 3 km and you will find Cresserons a few hundred meters south of this road. Travel further 1000 m and you will reach La Delivrande. Returning to the Hermanville crossroads facing south, Turn left and going East 1500 m and you will find Colleville Sur Orne. Travel another 4 km South-East of Colleville and you will find Benouville, Le Canal de Caen, the

6. Diaries for May, Operation Overlord *8 British Infantry Brigade Intelligence Summary* 8th British Infantry Brigade War Diary, WO 171/611, The National Archives UK (TNA), Kew, Para 1a (hereafter cited as TNA WO 171/611).

7. Diaries for May, Operation Overlord *8 British Infantry Brigade Intelligence Summary* TNA WO 171/611, Para 3a.

River Orne, and Ranville around 2000 m East of Benouville. Everything North of this road was under the control of 101 Beach Group, a logistics unit of brigade strength that formed the interface between the sea and the land. They co-ordinated the movement of men and materiel.

If we return to the Hermanville crossroads and travel along the road running to the south for 10 km along this road past Beuville, Bieville, and Lebisey, and we will find ourselves on the outskirts of Caen. It is along this latter road that the 3rd British Infantry Division, supported by 27 Armd Bde and 90 Coy would attempt to advance to capture Caen on D-Day Op Neptune. This thrust was executed by 2nd Battalion King's Shropshire Light Infantry (2KSLI) and the Staffordshire Yeomanry (the Staffs).They were meant to march assemble around Hermanville at 1100 hrs D-Day and advance with the men of 2KSLI riding on the Staff's tanks but, the Staffs were delayed for over an hour in heavy traffic on the beach and the roads leading inland. Minefields prevented the tanks from going off road and thus, CO 2KSLI took the decision to advance alone with the Staffs catching up later.[8] Their advance is halted at Lebisey that afternoon when an attack launched at 1615 hrs was halted by snipers and MG fire at 1800 hrs a mere 3000 m North of Caen's outskirts. 2KSLI and the Staffs Yeo then withdrew to a more defensible position at Bieville with the last elements safely withdrawn six hours later at 2315 hrs.[9] The attempt to push into Caen will occupy the bulk of this study.

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8. 2nd Battalion, The Kings Shropshire Light Infantry War Diary, WO 171/1325, The National Archives UK (TNA), Kew, 1100 – 1230 hrs 6 June 1944 (hereafter cited as TNA WO 171/1325).

9. Staffordshire Yeomanry War Diary, WO 171/863, The National Archives UK (TNA), Kew, 6 June 1944 (hereafter cited as TNA WO 171/863); TNA WO 171/1325, 1630 – 2315.

This study will also concern itself with the work done by 6th Airborne Division as part of Op Tonga, the pre-Neptune airborne landings executed by Anglo-Canadian forces. Their objective was to execute a series of airborne landings East of the River Orne, Caen Canal, and Sword Beach to secure the British left flank. They were also to capture the two bridges crossing the Orne and the Caen Canal North of Caen along a road running between Benouville and Ranville. All this was to be done during the night before the forces of Op Neptune landed. For approximately six hours, the paras of 6th Airborne would be cut off. Once the British landed at Sword beach, they would push inland, to Benouville, cross the bridges if they were still intact, and reinforce and resupply 6th Airborne. That is how the 11 lorries of C Pl 90 Coy finds itself waiting in Colleville, around 4km away from Benouville. They were waiting for their CO establish contact with the Paras. Once contact was established, supplies could pour over Rugger and Cricket bridges to resupply 6 Airborne by land. C Pl would then keep the paras supplied via Queen Beach until 6th Airborne's RASC unit could take over on D + 1 after landing at Juno.[10]

By 1800, C pl made contact with the Paras and, as the Paras had successfully captured the Orne and Caen Canal bridges, C pl was able to replenish the depleting ammunition of 6th Airborne by 2300 hrs on D - Day — a five hour job. As 6th Airborne's area of operations had yet to be fully secured, the drivers of C pl faced sniper fire throughout the day.[11]

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10. S & T History 90 Coy RASC Armd Bde-Assault an account of the work carried out during the first four days of the Invasion, June 1944, August 1944, WO 171/2377, The National Archives UK (TNA), Kew, 1 (hereafter cited as TNA WO 171/2377 June History Report).

11. TNA WO 171/2377, 6 June 1944.

Not all of 90 Coy landed on D - Day however, whilst A and D Pls stayed in the UK to be brought across the channel on 15 and 30 June respectively, B Pl landed on D - Day. Their tasking to simply support 27 Armd Bde primarily in terms of their fuel requirements and to otherwise keep the Bde supplied. Their 13 lorries were mainly loaded with fuel for the Bde's Sherman tanks. Alas, due to the heavy shelling of Queen Beach, only 9 lorries actually landed by 1200 hrs. The lorries that landed proceeded to the 27 Armd Bde's A Echelon Area in Hermanville-Sur-Mer and would quickly be put to work keeping the Bde supplied with fuel and ammunition.[12] Hermanville, situated along the main road departing Queen Beach — location of the Beach Sector Stores — became 90 Coy's main control point where vehicles would check in before proceeding to the beaches or to the units.

As a point of curiosity, you may have noticed that B Pl was not preloaded with ammunition but with POL.[13] This was because the Bde brought their own ammunition ashore firstly with the ammunition they carried in their tanks, but also with the ammunition they towed behind their tanks in *Porpoise* sledges. These sledges would be released shortly after the tanks made it ashore. Collecting the ammunition in these sledges also became one of B Pl's tasks in the first hours of the invasion.

Perhaps as a happy co-incidence, Neptune had failed to meet it's D Day objective of pushing all the way to Caen — an optimistic goal anyway.This meant that supply lines were shorter than planned which may have reduced the stress on the 9 lorries of B Pl at the cost of less space for disembarking troops; and thus, adding to the issue of congestion. It is

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12. TNA WO 171/2377, 6 June 1944.

13. 6 June 1944 TNA WO 171/2377 June History Report, See second page of 6 June entry.

difficult to understate how heavy the fighting was. Indeed, there were many instances where tanks were replenished with tanks still 'in their forward positions', at times, with supply lorries advancing under tank escort.[14] This single under strength platoon was trying to keep a whole brigade supplied. Tasks which would ordinarily been reasonably simple tasks were now incredibly onerous. Take for example the task of refuelling and reammunitioning the tanks. What should have been a simple task done at the end of each day to ensure the Brigade was ready for the next day's operations became a night long ordeal requiring the initiative of the 9 lorry drivers of B Pl who had to understand the requirements of their client unit before returning to the beaches to try to obtain the critical stores required by their units. It was paramount that these drivers not only knew what was needed, but the priority of what was needed in the event that there were insufficient stores available to meet an urgent order. This way, lorries were always moving and stores were always flowing. Fortunately, by nightfall on D - Day, a small Brigade supply dump was beginning to form in Hermanville — an act that would logistics chains. Even still, this put a great strain on the men who were worked day and night until D + 4.[15]

Thus was the dispositions 90 Coy on D-Day, two Pls would make their way ashore: onto support their parent unit, 27th Armd Bde and one help the Division to their left — 6th Airborne — until their own RASC unit could make it. Here, one can begin to see the role of 2nd line transport companies such as 90 Coy. They form the final interface between

14. TNA WO 171/2377 June History Report, 6 June 1944; TNA WO 171/2377 June History Report, 3.

15. TNA WO 171/2377 June History Report, 2.

the wider supply system and the fighting units — it is these units that *deliver the goods* — however, how did these 90 Coy interface with the rest of Army?

The Supply Chain in the Field

Whilst admittedly, the supply system on D - Day did appear somewhat improvised and ramshackle, there was good reason for this. Because the British failed to advance as far forward as planned, the supply dumps that were to be set up all along Sword Beach failed to materialize in the same way as planned. Still, the logisticians of the British Army tried to beat the formal planned system into an effective supply chain however much improvised. This task was simplified by the fact that the British Army had an organic, built-in supply chain in doctrine. This was after all, an army that could expect to be deployed to not just fight a large, European Army, but also fight small wars across vast stretches of the British Empire. This formed a pre-existing framework allowing the logisticians to bring some level of order from the chaos of D-Day. In a sense, the Overlord logistics plans were more about adapting the pre-existing supply chain to the specific peculiarities of Overlord than about creating something truelynew. Thus, when the Supply Officers of Overlord found that the land that was to become their depots were still occupied by the Germans, the Supply officers did not have to design a new supply chain, merely adapt the old plan to meet new conditions.

The Three Lines of the *Thin Red Line*

In simplistic terms, British Army logistics divided itself into three lines, the first line, the second line, and the third line. First line units consisted of the actual fighting units, units like the East Riding Yeomanry, the Queen's Own Rifles, or the King's Own Scottish Borderers. First line units had limited logistical capacities. First line units function as the

final point of distribution from the wider Army supply chain, and the actual *man with the rifle*. First line units are able to effect minor repairs to equipment, typically those that do-not require much in terms of skills to replace. The sorts of repair that the layman could effect like replacing a blown fuse, or changing the spring on a rifle. They are, in effect, end users.[16]

Third line units are more conceptual. They are, simply put, high-order depots. They exist at bases and railheads, and third line units are responsible for bulk-breaking, preparing stores for later distribution and issue, and are capable of some operational warehousing.[17] The third line is capable of major repair and overhaul of equipment and, depending on the precise context of the third-line metaphor, can even include civilian contractors repairing things that the field army is incapable of repairing. In the perspective of first line units, third line units are people far away who fix things that are broken and send forward stores when they're needed.

Second line units function as the interface between the third line and the first line.[18] The third line gets the supplies and prepares them for distribution to the units, the second line moves them to first line units, and the stores are used by the first line. 90 Coy RASC, the unit we are primarily concerned with, is a second line transport unit.

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16. *Field Service Regulations: Organization and Administration 1930: Reprinted with Ammendments Nos 1 – 11 1939*, vol. 1 (London: The War Office, 13 December 1939), s. 58(1)i, s. 102.

17. *FSR 1*, s. 105(2).

18. *FSR 1*, s. 101.

