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BICYCLE TROOPS

Report No. BAT-171-25

Prepared Under Contract SD-171

September 30, 1965

by

R. S. Kohn

REMOTE AREA CONFLICT INFORMATION CENTER
Battelle Memorial Institute
505 King Avenue
Columbus, Ohio 43201

Battelle Memorial Institute · COLUMBUS LABORATORIES

505 KING AVENUE COLUMBUS, OHIO 43201 · AREA CODE 614, TELEPHONE 299-3151 · CABLE ADDRESS: BATMIN

September 30, 1965

Director
Advanced Research Projects Agency
Office of the Secretary of Defense
Washington, D. C. 20301
Attn: Project AGILE

Dear Sir:

Enclosed are three copies of Report BAT-171-25, "Bicycle Troops", which was prepared in response to a request from Colonel B. F. Hardaway, March 1, 1965.

Information on the utilization of bicycle troops is highly fragmented and diversely located. Most references to bicycle troops are from the World War II time period or earlier, with the more informative items coming from approximately the first quarter of this century.

Since quite a substantial effort was expended in locating and acquiring pertinent reports, journals, books, and other documents, it was decided, while all of the information was at hand, to include more detail in the report than was necessary to answer the specific request, in order to provide a fairly comprehensive central source of information on bicycle troops for subsequent researchers.

The information contained in this report represents U. S. holdings only. Foreign sources were largely untapped, although a few volumes dealing with bicycle troops in foreign countries were provided by the Library of Congress.

It is important that the reader of the report keep in mind the time frame for each of the references used since changes occurring in the intervening years may have had some effect on the validity of statements made in the past.

If you have any questions or comments regarding this report, please contact us.

Sincerely,

John W. Murdock

John W. Murdock
Project Director
RACIC

JWM:mg
Enc. (3)

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BICYCLE TROOPS

by

R. S. Kohn

INTRODUCTION

This review of the utilization of bicycle troops was initiated in response to a request March 1, 1965, from Colonel B. F. Hardaway, Chief of the Advanced Research Projects Agency Research and Development Field Unit - Vietnam.

Although bicycle troops were of military value as late as World War II, their usage was in a decline which eventually culminated in the abandonment of the bicycle by modern armed forces. Now interest in the employment of bicycle troops is emerging once again, this time in Southeast Asia where the road network is inadequate for motorized transportation, but where paths and dikes may provide an acceptable avenue for bicycle movement. Undoubtedly, the experience of bicycle troops over the past century can contribute much valuable information for anyone concerned with the decision to employ bicycle troops today. There is, however, a strong caveat which must be observed. This is a historical review of the literature related to the utilization of bicycle troops. Each of the referenced authors is writing in terms of the concept of warfare which existed at the time of his writing. These concepts, of course, have changed in the last 70 years, so it is necessary to evaluate the information of the past in the light of today's environment, objectives, and requirements.

The evolution of the bicycle began in the early eighteen hundreds, but over half a century passed before its application to military usage. For another 25 years, it was a peacetime experiment. Finally, in the period from the Boer War

through World War II, the bicycle went through alternating periods of increasing and then diminishing use by the military establishment. During this half-century many changes took place in the environment in which bicycles were used.

Information on military cycling is highly fragmented and diversely located. The sources used in this study are by no means complete, but probably represent the best available within this country*. Since bicycles generally were used much more extensively by foreign military forces, undoubtedly archives of various foreign governments include much material which would be of value in understanding the usage of bicycle troops in various wars of the past century. In this respect, perhaps Japanese archival material would be most valuable, since U. S. records do little other than indicate that the Japanese have used bicycles quite extensively both in the jungle and elsewhere. American sources generally only make reference to this use and contain little detail. Inquiry directed to the Military Attache at the Japanese Embassy as well as inquiries directed to the Military Attaches of embassies of other countries known to have utilized bicycle troops in the past elicited no response. A number of documents of foreign origin, however, were obtained for use in this review. The process of translation, plus a mode of expression characteristic of a different era (and this applies to English-language document as well), has sometimes resulted in awkward expressions in quoted material, but the intent of the statements remains clear.

* The information sources used in this study are given in Appendix A.

SUMMARY

The use of the bicycle for military purposes probably dates back to the Franco-Prussian War of 1870. But clumsiness and imperfections in design militated against its practical use until the Boer War of 1899 when Dursley Pedersen produced a folding-model bicycle weighing only 15 pounds. By World War I, most of the foreign armies were employing bicycle troops. The number employed has been given by one source as 100,000 in the British army and 150,000 in the French and Belgian Armies, but other sources present substantially lower figures.

The increasing use of motorized equipment resulted in bicycles being forced to take a subordinate role within the military establishment. By World War II, the major combat role of the bicycle was its use by paratroopers, although the Germans did have bicycle troops as an organized part of their Army. After World War II, the eclipse of the bicycle became virtually complete and there are reportedly no formal bicycle units in either the U. S. or foreign armies at present.

The principal uses to which military cycling has been put are in courier service, in reconnaissance, and in combatant forces. As combatant forces, military cyclists were used for a number of tasks, for example, to seize strategic points, conduct raids and demolition tasks, serve on patrol, perform defense and delaying-action missions, act in riot control, and, as has been mentioned, in World War II, bicycles were carried by some paratroopers.

Bicycles have been used in connection with some form of guerrilla activity for many years. In 1898, they were used for transportation and barricades during riot-control duty in Cuba. During World War II, French and Belgian saboteurs on bicycles did so much damage that the use of bicycles after dark was extensively banned. In Vietnam today terrorists on bicycles are active, and bicycle handlebars have been used by guerrilla sympathizers to smuggle contraband past roadblocks. Recent reports from Southeast Asia have suggested an interest in the employment of bicycle troops in counter-guerrilla activities.

The military cyclist is essentially a soldier mounted on a bicycle, either as a temporary or permanent assignment. Ideally, he should possess tactical

understanding, rapid capacity for adaptation and decision, good terrain orientation, independence, and the capability for bold action in case of isolation. The soldier as a cyclist on a heavily packed bicycle should be able to cover an average distance of 50 miles, and a maximum distance of 100 miles a day, at about an average rate of 8 to 10 miles per hour, and still remain ready to fight. He should be clothed, equipped, and armed in such a way that he can lay down his bicycle at any time and enter combat as an infantryman, even for several days. All of the equipment absolutely necessary in combat must be carried by the cyclist, while the rest of the equipment is arranged on the bicycle. The body of the man must be free from any unnecessary load that would tax his muscles and lungs.

In the past, the military cyclist has been armed with either the carbine or revolver, or both. In the very early days, some machine guns were mounted on bicycles.

Very likely, the most recent design of a military bicycle is of World War II vintage. If one were to be designed today, its prime characteristic would probably be the lightest weight possible consistent with strength and operational requirements.

The type of organization and the strength of bicycle units have varied widely over the years. Both the time period involved and the character of the army in which the bicycle unit was employed have had their effect. These factors are of equal importance today, and a contemporarily established bicycle troop is not likely to conform to one required in preceding wars.

The tactical action of cyclists is largely based upon their mobility. This, in turn, is dependent upon the nature of the country in which operations are being carried out, and upon the weather and the state of the roads. Bicycle troops must be able to deploy rapidly, and quickly develop full strength and fire power for successful tactical action.

The nature of the terrain and the natural forces of the environment encountered severely affect the mobility of bicycle troops. Mud, sand, snow, uneven surfaces, grades, manmade and natural obstacles, water, and dust are detrimental to bicycle movement. Once the bicycle leaves the road or encounters adverse weather conditions, or even, for that matter, encounters substandard roads, its mobility is immediately reduced to some degree. For example, one writer recommends that the cyclist be dismounted when passing over sandy stretches since riding would only exhaust him. Appraisal of the mobility of the military cyclist thus must be viewed, not in an absolute sense, but in relation to alternate modes of movement. The bicycle may well be used under certain circumstances to effect compromise between foot and motorized movement. The decision, in each case, must be based on criteria pertinent to the local environment, and must result from an analysis of trade-off characteristics and from a series of value judgements of the relative benefits to be gained as a result of these trade-offs.

The advantages and disadvantages of using bicycle troops have remained virtually the same through the years. The advantages are these: (1) bicycle troops because of considerable expansion and depth are uncommonly invulnerable to air attack; (2) bicycles require no fuel and are inexpensive to maintain; (3) wooded areas and areas where only narrow footpaths are available can be patrolled by bicycle; (4) bicycle troops can cross greater distances in a shorter time than that required by foot troops; (5) bicycles do not create a large cloud of dust as do tanks and trucks; (6) bicycles are relatively silent and therefore more suitable for night work than are tanks or trucks; (7) cyclists are less conspicuous than tanks or cavalry; (8) cover for bicycles is not essential, therefore cyclists in an emergency can come into action at once in open country provided there is a small ditch or bank for the men; and (9) troops with full packs can be moved distances of 75 to 120 miles per day depending upon the terrain since they can be

moved along shoulders of highways congested with traffic or through wooded areas and other areas not suitable for other types of vehicles. On the other hand, there are these disadvantages to the use of bicycle troops: (1) they cannot employ shock tactics as can tanks and cavalry; (2) their operations are largely restricted to the close proximity of roads, and, if these are unsuitable owing to weather or other causes, the rate of march may be less than that of infantry; (3) they are susceptible to ambush; (4) they take up a comparatively large road space on the march; (5) when performing the mission assigned, the cyclists cannot depart far from their bicycles without sacrificing the mobility gained from the bicycles; (6) in time of retreat, direction is often constrained by the need to travel over well-defined paths rather than cross-country; (7) unfavorable terrain and weather seriously impair mobility; and (8) changes of grade result in elongation and contractions of the cyclist column similar to the movements of an accordion (see page 45).

BRIEF HISTORICAL REVIEW

The use of the bicycle for military purposes probably dates back to the Franco-Prussian War of 1870. At that time a number of factories in Paris were manufacturing bicycles, and it was proposed that soldiers as well as scouts be mounted on them. A limited trial was conducted in the French Army, but clumsiness and imperfections militated against the bicycle and its vogue was of short duration. The London Daily Telegraph of that day contained the following clipping[1]*:

> "Messrs. Reynolds and May, the two Americans who escaped from Paris by balloon at the same time as Gambetta, have gone to the beleaguered city to conclude a contract with the French Government for the supply of a large number of a new description of bicycle with India rubber tired wheel. They are to be distributed among the forces which are being gathered together in all parts of France for acting upon the flanks and rear of the Prussians. The rubber tires make their approach noiseless and they are easily propelled at the rate of 10 miles per hour. The ubiquitous Uhlans may therefore anticipate the rapid rates of some of the novel cavalry corps about to be created."

Most of the European armies experimented with the ordinary or high bicycle during the 1870's and organized a cycle corps. They also put the tricycle into service, and found that its stability and the larger amount of equipment it could carry was adantageous for army use over good roads. Quadricycles, propelled by two or more men and carrying a machine gun, and tandems, hauling a small gun or machine gun behind, were used by the English Army about 1890[1,2], but these vehicles were of little practical value because their solid and cushion tires did not operate well over rough terrain. The development of the pneumatic tire by Dunlop in 1888 really advanced the adoption of the bicycle by European armies[3].

In May of 1892, Folsom suggested the introduction of the bicycle into the U. S. Army. He recommended equipping each bicycle with an umbrella (as a sun

* References are given at the end of the report.

protector) which could be rotated 90 degrees and turned into a sail when the wind blew, thus helping along the weary cyclist[4]. In that year, a detachment of eight soldiers under the command of First Lieutenant W. T. May, 15th Infantry, made several practice marches upon bicycles, carrying the ordinary equipment and arms of the infantry soldier[5]. Also in May of 1892, relays of bicycle carriers posted by the American Wheelmen's Association covered 975 miles in 4 days and 13 hours, carrying a dispatch from the Headquarters Department of the Missouri in Chicago, Illinois, to the Headquarters Department of the East in New York Harbor. At about the same time (May 31, 1892), Major General Nelson A. Miles had this to say concerning a trip from Pullman (now a section of Chicago, formerly a separate town) to Chicago by military cyclists[6]:

> "Yesterday a few soldiers from Fort Sheridan under command of Lieutenant Hunt, the detachment having had very little experience in riding, went to Pullman just for curiosity to see how soon they could make the march from Pullman to Chicago, a distance of 15 miles. They started in the morning with their full equipment, the same as men outfitted for a campaign, in regular marching order. They made the distance, as I am informed by the officer, in one hour and twenty-five minutes...I asked the officer how the detachment stood the march and he said they were little fatigued and would have turned around and gone back over the ground again with pleasure."

While the National Guard of Connecticut is credited with being the first U. S. military organization to experiment with the bicycle, it was the just-mentioned General Miles who was foremost in its employment under severe field-service conditions. He organized the 25th U. S. Infantry Bicycle Corps at Fort Missoula, Montana, under the command of Second Lieutenant James A. Moss in July, 1896. By 1897, this group was able to cover the 1,900 miles between Fort Missoula and St. Louis, Missouri, in 34 days of actual travel, averaging 55.9 miles per day and 6.3 miles per hour[7].

Also in 1896, Captain R. E. Thompson, of the Signal Corps of the U. S. Army invented an attachment for the bicycle which paid out and retrieved temporary telegraph and telephone wire. Six hundred yards of wire could be paid out and reeled back in the remarkable time of 2 minutes[3]. A French Army unit of about this period is shown in Figure 1.

The bicycle really came into its own as an important adjunct to military forces in the field in 1899, when the Boer War broke out. Dursley Pedersen produced a folding-model bicycle weighing only 15 pounds, which could be carried across the shoulders for convenience in traversing rough, roadless country[2]. By 1900, France, Germany, Italy, Belgium, Russia, Switzerland, and Japan had adopted collapsible bicycles for their armies[8]. In 1899, Captain Gerard of the French Army designed a folding bicycle weighing 37 pounds. By 1911, Captain Sauvain, also of the French Army had reduced its weight to 24 pounds. (By World War II, the weight had climbed once again and had reached 40 pounds.)

