INTRODUCTION

Logistics are defined by Jomini as 'the practical art of moving armies' under which he also includes 'providing for the successive arrival of convoys of supplies' and 'establishing and organizing. . . lines of supplies'.[1] Putting these together, one arrives at a definition of logistics as 'the practical art of moving armies and keeping them supplied', in which sense the term is used in this study. The aim of the study is to arrive at an understanding of the problems involved in moving and supplying armies as affected through time by changes in technology, organization and other relevant factors; and, above all, to investigate the effect of logistics upon strategy during the last centuries.

Strategy, like politics, is said to be the art of the possible; but surely what is possible is determined not merely by numerical strengths, doctrine, intelligence, arms and tactics, but, in the first place, by the hardest facts of all: those concerning requirements, supplies available and expected, organization and administration, transportation and arteries of communication. Before a commander can even start thinking of manoeuvring or giving battle, of marching this way and that, of penetrating, enveloping, encircling, of annihilating or wearing down, in short of putting into practice the whole rigmarole of strategy, he has – or ought – to make sure of his ability to supply his soldiers with those 3,000 calories a day without which they will very soon cease to be of any use as soldiers; that roads to carry them to the right place at the right time are available, and that movement along these roads will not be impeded by either a shortage or a superabundance of transport.

It may be that this requires, not any great strategic genius but only plain hard work and cold calculation. While absolutely

basic, this kind of calculation does not appeal to the imagination, which may be one reason why it is so often ignored by military historians. The result is that, on the pages of military history books, armies frequently seem capable of moving in any direction at almost any speed and to almost any distance once their commanders have made up their minds to do so. In reality, they cannot, and failure to take cognizance of the fact has probably led to many more campaigns being ruined than ever were by enemy action.

Though it has been claimed that civilian historians are especially prone to overlook the role of logistics,[2] the present author has not found this fault confined to any class of writers. Napoleon's tactics and strategy have attracted whole swarms of theoreticians, historians, and soldiers who between them were able to show that both were natural, indeed necessary, outgrowths of previous developments. The one field of Napoleonic warfare that is still believed to have been fundamentally different from anything that went previously is the logistic one, which is itself enough to suggest that the subject has been neglected. Similarly, no one has yet made a detailed study of the arrangements that made it possible to feed an ambulant city with a population of 200,000 while simultaneously propelling it forward at a rate of fifteen miles a day. To take another example: though Rommel's supply difficulties in 1941–2 are probably mentioned as a crucial factor in his fall by every one of the enormously numerous volumes dealing with him, no author has yet bothered to investigate such questions as the number of lorries the Africa Corps had at its disposal or the quantity of supplies those lorries could carry over a given distance in a given period of time.

Even when logistic factors are taken into account, references to them are often crude in the extreme. A glaring instance is Liddell Hart's criticism of the Schlieffen Plan which, while concentrating on logistic issues, does so without considering the consumption and requirements of the German armies, without saying a word about the organization of the supply system, without even a look at a detailed railway map.[3] All we find is a passage about the circumference of a circle being longer than its radii, which reminds one suspiciously of that 'geometrical' system of strategy so beloved of eighteenth-century military writers. And this passage is put forward by some, and accepted by others, as 'proof' that the Schlieffen Plan, the details of which took scores of highly-trained

general staff officers half a generation to work out, was logistically impracticable!

Clearly, this will not do. Instead, the present study will ask the fundamental questions: what were the logistic factors limiting an army's operations? What arrangements were made to move it and keep it supplied while moving? How did these arrangements affect the course of the campaign, both as planned and as carried out? In case of failure, could it have been done? Wherever possible, as in Chapters 5, 6 and 7, an attempt is made to answer these questions on the basis of concrete figures and calculations, not on vague speculations. Yet even where, as is often the case, the sources available make it impossible to go into such detail, one can at least analyse the main logistic factors at work and assess their effect on strategy. And one can do this without adhering to stereotypes such as eighteenth-century 'magazine chained' or Napoleonic 'predatory' warfare.

An undertaking to study logistics and its influence on strategy during the last century and a half is very ambitious. To compress the topic into the space of a single book, and yet avoid mere generalities, this narrative concentrates on a number of campaigns between 1805 and 1944 (with an introductory chapter on the seventeenth and eighteenth centuries) selected to present different aspects of the problem. Thus, the Ulm campaign is commonly regarded as the most successful example ever of an army living 'off the country', whereas that of 1812 represents an attempt to utilize horse-drawn transport in order to cope with a problem that was too big to be solved – if it could be solved at all – by anything but the means offered by the modern industrial era. The Franco-Prussian war of 1870, of course, is said to have witnessed a revolution in the use of the railway for military purposes, while 1914 allows a glimpse into the limits of what could be achieved by that means of transportation. The German campaign against Russia in 1941 is interesting as a problem in the transition towards a wholly mechanized army; whereas, in the Allied forces of 1944, that transition had been completed. Finally, Rommel's Libyan campaigns of 1941 and 1942 present some aspects worth studying because unique. From beginning to end, we shall be concerned with the most down-to-earth factors – subsistence, ammunition, transport – rather than with any abstract theorizing; with what success, remains for the reader to judge.