The Principle of Supply

The whole supply system was guided by the need to keep the Army functioning by ensuring it had what it needed, when it needed it. At it's core,

> The principle of supply [in the British Army was] that field units should always have with them, or within reach, two days' rations and forage, and one iron ration, and that these stocks should be replenished by delivery, at a point within reach of the troops, of one day's ration and forage each day.[19]

Moreover, as the British Army was fully mechanized by the Second World War, supply was also to ensure that all vehicles would have full petrol tanks at the end of each day.[20] To enable operational mobility, 2nd line transport was also to have immediately available, an additional 50 miles of fuel; and 3rd line transport, a further 25 miles instantly available for use.[21] Of course, it is unlikely that such vast quantities of fuel were landed on D - Day, but it does provide a picture as to the standard logistical range of the Army. The British Army was expected to be able to advance independent of it's bases for slightly over 75 mi over the course of three days. Thus, this formed it's maximum operating range and maintaining this ability to move would become the challenge faced by 90 Coy, the RASC as a whole, and the RAOC.

Of course, it is sub-optimal for an Army to operate for long without access to its supply chain so, to support the Army, the supply chain was broken up into four main areas, ordered from furthest to nearest the front line, the Base Sub-Area(BSA), the Line

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19. *FSR 1*, s. 107(1).

20. Maginnis, *A Great Feat of Improvisation*, 73, 79–80.

21. Precis of Lecture No. 12: Petrol No. 27 (Winter) War Course, 2017/7 Box 3 File 7, Directorate of History and Heritage Archives (DHH), Ottawa, s 3.

of Communication Area (LoC), the Corps or GHQ Area, and finally, the Divisional Area. Those depots that 90 Coy went to along the beach? Those would form the Beach Sub-Areas (BSA).

The Base/Beach Sub-Area and Line of Communication

In the first days at Normandy, it appears that Beach and Base Sub-Areas were treated as one and the same. Whatever the 'B' stands for, BSAs functioned as the British Army's initial interface between sea and land. One can think of the BSA as a sort of harbour responsible for that first ship-to-shore operation, and for storing and organizing those supplies for later use inland. The BSA had the docks, the base railway marshalling yard, a main supply depot, a petrol sub-depot, field bakery, and detailed issue depot.[22] Cold storage was also available for rations such as sides of meat, etc — of course, it is unlikely that such niceties were available in the first days of the invasion, fresh rations weren't even available for quite some time.[23]

The BSA would then theoretically interface with the Line of Communication Area (LofC). The LofC can be thought of as a transport network connecting the BSA with field units. These were railway networks or truck convoys that transported stores from the BSA to the field army. One peculiarity in Normandy however was that the supply lines were quite short, measuring in the ones or tens of kilometres. Until the Anglo-American forces broke

22. Precis of Lecture No. 5: "Key Plans and Maintenance Projects" No. 27 (Winter) War Course, Paras 8 – 9, see also the diagram on the recto of the first page of the precis. Precis on Lecture "Supplies in War", (Part II) No. 27 (Winter) War Course.

23. Precis on Lecture "Supplies in War", (Part II) No. 27 (Winter) War Course, See diagram at end.

out of their beachheads, it was simply unnecessary to have a strict LofC area per se. The field army could simply draw stores directly from the BSA — the LofC area really is not necessary until the field army is some distance away from the BSA. As the Allies advanced deeper into France, a more formal LofC area would be established to convey the minutiae of war to the front.

Supplies in the GHQ, Corps, and Divisional Areas

Regardless of whether the Army was drawing stores directly from the BSAs or from the LofC, eventually, the field army would have to start drawing stores. To such ends, the Army was divided into two sections: the Corps / GHQ Area, and the Divisional Area. Typically, the distance — and thus, also depth of the Army — from the LofC area to the delivery points was 30 – 40 mi (50 – 65 km) At the GHQ level, one begins to see how the British Army sorted supplies. POL and other stores were handled in two theoretically separate systems. In either case, it is at the GHQ level that stores were bulk broken.

Let's handle the general stores first. Stores are delivered to the Supply Column (Sup Coln) where stores are bulk broken. Think of this bulk breaking with the analogy of a grocery store. A grocery store may receive it's goods in wholesale, bulk form, but then repackage it into smaller, more usable units to be easier to sell — a retail customer has little use for half a ton of potatoes; however, two pounds could make a nice dinner. In the case of prepackaged stores, bulk breaking is more similar to the procedure that occurs when a grocery store receives a palette of cereal which is subsequently unpacked and loaded as single

units on a shelf. Thus, the Sup Coln HQ can function as an interface where the Army's bulk handling meets it's piece handing functions.[24]

Petrol, Oil, and Lubricants (POL)

Likewise, fuel could, at times be shipped in bulk initially however fuel for the British Army was never delivered to field units as such. It was always containerized first into tins. There are few modern equivalents to this in our modern world. When we buy fuel at the petrol station, we pump it from a massive underground tank into our cars where it's sold by volume. Rarely do we buy a pre-packed can of fuel. This was however how the British Army preferred to receive it's fuel — in 4 Gal (18L) of petrol per tin.[25]These tins were nicknamed flimsies. Flimsies were meant to be disposable so they were built cheap; however, the design teams were perhaps overzealous. The flimsies had an unfortunate habit of breaking or leaking such that it was quite common for them to arrive damaged leading to fairly severe losses in fuel as well as a notable fire risk.[26] Indeed, the flimsies were of such low quality that the British Army began to simply use, and then copy captured German (Jerry) petrol cans — hence the term jerrycan (a German petrol can).[27] Moreover, by Overlord, jerrycans were plentiful and it appears that flimsies were mostly relegated to carrying water. Even

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24. Precis on Lecture "Supplies in War", (Part II) No. 27 (Winter) War Course, 3.

25. Precis of Lecture No. 12: Petrol No. 27 (Winter) War Course, 3. For reference, the 2025 Toyota Corolla sedan has an approximately 50 l fuel tank whilst the 2025 Ford F150 Raptor pickup truck has a 136l tank.

26. Maginnis, *A Great Feat of Improvisation*, 179, 198–9.

27. Maginnis, 179.

containerized fuel was arriving ashore already loaded in jerrycans and images of POL dumps post D-Day depict stacks of jerrycans and not flimsies.[28]

Nevertheless, despite the questionable durability of flimsies, the British Army had some sound reasons for using containerized, as opposed to than bulk final distribution. Firstly, tanker lorries in civilian use were not fit for military service; thus, if the British Army was to distribute fuel in bulk, special military tanker lorries would have to be developed — potentially at great cost.[29] Secondly, containers are compartmentalized. If a bullet pierces a tanker lorry, one may loose thousands of litres of fuel before one notices; however, if a bullet travels through a containerized fuel transport (i.e. lorry full of flimsies), one may loose only a few tins worth of fuel.[30] Moreover, containerized fuel has far fewer mechanical requirements. For bulk fuelling to work, one must have a working petrol pump. This could be quite inconvenient. Imagine having a tanker load of fuel but no simple way to get the fuel out of the tanker. Moreover, using this system, you can only fuel a few vehicles at a time. With containerized fuel, one merely pulls up to the vehicles, unload a few tins at each vehicle, and each crew then subsequently fuels their vehicle with a cheap easily replaceable funnel. Filling the fuel containers could be quite laborious in the field but this was partially mitigated by the flimsies being pre-packaged at the factory.[31]

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28. Army Film Unit, *The Build-Up of Troops and Matériel in the British Sector of the Normandy Beachhead*, A70 70-1 (6 July 1944), 8:30 – 10:55, https://film.iwmcollections.org.uk/record/_BvsowDHz1rSYs2sdsNsvg1He.

29. Maginnis, *A Great Feat of Improvisation*, 178 As it happens, the British do end up creating these military tankers but, for reasons enumerated below, they were most heavily used in rear areas. Distribution to field units continued to use containerized distribution throughout the war.Maginnis, 184–7

30. Precis of Lecture No. 12: Petrol No. 27 (Winter) War Course, Table at para 8.

31. Maginnis, *A Great Feat of Improvisation*, 178–9.

All told, the British POL supply chain was designed to provide containerized fuel for the Army. As designed, it was intended for the Army to be able to advance the whole army 75 mi (120 km) using only such reserves held by the field army (the GHQ/Corps areas, and the Divisional Areas). 50 mi (80 km) of fuel would be held by the the Divisions, whilst the Corps areas would hold the remaining 25 mi for the divisions, plus an additional 75 mi for the corps' organic transport.[32]

Having been bulk broken at the Corps or GHQ levels, it was now up to the 2nd line transport units like 90 Coy to then bring those stores forward into the Divisional areas and deliver them to the units of the end-user. Depending on operational requirements, this may mean delivering it directly to the individual end-users, or it could mean delivering such stores to the units who could then further distribute stores internally. This formed the basic, theoretical structure of the British Army's supply chain; however, just as how no plan survives first contact with the enemy, the supply chain had to adapt to tactical and operational necessities.

Storage and Dumping

Finally, before we carry on with the affairs of 90 Coy, it may be prudent to clarify what is meant by a 'dump' and other forms of storage. In a perfect world, supply chains would be perfectly efficient. Ever single item required by an army would be produced when it's needed, sent to where that item was required without delay, and used immediately on

32. Precis on Lecture "Supplies in War", (Part II) No. 27 (Winter) War Course, 3.

receipt.[33] Alas, hiccups invariably appear. Shipping gets stalled, major operations consume unusually large quantities of supplies, supplies are lost to enemy action, etc. Thus, if first-line units were to receive a continuous flow of supplies, it was — and remains — necessary to store a reasonable reserve of stores at various points along the supply chain to absorb the normal ebb and flow of supplies.