When World War I broke out in 1914, the motorcycle had been developed to a considerable degree of efficiency and was employed in large numbers in scouting and dispatch work. Folding bicycles, however, still proved their worth as a mount for infantry. One source states that 29,000 bicycles were used by the American Expeditionary Force, 100,000 by the British Army, and 150,000 by the French and Belgian Armies. Since the American Army had no cycle corps in World War I, the bicycles were probably used for communication, reconnaissance, recreation, and as a supplementary means of transportation[9]. Examples of the use of bicycle units in World War I are given in Appendix B which is a translation of an extract from Die Radfahrtruppe...[10]. German experience in World War I is illustrated in the following excerpt (pages 11 and 12)[11].

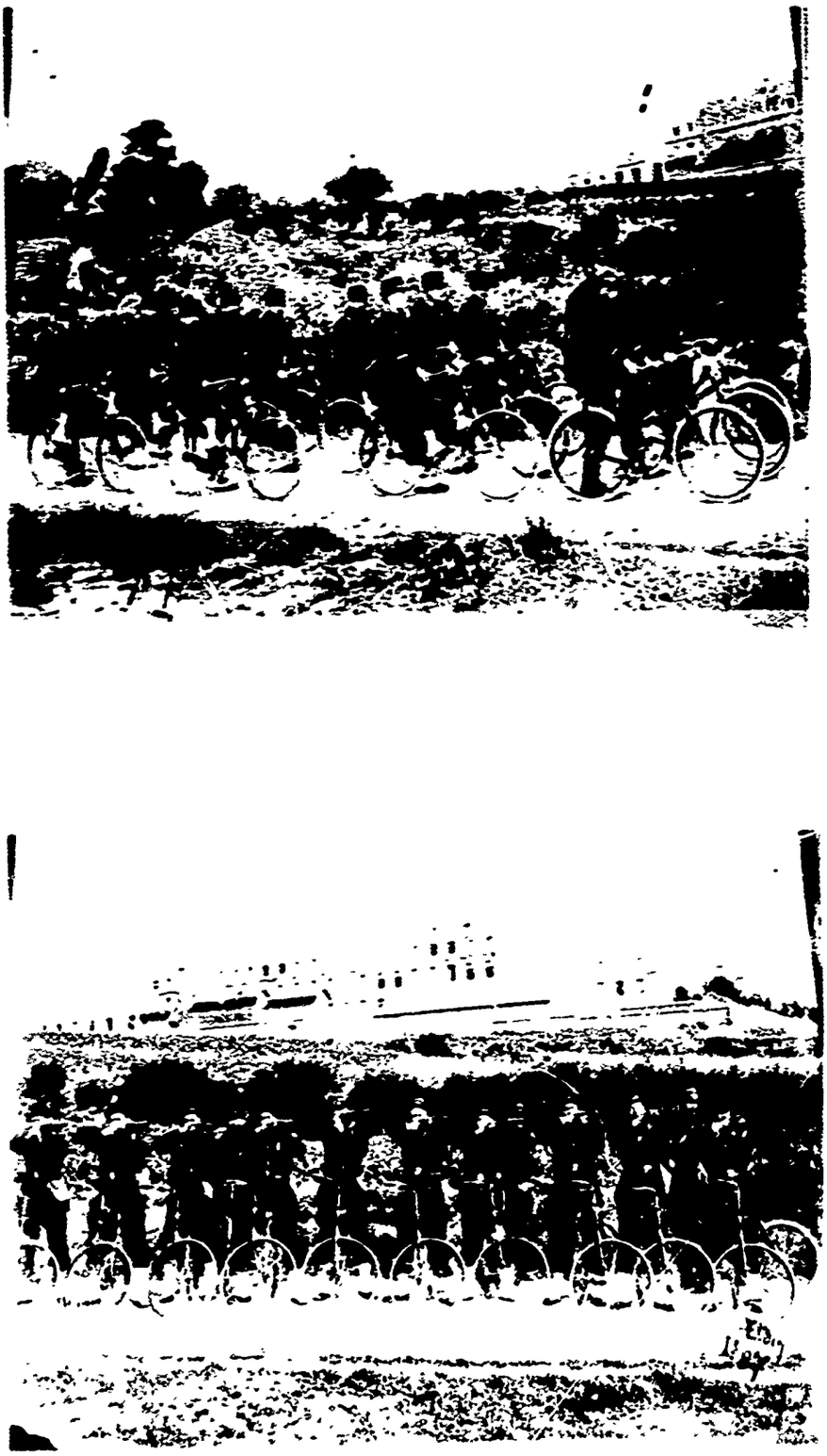

FIGURE 1. A FRENCH ARMY BICYCLE UNIT OF ABOUT 1896

"FORMATION.

"In July, 1916, 5 cyclist battalions were formed from cyclist companies withdrawn from Jäger battalions and divisional cyclist companies. The 1st, 2nd, and 3rd Battalions were formed on the Eastern front, while the 4th and 5th Battalions were formed in the Lille-Tournai area.

"Originally, each battalion was composed of 4 companies and a machine gun company. During 1917, a 6th Battalion was formed and a further 2 companies were added to each battalion so that the Cyclist Brigade then comprised 6 battalions of 6 companies each, besides the machine gun companies. In September, 1918, a 7th Battalion was formed, and it was said that the Cyclist Brigade was to be formed into a division. Owing to our attack early in October, however, the brigade was sent into line to cover the German retreat on the Cambrai-St. Quentin front and the reorganization did not take place.

"HISTORY 1916.

"After their formation, the 1st, 2nd, and 3rd Cyclist Battalions were engaged in the operations in the Carpathians during the Autumn of 1916, while the 4th and 5th Battalions took part in the battle of Somme. In October the 5 battalions were transported from the Carpathians and France to Transylvania, where they were brigaded together, and took part in the advance of the Ninth German Army under Gen. von Falkenhayn through the Carpathian into the Rumanian plains. The Cyclist Brigade assisted the cavalry in forming a screen for the advancing infantry.

"1917.

"In January, 1917, the Cyclist Brigade left Rumania, and was transferred to Flanders, where it guarded the frontier until called upon to act as a rearguard with elements of the 2nd and 7th Cav. Divs. in the German retirement to the Hindenburg line in March. In April, the brigade returned to Belgium, and elements went into line for short periods opposite Ypres and on the coast.

"The Cyclist Brigade, except the 3rd Cyclist Battalion, was transferred to Libau in Russia in October and later took part in the capture of the islands of Oesel and Moon in the Gulf of Riga.

"The 3rd Bav. Cyclist Battalion went to the Italian front in October and took part in the Austro-German offensive and advance to the Piave. It is said to have joined the Brigade on the Eastern front after the operations in this theatre had come to a standstill, but according to other reports it came back to the Western Theatre.

"1918.

"In February, 1918, the cyclists advanced on Reval and saw fighting with the Red Guards. Once the Narva had been reached, fighting practically came to a standstill and the brigade was only employed on police duties. In April, elements were transferred to Finland, and formed part of the German forces sent to assist the White Guards against the Red Guards. The 5th Cyclist Battalion, which formed part of the contingent sent to Finland, embarked at Reval on the 5th April and disembarked at Lovisa 2 days later, after an encounter with Red Guards. The battalion was severely engaged in the Lathi area at the end of April, when the Red Guards were defeated. After this, the 5th Cyclist Battalion was not engaged in any fighting worth mentioning and returned to Reval on the 8th July.

"Between the 5th and 10th September, the Cyclist Brigade entrained in the Pskow area and travelled via Dvinsk-Kovno-Eydtkuhnen-Allenstein-Thorn-Posen-Kottbus-Leipzig-Bebra-Frankfurt-a/M- Strassburg to Mutzig, where it detrained after a journey of 5-6 days.

"On the night of the 4th/ 5th October, the whole brigade entrained in the Saarburg area for the Cambrai-St. Quentin front. Part of the brigade travelled via Saarbrücken-Trier-Gerolstein-Gmünd-Herbesthal-Liége-Namur-Maubeuge-Landrecies to Le Cateau (47 hours' journey), while another part of the Brigade travelled via Metz-Diedenhofen-Sedan-Charleville-Hirson-La Capelle to Le Cateau (44 hours' journey).

"The Cyclist Brigade was alarmed on the 7th October at 21:00 and bicycled to Böhain and Büsigny, whence it went into line. All the battalions of the brigade were identified on the Le Cateau-St. Quentin front except the 3rd Bav. Cyclist Bn. According to prisoners, this battalion attempted to shoot the brigade commander Col. Tümmel on the 25th September but owing to a mistake, shot a divisional general through the chest. The battalion was thereupon disbanded and drafted to the infantry.

"STRENGTH.

"The ration strength of the cyclist companies when they came into line was 3 officers and 150 other ranks, which is the war establishment. The average fighting strength is reported to be about 120.

"MORALE.

"Cyclist companies have had few casualties so far, and most of the men are Active soldiers of good physique. Their morale is above the average."

The increased use of motorized equipment resulted in bicycles being forced to take a subordinate role within the military establishment. There are reportedly no formal bicycle units in the U. S. or foreign armies at present[12]. Their major combat role during World War II was for use with airborne troops. The Germans did have bicycle troops as a organized part of their Army, as evidenced by Figure 2 showing a combat action in Norway, and a formal review before Hitler in Poland as shown in Figure 3. The Germans also made much use of bicycles for troop movements in Normandy in 1944 to counteract interference with the railways and an apparent shortage of motor transport and gasoline. An article in the New York Times for July 6, 1944, says[13]: "Daily we see the highways from which fighting has been heard dotted with dead Germans lying near their bicycles. The French are gathering these cycles and we see them everywhere pedalling along the roads."

In summary, the development of bicycle troops in the armies of Europe (England, Sweden, Norway, Austria-Hungary, Germany, France, Belgium, Switzerland, Italy, Spain, Bulgaria, The Netherlands, Russia, Portugal, Serbia, Denmark, and Rumania), starting in some countries about 1870, and up to the middle of the 90's, was limited to providing staffs and troops with messengers on bicycles, and to experimentally employing rather small bicycle battalions during maneuvers and mostly in combination with the cavalry. The area of duties of the cyclists was relatively small, and the use of cyclists as combat troops was not seriously considered, although France, Germany, and Austria-Hungary had provided definite combat missions for cyclists.

The second development stage of the use of bicycle in armies extended from the middle of the 90's to the time of World War I. France, Italy, Belgium, and Germany developed combat bicycle battalions attached to the cavalry as an auxiliary arm. Eventually the bicycle unit became an organic part of the army, with a clearly defined circle of action.

FIGURE 2. GERMAN BICYCLE TROOPS IN COMBAT AGAINST NORWEGIAN MOUNTAIN TROOPS

Photographed April 21, 1940, in Bagen, Norway.

FIGURE 3. GERMAN BICYCLE TROOPS PARADING BEFORE THE FÜHRER

Photographed October 5, 1939, in Warsaw, Poland.

Then the bicycle was eclipsed by the growing changeover to motorized units. While still used extensively in World War II as paratrooper equipment, as a substitute for other transportation, for post, camp, and station duty, and for recreation, the bicycle was in a decline which culminated in its eventual abandonment by modern armed forces[10].

Now interest in the employment of bicycle troops is emerging once again, this time in Southeast Asia where the road network is inadequate for motorized transportation, but where paths and dikes may provide an acceptable avenue for bicycle movement[14].

DISCUSSION

Uses of Bicycle Troops

Principal Uses

The principal uses to which military cycling has been put are in courier service, in reconnaissance, and as a combatant force. Bicycles were also used by signal personnel and by the hospital service to a minor extent during the early days of military cycling, and were suggested for use by the military police in World War II.

As a combatant force, military cyclists were used to seize strategic points, conduct raids and demolition tasks, serve on patrol, convoy, and escort duty, perform defense and delaying-action missions, act in riot control, and, in World War II, bicycles were carried by some paratroopers during airborne operations.

It is interesting to note that in 1898 the U. S. Army utilized a cycle ambulance, which consisted of two tandem cycles connected by a light framework of tubing, upon which was placed a detachable stretcher of light steel tubing, with handles like handlebar grips[15]. In 1941, Albert P. Rippenbein, President of Bicycle Built-in-Two, Inc., pointed out in a letter to the U. S. Army Quartermaster General that it was possible, by means of two removable bars, to connect two folding bicycles side by side, one bar at the rear section, and the other bar connecting the front wheels so that they would steer together. This four-wheeled light vehicle (about 90 pounds) could be pedaled by one or two men, be towed as a trailer, be pushed by hand, or could be used as a chassis to support a hospital stretcher[16]. Civil Defense authorities also considered this usage in view of the possibility of a shortage of gasoline and damage to roads[17].

Use in Guerrilla Warfare

In the late nineteenth century the ability of the bicycle to move troops to points of incipient trouble with great rapidity was responsible for its proposed use in street-riot control. In 1898, Lieutenant Moss proposed a bicycle corps of 100 men to perform courier work, messenger service, and patrol and riot duty in Havana, Cuba. The bicycle was considered as a means of transportation only, the soldiers proceeding with their work as a company of infantry. The cycles were stacked to form a barricade against assault by mobs(18,19).

By 1925, guerrilla warfare was considered to form part of the attack duties of a bicycle troop. This included attacks on the flanks and on the rear of the enemy, and attacks of destruction against railroads, bridges, enemy trains, air fields, etc.(10).

On May 8, 1942, the German authorities in Paris published an order forbidding the use of bicycles after dark in almost half of occupied France(20). The ban on bicycles was designed to check a wave of attacks. The order noted that persons who attacked Nazi soldiers or committed acts of sabotage usually had bicycles on hand for quick escape. Belgium's secret army of 500 sabotage teams disguised as innocent bicyclists did extensive damage during World War II and reportedly kept the Germans from destroying the all-important port of Antwerp(21).