I

The background of two centuries

The tyranny of plunder

The period from 1560 to 1660 has been described as 'the military revolution' and as such was characterized above all by the immense growth in the size of Europe's armies. Marching to suppress the revolt of the Netherlands in 1567, the Duke of Alba made a tremendous impression by taking along just three *tercios* of 3,000 men each, plus 1,600 cavalry; a few decades later, the Spanish 'Army of Flanders' could be counted in tens of thousands.[1] The most important engagements of the French Huguenot wars during the latter half of the sixteenth century were fought with perhaps 10,000–15,000 men on each side, but during the Thirty Years War battles between French, Imperial and Swedish armies numbering 30,000 men and more were not uncommon. At the peak of their military effort in 1631–2, Gustavus Adolphus and Wallenstein each commanded armies totalling far in excess of 100,000 men. Such numbers could not be sustained during the later stages of the Thirty Years War, but growth continued after about 1660. At Rocroi in 1643, the largest power of the time – Imperial Spain – was decisively defeated by just 22,000 French troops, but thirty years later Louis XIV mobilized 120,000 to deal with the Dutch. Even in peacetime under his reign, the French Army seldom fell below 150,000 men, that of the Habsburgs being only slightly smaller, numbering perhaps 140,000. The war establishment of both forces was much larger still, the French one reaching 400,000 during the years of peak military effort from 1691 to 1693. In 1709, it was already possible for 80,000 Frenchmen to meet 110,000 Allied troops on the battlefield of Malplaquet. More and better statistics could be adduced, but they would only serve to prove what is generally recognized: namely, that apart from a period of about twenty-five years between 1635 and 1660, Europe's armies

multiplied their size many times over between about 1560 and 1715.

As armies grew, the impedimenta surrounding them increased out of all proportion. Unlike the spruce, well-organized force that Alba took with him to the Netherlands, the armies of early seventeenth-century Europe were huge, blundering bodies. A force numbering, say, 30,000 men, might be followed by a crowd of women, children, servants and sutlers of anywhere between fifty and a hundred and fifty per cent of its own size, and it had to drag this huge 'tail' behind it wherever it went. The troops consisted mostly of uprooted men with no home outside the army, and their baggage – especially that of the officers – assumed monumental proportions. Out of 942 wagons accompanying Maurice of Nassau on his campaign of 1610, no less than 129 were earmarked to carry the staff and their belongings, and this figure does not include a perhaps equally large number of 'extracurricular' vehicles. All in all, an army of this period might easily have one wagon, with two to four horses each, for every fifteen men.[2] Under special circumstances – when it was necessary to try and make a force self-sufficient for an unusually long time, as during Maurice's 1602 campaign in Brabant – the proportion might even be twice as much; on that occasion, no less than 3,000 wagons were collected to accompany 24,000 men.[3]

In view of the ever-growing hordes of troops, women, servants and horses, the methods used to feed them are of some interest. By and large, the military forces of every country consisted of mercenaries; the army as such owed them little more than their *solde*, out of which they were expected to purchase not merely their daily food but also, albeit often helped by an advance from their company captain, their clothing, equipment, arms, and, in at least one case, their powder. Always provided the treasury sent money and that the officers were honest in distributing it, the system could work well enough as long as the troops were stationed more or less permanently in some well-populated place. A regular market could then be organized and put under the supervision of the intendant, who was responsible – to the government, not the commander in chief – for finding out what could be supplied and for policing the premises allocated for commerce and exercising price and quality control.[4] The trade between the troops and the local population was generally conducted on a voluntary basis except when some shortage was expected; in such

a case it might become necessary to prevent the richer soldiers from buying up all the available stock for their own use.[5] The system, as is well known, was subject to endless abuses that worked against the interests of almost everyone involved. Nevertheless, there was not in principle anything manifestly impossible about it.