Ideally, this would be a large, dry, flat, climate controlled warehouse with good transport networks, but conditions in the field often are not always ideally suited to the logistician. Thus, supplies were often stored by stacking supplies in a field or some woodland and covering them with tarpaulins if they required protection from the weather. The precise requirements of this may seem quite trivial and not terribly important to the profession of fighting wars; however, seemingly trivial tasks such as labelling and organizing are critical. Consider what would happen if there was a German counter attack and the supply officer could not find the 76mm anti-tank shells because their boxes were not properly labelled or because the dump was not given enough land so that the aisles were too narrow. Moreover, what would happen to those same shells if they were dropped and the packaging was inadequate to protect their contents — and honestly, who hasn't dropped a heavy box before? Damage to the shell casing could prevent the casing from ejecting properly after firing leading to a stoppage and possibly leading to the tank being out of action.

Consider also what would happen if one of these these dumps was attacked and caught fire. Aisles do not merely provide access but function as fire breaks. These fire breaks are critical for hazardous material dumps such as POL dumps or ammunition dumps. When

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33. What we just discussed is known today as *Just in Time* Logistics pioneered by Toyota in the 1990s partly permitted by truly reliable, modern logistics.

these dumps catch fire, it is often too dangerous to attempt to extinguish the fire — POL burns and High Explosives explode. Instead, standard operating procedures tend to relate to containing the fire and letting it burn out on its own.

This may seem trivial but how do acts like this win wars? Unlike the combat arms, logistics does not win wars by plunging a bayonet into the hearts of the enemy. Instead, logistics wins wars by ensuring the combat arms can act without undue constraints. If there is insufficient ammunition or fuel to support an advance, a General cannot order that advance. If reserves are not ready when the enemy attacks, then the combat arms will have few options but to withdraw or fix bayonets. Logistics achieves nothing on its own but, through it's ability to impose or relieve constraints, logistics is a significant factor in determining if an operation is achievable or foolhardy. Let us return to Normandy in June of 1944 to see this in play.

Return to the Moment

By the morning of D+1, the situation for 90 Coy was slowly improving albiet, with real delays forming for offloading troops from ship to shore. As the men of C Pl land, they delivered their preloaded stores to their intended recipients before joining the constant circut from Beach Sector Stores to the dumps of 6 Airborne. By the afternoon of D+1 however, fears were beginning to materialize of a German counter attack targeted at the Eastern bridgehead presently held by 6 Airborne. As such, all available transport in the 3rd British Infantry Area were ordered to assist in preparing for this German counterattack on the British left flank. Thus, C Pl continued to built up a reserve of supplies in the 6 Airborne area, supplies that would be extremely useful if the German attack materialized.

Whilst C Pl was supplying 6 Airborne, B Pl was was busy establishing a reserve of stores for 27th Armd Bde, running up and down the congested road running between the Beach Sector Stores Dump and the Bde dumps at Hermanville. Fears of a counter attack however disrupted these plans and B Pl was ordered to transport a battalion of infantry 4–5 km East to St. Aubin d'Arquenas to plug the gap. At the time, the Pl was around half way through the process of unloading jerricans at the dump but this situation was urgent. As such, the infantry battalion was ordered to climb on top of the jerrycans and they were rushed East. Transport commitments fulfiled, B pl continued to build up the Hermanville dump and deliver stores to the forward elements of 27 Armd Bde.

The gravity of this buildup was quite a lot of work. See, it was not enough to simply bring ashore enough stores to sustain the troops currently ashore. If they did so a storm or a larger than anticipated counterattack could have been catastrophic. Thus, it was nessessary to establish a reserve ashore. On D+1, the goal was to establish an additional day of supplies for all troops ashore. D+2, 1.5 additional days; D+3, 2 days; and by D+14, 5 days. This gradient is reflective of the deminishing returns of having a longer period without supplies as well the fact that there is an exponential relationship between troops ashore and the size of the reserves — increasing the number of troops and the size fo the reserve at the same time results in exponentially more stores needing to be brought ashore. This operational imparative meant that, understrength logistics companies had to move far more supplies following D-Day than what would ordinarily be expected of full strength companies. In practical terms, this meant working around the clock with very little rest. In the 60 hrs from landing on D-Day to D+2, B had only been permitted 1-2 hours of rest total. By D+2, the men were starting to fall asleep at the wheel! Nevertheless, this foresight would pay off when

the Allied Expeditionary Force was cutoff from the UK by a storm that would arrive a week later.

This example is representative of the role of logistics in warfare. Logistics contributes to military success by removing constraints, but this is often expressed, not by reacting to a threat per se, but by ensuring that the Army is in a material condition to receive the enemy. This is often done by prepositioning assets where they may *foreseeably* be required whether that be by transporting troops or by establishing dumps. This establishment of dumps meant that supplies would be available *if* they were required. Their success is only evident in the absence of failure. Ultimately, the supply of ammunition was maintained, albiet, with some shortages later on.

Given good transport links, creating a single large dump would greatly simplify matters. Entry and exit routes could be improved by the Royal Engineers to help alleviate congestion and one-way circuits could be established. Moreover, having everything available in one place would mean that the probability of a signle demand exceeding the avaialblity of stores in that one major dump was low. Alas, any such dump would have to be huge and would likely be highly visible from the air. This in turn would increase the probability of attack and the loss of materiel. Thus, materiel needed to be dispersed across more dumps, and across a wider area to make the supplies easier to hide and to minimize the risk of losses by any single attack.

Still, even with such forethought however, losses could be enormous. Following D-Day, the Luftwaffe made it a habit to sent sorties over the beaches to attack anything of value. On at 1345 on D+2, one such attack materialized on a POL dump adjacent to the main beach exit. The attack ignited the POL in the dump and the resultant fire spread to

near by supply and ammunition dumps. Over the next 3 hours, 60000 gallons of POL and 400 tones of ammunition were consumed in the flames — around 1/4 of the stores landed in a day.[34] Efforts to extinguish the flames

This was indeed, not the only fire. POL fires dot the various various Army war diaries and RAF Operations Record Books as the Germans attempted to interdict British supply lines. What is interesting however is that these fires occurred sufficiently frequently that they begin to be rotuine. Often records simply show 'P.O.L. Dump hit...' followed by, 'P.O.L. Dump fire extinguished'.[35] As the invasion continued, it became increasingly common for a quantified estimate to be omitted in the war diaries or operations record books. We can assume that, as these men continued to work, they learned to take better fire percautions such as prepositioning firefighting apparatus, establishing sufficiently wide firebreaks in between stacks of POL, and dispersing the storage locations for these dumps helped to minimize losses.

Whilst such percautions are admittedly, quite mundane, it is preparations such as these that are essential to keep an army mobile. Consider that 90 Coy was, as these fires were raging, running loads of petrol forward for the tanks. If losses were not averted and minimized, a single fire could be allowed to destroy a catastrophic amount of fuel. As it was, the loss of fuel was a mere inconvinience. First line units still recieved enough fuel to operate. Once again, it is rare that logistics can win a war, but it can certainly loose it. Without

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34. No 1 RAF Beach Unit (Later Squadron) Sept 1943-July 1944 IIn/FJ3/1 and 14 Including No 70 and 71 Beach Units Operations Record Book, AIR 29/438/9, The National Archives UK (TNA), Kew, 8 June 1944 (hereafter cited as TNA AIR 29/438/9).

35. TNA AIR 29/438/9, 10 June 1944.

these standard, boring preparations taking place, it is probable that the British Army of 1944 would have simply been unable to fight in Normandy as it would have been much easier for the Germans to simply destroy the buildups the British were making. Whilst these stacking and loading standards are quite mundane, they are important to actually winning wars.

Consider also unforeseen events where problems could not simply have been planned out of existance. The paras 6 Airborne fighting East of the Orne would, due to the general difficulties in providing sustainment from the air, often found itself short of rations or ammunition. Mathamatically, supplying these stores should be simple. You know the strength of a division, you know how many days of rations to provide them and some simple multiplication reveals the number of meals required. Take the number of meals, divide by the number of rations in a case, divide that by the number of cases that will fit in a lorry, all all that's left to do is to find the rations, load up the lorries and go. Job done! Nice and easy!

Alas, if only life was so simple! See, dumps had to supply these rations and this math is only accurate if the supply officers knew how many men they had to feed. Typically, this is solved by storing an excess of rations at these dumps to make up for any shortfall; however, in the first days of the invasion, rations were in short supply so these reserves that would have been prudent to build up simply had not had time to amass ashore. Thus, on in the evening of D + 1 when Commander RASC (CRASC) 6 Airborne Division — the officer in charge of supplies for 6 Airborne — found out that they had been reinforced and that these reinforcements were to be fed by him, he would have had his staff check their supplies. His team would have informed him that they simply did not have the rations available.[36]

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36. TNA WO 171/2377 June History Report, 6.

What would have then likely happened was that he would calculate the rations required, put a message through to Beach Sector Stores and request those rations. This would set into motion several chains of events from clerks and officers nervously eyeing ledgers, making sure that this requisition could actually be met off hand. If it could not, they would be figuring out where they could squeeze from the supply system for a little extra. Maybe transfer stores from a different dump, maybe reduce the size of a shipment for the next morning in hopes that they could fill their evening request, etc.

Whilst all this was happening, transport officers would be liaising with transport units like 90 Company and pushing through orders to arrange for the transport (in this case, three vehicles) to then get those rations from BSS to the end user. CRASC 6 Airborne whilst all this was happening would be ensuring he actually had room to put the rations once they were delivered, figuring out how to ensure his new troops knew where and when draw stores, etc. This back and forth is simple work. The stores existed but they're just not where they were needed at the right time. Thus, all that needed to be done was find the supplies — not hard with stores as ubiquotous as rations — and deliver it.

What happens however if the supplies required simply do-not exist in the quantities required ashore? By the afternoon of D + 2, 6 Airborne was growing short of 75 mm Pack Howitzer shells.[37] As such, 6 Airborne requested that 2000 rounds be dropped during Operation Robroy Three — the third in a series of four operations intended to supply 6 Airborne by air over the first four days of Operation Overlord.[38] Due to poor weather,

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37. TNA WO 171/2377 June History Report, 7.

38. **6aqwd**.