The Germans most commonly used companies and platoons in fighting guerrillas and armed them with heavy machine guns and grenade rifles. For transportation, they used bicycles, motorcycles, and trucks. Patrols rode back and forth continuously, covering a strip several kilometers wide on either side of the road in the daytime. When troops were available, this strip was as wide as 20 kilometers. All populated places within it were investigated. At night,

however, only the road itself was patrolled. The Germans considered the combing of large forested areas impossible[22].

Department of the Army Field Manual FM 31-16 points out that guerrilla sympathizers may attempt to smuggle restricted items through roadblocks in the handlebars of bicycles[23]. Both this manual and FM 31-22 state that counter-guerrilla forces can attain superior mobility by commandeering non-TOE aids to mobility such as trucks, bicycles, rafts, sampans, riverboats, motorcycles, and horses or mules[23,24].

The Viet Cong use a bicycle mine (see Figure 4) in South Vietnam[25]:

> "This mine is fired electrically, by means of a wristwatch delay firing device. The main charge and detonator are introduced into a tube of the bicycle frame under the saddle, and an electric wire is extended outside the frame. Detonation is initiated by a watch and two 4.5-volt batteries which are placed inside the bicycle headlight, with its wire protruding outside along the frame.
>
> "During movement, the ignition device is not linked to the explosive, but upon arriving at the prescribed sabotage site, these two components are then connected, and the watch of the ignition device is preset.
>
> "The VC have also adapted another firing device, using bicycle generator power. Thus, during movement, the generator is kept apart from the wheel. When arriving at the sabotage site, the head of the generator is placed against the bicycle wheel. When someone operates the bicycle, its generator sends a spark up the ignition line and initiates the explosive."

Load-Carrying Ability of the Cyclist and the Bicycle

In 1897, Lieutenant James Moss wrote[7]:

> "Everything should be carried on the machine itself and nothing on the rider. If placed on the body, in addition to carrying the actual weight of the object, the rider also experiences a certain amount of physical exhaustion from the weight bearing on his body. Besides this, one falling from a wheel with any weight secured to the body is much more likely to sustain an injury than one whose limbs and body are entirely free and unhampered."

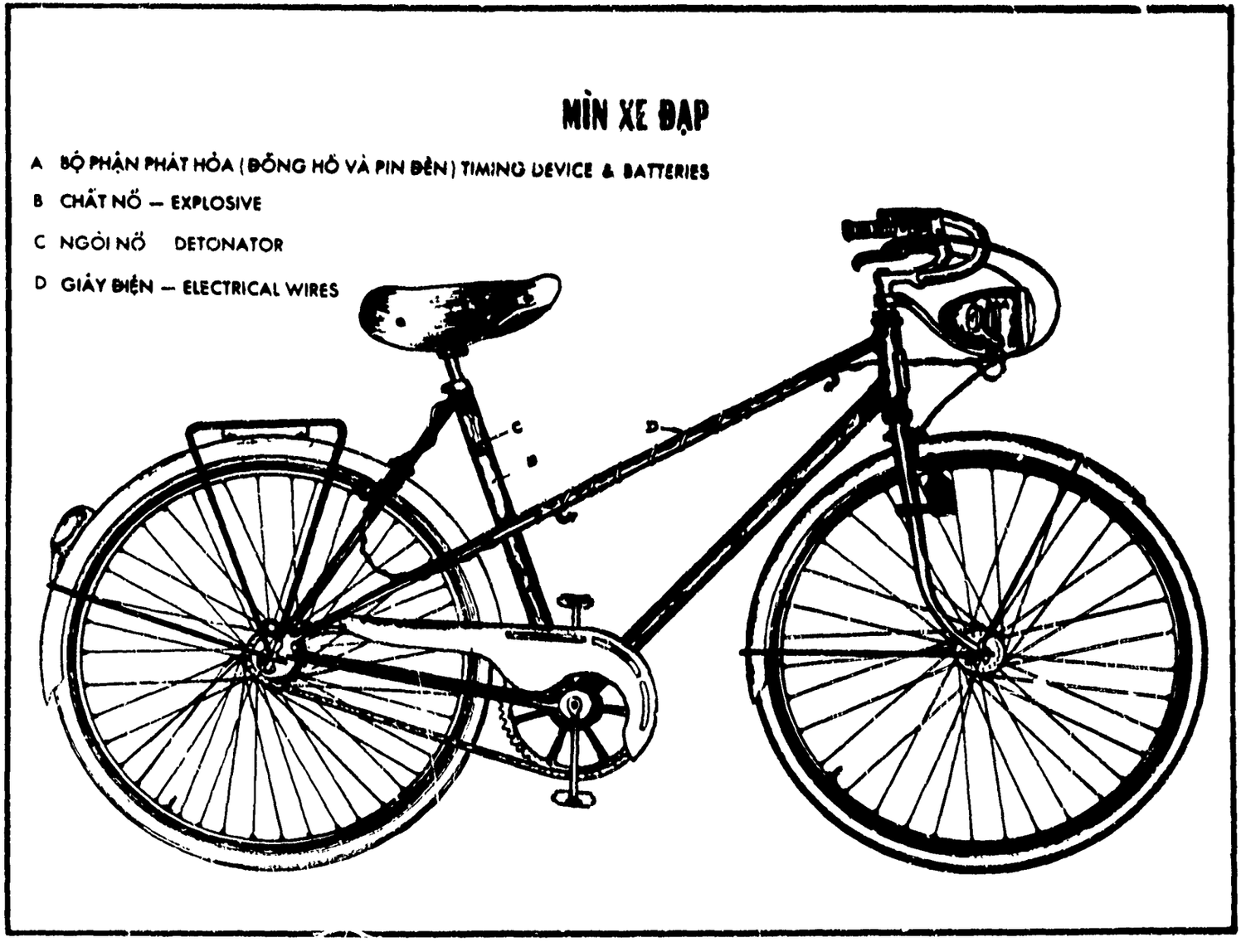

FIGURE 4. BICYCLE MINE USED BY VIET CONG

Reprinted from Reference (25).

His commanding officer at that time, Colonel A. S. Burt, took exception to this recommendation on the basis that the need for instant action in actual service was of greater importance than the physical comfort of the man. He believed that the rider should carry his weapon and ammunition on his person[7]. This view was supported by Major Theiss in 1925 when he wrote[10]:

> "Each part of the equipment absolutely necessary in combat must be carried by the men when cycling (corbat march) (rifle ammunition, etc.). The rest of the equipment is arranged on the bicycle. The body of the man must be free from any unnecessary load, since it would tax the activity of his muscles and lungs very much."
>
> "If no immediate combat activity is to take place (administrative march), most of the equipment must be arranged on the bicycle; otherwise, as previously explained, only the equipment which is not immediately needed in combat.
>
> "The equipment on the bicycle must be distributed so that there should not be too much difference between the front and the back wheels. It is best to pack the frame between the two wheels.
>
> "In packing the bicycle, not only weight distribution, but the bicycle itself, which, because of its construction and its operation, should not be loaded in its entirety, must be taken under consideration.
>
> "The front wheels and the total handlebar system must not be hindered in their mobility. Hence, only small loads (from the viewpoint of shape and weight) can be packed there. The best way is to load in a pocket-shaped container which can contain the tent, the windproof jacket, and other small objects.
>
> "It is easy to mount a carrier on the rear wheel; hence a large part of the equipment is often placed on this carrier. It is best to use the frame, that is the center part of the bicycle, for loading purposes. This center part is where the body of the man and the bicycle is active and this activity should not be restricted in any way. In the k.u.k.* bicycle unit, the machine gun with the total material and the ammunition was transported on the bicycle. The machine gun, as is well known, can be taken in two pieces (gun barrel and the frame). Each one of these parts was tied to the connecting tube of the frame.

---

*k.u.k. -- kaiserlich und königlich meaning imperial and royal.

"The pedals were placed farther from one another in order not to restrict the operation of the bicycle, thus, the main load can be fastened to the frame, which is a great advantage.

"Finally, some objects can be affixed to different parts of the bicycle. Thus, the short spade can be attached to the rear wheel, the coat can be rolled below the saddle, etc. Loading the saddle part of the bicycle does not hinder riding so much as loading the wheels."

The total weight of the packed bicycle can vary considerably. During Lieutenant Moss's experimental work in 1896, the average weight of the packed wheel varied from 75 to 80 pounds(26). In 1940, during a Swiss Army training exercise, each bicycle with complete equipment and ammunition weighed 132 pounds, plus the weight of the rider, his rifle and helmet(27).

Attempts to ease the load of the bicycle trooper resulted in the design of the folding bicycle. The first one of these, in 1800, weighed 18 pounds and was constructed of poplar wood. The same year, Captain Gerard of the French Army designed a bicycle weighing 37 pounds. In 1911, Captain Sauvain, also of the French Army, had reduced this weight to 24 pounds. But by World War II, the weight had climbed once again and had reached 40 pounds.

In 1954, General Vo Nguyen Giap used converted Peugeot bicycles capable of carrying 500 pounds each to supply his troops at Dienbienphu. This load is 10 to 12 times that which can be carried by a coolie, and more than an elephant can carry(28).

Armament of the Cyclist and the Bicycle

In 1898, a U. S. Army cyclist was, as a general rule, armed with an infantry rifle or cavalry carbine, carried in clips on the left-hand side of the cycle, muzzle to the front and barrel up, plus a double-action revolver in

a holster suspended from the hanger of the web belt, behind the right hip. The rifle clip was designed to readily admit the instant removal of the piece and yet hold it securely against accidental detachment. One design consisted of jaws of spring steel, lined with leather; the forward clip was clamped to the upper bar of the frame near the head; the rear slip was clamped to the rear bar and bolted with the binding bolt of the saddle post. The rear clip grasped the piece around the small of the stock, the magazine and bolt handle projecting over the upper bar of the frame; the forward clip grasped the piece about the barrel just in front of the upper band(15).

France armed its cyclists at first with the carbine, later with the infantry rifle, and then again with the carbine. Italy, The Netherlands, Bavaria, and Austria-Hungary armed their cyclists with the carbine. In Switzerland and Sweden the cyclists, at first, had only revolvers; the same was done in Germany, in 1894, because then only cyclist messengers were used. The first German (Prussian) bicycle companies had the infantry rifle. This was the short or cavalry rifle. The rifle was slung across the back from the right shoulder to the left hip. Fixing the rifle on the bicycle was not deemed suitable by the Austrians on the basis that the cyclist must be ready for instant action in the case of sudden combat.

In the Austrian Army, each cyclist carried the bayonet belonging to the rifle. Pistols were carried only by the units which did not have rifles, that is, the machine gun squad and the medical personnel. No soldier carried both the rifle and pistol at the same time. This, of course, was at variance with the U. S. Army practice in 1898(10).

In 1898, the U. S. Army had the Pope Manufacturing Company develop a bicycle on which was mounted a Colt automatic machine gun. This is illustrated

in Figure 5[3]. In 1901, Vickers, Sons and Maxim devised a machine gun tricycle, (shown in Figure 6). Two Maxim guns were mounted upon the tricycle which weighed 120 pounds. The two guns weighed 54 pounds, the tripods 106 pounds, spare parts 8 pounds, and 1,000 cartridges 86 pounds. This constituted a total weight of 374 pounds, to which was added the weight of the two men who rode the vehicle. While the tricycle was capable of running at a high rate of speed over level ground, it was necessary to dismount and push the machine up grades. The gun could be put into and out of battery within less than 2 minutes[29].

Insofar as ammunition was concerned, the Austrian Army in 1925 took the position that, although the bicycle unit is primarily engaged in a war of movement and thus participates relatively rarely in large-scale fighting requiring a huge ammunition expenditure, it must be equipped with a rather large amount of ammunition since its exposed position makes ammunition supply difficult.

For this reason, the soldier was equipped with 140 cartridges (80 in the ammunition pocket, 60 in the knapsack) with 60 more in the company truck. Ten thousand rounds were provided for each machine gun, with 3,250 in the ammunition carriers and 6,750 on the company truck[10].

Advances in weapons technology and fire power probably make the above information of little more than academic interest.

Design of Military Bicycles

Most of the material found relative to the design of military bicycles was concerned with folding bicycles since this type was favored because of the urgent need for portability. The first of these was produced in 1899 by Dursley Pedersen an English manufacturer. Figure 7 is an illustration of this cycle[8]. One of the most conspicuous features of the machine was the saddle, which did not consist of a shaped leather seat securely fixed upon a saddle pillar,

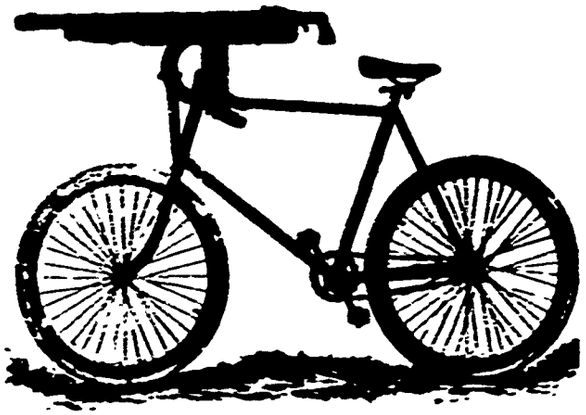

FIGURE 5. COLT AUTOMATIC MACHINE GUN MOUNTED ON AN ARMY BICYCLE

The weight of the gun alone was about 40 pounds. Reprinted from Reference (3).