Once the army had to operate away from its permanent station, however, the situation became very different. Establishing markets takes time, and the local peasants could not be counted upon to sustain the force unless, as was usually the case, its movements were slow and marked by lengthy pauses. The prospect of gain could induce some larger merchants – the sutlers properly speaking – to follow the army, but they and their wagons would increase still further the size of its tail[6] while their stocks could not in any case last forever. In friendly territory it was sometimes possible to send commissionaries ahead in order to organize the resources of this or that town and set up a market. In a very few cases, when armies were repeatedly using the same routes for years on end, more or less permanent stations would be organized in which everything required by the soldiers was available for sale.[7] Another method of keeping an army on the move supplied was to quarter it on the inhabitants of the towns and villages on the way. In addition to free shelter, salt and light, these could be expected to provide other necessities *en lieu* of cash payment. In practice, of course, this did not always work out well; as often as not, the soldiers would both take their food and keep their money, not to mention that of their hosts.

On the other hand, no logistic system of the time could sustain an army embarked on operations in enemy territory. Nor, indeed, was the need for such a system felt prior to our period. From time immemorial the problem had been solved simply by having the troops take whatever they required. More or less well-organized plunder was the rule rather than the exception. By the early seventeenth century, however, this time-honoured 'system' would no longer work. The size of armies was now too large for it to be successful. However, the statistical data and administrative machinery which, in a later age, would help to cope with this increase in numbers by turning plunder into systematic exploitation did not yet exist. As a result, the armies of this period were probably the worst supplied in history; marauding bands of armed ruffians, devastating the countryside they crossed.

Even from a strictly military point of view, the consequences of such a situation were disastrous. Unable to feed their troops, commanders were also incapable of keeping them under control and of preventing desertion. To overcome both, but also in order to secure a more regular source of supply than could be afforded even by the most thorough plundering,[8] commanders during the last few decades of the sixteenth century began to see the need to have the army furnish the soldier with at least his most elementary needs, including food, fodder, arms, and sometimes cloth. This, again, was done with the help of sutlers, with whom contracts were signed to supply the army; the resulting expenses were then deducted from the soldiers' pay.[9] The beginnings of this new system can be traced almost simultaneously in the armies of two of the largest powers of the time, France and Spain, led respectively by Sully, Minister of War to Henry IV, and Ambrosio Spinola.[10]

Whatever system of supply was used, the first requirement for a well-ordained army was invariably money. During the second half of the sixteenth century, however, the growth of armies far exceeded that of their governments' financial possibilities. Even the richest power of the time, Imperial Spain, was bankrupted no less than three times by military expense during the period from 1557 to 1598. By the time of the Thirty Years War, no major European State except the Dutch could afford to pay its troops. Consequently, it was necessary to resort to the system of contribution. Though ultimately adopted by all belligerents, it is generally recognized to have originated with Wallenstein, the Imperial commander.[11] Instead of demanding provisions from local inhabitants which were to be paid for by treasury receipts, Wallenstein extracted large sums in cash which then went to the Army cashier, not to the individual soldier or unit. While frankly based on extortion, the system had two distinct advantages: it assured the soldier of regular pay on one hand, and relieved him of the need to rob for his own personal benefit on the other. In intent it was more orderly, and therefore more humane, than its predecessors; though in practice it worked out so terribly that, shocked by its horrors, Europeans everywhere were still making efforts to avoid its repetition a century and a half later.

So much for the supply system of the period. In assessing its effect upon strategy, the most striking fact is that armies, unless they were more or less permanently based on a town, were forced

to keep on the move in order to stay alive. Whatever the method employed – whether 'contribution' *à la* Wallenstein or direct plunder – the presence of large bodies of troops and their hordes of undisciplined retainers would quickly exhaust an area. This state of affairs was particularly unfortunate because it coincided with a time when the spread and development of the bastion was rapidly reinforcing the defence as against the offence. If Charles VIII had been able to conquer Italy *'col gesso'*, the strength of a late sixteenth- and early seventeenth-century power no longer consisted mainly in its field army; instead, it lay in the fortified towns, and a country liberally studded with these would even find it possible to wage war without any real field army at all. Under such conditions war consisted primarily of an endless series of sieges; whereas a strategic move into enemy country often struck thin air.

When it came to deciding just which fortress was to be besieged, or for that matter relieved, considerations of supply often played a very important role. The logistics of the age being what they were, a town whose surroundings had been thoroughly devastated might well be immune to either operation. This is well illustrated by the Dutch failure to relieve Eindhoven in 1586, a failure caused less by the difficulty of feeding a force of 10,000 men on its fifty-mile approach march to the place than by the inability to do the same when it was encamped beneath its walls.[12] Since a really protracted siege would cause the surrounding countryside to be completely eaten up regardless of its previous state, it was only possible to conduct an operation of this kind under exceptional circumstances. Thus, Maurice during the siege of Ostend could keep his army supplied from the sea; unfortunately the garrison was able to make use of the same means, the result being that the siege lasted for a record-breaking two years.