Robroy Three was cancelled though not before five aircraft had already taken off with small arms ammunition and wireless sets. As such reserves of these shells simply did not exist ashore.[39] Thus, 6 Airborne made some inquires with the Navy and an officer of 90 Coy was sent to the Navy's Command Post to liaise with them as they attempted to locate the stores. Some of these shells were supposed to have been landed some time during the first few days of Overlord but none could be found ashore.[40]

Locating stores in 1944 was difficult. It was not like today where one can search a database for the stores required, find which ship the shells are on, and just ask that ship to expedite that delivery. It required hours going through reams of paperwork trying to locate a single line in a ledger but, until someone worked out which ship these shells had been loaded onto, the paras would not be able to use their artillery.

By the morning of D + 3, these shells were still nowhere to be found and 6 Airborne was beginning to grow desperate. We will discuss the importance of artillery later, but sufficed to say, the British were reliant on their guns. They were so desperate indeed that, that morning, 6 lorries of 90 Coy were held so that instant the shells made it ashore, they could be sped to 6 Airborne's gun lines. To permit this, CRASC 6 Airborne made special arrangements with Beach Control to allow the DUKWs — amphibious lorries — to make an inland delivery (typically the DUKWs are just used as ferries to Beach Sector Stores as any lorry can drive far inland but few lorries can drive into the English Channel without severe consequences). Thus, when the ammunition was finally located on the afternoon of D + 3

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39. **6aqwd**.

40. TNA WO 171/2377 June History Report, 7.

by 6 Airborne RASC HQ's Ammunition Officer, Navy contacted the reliant ship, the ship unloaded her stores into the DUKWs, and the DUKWs drove directly to 90 Coy's Colleville harbour, the ammunition was cross loaded onto 90 Coy's 3 tonners, and that ammunition was rushed to 6 Airborne's gun lines which were, at the time, stood to and actively engaged with repelling a German attack.[41] The German attack was successfully repulsed by element's of 27 Armd Bde — also supported by 90 Coy. It was not until the next day, D + 4, that 6 Airborne's own RASC transport made contact with their parent unit. Until that time, the 46 lorries of 90 Coy (reduced to 20 by D + 4) had been supporting two divisions and one Brigade, a force which would have been undermanned to support even a single Brigade.

Think about what it thus meant that 6 lorries (around 1/4 of 90 Coy's remaining strength at the time) was held, standing by to ferry that 75 mm ammunition instead of delivering other critically needed stores — granted, by this time, some of the 3rd British Infantry Division's own transport had landed as well. What would have happened if those shells were not located? 6 Airborne would have lost much of its artillery support. Moreover, think about how complex it was to locate and deliver even a single load of artillery. Teams involved included at least 6 Airborne's CRASC (at least one officer and a few NCOs), the Navy Command Post (at least one officer, a clerk, and a signaller), at least one officer and six drivers from 90 Company, likely around six DUKW drivers, the teams at sea loading and unloading cargo, the Beach Control point, dozens of MPs controlling traffic, and doubtless more I have yet to think of. Whilst the combat arms rightly gets much of the credit for fighting wars, and the Generals credited for figuring out where to put men, spare a thought

41. TNA WO 171/2377 June History Report, 7–8.

to the staff work done by the men keeping ledgers, speaking on the radio, co-coordinating actions and pushing forward supplies. When times are desperate, one not only needs brave men, but highly organized logisticians to ensure that which was needed was obtained. Why else would you have drivers driving almost non-stop for some 60 hours if their work could be ignored?

Operations to Hold Ranville

Based on our impression of the first few days of the invasion, you would be forgiven for thinking that supply in general was quite a ramshackle affair. Thus far, the picture is probably exhausted lorry drivers ferrying materiel and troops this way and that, creating hasty dumps of essential stores, with busy supply officers running this way and that trying to scrape together what resources resources were available to support operations; however, as the situation stabilized in Normandy, supply slowly starts to become more regular and these quick and hasty names I keep bringing up like Hermanville, the 6 Airborne's Dumps, etc. start to become more important. It is thus worth pausing to assess the situation and to put some order to the chaos and really consolidate the supply chain that both we and 90 Coy were working to navigate.

The Supply Chain to Ranville

With the exception of the Paras who were being partly supplied by air, the supply chain supported by 90 Coy — at least, as far as the Coy was concerned — originated from sea on the various transport ships loaded down with any number of stores. These could be landing craft, landing ships, or any other vessel capable of carrying a large volume and tonnage of cargo. If these ships such as the LST could be beached directly ashore, then they

were typically beached and their stores discharged via their bow ramps. These supplies were then taken to the Beach Sector Stores where they would be stacked in an organized manner taking into account the need for creating aisles for both access, and fire protection.

If the ships however could not beach themselves, then the stores could be brought ashore either by Rhino ferry, or DUKW (pronounced 'duck'). As mentioned before, the DUKW was an amphibious lorry with a 5000 lbs payload — 2.25 tons — or a tad smaller than the 3 tonners used by 90 Coy. Whilst DUKWs were amphibious, they were really not designed to be driven for long distances ashore over rough terrain. Moreover, the diverting of such special vehicles from their amphibious role lead to a shortage of DUKWs on the beaches of Sicily.[42]Indeed, at Salerno the diversion of DUKWs from their task was so problematic that American Vice Admiral Hewitt advised that, in future operations, DUKWs ought to fall under command of the Navy.[43] For the British, DUKW drivers continued to belong to Army units however, British DUKW drivers were provided with a copy of written orders, 'signed by the DA & QMG 1 Corps', to be presented to anyone diverting them from their purpose, that they would be court marshalled if such a diversion was not an 'operational emergency'.[44] DUKWs were mainly used to transport stores from ship to the supply dumps nearest the beach — any lorry can drive several miles inland but driving into the sea with a common 3 tonner is unwise. Of course, in emergency situations as we have already seen with

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42. Dworak, *War of Supply*, 87–9.

43. Dworak, 108.

44. 27 Armd. Bde Maintenance Project - 2nd Edition (Appendix to May 1944) HQ 27 Armoured Brigade War Diary, WO 171/623, The National Archives UK (TNA), Kew, Section 14 para 3 (hereafter cited as TNA WO 171/623); Quotes from 3 Br Inf Div Adm Plan - Second Edition (Appendix to May 1944) 3rd British Infantry Division AQ War Diary, WO 171/413, The National Archives UK (TNA), Kew, Section 12 Para 8 (hereafter cited as TNA WO 171/413).

the shipment of 75 mm pack howitzer shells, occasional exceptions would be made but it was generally best to use the DUKWs to fulfill the mission that only a DUKW could achieve.

DUKWs were useful for moving things that would fit in a lorry; however, for transporting vehicles or if there was simply a shortage of DUKWs, then Rhino ferries were used. The Rhinos were essentially ungainly, spartan shallow draft barges assembled from sheet-metal pontoons.They were typically moved with rhino tugs going back and forth between from ship to shore and back again though they did also have two motors allowing them to sail at 2-3 knots.[45] Rhinos had the advantage over DUKWs that they could take several vehicles on board at a time and, once beached, the vehicles could just be driven off and any stores in those vehicles, offloaded at the sector stores dumps as they drove past; however, the Rhinos were very unmanuverable and had an extremly low freeboard leading to the passengers often getting quite wet.[46]

In any case, however the stores were brought from ship to shore, notwithstanding preloads destined for units deeper inland, their first port of call in these first days of the invasion would have been the Beach Sector Stores. This would rapidly evolve into the fully fledged Base/Beach Maintenance Area (BMA) Moon controlled by 101 Beach Sub Area.[47] BMA Moon started along Sword Beach's Peter, Queen, and Roger sectors and extended around 2km inland. The full BMA with it's organized supply dumps do not appear to have

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45. Craig Lee Symonds, *Neptune: the Allied invasion of Europe and the D-Day landings* (Oxford: Oxford University Press, 2014), 200, see also annotation on Rhino ferries on pages 8-9 of plates; **transportation**.

46. Symonds, *Neptune*, 310.

47. See traces in Neptune No. 1 RAF Beach Squadron Operation Order found in Appendix C to the May records. Traces are located between the Operation Order and the Signals Plan that follows the orders. Traces use a derivative of map sheet 7F TNA AIR 29/438/9.

been fully developed by D + 2; however, those dumps 90 Coy created as a Brigade ammunition dump in the vicinity of Hermanville was likely on the land that became BMA Moon's ammunition dump.[48] From these first dumps, logistics units like 90 Coy would then transfer the necessary stores to dumps further inland essentially forming a chain of operational reserves. For example, take 6 Airborne's Ranville maintenance area mainly drew stores from Hermanville and units working in 6 Airborne's Area of Operations (AO) would then draw stores from the Ranville dump forming smaller, often less formal dumps along the way.

Ranville

How these dumps grow and evolve becomes of interest to the to the historian of logistics because of what it shows us about how logisticians prepared to meet every likely eventuality; thus, let us return to Ranville. Recall that the Germans were probing the area to see if they can dislodge the British and 6 Airborne of their lodgement North-East of Caen and East of the River Orne and the Caen Canal. The paras had been holding onto a number of disunited pockets surrounding their objectives and drop zones. At the time, the territory held by the paras was still quite disunited and there was no continuous British front line per-se but pockets of British troops securing local perimeters. This is not a problem per se, rifle fire can have a range exceeding 1000 m so there was no strict need to maintain a continuous line. Nevertheless, it did mean that the more weakly held areas in the British zone were subject to German attack or infiltration.

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48. Trace of BMA Moon annexed to Neptune RAF Beach Squadron Operation Order found in TNA AIR 29/438/9, Legend entry 67.