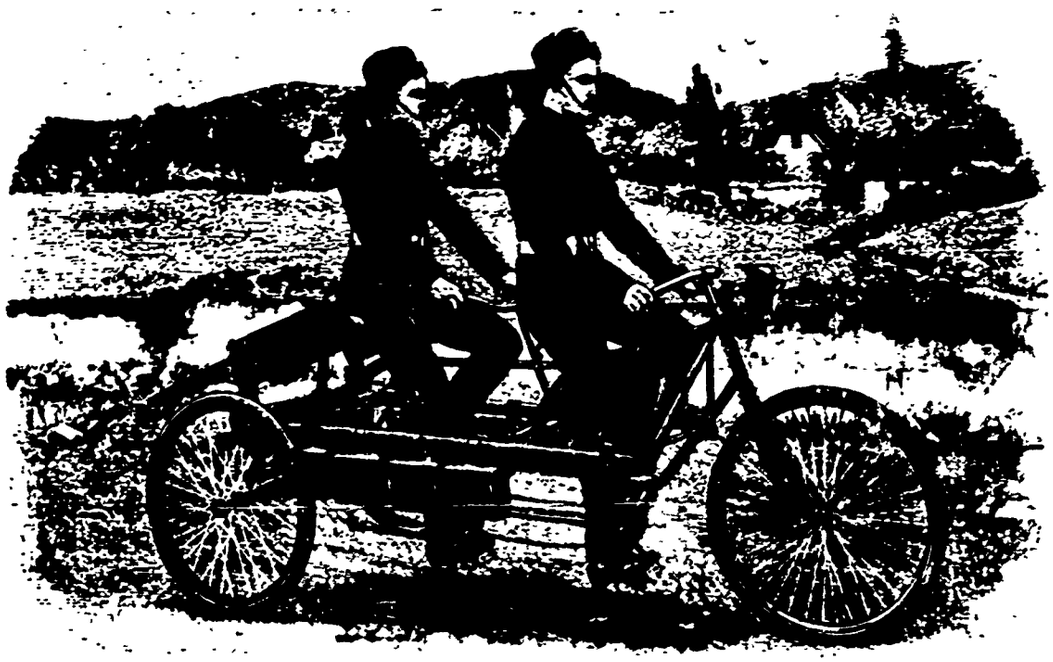

FIGURE 6. THE MAXIM MACHINE GUN MOUNTED ON A TRICYCLE

Reprinted from Reference (29).

but had the seat suspended hammock fashion between seven spiral springs attached to the adjustable saddle pillar and the top front fork, to which it was secured by means of a strap, which could be adjusted so as to tighten or to slacken the saddle as desired. This saddle was reputed to adjust itself to every movement of the body, and allow perfect freedom to those muscles which cycling brought into play. By this means, perineal pressure was entirely averted, while perfect ventilation, ease, comfort, and softness of seat were assured. The cycle, which weighed only 15 pounds, was folded by slipping out the front wheel and tubes at the head and at the point where the two tubes radiating from the crank bracket joined the front tubes. The front wheel then folded back upon the back wheel and was kept in position with a strap. It took but 20 seconds to perform the operation and to sling it upon one's back, and it could be as readily put together again. The rifle was fixed vertically in a slot on the frame of the front wheel wheel[3,8].

In 1899, Captain Gerard, of the French Army, designed the folding bicycle illustrated in Figure 8[30]. The frame was strengthened by a second tube running parallel with the first, thus giving the machine great rigidity. These two tubes, owing to their considerable diameter, reduced the vibration that played so great a part in the expenditure of energy by the bicyclist. At the center of the right-hand side of the parallelogram forming the frame, there was a ball joint. Each of the parallel tubes was divided in the center, and the ends, which were beveled, were held in place, when the machine was open, by coupling sockets. When the ends of the tube were exposed by loosening the sockets and shoving them back upon the rings, the front part of the bicycle could be folded around onto the rear half, the wheels being superimposed. If desired, the bicycle could be divided into two parts, while the handlebar could be removed

FIGURE 7. THE DURSLEY PEDERSEN MILITARY BICYCLE SHOWING PRINCIPLE OF CONSTRUCTION OF FRONT FORKS

Reprinted from Reference (8).

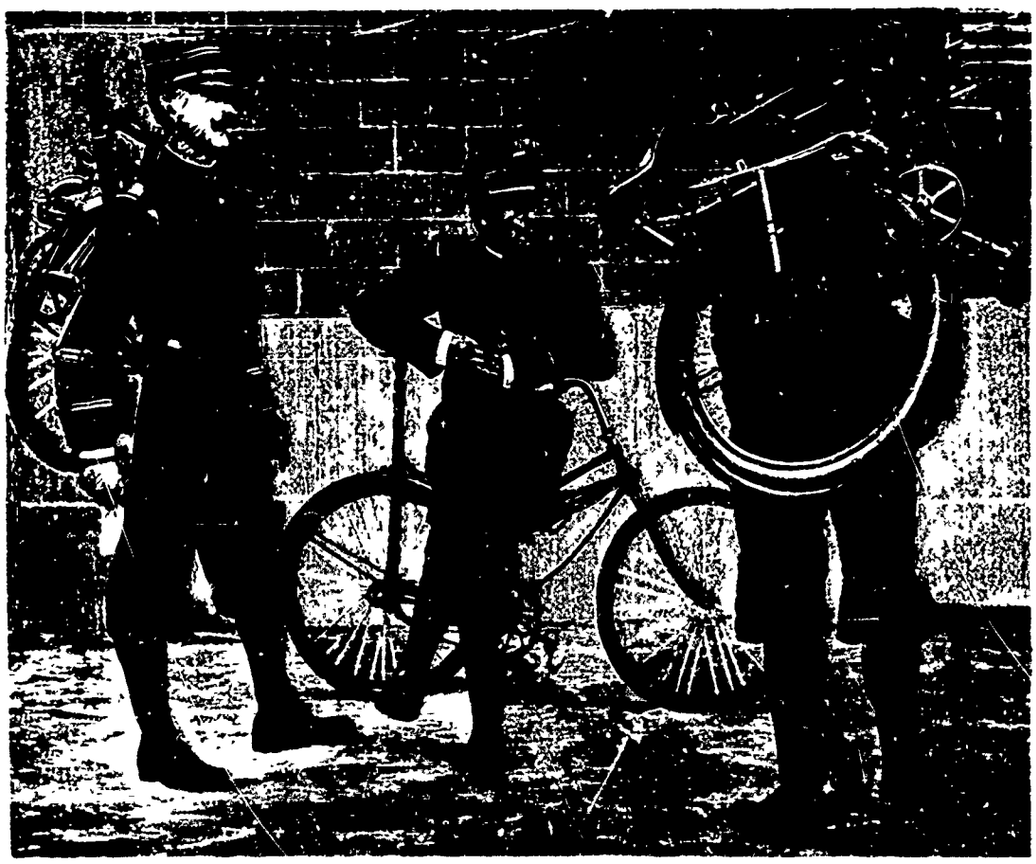

FIGURE 8. FRENCH MILITARY FOLDING BICYCLE

Reprinted from Reference (30).

from the steering head. The wheel was of such a height that the bicyclist could maintain such a position in the saddle that he could at any moment touch the ground with his feet[30].

Many objections were voiced against the 37-pound weight of these bicycles. So, in 1911, another French military cyclist, Captain Sauvain, demonstrated a 24-pound bicycle. It was reported that the bicycle could be opened or folded, slung on the back or unslung, in one-half the time required for the Gerard type. The wheels were less than 24 inches in diameter, and reportedly did not interfere with the movements of the cyclist, even for firing prone[31,32].

In 1915, an article in The Bicycling World and Motorcycle Review stated that the British factory manufacturing the Sturmey-Archer three-speed hubs was devoting its entire capacity to making three-speed hubs for bicycles to be used by the allied armies[33]. This reportedly made it possible for the rider to cover almost any kind of road with the least possible effort. According to the article, it was a common sight to see a patrol pedaling along in low gear on a heavy, muddy road, making good time in comparison with what a horse could do.

In 1942, the U. S. Army Chief of Ordnance initiated a project to develop a folding bicycle with the following characteristics[34]: (1) maximum weight 40 pounds, (2) drive reduction approximately 2 to 1, (3) folding handlebars and pedals, (4) wheel assemblies to consist of standard 26 x 2.125-inch tires with medium-weight spokes and light hubs, (5) chain 3/16 x 1-inch pitch, (6) saddle reduced in weight as much as possible, and (7) handlebars and saddle to be adjustable in height and tilt. Accessories were to be added in the following priority provided the weight of the bicycle with accessories did not exceed 40 pounds: (1) package carrier mounted over the rear wheel, (2) front and rear fenders, (3) stand, (4) chain guard, (5) tool kit, (6) tire pump, (7) headlight,

(8) bell. Presumably one of these bicycles was used by the 88th Infantry Airborne Battalion since it reportedly adopted a collapsible bicycle which could be assembled or folded in 15 seconds without tools(35).

British paratroopers also used a folding bicycle weighing slightly less than 30 pounds. In appearance it resembled a woman's cycle, for it did not have the ordinary crossbar. In practice, all that the paratrooper had to do when he landed and wished to mount his bike was to straighten out the machine and operate two butterfly nuts -- a work of only a few seconds(36).

In 1944, the Proof Department at the Army Air Forces Proving Ground Command, Eglin Field, Florida, tested a 41-1/2-pound folding bicycle, Model HF-777 (Huffman Manufacturing Company), and came to the following conclusions(37): "(a) the lightweight folding bicycle as furnished is functionally satisfactory; (b) the bicycle would be less dangerous to the rider, and more generally useful if provided with a chain guard and fenders; (c) a more comfortable saddle is desirable."

It was possible to fold this bicycle and ready it for attachment to the haversack in 1 minute and 30 seconds, and it was possible to ready the bicycle for riding in 55 to 60 seconds.

In 1954, General Giap supplied the Viet army at Dienbienphu, in part, by bicycle transport. Peugeot bicycles were converted to carry 500-pound loads by adding wooden struts to strengthen the frame and the front fork, and by using bamboo poles to extend one handlebar and the brake levers(28).

In 1962, Cornell Aeronautical Laboratory Inc., examined the concept of a lightweight "jungle cycle", with emphasis on a suspension which would alleviate the off-road ride problem. This was not a folding bicycle(38).

An article on Polish airborne cavalry takes a different viewpoint than Cornell, although motorized equipment, rather than bicycles is involved. It states

that scooters are needed for command, reconnaissance, and liaison purposes, even though air cavalry units will engage in ground combat at a relatively short distance from their helicopters; and goes on to say that they need have no frame, front wheel brakes, or springs. Rationale for this statement is the reduction in weight and size realized. The items omitted are reputedly not required because the scooters would not be used for movement over public roads(39).

Organization, Strength, and Tactics of Bicycle Units

Organization and Strength

The type of organization and strength of bicycle units have varied widely over the years. Both the time period involved and the character of the army in which the bicycle unit was employed have had their effect. These factors are of equal importance today, and a contemporarily established bicycle troop is not likely to conform to one required in preceding wars. It is possible, however, that knowledge of some of these previous organizations may materially assist in the current decision-making process.

In 1897, Lieutenant Moss stated(7): "In my opinion, it is impossible for one commander to handle more than 40 or 50 bicycles. It is impossible to keep any kind of a formation while traveling over ordinary wagon roads -- every man naturally picks the best way, and a detachment is sometimes unavoidably strung out over long distances." In 1898, Captain Giddings defined the cycle company as a unit consisting of two platoons with each platoon divided into sections of eight men each. He believed that one cycle company to each infantry and cavalry brigade in a field army, or the organized militia, could be used to great advantage(15). Giddings went on to say that these companies, under the direction of the chief of cyclists, should be directly under the control of the commanding

general of the division or corps, or could be organized into battalions, or distributed to serve separately, as the needs of the service might dictate. On the other hand he felt that couriers should be members of the organizations which they served, their efficiency being greatly increased by familiarity with the names and appearance of officers to whom they were likely to be sent, and by the general knowledge which comes of service with their own troops.

In July, 1916, the German Army formed five cyclist battalions. Originally, each battalion was composed of four companies and a machine gun company. During 1917, a sixth battalion was formed and two additional companies were added to each battalion, so that the cyclist brigade then comprised six battalions of six companies each, besides the machine gun companies. In September, 1918, a seventh battalion was formed, and it was said that the cyclist brigade was to be formed into a division. Owing to a U. S. Army attack early in October, however, the brigade was sent into line to cover the German retreat on the Cambrai-St. Quentin front and the reorganization did not take place[11].

The Swiss Army of 1912 contained eight bicycle companies, one assigned to the headquarters of each division, one to army headquarters, and one to the cavalry brigade[40]. The strength of a cyclist company in 1916 was 179[41].

In 1915, a Dutch Army Regimental Headquarters had four bicycles for orderlies and 12 bicycles for reconnaissance patrol. The Dutch bicycle company contained 150 men[42,43].

In Italy, in 1911, each Bersaglieri Regiment had one company of cyclists, which was employed in supporting a cavalry brigade[44]. In 1916, 12 cyclists were assigned to a squadron, and a total of 60 were assigned to a regiment, consolidated into one command under an officer[45].

The strength of the British bicycle corps in World War I is not quite clear. One source says that the British cyclists corps numbered 20,430 men in March of 1918[46]. Another source says that 100,000 wheels were in use in the British Army[9]. Perhaps the latter figure includes bicycles used for messenger service, camp transportation, recreation, and other non-troop uses. In 1942, each infantry battalion had 33 cycles attached to it. These were used for maintaining communications when radio or telephone arrangements broke down, and for reconnaissance work, including the making of maps of areas ahead of a unit.

In 1911, the French Army had five bicycle companies. Each one of the companies had four officers and 120 men, nine of whom were noncommissioned officers. War strength was brought up to 175 rifles[32]. During World War I, the French and Belgian Armies are reported to have used 150,000 bicycles[9].