In so far as it was possible to eat up one place after another commanders found it easier to operate in the field. Since armies were not supplied from base, and also because in many cases they did not even expect to be paid by the states in whose name they were fighting, lines of communication were of little moment in determining the directions of their movements. The system of contributions made Wallenstein's hordes almost self-sustaining. The same is true of most other forces, including those of Gustavus Adolphus who, from the beginning of 1631 onward, was extracting the bulk of his supplies from the country in a manner not

notably different from anybody else's. Except for a few special cases, it was therefore strategically impossible to cut seventeenth-century armies off from anything except, sometimes, their areas of recruitment. Campaigns having this last objective in view were occasionally launched.[13] Subject to the limitations discussed below, armies could – and did – follow the call of their stomachs by moving about freely to whatever region promised supplies, while largely indifferent to their own communications with non-existent bases.[14] Far from calling for speed in operation, this kind of warfare did not even make for a sustained and purposeful advance in any well-defined direction.

As against this almost unrestricted freedom from lines of communication, the strategic mobility of seventeenth-century armies was severely limited by the course of the rivers. This normally had little to do with the difficulty of crossing as such; rather, it stemmed from the fact that the shipping of such supplies as were carried along by water was always very much easier than dragging them overland. While this particular consideration applied equally to all armies it was found, paradoxically, that the better a commander organized his supplies the more dependent on the waterways he became. This was due both to the enormous carrying-capacity of ships as compared to that of horse-drawn wagons, and to the fact that the former did not create additional requirements of their own. Thus, one of the foremost military engineers of the century calculated that 100 *lasten* flour and 300 *lasten* fodder could be contained in just nine ships, whereas on land no less than 600 wagons were needed in order to transport the former alone.[15]

Of all the commanders of the age, none showed himself more adept at exploiting the advantages offered by water-courses than Maurice of Nassau – and, conversely, no one found it more difficult to operate without them. By rapidly shipping his artillery train from east to west and back along the great rivers – Maas, Rhine, Lek and Waal – Maurice succeeded in surprising the Spaniards time and again, appearing now in Flanders, now in Guelderland, always catching the Spanish fortresses before they could be made ready for defence. Once he got away from the rivers, however, he was lost. This is best illustrated from his campaign of 1602, which, incidentally, was one of the very rare contemporary instances of an attempt to win a war by means of purposeful strategic manoeuvre.

Crossing the Maas, Maurice planned to avoid the fortresses on his way, penetrate deep into Brabant, bring the Spanish army to battle and finally swing west into Flanders; the ultimate aim being the liberation of both provinces. For this purpose, a large field army – 5,422 cavalry and 18,942 infantry – was concentrated; he also had thirteen cannon, seventeen half-cannon and five field pieces, but of this artillery train only twelve half-cannon were to accompany the army in the field, the rest being sent by water to meet him. The force was supposed to be self-contained for the first ten days, and was accompanied by 700 wagons carrying fifty *lasten* flour; another fifty were to go by water. In spite of these not inconsiderable preparations, there could be no question of even trying properly to organize the army's supplies for the duration of the campaign; all the above-described measures were only supposed to last the army until it should be possible to harvest the fields on the way and process the grain into bread.

As it was, the campaign was launched too early in the season. Crossing the Maas on 20 June, it was immediately found that the corn of Brabant was not ripe for harvesting. The stores carried along also proved disappointing, the army's English contingent in particular wasting its allocated share and having to be assisted by the others. Maurice thereupon wrote the Estates General that he did not know how he was to continue the campaign, that he would try and bring the Spaniards to battle, but would have to return to the Maas if he was unsuccessful. Having marched for just one week, the army came to a halt on 27 June; for the next three days the process of baking fresh bread was pushed ahead 'with great industry', so that the advance could be resumed on 2 July. When another pause for baking had to be made three days later, Maurice definitely made up his mind that, if unable to force a battle near St Truijen, he would return to the Maas. By 8 July, St Truijen was in fact reached, but then it was discovered that only sixteen out of the fifty *lasten* supposedly following the army by water could be found. Faced with starvation, Maurice decided to retreat. After the remaining flour had been distributed and baked, the march back started on 10 July but had to halt on the next day because it was 'exceedingly hot'. On 12 July, the English contingent had again wasted all their bread and had to be helped out by the army. Back on the Maas, a large consignment of bread and cheese reached Maurice on 19 July, whereupon he determined to march into Flanders. However, the