On D + 4 (10 June), exactly this happened in the fields roughly between Ranville, and a town 2 – 3 km to the North East called Breville. The Germans had managed to break into a DZ from Breville but their attempt to cross the DZ was repulsed. Having been repulsed, the Germans contented themselves with holding a a wood near Le Mariquet using around a company of troops. The significance of this position is that it would separate 'the 5th and 3rd Para Bdes, which had not actually made contact at this stage'.[49] In light of this, 7 Para battalion, at the time holding the South-West corner of the drop zone (DZ) was ordered to 'sweep the woods and to clear the enemy out of them' and to do all of this in the pouring rain.[50] The paras, having no organic armoured units, was to be supported by B Sqn, 13/18th Hussars, 27th Armd Bde as well as the 13/18th's Recce (reconnaissance) Troop (Tp).[51]

The plan of attack was simple. The wood was divided into four separate woods named W, X, Y, and Z and, at 1600 hrs, the infantry and armour would work together to sweep the woods. At this stage, we would normally expect to discuss infantry-armour co-operation — it was awful with the paras not even realizing how many tanks would be supporting them.[52] We could then discuss how, despite the loss of 4 Sheramns and 2 Stuarts to German anti-tank guns, the attack was successful in clearing the wood and capturing 'over 100 P[risoners of]

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49. 7th Battalion, The Parachute Regiment War Diary, WO 171/1239, The National Archives UK (TNA), Kew, June, Appendix 2, p 1 (hereafter cited as TNA WO 171/1239).

50. TNA WO 171/1239, June 1944, Appendix 2, p 1.

51. TNA WO 171/1239, June 1944, Appendix 2, p 1; 13/18 Royal Hussars (Queen Mary's Own) War Diary, WO 171/845, The National Archives UK (TNA), Kew, 10 June 1944 (hereafter cited as TNA WO 171/845).

52. TNA WO 171/1239, June 1944, Appendix 2, p 2.

W[ar]' and greatly improving the moral of the Paras.[53] What is far more interesting however, is what came next.

The next day, 11 June, 13/18th Hussars joined the rest of 27 Armd Bde on the ridge north of Periers-sur le Dan; however, B Sqn, the same Sqn that supported the Paras' attack the day earlier, remained with the paras. Next day, 12 June, the balance of 13/18 Hussars join B Sqn and are attached to 6 Airborne but would be supported by 27 Armd Bde. This meant that 90 Coy was now responsible for not only 27 Armd Bde located on the ridge between Hermanville and Periers-sur le Dan, but also for maintaining the 13/18th Hussars operating in the vicinity of Ranville. Over the next few days, the 13/18th Hussars would support a variety of British units in the vicinity of Breville who's effect was to neutralize the threat of a German attack on the Eastern flank of the Allied beachhead.

Meanwhile, for 90 Company, 11 June was fairly quiet. Their activities for the day simply consisted of a mere 5 lorry loads of general supplies for 27 Armd Bde. As such, the under strength Coy took the time to do some maintenance having been worked to the bone since D-Day keeping 27th Armd Bde and 6 Airborne supplied.[54] Given the light day, it is likely that the tired men of 90 Coy also took a moment for themselves and got some more sleep or penned a letter to their friends and family. The next day would also come with some pleasantries for, for the first time since boarding the landing ships from 1-3 June, the company at last received letters from home.[55] There must have been a simple human joy in

53. TNA WO 171/845, 10 June 1944.

54. TNA WO 171/2377, 11 June 1944.

55. TNA WO 171/2377, 12 June 1944.

hearing from one's friends and family. Captains Grey and Foreman must also have been quite pleased for, in this correspondence, they were nominated for recognition (i.e. nominated for a medal) for their actions supporting 27 Armd Bde, and supporting 6 Airborne division respectively only a few days earlier. Finally, L/Cpl Jones — no known relation to the L/Cpl Jones of Dad's Army fame — was nominated for an award after rendering first aid during an air-raid on the night of 9 and 10 June.[56]

It is worth noting that letters did not always bring joy. The mail was how soldiers on active service received news of injuries, illnesses, and deaths from home. Moreover, some letters might be from girl friends ending relations, or spouses recounting the difficulties of live at home in war time. Unfortunately, the sources I had access to included remarkably little personal correspondence; indeed, none between family member's and I am thus not in a position to make significant comment on this aspect of the war. Nevertheless, when, in our modern world, we can usually communicate with our friends and family pulling a smartphone out of our bags and sending a quick text, the situation was not like that in 1944. When the men were sealed in transit camps pending embarkation in advance of the invasion in late May and early June, they were largely cut off from those outside their unit. It is likely why this seemingly insignificant event was included in a war diary entry was a page and a half long, as opposed to the more common several entries per page.

Despite the pleasantries however, there was still work to be done. In light of the 13/18th's attachment to 6 Airborne, on the 12th, 90 Coy started to create a series on ammunition and POL dumps in the vicinity of Ranville to supply the 13/18th operating in

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56. TNA WO 171/2377, 12 June 1944.

the area. Moreover, in light of the supply chain's single point failure along the Benouville-Ranville road, these dumps would also serve as an operational reserve in case the 13/18th were cut off.[57] The actual process of lorries moving to dumps and collecting stores started at 1800 hrs; however, it is worth also thinking about the volume of work done by officers ahead of time. Doubtless, a number of staff officers at the Company or Brigade levels would have calculated the required quantities of ammunition, POL, and rations likely prudent to keep on hand at Ranville, making forecasts of ammunition and fuel draw, etc. They would use mathimatical guidance — fuel consumption is fairly predictable — but doubtless also a level of judgment. After all, on 12 June 1944, six days after the start of the invasion, no-one could be certain how much ammunition would actually be consumed in this theatre of war.

Having made such a judgment, these officers would have likely filed indents with the BMA. The BMA would then have to see if they could supply the the stores requested on the indents. Just as occurred earlier with the 6th Airborne supplies, if they could prudently supply the materiel, all's well. Simply prepare the stores to be picked up, and arrange a convenient time to draw the stores. If they could not however, there would doubtless have been efforts made across the supply chain to acquire these stores and, only if this was impracticable, would it be likely that the request was denied.

Whilst all this was happening at the BMA, logisticians at 27 Armd Bde or 90 Coy must have been calculating the required number of lorries, the available number for making the shipment, etc. Evidently, the request was approved and 90 Coy decided it could spare 12

57. TNA WO 171/2377, 12 June 1944.

lorries for this dumping operation.[58] The operation continued to the next day, 13 June, when the Company's commitment increased to 20 lorries to the dumping operations completing the dumping program some time that day. The Company managed to get some rest on the 14th where, beyond some small deliveries, the Company had a maintenance day to look after themselves and, more importantly, their lorries.[59]

One now might ask, why all this activity in the area around Ranville? Operations around this time to capture the wood are today remembered as the Battle of Breville; however, this gives the impression of a set-piece battle which this battle was not. Instead, this was a brief period of fighting surrounding this town which turned out to have strategic importance. What started as a firefight to be handled by a unit fighting in their area of operations, evolved into a strategically significant battle involving units drawn in from other divisions. From a fighting standpoint, this has some minor interoperability concerns as well as some chain-of-command issues; however, simple co-operative measures such as the placing of the 13/18 Hussars under the command of 6th Airborne smoothed over these issues.

Sustainment however is a larger issue. Place yourself as a supply officer in this situation. When someone moves an infantry battalion into your area, one moves mouths to feed and rifles to fire. Moving a unit of infantry into an area already dominated by infantry does not cause a fundamental shift in requirements. All that has to happen is that the supply chain must expand to be able to meet the requirements — itself a challenge but less problematic than what happens if you move units with new sustainment requirements. The

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58. TNA WO 171/2377, 12 June 1944.

59. TNA WO 171/2377, 14 June 1944.

issue is that a Second World War British infantry division typically did not have organic armour — certainly not the Paras nor 51 Highland division also operating in the vicinity of Ranville. This means that the supply chain must now be prepared not only for increased volumes, but also for different supplies. An infantry division has lower POL requirements than an armoured division and the ammunition requirements change — infantry have no use for 75 mm tank rounds. Moreover, tank units are tied to the supply chain in ways the infantry is not. Infantry can forage and men can be put on half rations for short durations without significant consequences; however, a moving tank will always consume roughly the same amount of fuel if driven the same way, on the same terrain.

Thus, if one wishes to use tanks — tanks being quite useful in warfare during the Second World War — one must have sound logistics. This is where the flexibility of logistics units come in play. At this point, 90 Coy still has a mere vehicles; however, forethought, contingency planning, and adaptability was doubtlessly helpful. Detaching 13/18 Hussars from 27 Armd Bde was simple for the combat arms but 90 Coy needed to think deeper. It had to think about how to schedule supply runs some five kilometres away from the main body of the Brigade along busy roads which doubtlessly meant traffic jams. Moreover, it had to consider contingencies. What would happen if the bridges at Benouville or Ranville were taken out of service and the 13/18th's sector was attacked? Bridging units were available and standing by for such contingencies but building a bridge under active air attack is not an enviable task. In light of this, the decision was taken to expand the dumps at Ranville so that it could support a few infantry divisions as well as an armoured regiment. Doubtless, it was helpful that 90 Coy and the Paras likely already had a close working relationship seeing as how, just a few days earlier, it was 90 Coy that supplied them; however, it is likely

that some significant effort was needed in order to establish and maintain the new dump. In a sense, whereas moving an combat arms unit is akin to moving a body of men, moving the supply chain involves setting up new infrastructure and it is this infrastructure that is critical for the effective conduct of modern war. Once again, this work to maintian current requirements and to prepare for future eventualities is the key contribution of logistics units.

The Arrivals of A & B Pls (14 – 23 June)

The Battle of Breville and establishment of the Breville dump having been completed, both B and C platoons of 90 Coy spent the 14th of June maintaining their vehicles and, doubtless, getting some rest at Coy HQ located in a field, some 500 m NW of Cresserons. Here and there, the Coy do some minor transport details — delivering rations, ammunition, fuel, the usual minutiae of war — but the situation was quiet. The next few days are fairly quiet for the Brigade. Most of its forces are in defensive positions across the 3rd British Infantry Division front north of Caen or in the area East of the Orne. Here and there, the Brigade takes small action defeating German strong points or repelling minor attacks but nothing that, from a logistical standpoint, couldn't be managed through the usual supply runs.

Back in England, A, and the part of B platoon 90 Coy RASC that did not land on D-Day were, at this time, mounting their lorries and driving onto the LSTs for a their channel crossing. The 59 vehicles and 165 personnel of this platoon group arrives and begins disembarking at Queen Beach around 2000 hrs on the 15th. Three hours later, they finish the 6-7 km journey to Cresserons to join the rest of the company. Their arrival doubtless involved the greetings of friends, as well as some good natured ribbing experienced by new troops

joining old troops. There must have been questions asking about the present situation, the location of latrines, mess arrangements, and the usual questions one asks living in the field; however, the sporadic bombing likely helped to emphasize the fact that there was indeed *a war on*.[60] In light of this, the Company dig slit trenches to provide some cover against bombardment.