In the U. S., a bicycle corps was first organized in July, 1896, with the creation of the 25th Infantry Bicycle Corps. This was not a very sizable organization, consisting of one lieutenant, one sergeant, one corporal, one musician, and five privates[9]. In 1910, there were only 200 bicycles in use in the U. S. military service[47]. The U. S. Army had no cycle corps in World War I, although 29,000 bicycles were used in the American Expeditionary Force[9]. However, by 1925 the table of equipment of the war-strength infantry division specified the following apportioning of bicycles: special troops, 18; two infantry brigades, 112; one artillery brigade, 20; one combat engineer regiment, 25[9]. In 1941, the 500-man-strong 88th infantry airborne battalion was formed. The battalion had 140 motorcycles, a small number of jeeps, and some bicycles. According to the New York Times, the number of bicycles used was 280[48]; but an article in the publication American Bicyclists and Motorcyclists in early 1942 set the number of cyclists at 40[35]. At about this same period, the military police recommended that bicycles be adopted for military police use on the following basis:

ten for aviation, post, camp, and station military police company; four per military police battalion headquarters, zone of the interior; six per military police company, zone of the interior; and four per prisoner of war inclosure. It is interesting to note that the military police also recommended that a suitable lock be issued with each bicycle[49].

In 1943 the War Production Board allocated 60,000 bicycles for the Armed Forces. These were principally used for transportation. The U. S. Army Mobility Command reports that at the present time there are no formal bicycle units in the U. S. Army[12].

The Japanese Army used bicycles extensively during World War II, but little detail is available[50]. Writing in the Infantry Journal in 1942, Lieutenant Colonel Paul W. Thompson commented, "In the Japanese advance a Malayan bicycle seen (and there were many to be seen) was a bicycle commandeered. After a few days of campaigning, the sight of Jap patrols and units wheeling down the jungle lanes became commonplace". The same article has an illustration of a bicycle tied on the rear of a tank which was ambushed just south of the Muar River by the Australians. The article also makes the point that the Japanese moved by foot, by boat, and by bicycle, while the British Empire forces moved by truck. The advantage was definitely with the Japanese[51]. Many thousands of the Columbia COMPAX folding bicycle were used by Dutch parachute troops in Java[52,53].

In 1963, the Army of the National Front of Liberation of South Vietnam (Viet Cong) used bicycles to cover large distances through the jungle.

The most detailed information on the organization of bicycle troops is contained in War Department Technical Manual TM-E 30-451 entitled Handbook on German Military Forces, March 15, 1945[54]. One of the three infantry regiments in the Volks Grenadier Division was an infantry regiment (bicycle). That regiment

included one infantry battalion (bicycle), and one normal infantry battalion, a regimental infantry howitzer company, and a regimental bazooka company. The bicycle infantry regiment was employed in the same way as the other two battalions of the Volks Grenadier Division or used as a mobile reserve.

Appendix C contains numerous organizational charts and records of bicycle strength for various components of the German Army during World War II.

Tactics

The best information obtained on the tactical action of cyclists was found in Cyclist Training issued by the British General Staff in 1917, and in Die Radfahrtruppe...[10], published in 1925 by Major Rudolf Theiss of the Austrian Army (excerpts from both of these publications are presented in Appendix D). Although some of this information may appear to be anachronistic today, it does represent the tactical application of the bicycle at the peak of its usage.

Specifications, Equipment, and Training for the Military Cyclist

Military cyclists are soldiers mounted on bicycles, either as a temporary or permanent assignment. Ideally, they should possess tactical understanding, rapid capacity for adaptation and decision, good terrain orientation, independence, capability for bold action in case of isolation, a sense of responsibility, a capacity for surveying the total position from large distances, and attachment to a task connected with strain and privation[10].

The duty to be performed by a military cyclist may be the rapid conveyance of orders or dispatches, scouting or patrolling, signalling, reconnoitering the enemy's position, sketching, or acting in considerable strength in support of

his advance cavalry, or independently of it. These varied duties demand intelligence, some education, accurate judgment, caution, and skill[56].

In 1892, a cyclist was expected to possess a sound constitution and was not to be more than 5 feet 8 inches tall nor weigh more than 140 pounds[56]. By 1898, the allowable weight was increased to 150 pounds[15], and by 1925, the Austrian Army had further increased the allowable weight to between 155 and 165 pounds. At the same time, it was noted that the allowable height was only 60 inches. This latter figure appears somewhat questionable[10].

In principle, the cyclist is clothed, equipped, and armed in such a way that he can lay down his bicycle at any time and enter combat immediately as an infantryman, even for several days. But this poses some problems. On the one hand, the cyclist needs the same field garb as the infantryman, suitable for foot combat as well as for camp; on the other hand, he needs protection against weather; when he is riding on the bicycle, the field garb may not be suitable. A light, windproof jacket is preferred since cyclists must be equipped as lightly as possible[10]. In cold weather, arctic overshoes, the winter cap, and fur collar are a necessity, the inaction of the hands and feet while riding renders them especially sensitive to cold[15].

In 1925, Major Theiss pointed out that the cyclist needs a special gas-protecting device, since the usual gas mask encumbers breathing and fits too tightly around the face. Any restriction of volume of air breathed is an obstacle to efficient cycling. When marching freely, the foot soldier breathes seven times per minute, the volume of air breathed being 13 liters; the cyclist, however, at 15 kilometers per hour breathes 12 times per minute, using a volume of 25 liters. Hence, Major Theiss recommended that a gas-protection device be arranged in such a way that it does not hinder the cyclist too much in seeing or breathing[10].

On Lieutenant Moss's trip from Fort Missoula, Montana, to St. Louis, Missouri, in 1897, he weighed and measured his troopers just before leaving Fort Missoula and again 3 days after reaching St. Louis[7]. Sixteen gained in chest expansion; the greatest individual gain was 3 inches and the smallest 1/8 inch; the average gain was 1-1/16 inches; and three neither gained or lost. Four increased in right-bicep measurements; maximum increase was 3/4 inch; minimum was 1/4 inch. Nine lost: maximum loss was 1-1/2 inches; minimum was 1/4 inch; five neither increased or decreased. Ten gained in right-leg measurements: maximum gain was 1 inch; minimum was 1/8 inch. Four lost: maximum loss was 1 inch; minimum was 1/4 inch; five neither lost nor gained. Fourteen gained in weight: maximum gain was 9 pounds; minimum was 2 pounds. Five lost: maximum loss was 6 pounds; minimum was 1 pound.

Writing in 1898, Captain Giddings said[15]:

> "The stomach is the organ most affected by severe cycle marches, and especial care should be taken that it be not deranged.
>
> "Only plain food should be eaten, and that should be thoroughly masticated. Soup, eggs, fish, beef, mutton, poultry, ordinary vegetables, bread, and coffee are recommended; veal, pork, turnips, cabbage, etc.; are to be avoided.
>
> "Cyclists should drink as little as possible between meals, and then only coffee, which should be carried in the canteens. They should always ride with the mouth shut, breathing through the nostrils only. Breathing through the nostrils prevents thirst in a measure, and economizes the strength of the soldier. Alcoholic stimulants should be avoided."

In 1925, Major Theiss also advocated abstinence from alcohol. He believed that no man should undertake a large trip with an empty stomach, and advocated the use of small food supplements (chewing gum, fruit, dehydrated fruit, etc.)[10].

The fact that bicycles are used by a large part of the population in their daily activities suggests the ease of organizing improvised units. Major Theiss argues very strongly against this viewpoint. He states that the entire bicycle unit is essentially controlled by the technique of the march, and to treat this all-important question as a secondary matter is to misunderstand completely the very nature of the bicycle unit. Cycling in formation on poor roads, in the dark over large distances, with field equipment requires thorough schooling if the company is to be kept in intact formation.

Major Theiss continues[10]:

> "1. The soldier as a cyclist on a heavily packed and heavy bicycle must be able to cover on poor roads and at a certain speed, an average daily distance of 60 to 80 kilometers and still remain ready for action. This makes the difference between the sufficient cyclist and the military cyclist. Even the best race cyclist is not always suitable to make an army cyclist without preparation.
>
> "During cycling other muscles are used than during walking. These are, especially, the glutex and lower leg extensors, which must be strengthened and thoroughly formed, and this is obtained only by systematic training.
>
> "Heart and lungs, among other organs, are taxed and must be healthy. The least irregularity of the heart degenerates rapidly into a cardiac disease. Tired or weak lungs cannot compensate for the high requirements made by cycling on the respiratory organs. Let us not forget the increase in temperature of the body during cycling and the subsequent rapid cooling when the ride is interrupted.
>
> "Cycling requires more strength than walking, although in sufficient daily use of the bicycle the cyclist needs less strength than the pedestrian. To cover a definite distance, the average daily performance of the infantryman is 15 to 20 kilometers; that of the cyclist is 60 to 80 kilometers. Both need four to five hours to cover the distance in question; but four hours of cycling strains more and requires much more strength than five hours of walking. According to L. P. Zuntz, a man uses 40.3 calories per kilometer at the rate of four kilometers per hour; while walking he uses 20.84 calories per kilometer at the rate of 15 kilometers per hour in cycling." [Road conditions would, of course, be quite important in any such computation.]

Theiss proposed a three-phase training program: (1) school cycling; (2) safety and terrain cycling; and (3) endurance cycling.

For endurance cycling, he proposed that the first daily performance be limited to 12 to 15 kilometers at a speed of 4 kilometers per hour. This was gradually increased until the cyclist could cover from 20 to 30 kilometers daily at a speed of from 12 to 15 kilometers per hour. Then an extensive march and combat exercise was undertaken, systematically increasing the daily performance to 80 kilometers. From time to time and for rather short distances a speed of 20 kilometers per hour was attained.

After each cycling hour, a short rest or a short foot march (both of about 10 minutes) was ordered. If cycling is uninterrupted for several hours, the muscles used during cycling become very tired while the other muscles become relaxed excessively, hence a short rest or a change in muscle activity is advisable. When the cycling distance exceeded 60 kilometers, a midday rest of from 2 to 3 hours was generally employed. The tasks to be performed and road and weather conditons, generally determined the number and length of rests.

Mobility of Bicycle Troops

Speed and Distance

Speeds attained and distances traversed are highly dependent upon the terrain and the environmental conditions encountered. Despite these potential variations, several armies have developed certain standards of performance, presumably based on average conditions, and these standards are, in general, rather consistent.

For its bicycle messengers, the United States Army Signal Corps in World War II prescribed a rate of travel of six miles per hour for routine

messages, ten miles an hour for priority messages, and "highest speed consistent with the certainty of arrival" for urgent and operational priority messages[57,58]. This is little different from that specified by Lieutenant May in 1892[56]. At that time, cadence was defined as the number of revolutions per minute of the pedal and designated as slow, easy, quick, or double. Due to the gearing of the bicycle of that day, this resulted in corresponding speeds of 4, 6, 10, and 16 miles per hour. The first three of these speeds were still in use in 1898, but this time were oriented to infantry marching time, rather than the mechanical construction of the bicycle[15]. The marching rates, mounted, were given as:

> "Slow time -- moving at the rate of infantry marching in quick time; 300 feet per minute; 4 miles per hour. This gait will be used only when marching with other troops.
>
> "Ordinary time -- moving at the rate of infantry marching in double time; 540 feet per minute; 6 miles per hour. This gait will invariably be used unless otherwise ordered.
>
> "Fast time -- at the rate of cavalry marching at the gallop; 10 miles per hour. This gait will be used by couriers and whenever ordered. The chief of the leading subdivision always regulates the gait".
>
> * * *
>
> "The average march per day for any considerable body on ordinary roads is 50 miles. The usual marches of cyclists, however, will be forced, and when the urgency is great, the roads fair, and the load light, 75 to 100 miles can be covered in 10 hours."

The British Army in 1917 also specified that the rate of marching, excluding halts, would generally vary from 8 to 10 miles an hour, according to the weather, the nature of the country, and the state of the road. Some cyclist units might attain a higher rate of speed, even for considerable distances, but the above is the average pace at which a column could travel for any length of time. Insofar as distance was concerned[55]: "A column of the size of a

battalion should not be expected to cover more than 50 miles in a day, under favorable conditions of road and weather, until the men have had considerable training and are in hard condition, when they may cover up to 60 miles. Small parties of selected riders can march a hundred miles a day for several consecutive days without undue fatigue, provided that the conditions are favorable."

According to the Italian regulations of 1904, the rate of march of cyclists was as follows: slow rate, 5 miles per hour; maneuvering rate, 6 to 7 miles per hour; road speed, 7 to 10 miles per hour; and accelerated rate of march, up to 12 miles per hour. Cyclists could ride up to 50 miles, without long rests. For riding 55 to 60 miles, from 5 to 6 hours were required(44).

The German Army in 1945 specified the average speed of a cyclist march column as eight miles per hour(54). In 1940, Swiss bicycle troops on a training exercise covered a distance of 200 miles through the Alps in 36-1/2 hours maintaining an average speed of five and a half miles per hour(27). Furstenberg, writing in approximately 1941, stated that German military cyclists were expected to obtain a speed of 7 miles per hour for average performance, and from 4 to 5 miles per hour or less on poor roads, hilly or mountainous grounds, or under conditions of bad weather or head wind. He also stated that daily performance was expected to be 35 to 42 miles, and under very favorable conditions up to 72 miles(59).

In 1925, Major Rudolf Theiss of the Austrian Army stated(10):

> "The average speed of closed units, in the case of excellent flat roads and good weather, is 15 km [9 miles] per hour for a period of three to four hours, 10 to 12 km [6 to 7 miles] per hour for periods exceeding four hours, on rather poor roads and during unfavorable weather 8 km [5 miles] per hour, and in very unfavorable cases 6 km [3-1/2 miles] an hour only, During the night the average speed can decrease to 4 km [2-1/2 miles] per hour. That is the infantry speed. The average day march performance of the infantry (4 km per hour [2-1/2 miles]) compared with that of the cavalry (8 km [5 miles] per hour) and to that of the bicycle unit stand in the ratio of 1:2:3 (up to 4).

"Patrol and individual cyclist messengers can cover up to 20 km [12 miles] per hour. For larger detachments, the 20 km per hour speed is possible only for a short distance. The higher speed of the bicycle unit, as compared with that of other formations, affirms itself mainly in the day performance.

"The average day performance of a well trained bicycle unit is 80 km [48 miles], with performance up to 100 and 120 km [60 and 72 miles] possible at times. All these numbers are given with great reserve."