Withe the new intake of vehicles and men, the Coy spend the next few days reorganizing and dewaterproofing their new vehicles and doubtlessly, handling routine supply runs, all whilst being sporadically shelled. Beyond slit trenches there was little to be done beyond spread out the vehicles with 75 yds between them to minimize the damage of a single bomb or shell. One must wonder what a dreadful inconvenience this must have been to have to go possibly hundreds of metres just to get to one's lorry. In addition, one wonders the nature of the earth works in these areas as, with such dispersed vehicles, it must have been dreadfully open to have been caught in the open during a shelling. This harassing fire must have been irritating as the Germans did not do very much heavy shelling. Instead, using 17 June as an example, the Germans would lob a few shells (six in this case) over the course of a day and hope they hit something. One wonders if slit trenches were dug at every vehicle or if you hear the whistle of an incoming shell, if you just lie down and pray. It is likely that sleeping positions were in slit trenches — indeed, some REME units even managed to scrounge beds and place them in trenches with armoured sheeting above them — but even a trench was

60. TNA WO 171/2377, 15 June 1944.

not always enough to protect the men. Every few days, a man would be evacuated with wounds from shelling or bombing.[61]

As an aside, I should note that when I say 'dewaterproof', it's not so much making it so that the vehicles would not leak, but that they removed a series of minor modifications made to their lorries to ensure they would not be damaged during the crossing of the English Channel as well as when they waded ashore. Unmodified vehicles could typically wade some 18 inches, but modifications were made to all vehicles involved in Overlord to permit them to wade in up to 4'6" of water.[62] Much of this work was done by the Woman's Army Corps.[63] Whilst these modifications allowed vehicles to operate in water and protected them from the ravages of the ocean. Some work involved sealing certain components or the removal of filters — filters that could clog when wet. These modifications had to be removed before the vehicles drove too many miles as the modifications could be harmful to the vehicles on dry land.[64]

Oh Mundanity!

As you can likely begin to infer, late June was not a busy time for 27 Armd Bde. Beyond sporadic fighting, there is little of note to the tactical situation and thus, supply runs

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61. TNA WO 171/2377, Consider entries from 10 June (6 wounded), 13 June (1 wounded), 17 June (1 wounded), 21 June (1 wounded). Casualties were heavier at the start of the month but eased up towards the end.

62. *History of the Combined Operations Organisation: 1940-1945*, TNA WO 277/30 (London: Amphibious Warfare Headquarters, 1956), 165.

63. Indeed, the role of women in WW2 logistics is an opportunity for developing our understanding of the role of women win the Second World War.

64. **6aq**.

were still taking place. However, during this brief stabilization in 27 Armd Bde's AO, one begins to see a return to the normality of military life as captured by the Bde's administrative orders.[65] Indeed, the Brigade's first Admin O was not issued until the start of this period on 14 June likely because the Bde was simply far too busy. Nevertheless, these orders provide a wonderful opportunity to examine daily life for 90 Coy and indeed, the whole of 27 Armd Bde.

It is perhaps revealing that it had to be said that 'Latrine trenches must not be allowed to fill up. Fresh trenches must be dug and the old sites clearly marked'.[66] Apparently, this was quite a problem as, two days later, the Bde was advised that, 'Attention will be paid not only to properly constituted latrine erections but also to the general sanitary condition of the area, particularly checking failure to use facilities provided' — clearly, there was an issue getting the men to use the latrines provided.[67] More over, it appears it is indeed true that old habits die hard for, on 14 June, the whole Bde had to be reminded to drive on the right side of the road, and to turn on the correct side.[68] It was also with some amusement on reading that 'Any livestock *accidentally* killed by shell or [Small Arms] fire may be cut up and eaten by units if bled fresh and in good condition' (emphasis added); however, one is left wondering just how accidental some of these killings were as, by this time, the men may not have had fresh food for over a week.[69]

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65. TNA WO 171/623, See end of June diaries.

66. June Adm Order No. 3 TNA WO 171/623, Para 10.

67. TNA WO 171/623, June Adm Order No. 4, Para 1a.

68. June Adm Order No. 1 TNA WO 171/623, Para 9.

69. June Adm Order No. 1 TNA WO 171/623, Para 10.

Beyond these more humorous examples however, these Admin Os reveal a situation of scarcity. For a start, in the Brigade area, there were only three water points by which units could draw water: Benouville, Colleville Sur Orne, and Hermanville. Thus, along 27 Armd Bde lines, some units or detachments may have been over 2 km away from the nearest water point.[70] Thus, every day, either 90 Coy or the units would have had to drive dozens of water cans to the nearest water point, fill them, then drive all the way back consuming both time and fuel. Ration parties and ordinance stores would also have daily delivery runs which allows us to start to see the baseline problem of sustainment.

Ration requirements are easy to forecast, simply count the number of mouths to feed, multiply by the number of meals between supply runs, divide by the number of meals in a case, and round up to the nearest whole case. General stores such as ordinance stores however were more complicated. 'All demands [were to] be made to [the Brigade Ordinance Officer] at Bde A Ech[lon] by 1600 hrs daily. Available stores will be delivered next day'.[71] This thus creates an elastic demand on 90 Coy where any day could have more or fewer stores thus complicating calculations.

The first week of Overlord also saw some real shortages. Almost all vehicles and, not withstanding Lee Enfiled rifles, weapons were in short supply. In addition mine detectors, 'binoculars . . . compasses . . . watches', and surveying equipment used by the Artillery were all in short supply. Even communications equipment was short.[72] What's worse was drivers

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70. June Adm Order No. 1 TNA WO 171/623, Para 4.

71. June Admin Order No. 1 TNA WO 171/623, Para 6a.

72. TNA WO 171/623, Appendix A to 27 Armd Bde Adm Order No. 1 (June).

had a habit of running into communications cables consuming ever more supplies.[73] The situation was so serious that special care had to be taken that, if at all possible, if an officer — someone who would likely have binoculars, compasses, and issued watches — or OR had some of these controlled stores, actions needed to be taken to relieve that individual of the goods.

On top of this, armoured units had special stoves, the No. 2 (tank) cooker, for the tanks so that tankers could heat their meals or boil water in the field. Non-armoured units could usually rely on being well enough connected to the supply chain that they were to stay connected to the Cooks' lorries; however, before the invasion, a number of non-armoured units were issued these No. 2 cookers. By 21 June however, any 'vehicle not entitled to carry them' that had access to a mess, were to return the stove to the Brigade Ordnance Officer so that the stove could be reallocated.[74]

All these must seem quite minor. Why should a serious historian concern themselves with something as trivial as the availability of binoculars, compasses, stoves, rations or water? The answer is simple: get these wrong, and you loose the war. The trivial appearance of these stores is by design. The mission of the Services is to When well run, a commander, and thus, the author of most of our sources need not think about logistics but it does not mean it is unimportant. Without these stores, officers cannot see far or navigate and the men will starve and dehydrate. Put yourself in the hobnailed ammo boots of a supply officer and you received that order on redistributing cookers.

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73. June Adm Order No. 2 TNA WO 171/623, Para 3.

74. June Adm Order No. 3 TNA WO 171/623, Para 3a.

All of these requirements would have to be foreseen and prepared well in advance to ensure the required stores were available when needed. This is when the army was simply in stasis; however, by the end of June, the operational tempo for 90 Coy was beginning to once more accelerate.

Operation Mitten 27–28 June 1944

Operation Mitten occurred mostly within a single 24 hour period from 27 – 28 June 1944. It aimed to destroy a German salient around 10 km North of Caen. This salient was anchored by two Chateaux, Chateau de la Londe, and Chateau de la Landel. The assault on the salient was principally attacked by the 8th Brigade of the 3rd British Infantry Division. 27 Armd Bde would provide tank support and 141 Royal Armoured Corps came equipped with Churchill Crocodiles — Churchill tanks who's bow machine gun was replaced with a flame-thrower.

As ever, 90 Coy's tasking was principally to support the armoured units; however, their first job of the operation was to deliver some 30 lorry loads of 105 mm ammunition to the gun lines several kilometres away from the front lines South of a commune named Plumetot. Here, several Gun Batteries of the Royal Artillery were emplaced in preparation for the upcoming battle.

British Artillery

Artillery is often thought of as a supporting arm; yet, the British Army of the Second World War tended to operate on the principle that it is better to expend firepower rather than manpower. In light of this, when faced with difficulty, the British Army was liable to attempt to crush that obstacle under the weight of artillery. This could be from fire directed

by a Forward Observation Officer (FOO) against a specific, observable target (fire for effect), or it could be a preplanned suppressive bombardment such as a creeping barrage where the guns are laid to bombard a moving line in advance of advancing troops.

Artillery was quite an effective and flexible tool. Take the example of Lt Boyle of 17 Field Regiment RA who acted as a FOO for 38 Irish Bde in Sicily. He and an infantry company commander once saw a large number of German troops massing, likely in preparation for a counter attack. Thus, Lt Boyle got on the wireless, adjusted fire onto the German unit, and order '10 rounds gunfire' from an artillery regiment of 24 guns. Soon, '240 shells landed within an area less than a football ground'.[75] The company commander was impressed and asked for another salvo. The FOO simply said the proword 'REPEAT' and another 240 shells once more saturated the target area.[76] It is this ability to rapidly concentrate firepower on any point within range of the batteries by simply making a call on the radio that lies behind the power of the artillery.

Doctrinally, it could be used to kill an opponent, neutralize them (force them to keep their heads down for long enough for friendly infantry to kill or capture that opponent), demoralize them, or 'partially destroy' them (kill or wound 2% of entrenched forces or 20% of troops in the open).[77] Unlike the First World War, by the Second World War, it was relatively uncommon for the British to fire multi-day preparatory bombardments to entirely destroy enemy positions. These bombardments were too wasteful of ammunition, destroyed

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75. Stig H. Moberg, *Gunfire! British Artillery in the Second World War*, OCLC: on1012892375 (Barnsley, S. Yorkshire: Frontline Books, an imprint of Pen & Sword Books Ltd, 2017), 133.

76. Moberg, 133.

77. Moberg, 133.

the ground, and were not terribly effective at destroying an entrenched enemy.[78] Second World War bombardments tended to focus on providing the enemy with a 'short, sharp shock' keeping enemy heads down whilst friendly forces advanced. Of course, if troops were in the open, FOOs only be too willing to kill them but the usual aim was to suppress them.[79]

Despite these ammunition saving measures however, to do this required a vast expenditure of ammunition. It was assumed that for a unit with 25-pounders[80] to partially destroy enemy unit equipment in a 100x100 yd square, the unit would need to expend 40 rounds of ammunition. Demoralization would require 40 rds/hr over 4 hours (160 rds total) or 100 rds/minute for 15 minutes (1500 rds). Neutralizing the enemy would require 8 – 32 rds/minute for as long as the enemy was to remain neutralized.[81] Whilst batteries would have around 32 rds/gun in the gun's limbers,[82] this quantity is sufficient for a short fire-mission but woefully inadequate for a major operation that could easily consume over 600 rds/gun; thus, the RASC would dump and replenish ammunition to keep the guns fed.[83] The stocks required to maintain this instant access to firepower could be enormous. In the lead up to Operation Goodwood, which we will discuss later, each gun was issued with 750 rds of ammunition just to ensure that the RA would be able to meet demand.Without logisticians,

78. Moberg, *Gunfire*, 132.

79. Moberg, 133.

80. Common British field gun

81. Moberg, *Gunfire*, 133.

82. Moberg, 51.

83. Moberg, 122–3, 125.

the British would likely have had to use more costly, manpower based attacks which come with higher casualties.

On humanitarian grounds, high casualties are not desirable; however, on strategic grounds, this would have been disastrous. Unlike the US or even the Canadians, by 1944, the British were running out of men. The British were unable to replace casualties from drafting more troops from home. The manpower no longer existed. The British could not be wasteful with men for each death or wounded man would mean the army in North-West Europe would shrink. Just to make up the numbers for Overlord required the British to draw down staff from training establishments across the country. It was acknowledged that reinforcements were unlikely to become available. Already the British Army was constraining its operations and being less daring to conceive manpower. This was with ready access to ammunition and firepower. Without regular supplies of ammunition to the guns providing this instant access to overwhelming firepower, it is difficult to imagine how the British Army would be able to maintain sustainable casualty rates to continue operations in Europe. Once again, whist supply does not — or at least, should not — fight per se, effective fighting is impossible without them.

Support to Operations

Whilst Operation Mitten started with artillery preparations, 90 Coy was the RASC unit for 27 Armd Bde. In light of this, the majority of their work was in support of the armoured component of the operation. The 3rd British Infantry Division was, as usual, supported by 27 Armd Bde, but for Mitten, the Div was also supported by Churchill Crocodile flamethrower tanks from 141 Royal Armoured Corps. These tanks were unusual because, in

addition to the usual fuel, spare parts, and ammunition, the Crocodiles also required fuel for the flamethrower as well as compressed nitrogen cylinders for propelling that fuel towards the enemy. In light of this, on 27 June, the first day of the operation, 90 Coy establishes a dump 1–2 km from the combat area at Gazelle consisting of 3000 Gal (13640 L) of flamethrower fuel, and 90 nitrogen cylinders to keep the Crocodiles in service.[84]

Alas, the assault that evening by supported principally by the Staffordshire Yeomanry (Staffs Yeo) was unsuccessful. Thus, over night plans and preparations were made to try again with more forces the next morning. Thus, 90 Coy spends much of the night replenishing the Bde. Indeed, by 0300 hrs on the 28th, 90 Coy had delivered 1082 rds of 75 mm High Explosive (HE) ammunition to the squadrons of the Staffs Yeo providing a picture as to the ammunition expenditure in the evening prior. The next day, 27 Armd Bde was ordered to support the renewed assault by patrolling the area and providing harassing fire as needed. Squadron shoots were limited to 50 rds/gun.[85] These 50 rounds represented approximately half of the capacity of each tank. The fact that ammunition could be so freely expended is estimate to the effectiveness of logistics support for there was no fear that they would run out of ammunition. Indeed, if there were any such fears, the were needless. Operations resumed around 0500 on the 28th, By 1600 hrs, 90 Coy had delivered an additional 600 rds of ammunition to the Squadrons. An hour after the successful end of Operation Mitten around 1700 hrs, 90 Coy begins to fully replenish the Bde and by 2000 hrs, they delivered

84. TNA WO 171/2377, 27 June 1944.

85. TNA WO 171/623, Operation Instruction No 2 (see June appendix).

an additional 1200 rds of 75 mm ammunition, and likely fuel and rations as well, to Staff Yeo.[86]

In addition, as 141 RAC was still being supported by them, 90 Coy sets up a temporary maintenance point in Le Vey, approximately 5 km West of the Gazelle maintenance point, to replenish 141 RAC. Over the course of three hours, they deliver 2400 gal (10910 L) of flamethrower fuel to 141 RAC and, the next day, the flamethrower stores at the Gazelle dump are withdrawn and returned to depot.[87]

All this work was done for a simple two day operation and it is indeed right and proper that we remember the enormous loss of life suffered by the combat — indeed, over the course of June, 3 Div suffered disproportionate casualties and we owe it to the fallen not to forget them — but from an operational perspective, to simply focus on the dashing infantry is imbalanced.[88] Over the course of around 36 hours, Staffs Yeo had consumed 2882 rounds of ammunition to kill six tanks.[89] Of course, a significant amount of that ammunition would have been HE ammunition fired against infantry; however, this expenditure is still quite large. Moreover, without fuel or rations, the attack would have round to a halt quite quickly. Without the support of 90 Coy, the armoured component of this assault would have been impossible. Infantry casualties for Operation Mitten were already higher than casualties for the rest of the British Army and they would only have been higher if not for

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86. TNA WO 171/2377, 28 June 1944.

87. TNA WO 171/2377, 28 – 29 June 1944.

88. Norman Scarfe, *Assault Division: a History of the 3rd division from the Invasion of Normandy to the Surrender of Germany* (Camebridge: Spellmount Limited, 2004), 112.

89. TNA WO 171/623, June appendix, Operation Mitten Intelligence Diary, Entry 58; TNA WO 171/2377, on ammunition expenditure, 27-8 June 1944.

the armoured support. To stop our analysis of war with just fighting ignores what makes wars possible in the first place. Moreover, note the significant amount of activity after the closure of operations. Effective logistics work is not simply to support the current fighting but to ensure the Army is ready for the next action before that action has even been fully thought out.

The Lead up to Charnwood

In the week following Mitten, the situation for 27 Armd Bde and 90 Coy as a whole consisted of operations planned and operations cancelled, minefields laid and withdrawn, etc. It is likely that 90 Coy was involved in providing the mines to the Regiments but these would likely have been carried in routine supply runs. Generally, the situation was quiet. On 3 July, the balance of the Company finally begins to trickle in. From 3 – 5 July 55 vehicles and 162 personnel, the Company workshops, etc. trickle into Coy HQ in Cresserons. This buildup is inline with a general massing of the Army in preparation for the upcoming Operation Charnwood. In light of this, 90 Coy's headquarters is moved a few hundred meters to make room for a Medium Artillery Battery. As usual, despite the general crowding in the area, the Coy disperses over several hundred square meters across several open fields to minimize potential losses to enemy shelling or air attack.[90] There was still sporadic shelling in the area and there was almost no cover to help compartmentalize the damage from a single shell.[91] As such, distance would have to suffice to minimize the potential for losses.

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90. TNA WO 171/2377, 1 – 5 July 1944.

91. TNA WO 171/623, 5 July 1944.

Following 5 July, activity for 90 Coy begins to pick up in earnest. Unlike Operation Mitten, which aimed to capture two chateaux, Operation Charnwood was a much larger operation aimed at capturing Caen. 27 Armd Bde's task was to push support the 3rd and 59th Infantry Divisions in their push South to the Caen – Bayeux railway and River Orne therein capturing the bulk of Caen North of the river. Following this, Charnwood also aimed to secure bridgeheads across the Orne to act as a springboard for future operations.[92]

Whereas Mitten was mostly fought with a single infantry division and an armoured brigade; Charnwood would be fought with three infantry divisions, three armoured brigades, and would begin with a large scale bombing campaign. Charnwoods grander scale meant far deeper operational entanglements. Charnwood required more POL points, ammo points, provisions for rations, etc. Frequently overlooked are the more extensive traffic control requirements. We're used to thinking of armies as symbols on a map that can be moved at will as this is how they appear in books. Reality however is far more complicated. An Army is comprised of divisions that are capable of nominally fighting semi-independently. These divisions range in size from around 10 000 – over 20 000 men.[93] To move this volume of men across poor rural roads is no mean feat.

Challenges range from the obvious issue of the traffic jams that can arise from funnelling large volumes of men across narrow roads to more obscure issues like road wear. Wet, unpaved roads subjected to the simple tramp of boots will slowly be chewed into a

92. TNA WO 171/623, Operation Charnwood, 27th Armoured Brigade Operation Order No 2 (See appendix to July diary following papers pertaining to Goodwood).

93. For context, the Airbus A380, the worlds largest passenger aircraft, is certified to seat not more than 853 passengers.

muddy mess. Wheels will likewise wear deep ruts even in dry roads. Tracks of course are the worst. Their ability to grip nearly any surface also means that a brigade of armour moving through an area can rapidly destroy even a metalled road. In light of this, tracked were typically routed along dirt tracks whilst wheeled vehicles used roads. Much to the chagrin of staff officers, this practice was not always adhered to leading to the deterioration of the road networks.[94] These movements would be co-ordinated using detailed movement tables that divided the units to be moved into a number of *serials*. These tables would provide start points, end points, routing information, routing, and timings to minimize congestion and spread road wear. Ideally, only a single serial would be on any single road segment at a time. Too many units on a single road could easily result in units becoming intermixed and getting lost. Beyond the simple headache of being stuck in traffic, units getting lost means they are not where they need to be and relocating units, disentangling them, and sending those units back to where they need to be could take hours. Hours where the affected units are not as effective as they were supposed to be.