Effect of Terrain

Discussion of the effect of terrain upon the mobility of the bicycle generally devolves into two seemingly polarized viewpoints. One is that any departure from flat, good roads represents a decrease in the mobility of the bicycle. The other is that the bicycle is capable of traversing any terrain regardless of its difficulty. Closer inspection of the statements of the advocates of this second viewpoint, however, discloses that they tend to understate or de-emphasize the fact that the ability to traverse this difficult terrain is predicated upon the fact that the bicycle rider must either push or carry his vehicle over the areas where riding is impractical. They also gloss over the fact that the nonriding portions of the trip may be a substantial percentage of the total. In sum, however, the use of the bicycle may provide the infantryman with increased mobility as compared to that of the foot soldier.

Bicycle mobility has been affected by both the surface and the grade traversed. The hard-surfaced road, of course, provides the optimum track for the utilization of bicycle mobility. But the existence of this type of surface greatly alleviates the need for bicycle troops since motorized infantry can be used more effectively under these conditions. For either on- or off-road travel, the cyclist is faced with a variety of surface conditions -- mud, sand, snow, uneven surfaces, grades, manmade and natural obstacles, water, and dust.

battalion should not be expected to cover more than 50 miles in a day, under favorable conditions of road and weather, until the men have had considerable training and are in hard condition, when they may cover up to 60 miles. Small parties of selected riders can march a hundred miles a day for several consecutive days without undue fatigue, provided that the conditions are favorable."

According to the Italian regulations of 1904, the rate of march of cyclists was as follows: slow rate, 5 miles per hour; maneuvering rate, 6 to 7 miles per hour; road speed, 7 to 10 miles per hour; and accelerated rate of march, up to 12 miles per hour. Cyclists could ride up to 50 miles, without long rests. For riding 55 to 60 miles, from 5 to 6 hours were required(44).

The German Army in 1945 specified the average speed of a cyclist march column as eight miles per hour(54). In 1940, Swiss bicycle troops on a training exercise covered a distance of 200 miles through the Alps in 36-1/2 hours maintaining an average speed of five and a half miles per hour(27). Furstenberg, writing in approximately 1941, stated that German military cyclists were expected to obtain a speed of 7 miles per hour for average performance, and from 4 to 5 miles per hour or less on poor roads, hilly or mountainous grounds, or under conditions of bad weather or head wind. He also stated that daily performance was expected to be 35 to 42 miles, and under very favorable conditions up to 72 miles(59).

In 1925, Major Rudolf Theiss of the Austrian Army stated(10):

> "The average speed of closed units, in the case of excellent flat roads and good weather, is 15 km [9 miles] per hour for a period of three to four hours, 10 to 12 km [6 to 7 miles] per hour for periods exceeding four hours, on rather poor roads and during unfavorable weather 8 km [5 miles] per hour, and in very unfavorable cases 6 km [3-1/2 miles] an hour only, During the night the average speed can decrease to 4 km [2-1/2 miles] per hour. That is the infantry speed. The average day march performance of the infantry (4 km per hour [2-1/2 miles]) compared with that of the cavalry (8 km [5 miles] per hour) and to that of the bicycle unit stand in the ratio of 1:2:3 (up to 4).

> "Patrol and individual cyclist messengers can cover up to 20 km [12 miles] per hour. For larger detachments, the 20 km per hour speed is possible only for a short distance. The higher speed of the bicycle unit, as compared with that of other formations, affirms itself mainly in the day performance.
>
> "The average day performance of a well trained bicycle unit is 80 km [48 miles], with performance up to 100 and 120 km [60 and 72 miles] possible at times. All these numbers are given with great reserve."

Effect of Terrain

Discussion of the effect of terrain upon the mobility of the bicycle generally devolves into two seemingly polarized viewpoints. One is that any departure from flat, good roads, represents a decrease in the mobility of the bicycle. The other is that the bicycle is capable of traversing any terrain regardless of its difficulty. Closer inspection of the statements of the advocates of this second viewpoint, however, discloses that they tend to understate or de-emphasize the fact that the ability to traverse this difficult terrain is predicated upon the fact that the bicycle rider must either push or carry his vehicle over the areas where riding is impractical. They also gloss over the fact that the nonriding portions of the trip may be a substantial percentage of the total. In sum, however, the use of the bicycle may provide the infantryman with increased mobility as compared to that of the foot soldier.

Bicycle mobility has been affected by both the surface and the grade traversed. The hard-surfaced road, of course, provides the optimum track for the utilization of bicycle mobility. But the existence of this type of surface greatly alleviates the need for bicycle troops since motorized infantry can be used more effectively under these conditions. For either on- or off-road travel, the cyclist is faced with a variety of surface conditions -- mud, sand, snow, uneven surfaces, grades, manmade and natural obstacles, water, and dust.

In July, 1896, the U. S. Army organized the 25th U. S. Infantry Bicycle Corps under the command of Second Lieutenant James A. Moss. Moss conducted numerous experiments in the mountain country in the area of Fort Missoula, Montana, that year, and the following year took the corps on a 1,900-mile trip from Fort Missoula to St. Louis, Missouri. The corps covered this 1,900 miles in 34 days of actual travel, averaging 55.9 miles per day and 6.3 miles per hour. (The Commanding General, Headquarters Department of Dakota, figured that when the actual time consumed, each day, from starting point to destination, including the stoppages for repairs to the wheels, etc., was taken into consideration, the average rate for the trip was only 3.9 miles per hour.)

Lieutenant Moss's comments on the roads of that day are rather interesting and perhaps could apply to roads in some of the developing nations today. According to Lieutenant Moss(7):

> "Some of the roads were about as good dirt roads as could be found anywhere in the United States, while others were a disgrace to civilization. As a rule we found the roads an index to the people of the communities through which we passed. Where the roads were properly graded and well worked, the inhabitants were well informed, used modern farming implements, had fine windmill and other conveniences. On the other hand, where the roads were in a bad condition and evidently much neglected, the people were narrow-minded, devoid of any knowledge of the topography of the country, and behind the times in everything."

Lieutenant Moss found that gumbo mud was the greatest deterrent to mobility. Time and time again the bicycle troop was forced to dismount and roll the bicycle along, or forced to dealy the trip while mud was scraped from the wheels, chain, and sprocket.

This reiterated comments made in his 1896 report of the experimental work done by the 25th U. S. Infantry Bicycle Corps in the territory surrounding Fort Missoula, wherein he stated that the wheels were a hindrance only in gumbo mud(26).

His attitude toward gumbo mud, of course, was reconfirmed during his 1897 trip, but he also found loose sand to be a formidable hindrance. On the morning of July 5, 1897, the corps struck the sand hills of Nebraska. Lieutenant Moss's narrative says in part[7]:

> "This part of the trip was a real nightmare. It was impossible to make any headway by following the wagon road in loose sand ankle-deep, and the corps therefore, followed the railroad track for 170 miles, before they got out of the sand. By almost superhuman efforts this distance was covered in 4-1/2 days, averaging 37.7 miles per day. The alkali water was abominable and the heat terrific. On July 7, the thermometer registered 110° in the shade, and over half the corps were sick, two soldiers having their feet badly blistered from the burning sand.
>
> "Some of our experiences, especially while in the sand hills of Nebraska, tested to the utmost not only their physical endurance but also their moral courage and disposition; and I wish to commend them for the spirit, pluck, and fine soldierly qualities they displayed."

While Captain Giddings in his Manual for Cyclists, published in 1898, disagreed with Lieutenant Moss to some extent by maintaining that heat and cold could not materially affect the march of cyclists, he reinforced Lieutenant Moss' attitude towards sand by stating[15]: "In climbing steep hills or passing over sandy stretches the command is habitually dismounted. Riding up hills or in sand only exhausts the men. Walking at such times not only saves their strength, but makes a change and rest from riding." Sand remained an obstacle to the bicycle troop through World War II. Sir Edmund Crane, writing in 1944 about the Normandy invasion, pointed out that the bicycle troops were forced to scramble over the beaches before it was possible for them to re-form and once more mount their wheels[36].

At the other climatic extreme, snow also poses its problems for the cyclist. Cycling is still possible with a 10-centimeter (~ 4 inch) snow layer, but hard-frozen snow may cause slight falls; hence, speed should be decreased[10].

In October, 1940, a Swiss Army bicycle patrol of 15 men traveled approximately 200 miles through the Swiss Alps in a 36-1/2-hour period. The ascent from Kandersteg, 3,835-foot altitude, to the summit of the Gemmi, 7,640 feet, proved the crucial test. The troop encountered rain, sleet, and snow, and finally common snow fields, one after the other, 22 in all. With their bicycles mostly on their shoulders, the men overcame these treacherous stretches without mishap. With complete equipment and ammunition, each bicycle weighed 132 pounds[27].

Uneven terrain is also a source of hazard and discomfort to the military cyclists. On a trip from San Antonio, Texas, to San Marcos, Texas, in 1895, Major Leo M. Maus reported that[60]: "The character of the soil is either adobe, gravel, stoney, or clay, and the road is fringed nearly its entire length with a growth of mesquite. Owing to the rains during the season, the roads were very badly cut up and had dried in this manner, making wheeling a difficult matter except for the expert road rider. In many places, only a narrow track was left between the ruts and the slightest deviation was liable to throw the rider and injure the wheel." Major Maus also remarked that cyclists must understand that the greatest care should be observed in riding over rough or rocky roads and that they should dismount and lead the wheel at such points in order to prevent it from being disabled.

The physiological effect of riding over this rugged terrain was encountered by Lieutenant Moss on his trip to St. Louis[7]. He advocated some handlebar device for taking up the vibration or a part of it. On several occasions, the cyclists suffered during the day, and were kept awake at night from pains in the hands and arms caused from the constant jarring of the machines while riding over rough roads. This same problem was considered by Cornell Aeronautical Laboratory, Inc., in its April 24, 1962, Proposal Number 411 entitled

"A Preliminary Proposal for Very Light Weight, Off-Road Ground Vehicle Concepts and a Program of Prototype Developments" which was submitted to the Advanced Research Projects Agency on May 7, 1962. No action was taken on the proposal at that time. It was suggested in the proposal that suspension be provided to alleviate the off-road ride problem and therefore permit higher cross-country speeds."(38) However[as stated earlier in this report (page 31)], an article on Polish Airborne Cavalry recommends unsprung vehicles to reduce weight and size(39).

Another of the natural obstacles which the military cyclists must surmount is that of the grade which he must negotiate. Lieutenant Moss considered the bicycle to be a hindrance when ascending or descending grades steeper than 4.5 degrees(7). Major Theiss points out that a 3 per cent slope requires twice as much effort to maintain the same cycling speed as on a flat road(10).

Kann mentions another inconvenience due to the pace imposed by changes of grade(32):

> "In this manner, the head of an element, after a descent executed quickly, encounters a steep gradient, obliging it to slack in its advance abruptly; the rear, at this moment, will find itself still on the slope and will likewise reduce its speed in order not to throw the first files into disorder. At the top of the hill, the inverse phenomenon is produced. It will result in elongations and contractions, similar to the movements of an accordion. To prevent these at once or to limit them, it is necessary to allow certain play between the files and the sufficiently considerable distances of a section following; if the strength of the column permits several companies, a free space of from 300-400 meters, was generally estimated to be suitable to maintain between them. Besides, the cyclist marched two or three in line (instead of four as troops on foot or mounted); this is a second cause of elongation. One acts wisely, therefore, not to group the cyclists into too strong units, which stretch out beyond measure over the roads, becoming heavy and burdensome."

The manual, Cyclist Training, Provisional, 1917, issued by the General Staff of Great Britain's War Office contains similar advice[55]:

> "Columns should not ride up long or steep hills, as it fatigues the men, and but little time is saved.
>
> "In the case of long columns this rule would ordinarily entail the rear of the column marching some distance along level or even downhill ground, which is both a waste of time and energy. It is advisable therefore, whenever it is unnecessary to economize road space, to allow considerable latitude as to the distances between platoons and companies, so that the need for premature dismounting may be reduced to a minimum. When descending steep winding hills, cyclists should always walk. If the hill is suitable to ride down, men should not be made to walk purely with the object of retaining a prescribed distance; it just be borne in mind that downhill riding is one of the best means of resting and refreshing men in a long ride; therefore, as each platoon reaches a crest of a hill, they should mount and be allowed to ride down at a steady pace, set by the leader in conformity to the slope. On reaching level ground the pace can be reduced with the object of letting the rear platoon close up."
>
> "It should be remembered that, if the head of the column is halted at the top of the hill, the march cannot be renewed without an undue lengthening of the road space occupied."

Major Theiss mentions another natural obstacle which the cyclist encounters[10]: "Winds, especially side and front winds, slow down cycling or may prevent it. According to Du Bois Reymond, a cycling speed of 2.4 kgm effort is needed when there is no wind. Whereas a 4.2 kgm effort is required with a wind of 6 mph, the same wind in the back requires 1.9 kgm only."

Lieutenant Moss also stated[7]: "The wind is one of the worst and most discouraging things to contend against."

Writing in the Infantry Journal in September, 1942, Bert Levy commented[61]: "You know which walls and fences are low enough for you noiselessly to lift a bicycle over them and pedal away."

In 1896, Lieutenant Moss encountered the problem of overcoming natural and manmade obstacles and seems to have solved them very well[26]:

> "After little practice the corps attained great proficiency in getting over fences and fording streams. It would take up only 20 seconds to halt, get over an ordinary fence and start again. Several times we got over, with very little trouble, a board fence nine feet high, the bicycles being packed in heavy marching order.
>
> "To get over an ordinary rail or picket fence, the corps acted in sets of two's: they were first formed in columns or files, parallel to the fence and dismounted, if not already so. At the command 'jump the fence' every number one would rest his wheel against the fence and get over as quickly as possible; number two would then grasp his own bicycle by the neck and rear bar of the diamond and hand it over the fence to number one, who would grasp it in a corresponding position and rest it against his side of the fence. After number one's wheel had been gotten over in the same way, he would get over the fence as quickly as possible, everyone then assuming the position of 'stand to bicycle', facing in the same direction as before the fence was jumped. To get over a high board fence, all the wheels were rested against the fence; six men would get on top of the fence by first standing on their bicycles, with one foot on the seat and the other on the handlebars, with their hands on top the fence, and then raising themselves up: three of the men now on top would jump down on the other side: the two men who had remained on the opposite side would then raise the wheels up and hand them to the men on the fence, who in turn handed them down to the men on the other side. When all the wheels had been thus gotten over, the men on the fence would lean over as far as possible, and catching hold of the hands of the soldiers on the ground, would help them over. Everyone having gotten over, the same formation was assumed as after getting over an ordinary rail or picket fence.
>
> "In fording streams, if the water were not more than 10 or 12 inches deep, the wheels were either rolled or carried across by their riders. In deep water, however, especially with a swift current, every wheel was carried across by the soldiers: the wheel was rested on a strong stick at the junction of the neck and lower bar of the diamond, either end of the stick resting on their shoulders, while they steadied the wheel with their hands.
>
> "Our wheels were packed in the heavy marching order in all these exercises and we could not, therefore, roll them through water more than a foot or so deep without wetting our rifles and knapsacks."

It should be remembered, however, when reading this account, that these events took place prior to the invention of the folding bicycle by Captain Gerard of the French Army(62).

Dust does not affect the cyclist's mobility, but it does have a bearing on detection of a bicycle troop. Although one writer states that one advantage the bicycle troop has over a cavalry patrol is the fact that it raises little dust and it is impossible to tell from the track which way the troop was going(15), another says that a closed bicycle column, when the weather is dry, causes a large cloud of dust which can be easily recognized by the enemy. A formation in depth decreases this danger(10).

A British civilian who traveled approximately 500 miles by bicycle with the Viet Cong in 1963 found that even with all the hazards connected with bicycle travel in Vietnam--narrow winding trails, roots, snags, stumps, traps, loops, spikes, bamboo trellises, and overhead creepers--it provided a good means of transportation and was preferable at times to being in a jeep since the silence of bicycle travel allowed early warning of approaching planes and the cyclists had ample time to hide in the undergrowth.

To summarize, it seems clear that the nature of the terrain and the natural forces of the environment encountered severely affect the mobility of bicycle troops. Once the bicycle leaves the road or encounters adverse weather conditions or even, for that matter, encounters substandard roads, its mobility is immediately reduced to some degree. Under these circumstances, appraisal of the mobility of the military cyclist must be viewed, not in an absolute sense, but in relation to alternate modes of movement. Thus, the bicycle may well be used under certain circumstances to effect compromise between foot and motorized movement. The decision, in each case, must be based on criteria pertinent to the local environment, and must result from an analysis of trade-off characteristics

and from a series of value judgments of the relative benefits to be gained as a result of these trade-offs.

Advantages and Disadvantages of Using Bicycle Troops

The advantages and disadvantages inherent in the use of bicycle troops have remained relatively unchanged through the years. As we trace statements of writers on the subject through the years, a fairly consistent pattern emerges as follows:

Advantages:

(1) During marches, the bicycle unit, because of considerable expansion and depth, is uncommonly invulnerable to air attack[10,59].

(2) The bicycle requires no fuel and is inexpensive to maintain[49].

(3) Wooded areas and areas where only narrow footpaths are available can be patrolled by bicycle[63].

(4) Owing to its high speed (compared with that of foot troops) the bicycle unit can cross large distances in a short time and deploy a considerable fire force in remote places[10,55,59].

(5) Bicycles do not create as large a cloud of dust as tanks or trucks[10].

(6) Bicycle units are relatively silent, and therefore they are more suitable for night work than trucks or tanks[10,44,55,59,63].

(7) Cyclists are less conspicuous than tankers or cavalry[7,55].

(8) Cover for bicycles is not essential; consequently cyclists in an emergency can come into action at once in open country, provided there is cover such as a small ditch or bank, for the men[55].

(9) Troops with full packs can be moved distances of 75 to 120 miles per day by bicycle, depending upon the terrain, along shoulders of highways that are congested with traffic[63].

Disadvantages:

(1) Bicycle troops cannot employ shock tactics as can tanks and cavalry[55].

(2) Operations of bicycle troops are restricted to the close proximity of roads, and, if these are unsuitable owing to weather or other causes, the rate of march may become less than that of infantry[15,55,59].

(3) Cyclists, acting alone, are easily ambushed[44,55].

(4) Bicycle troops take up a comparatively large road space on the march[44].

(5) In performing the mission assigned, cyclists cannot depart far from their bicycles without sacrificing the mobility gained from the bicycle[32,64].

(6) In time of retreat, direction is often constrained by the need to travel over well-defined paths rather than cross-country[55].

(7) Unfavorable terrain and weather seriously impair mobility[32,44].

(8) Changes of grade result in elongations and contractions of a cyclist column, similar to the movements of an accordion (see page 45)[32,55].

Note: Dates of the references cited above are as follows:

Reference	Date
10	1925
32	1911
44	1911
49	1942
55	1917
59	1941
63	1940
64	1911

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APPENDIX A

INFORMATION SOURCES

APPENDIX A

INFORMATION SOURCES

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APPENDIX B

USE OF BICYCLE TROOPS IN WORLD WAR I

[Translated Excerpts from Die Radfahrtruppe...(10)]

APPENDIX B

USE OF BICYCLE TROOPS IN WORLD WAR I

[Translated Excerpts from Die Radfahrtruppe...(10)]

Use in World War I

a. The Messenger on Bicycle

Telephone connection did not exist everywhere, hence the increasing use of the messenger on bicycle or on motorcycle, especially where important military action was being carried out.

b. The Bicycle Unit

In connection with the cavalry corps, the bicycle was used at the side of the cavalry men in performing distant reconnaissance duties. In the German and in the Austro-Hungarian army in the West and in the East (of the European theater of war), as well as on the enemy side, engagements took place between bicycle units and foremost army elements. German cavalry men and cyclists, for instance, encountered English cyclists, September 8, 1914, near the bridge on the Small Morin near Boitron, Belgian cyclists, October 7, near Edemolen, and French cyclists, October 10, near Rouge Croix, Doulleu, and Morslede.

Tasks individually involving reconnaissance, concealment (diversion), and pursuit were performed.

The 1st bicycle company of the rifle battalion of the Guards was divided into groups as an advance guard for the 5th Cavalry Division in pursuit of the enemy.

On September 3rd, 1914, after a 35 km march, the Company in question was approaching the Marne which was to be crossed near Mt. St. Père, and reached the river a few kilometers east of Château-Thierry. The French expected the appearing of enemy forces so little, that they were careless in raising their defenses along the South bank and also in a bridgehead position along the North bank, so that they remained quite exposed.

The bicycle company immediately opened a surprise fire against the French; a terrible panic followed. Even the group along the North bank was completely taken by surprise, and although much superior in force, took to disorderly flight over the bridge. Infantry and cavalry troops invaded the bridge hurriedly, as this was prematurely blown up. This catastrophe and the well aimed fire of the bicycle company resulted in the complete annihilation of the French units. A large part died in the river, many were shot down when taking to flight, the rest (one company) along the North bank was captured.

After this successful combat, the bicycle company returned immediately to its original task to cross the Marne, which they did at Château-Thierry.

Pursuit of the opponent by cyclists was carried elsewhere: by German cyclists toward Gumbinnen and Eydtkuhnen in 1914 (where the bicycles were often left 5 km back); in the West on September 6th, 1914 by 2 bicycle units and 5 troops with the Xth Reserve Corps through Esternay; by 2 bicycle companies with cavalry men, riflemen and engineer soldiers with the corps of the Guards toward the Seine the same day: by the bicycle battalion of the cavalry division of the Guards toward La Bassee and Béthune in October 1914: in Wallachia in 1916, where especially the pursuit action of the German 2nd bicycle brigade in the unit force of the k. u. k.* Group Colonel von Szivó between Cserna and Alt is worth

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* Kaiserlich und koniglich = imperial and royal.

mentioning; in Venetia in 1918, where groups of cavalry, machine guns on motor vehicles, and cyclists were used by the Italian cavalry corps in order to occupy the region evacuated by the Austro-Hungarians. On September 9th, 1914, in a pursuit movement, the French crossed the Marne first with the cyclists of the 10th Cavalry Division.

Many times it was the duty of the bicycle unit to seize rapidly important localities, in order to guarantee the approach and deployment into combat of the Army forces.

Thus on August 14th, 1914, Assesse was reached and occupied in front of the enemy by two German squadrons, 1 bicycle company and 2 cannons; on August 30th, a German bicycle detachment with cavalry men prevented the bridges on the Oise near Ribecourt from being blown up, thus making possible the crossing of the river by the Cavalry Corps von Richthofen; thus in 1914 the already burning Nida bridge near Motkowice was saved by the rapid approach of German cyclists; the bridge on the Czarna was open for the advance by occupying the heights North of Moravica (near Kjelce), and the same was done by timely occupation of the bridges near Koscielec and Kola and of the 3 Bzura passages near Alexandrov. In September, 1914, the 10th French bicycle group was again used (for instance near Warlencourt) only to permit deployment to the cavalry division.

Not only individual important points can be occupied by cyclists more rapidly than by any other detachment, but this can be done also by quite large front sectors until the main unit bodies arrive.

During the Battle on the Aisne in 1914, it was the duty of a German bicycle battalion, consisting of 6 companies, to hold the sector of Czerny south of Laon from September 14 to 23.

The combat of Haelen in 1914 is a Belgian counterpart of this. General de Witte (Belgian Cavalry Division) had the order to delay the enemy in the Gette-Demer Line. For this purpose he occupied Diest with a bicycle engineer company, Zelck with 1 squadron and 2 bicycle platoons, Haelen with a bicycle company and 2 bicycle platoons, Geet-Betz with 1 squadron, Budingen with 1 squadron, and Driecs with 1 bicycle platoon. Behind this defensive front, he gathered as local supports in assaults 13 squadrons, 3 batteries, and 1 bicycle company with machine gun platoons at Loxbergen. The 3rd Belgian Brigade advancing toward Loxbergen was still at a distance of 21 km, whereas the cyclists of the 7 and 9th German rifle battallions were attacking already as advance elements of the Cavalry Corps Marwitz. The German cyclists were stopped for 7 hours, since the next German elements (foot riflemen) were only able to arrive later.

An interesting example was given by the k. u. k. bicycle riflemen for reconnaissance duties by cavalry and cyclists.

Two dragoon squadrons of the k. u. k. 7th Cavalry division, which had been sent in advance the first day West of the Weichsel (Vista, Vistula) for the purpose of strategic reconnaissance, and the bicycle company of the 24th Military Police troops formed a liaison unit entrusted with reconnaissance duties in the direction of Kjelce.

Cavalry men and cyclists advanced on the highway of Miechow (Cracow) toward Kjelce in order to locate the enemy, supposedly in force of a cavalry division. August 13, the foremost cyclists encountered enemy cavalry men on the height of Checiny.

The cavalry men shot a few times but retired immediately along the highway northwards. Our following liaison patrol reported Zagroda as free from

the enemy; soon after this, however, the highway and railroad defile was occupied by the enemy, just north from Zagroda.

Arriving at Zagroda, the commander of the bicycle company ordered immediately a platoon to attack. This platoon was forced to cross the bridge north from Zagroda under enemy fire, but then it deployed on either side of the highway, and since no aggressor was visible despite the fire from the forest, it went in one movement up to the forest. At a distance of 100 steps from it, some retreating enemy cavalry men were noted. Arrived at the north edge of the forest, the platoon suffered, from the outskirts of the locality called Bialogon, an intense infantry fire which was soon mixed with the fire of individual machine guns. Informed of this situation, the company commandant came on bicycle with the machine gun platoon of the company to the position of the platoon.

The machine gun platoon was put into action; the other two platoons were developed into an encircling attack on the right (east). Extending its own left wing, a squadron which had arrived in the meantime soon took a hand in the constantly increasing fire duel. Meanwhile the enemy had continued increasing its fire; however, a precise estimation of the enemy force was not quite possible because of the forest and of the well developed vegetation of the fields. But now the enemy artillery commenced an intense fire; hence the commandant of the reconnaissance unit judged that his task to force the enemy into deployment was finished; he interrupted the fight and ordered to disengage rapidly. Without being pursued by the enemy, the unit reached the height north of Checiny, while individual patrols remained in the combat zone for diversion purpose.

Concerning the disengagement by the bicycle company, the platoons which had left their bicycles the farthest back were withdrawn first, whereas

the machine gun platoon with its escort (cover) remained longest near the enemy, and followed then rapidly on bicycle.

August 15 the main body of the k. u. k. bicycle battalion, which had protected the camp of the 7th Cavalry Division for the night, received the order to conduct reconnaissance duties from Kije. The cyclists soon encountered the advance of the Russian Cavalry Division Novikov, which they routed at the Nida bridge near Morawica, owing to a successful surprise fire. The cavalry men taking flight withdrew through the terrain up to Kjelce, were overtaken, while using the highway, by the pursuing cyclists and forced out of Kjelce. The bicycle battalion continued its reconnaissance through Kjelce always commanding the large march route of the enemy cavalry in front.

The formation of mixed reconnaissance units, as in the preceding instance, was in general use in 1914 already. Often, the cavalry men and the cyclists had a radio station like during the reconnaissance of the cavalry division of the Guards toward Namur-Dinant on August 8th, 1914, and elsewhere.

Most famous was the part taken by the k. u. k. bicycle riflemen in the battle of Limanowa-Lapanow in 1914.