As it happens, just prior to Charnwood, 27 Armd Bde and attached units had to move from the Bde's main quarters from Cresserons close to their pre-attack assembly area some 4 km south at Gazelle. Some units to be attached to 27 Armd Bde were further afield and they would also have to make their way to Gazelle to permit the various units to gather prior to D-Day. This road march occurred on the night of 6/7 July (D-2/D-1) from roughly 2300 hrs on the 6th to 0100 hrs on the 7th — a few minor exceptions occurred with minor

94. 27 Armd Bde Adm Order No 8 (See July Appendix) TNA WO 171/623, Para 3.

units.[95] This road march would have occurred in blackout driving conditions and, as far as the sources describe, was likely successful with units arriving at Gazelle more-or-less on-time despite the heavy showers that were occurring at the time.[96]

Preparations continued after the Brigade's arrival. Once again, Churchill Crocodiles would be attached to the brigade so a 3-ton lorry loaded with flamethrower fuel was attached to the first echelons of each of 27 Armd Bde's three regiments.[97] Around 2150 hrs D-1 (7 July), some 300 Lancasters bombed the Northern Approaches to Caen in preparation for the coming assault. Witnesses watching from the Brigade area note that the bombing was 'most spectacular'.[98]

D-Day arrived on 8 July and, after a cloudy evening on ground that may have still been quite damp, units began forming up at 0200. H-Hour arrived at 0420 hrs with a 'tremendous [creeping] barrage' paving the way.[99] Progress for the Brigade was rapid and despite encountering some minor resistance, by the end of the day, the Brigade had reached the outskirts of Caen.[100]

D-Day Charnwood for 90 Coy was busy. On top of supporting the troops of 27 Armd Bde, 90 Coy was also responsible for supporting all other armoured units supporting 3rd

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95. TNA WO 171/623, Appendix C, 27 Armd Bde Operation Order No 2, 6 July 1944.

96. TNA AIR 29/438/9, 6 June 1944.

97. TNA WO 171/2377, 7 July 1944.

98. TNA WO 171/623, 7 July 1944.

99. TNA WO 171/623, 8 July 1944.

100. TNA WO 171/623, 8 July 1944.

and 59th British Infantry Divisions.[101] These units mostly consisted of the Chochodiles of 141 RAC, as well as Royal Engineer (RE) vehicles. These consisted of Armoured Vehicles Royal Engineer (AVRE) and Flail tanks.

AVREs were Churchill tanks specially modified to assist with engineer tasks. They could carry and deploy fascines (bundles of tree branches for filling ditches), fire a special spigot mortar affectionately referred to as a flying dustbin — useful for demolitions. AVREs also gave RE sappers cover if they needed to leave their vehicles, often in rather exposed positions, to demolish or build something. Flails were modified Shermans equipped with a demining flail. These vehicles would clear lanes through minefields permitting penetration by infantry or armoured units. Needless to say, the addition of these units added to the logistical burden of work by 90 Coy.

Nevertheless, the prime role for 90 Coy was to keep the Brigade supplied with ammunition. Conveniently, there were still stocks of ammunition left over in Gazelle from Operation Mitten that were never withdrawn. Thus, for Operation Charnwood, 90 Coy would maintain the Gazelle dump until stores were exhausted before opening a new ammunition point at Cresserons later that day, presumably as the Gazelle dump was exhausted.[102] This was advantageous as it meant that the closure of the Gazelle dump would not require transport or labour to move them to a new dump. The ammunition in Gazelle would simply be expended, and the dump closed.

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101. 27 Armd Bde Adm Order No. 7, 7 July 1944 TNA WO 171/623, Para. 3.

102. TNA WO 171/623, 27 Armd Bde Adm Order No. 7, 7 July 1944; TNA WO 171/2377, 8 July 1944.

In addition, they also kept '1000 Gals [of flamethrower fuel] and 35 nitrogen bottles on wheels . . . at Cresserons' and were to be available to dump further supplies on call.[103] In addition, organic transport for the Regiments comprising 27 Armd Bde also had their own ammunition lorries ready to ferry ammunition whenever they were needed. These requests would have been made using the wireless.[104]

Conveniently, prior to the attack, three days compo rations were issued to all armoured troops in addition to the usual three days reserve of AFV packs that were carried in tanks.[105] In light of this, rations were not a major consideration for armoured logisticians during the operation. It was a two day operation, but six days ration had already been issued. Of course, if further rations were required, they could still be requested.

Curiously, the 27 Armd Bde's Administrative Orders for Charnwood does not mention fuel but we can be absolutely certain fuel was consumed. Thus, it is probable that fuel would just be delivered through the *usual means*. It is thus, likely safe to assume that sufficient fuel was carried by the tanks, or otherwise within first line units to last the whole day. This would have been reasonable given that first line units were capable of holding of fuel. More over, given the attachment of a signals unit at 90 Coy HQ, it would have been routine to hastily load a lorry or two with fuel if a unit happened to consume an unexpectedly large volume of fuel. That evening, from 2100 – 2359 hrs, 90 Coy set up a POL point just south

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103. 27 Armd Bde Adm Order No. 7, 7 July 1944 TNA WO 171/623, Para 6.

104. 13th/18th Royal Hussars Operation Order No. 1, Operation Charnwood (See July appendix) TNA WO 171/845, Para 9b.

105. 27 Armd Bde Adm Order No. 7, 7 July 1944 TNA WO 171/623, Para 7.

of Hermanville.[106] Whilst the sources do not state this plainly, the location chosen for this POL point appears to allow for one way traffic through the point thus allowing there to be a constant flow of vehicles travelling through the point. It is likely that as first line units were beginning to return to their harbours that evening, first line transport would have gone to the POL point 4 – 6 km away to collect enough fuel for their units. These transport units would then have had to make the trip to the nearest dump either at Gazelle or Cresserons. All this would have likely occurred prior to the return of the units to their harbours. Imagine how congested these roads must have been. It is no wonder rations were so liberally issued before operations!

Once the units were in harbour, it is easy to picture the scene that likely unfolded. Ammunition was surly being ferried about, tired men lifting endless jerrycans of fuel onto the top decks of tanks and tossing down empty cans, ammunition being passed into turrets and stowed inside tanks, etc. One also wonders a more human component. Would rations be heated on stoves at this point or would tins having been left in the warm engine bay earlier now be at a decent temperature? One wonders if tea was being brewed and if the men opted to sleep in slit trenches for protection, or on their tanks for comfort. Surely, for some, it would have been a sleepless night as briefings, planning, and other preparations took place through the night in preparation for the resumption of operations the next morning.

Operations resumed around 0500 hrs with the Bde deploying patrols forward to the positions they left some six or seven hours earlier.[107] 90 Coy spent the morning issuing

106. TNA WO 171/2377, 8 July 1944.

107. TNA WO 171/845, 9 July 1944.

ammunition at their ammunition points and also and pushed flamethrower fuel to 141 RAC. From 1400-1600, as the various units were reaching their final objectives, units of 27 Armd Bde returned to their harbours for refit. Doubtless, once the battle ended, the logisticians of 27 Armd Bde would have to ammunition, refuel, and generally replenish the Bde.[108] Again, whilst this work seems trivial compared to the work of actually fighting the enemy, the work completed by units such as 90 Coy were critical for the conduct of the war. Once more, the work of logisticians *enabled* the fight but unlike previous smaller operations like Mitten, or more improvised operations such as those that occurred that occurred shortly after Neptune's D-Day, in Charnwood, 90 Coy RASC operated a planned, deliberate role during the operation as part of a much wider machine. Unlike around the Neptune landings, where 90 Coy was dispatching transport units in every direction, here their task was clear: keep the Brigade supplied with ammunition.

There was a slightly quiet lull post Charnwood. On the 10 July, Bde HQ moves a few kilometres to Douvres and the whole Bde is placed initially on 24 hours notice, later extended to 48 hours notice, which allowed the men to rest, take care of their vehicles, and recuperate.[109] Whilst this happened, the British Second Army was reorganizing to make up losses — the British were running out of men and needed to make up the shortfall for Goodwood.

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108. TNA WO 171/2377, 9 July 1944.

109. TNA WO 171/623, 10, 13 July 1944.

Post Charnwood/Pre Goodwood
Goodwood (18-20 Jul 44)
Post Goodwood

Criticality of Supply
Conclusion

On the Use of Artificial Intelligence (AI) and Machine Learning (ML) Tools

I have used AI/ML tools in the writing of this MRP. This MRP was typeset using the Latex type setter and citations were resolved using Biblatex. As these are markup languages, they require a very specific syntax documented in a wide variety of manuals. When writing the Biblatex bibliography files, ChatGPT was used to find the appropriate parameters to tag bibliographic information to ensure Biblatex could correctly typeset that bibliographic entry. I could not find the correct methods in the manual and trial-and-error is time consuming. This was done with the knowledge of my supervisor.

I have also used Apple's Vision Application Programming Interface (API) and ocrit — a simple Swift open source program using the Vision API I found on Github — to aid my research. As all my primary sources had been digitized, I found it convenient to OCR all primary sources to simplify the finding of information I had read in previous. I found that ML OCR engines such as Apple's Vision API are simply far more accurate than their conventionally programmed counterparts. Apple's API could be integrated into my workflow quickly and at least cost; thus, Apple's API was chosen.

It is likely that the Google search engine used regularly in the course of my research used AI/ML and this admittedly may have impacted some of my sources however, I took care to use other catalogues and databases to minimize the effects this risk. Moreover, I am aware that MacOS now more heavily integrates AI/ML and neural networks in the OS. Notwithstanding that which is written here however, I have not knowingly used AI/ML tools in the conduct of this research, and the work is my own.

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