As, during this battle, at the culminating point of the crisis at Alt-Sandec, a large gap was present against which the enemy was about to use an entire corps, the battalion of bicycle riflemen, among the very last reserves, was brought just in time into action. Calvary elements were hurled against the enemy who was forcing ahead toward Zabrzes; the Dunajec Valley, however, was still open. The bicycle battalion was alarmed during the night, transported by train to Neumarkt and from there sent to Zabrzes, in order to reach the aggressor in the rear. December 11, 1914 - the decisive action of the battle occurred in the night of December 11-12 - the cyclists received the order to push forward from Zabrzes in the valley to Lacko-Laczki, and to delay the enemy

The advance company approached up to 2 km from Lacko, put the machine gun platoon into position here and brought a platoon into the attack, while keeping the other two ready for the same purpose. Upon the advance of the first line and when the machine gun commenced to fire, the enemy evacuated its position and took flight. Immediately the battalion commander ordered the 2nd Company to start pursuit on their bicycles, while the advance company, deployed in a foot fight, gathered near the bicycles. The pursuit was carried out until darkness of December 11, and was continued December 12.

During the battle the following fact took place. On the left and on the right of the valley highway respectively, one company was advancing on the heights in combat formation. The other two companies remained as reserves on the highway, and while advancing by sectors, led the bicycles of the entire battalion with them. When the foremost companies reported that the heights were free from enemy elements, the two companies near the bicycles were immediately brought into further pursuit on bicycles, whereas the companies which had been in the first line so far returned to their bicycles and followed.

As it had been the case at Limanowa, a dangerous gap was closed successfully with the help of cyclists, and the cyclist reserves intervened again on other threatened points.

In the combat of the German 18th Cavalry Brigade at Quierzy on September 15th, 1914, a cyclist company was forming the last reserve. When a race to the sea is involved, again and again we find the cyclists hurled against the enemy, as it was the case at Miraumont in connection with the 2nd Army cavalry corps on September 28th, at Achiet le Grand with the 7th Cavalry division, at Grenay on October 15th with the 9th Cavalry division, whose artillery carried a protection mission against enemy attacks.

On the eastern front, the German 2nd bicycle brigade intervened in August, 1916, at the Pantyr Pass. In Rumania, in 1916, the 9th Army created a cyclist reserve.

In 1916, the Italians placed against the advancing k. u. k. units on the Casara Meata their Bersaglieri cyclists as a last reserve, which was entirely captured with the complete bicycle park by the 73rd Infantry Regiment. During the battle on the Piave in June, 1918, each Italian corps in the plain had used 3 bicycle battalions as reserve, as well as 3 bicycle battalions on the side of the Austro-Hungarian forces, in order to use the initial success.

Finally, in frontier protection duties in the Burgenland, bicycle units formed mobile reserves which warded off enemy penetration, by rapidly appearing on the threatened point as it was the case at Schwarzenback October 31, 1921.

On the part of French bicycle units, a series of versatile uses in the combined force of the cavalry division in the West in 1914 is known. The combats of August 8 and 9 of the 5th French bicycle groups are extremely instructive.

At Jemelle the cyclists form a standing side guard, while the cavalry advances toward Buissonville. In the same way they protect the cavalry during the entire march up to the bridge of Poulseur. When the cavalry withdraws the cyclists remain as a rear guard. In the region of Herbet the cyclists must keep the Ourthe passages occupied, in order to protect the cavalry division at rest. During two days cyclists were alternately advance guard, side guard and rear guard, reconnaissance unit and outposts, and covered 140 km in day and night march. September 8 and 9, 1914, French cyclists in the forest of Villers-Cotterets made a successful surprise attack on a German ammunition carrier column accompanied by cyclists. September 20, they repeated a similar attack from an ambush on the Cambrai-St. Quentin highway.

Very often bicycle battalions had to perform protection tasks, not only as advance guard, side guard, and rear guard, but also as special combat groups.

German cyclists with cuirassiers of the Guards and two batteries formed the flank protection for the Richthofen Cavalry corps at Purnode from August 16 to 19, 1914. At Longueil on August 31st, cyclists covered the Oise passage of the German 4th Cavalry division, and formed at Mary-Lacy, September 8, 1914, together with a battalion, the right wing protection of the Marwitz Cavalry corps protecting the Marne.

As rear guard, French cyclists (10th Group) on September 24th, 1914, at Peronne-Berny, are found active at the very place where they yielded in three sectors, and permitted the regrouping of the infantry by delaying action at Vermandovillers. A German rear guard of cyclists, hussars and infantry, holds a bridgehead at Chateau-Thierry on September 8 and 9, 1914. In the withdrawal combats in Albania, with the rear guard of the k. u. k. 20th Mountain brigade, 2 bicycle companies, 1 engineer company, and mountain batteries are used. (Ochrida Lake, September 12, 1917). On November 1st, 1918, the Honved bicycle battalion (Hungarian army) protected the retreat of the 2nd Corps at Pinzano. As rear covering force of the cavalry division of the Guards attacking at Soissons, cyclists and 2 batteries fought at Leuilly on September 1st, 1914. Soon afterwards, on September 11th, the already distinguished 1st bicycle company of the Rifleman battalion of the Guards formed the rear guard of the retreating 5th Cavalry division. Attacked in their flank by a French Zouave division, the cyclists deployed toward the endangered flank and delayed the enemy until the cavalry division was safe. Before interrupting the combat, first all the bicycles of the half party were brought into a cover under enemy fire through

ploughed land. From this cover, it was possible for them to leave promptly and reach, after satisfactory performance of their task, their previous rear guard position.

Special engagements must yet be mentioned among others:

Railroad destruction of the Gent-Courtrai line at the crossing point of Wareghem by an operation unit formed of 1 squadron, 1 bicycle company, 2 batteries, and 1 radio station, of the Bavarian Cavalry division on October 6th, 1914. Blowing-up of the Schelde bridge at Orroir the same day by the cavalry with 1 bicycle company, 1 cavalry engineer battalion, and 1 battery of the 3rd German Cavalry division.

Concealment of the right flank of the von Kluck Army by a thrust of the 9th Cavalry division with 1 bicycle battalion toward Rosoy on September 6th, 1914; formation of a "mobile barrier" in front of the enemy front by alternately occupying different points, which was supposed to simulate infantry forces, by the second French Group on September 8, 1914; concealment of the march into the Siegfried position by means of bicycle battalions in 1917.

Outflanking of a rear guard by cavalry and cyclists of the 2nd Italian Brigade at Fiaschetti on October 30, 1918. While the cavalry had to contain the enemy on the Col del fer and then on the frontal hill, cyclists with cavalry men performed an outflanking movement North, and thus, unobserved by the enemy, reached the Bridge of Fiaschetti, which they occupied without any casualties. This is a typical use of the cyclists.

In combination with armored cars (motor vehicles with machine guns), cyclists on the German side fought in the thrust movement at Nieppe on April 13th, 1918, and on the French side in the defense battle at Edemolen on October 7th, 1914, against the advance guard (1 squadron and 1 bicycle battalion)

of the Bavarian Cavalry Division. The Italians also combined tanks with bicycle battalions on November 4th, 1918 against the k. u. k. 2nd Corps.

A cyclist relay was organized in 1914 by the German cyclists between the Army Headquarters of Kjelce and the headquarters of the Cavalry Division at Wola Jacklowa.

All the previous examples shed much light on the versatile and successful use of the cyclist units, especially in mobile warfare. Beyond these examples, what we must not fail to see is the activity of these units. We find them again at the occupation of the Baltic Isles, at the seizure of Livonia and Estonia, in Macedonia and on the Chersonese, in the Carpathians and in Transylvania (Volcano Pass, Szurduk Pass), in Flanders, in Lorraine and in the Vosges, at the retreat on the Antwerp-River River Meuse line in 1918, and in many other battle fields.

The value of a mobile front reserve made itself felt on the Italian Front, especially because of the extremely loose occupation on the side of the k. u. k. units.

The few cyclists were constantly deployed into the endangered sectors respectively, and as riflemen took a timely hand in the combat on each occasion.

From Adamello to the sea, the cyclists were in every place where they were needed, reinforcing the defense, repelling attacks, recovering lost points. Monte San Michele, Monte Piano, Sexten, Folgaria, Col di Lana, Rovereto, Val Sugana, Colbricon, Monte Meletta, Col de Rosso, Montello, Piave... such names have far more to tell than tedious and lengthy descriptions. In the Austrian coastal area, volunteer cyclist battalions served for the seashore protection.

Position warfare was unable to lower the importance of the cyclist unit, which only had to be used in the correct way. When the French, after the

beginning of the position war, absorbed their cyclist into the infantry, they committed a great error which they had to acknowledge later.

III. Basic Principles Concerning Use and Command

1. Type of Use According to Units

The dispatching of messengers on bicycles depends on reliable time schedule calculations taking into account the road and weather conditions. Outside the combat zone, one messenger for one task is enough. In the battle area, two messengers for the same task and on different roads is recommended.

The organization of lines of sentries (relay messengers), which cannot be absolutely dispensed with, despite the progress of the liaison technique, can under certain conditions be carried out by small elements of the bicycle formation. For the most part this purpose will be fulfilled well by the unit cyclists.

In the column service, during marches, the unit cyclists must march with their staff, that is, they walk their bicycles, since cycling at the pace of the infantry produces a certain strain, in the long run. When carrying out their duties, all messengers on bicycle must be assisted by the marching columns by immediately clearing the best side of the highway or road.

The combat units of the cyclist branches of service are used either quite independently as bicycle battalions, or in several battalions combined to carry out definite cyclist missions, or within the framework of the cavalry which they will relieve from certain tasks.

In combined advance, the cyclists will have to adjust their speed to that of the cavalry men by advancing by sectors.

For tanks, the bicycle unit, under certain conditions, carries out reconnaissance, protection, and conducts liaison duties. Individual tanks are the most suitable escort arm (machine guns and guns) for larger bicycle units.

2. The Tasks of the Bicycle Unit

The combat duties comprise distant and close reconnaissance. The aviation has not made calvary and cyclists obsolete. In flying weather, distant reconnaissance can be left to the aviation. Close reconnaissance on the ground, finding the enemy by determining combat spots, evacuation of prisoners, stopping the foremost enemy forces by uninterrupted contact can be performed only by the combat force on the ground.

A cyclist battalion is assigned a space of at most 20 km in width for its reconnaissance duties.

Protection. During movement, the bicycle unit is well used as advance guard, side guard, and rear guard of larger army bodies. Owing to its mobile and far advanced contacts developed in sections, it can detect the enemy and report it sooner than other units.

During rest, the bicycle unit is used advantageously in outpost service. Distant outposts alarm the calvary at rest, and rapidly permit combat readiness and protect them from surprise attacks.

Protection duties involve also the covering (tactic protection, escorting) of other units in movement, such as calvary, artillery, tanks, motorized infantry, radio stations, engineers with their individual tasks, and the escort and protection of larger truck transportations.

A main task of the bicycle unit will always be the covering of free flanks (their extension), the filling of gaps and the protection of a retreat. In the

last case the cyclists can delay the enemy much longer than other rear guards, since they are able to return to their main forces rapidly. They can disengage themselves rapidly from the enemy.

Often a rear protection of the combatting units is necessary, and this is carried out by the cyclist unit.

Special Tasks During Attack

During attack, the bicycle unit has the duty to rapidly occupy far advanced important localities (traffic centers, river passages, heights), to reach them in time and to hold them reliably. In this case, delaying action is a must as when covering retreat movements. In the attack, the bicycle unit makes it possible for the main unit to arrive in good order; in the retreat, it makes it possible to withdraw undisturbed.

If there is a break-through in an offensive combat, the cyclists are used to widen the break-through and to fully use the success obtained. They will be first in starting the pursuit, and if correctly led, will contribute to the most complete success.

By means of bold encircling maneuvers in pursuits, and by thrusts in the rear of the enemy, small bicycle units change the enemy defeat into disintegration and panic. Cavalry pursued by cyclists falls into a very critical situation.

By enveloping and encircling the aggressor, the cyclists belong, to a large extent, to the envelopment wing.

Guerrilla warfare forms part of the attack duties [of a bicycle unit]. It must be waged on the flanks and in the rear of the enemy. Destruction tasks (surprise raids, coups de main) against railroads, bridges, enemy trains, airfields and so on go hand in hand with guerrilla warfare.

If resistance turns sharper in localities, tanks should be assigned for penetration by assault through the place.

Special Defense Duties

The defense duties devolving on bicycle units are: frontier protection, that is observation; blocking and protection of the broader; timely determination of the attacking enemy, stopping the enemy in delaying action; diverting the enemy into a definite desirable direction; and the defense of important points.

River defense by loose observation along the banks, and active defense by mobile reserves.

Railroad protection in endangered regions.

Taking over easily defensible front sections (rivers, swamps, ridges of hills) in order to liberate the infantry for the attack in other parts of the battle field. Occupation of covering positions.

Other Duties

Operative reserve in movement and position combat, and "last reserve" in all critical situations.

Air raid protection during march by overlapping use of air defense machine gun platoons along important march lines.

Escort of supply lines (baggage) in unsafe parts of the battle field.

Highway police during extremely large unit displacements.

Occupation units in occupied regions.

As regards the use of the bicycle unit in peace time, it is quite suitable in the case of elementary events, since the unit can be brought very rapidly to the place requiring its presence.

4. Basic Principles for the Leading of Bicycle Units

a. Each commanding officer must be accurately informed of the capacity of the bicycle unit under his command.

b. Before using the bicycle unit, the tactical situation must be checked again in detail, in order to obtain maximum success. Any important division of the bicycle units must be avoided. A modification of the behavior - often ordered many days in advance - of the cyclists is for the most part no longer possible once used. Written orders must not be taken into the combat, because they contain many operative facts concerning the cyclists and would reveal important data to the enemy if seized by him. Much freedom of action must be left to the bicycle units used.

APPENDIX C

EXCERPTS FROM HANDBOOK ON GERMAN MILITARY FORCES[54]

APPENDIX C

EXCERPTS FROM HANDBOOK ON GERMAN MILITARY FORCES(54)

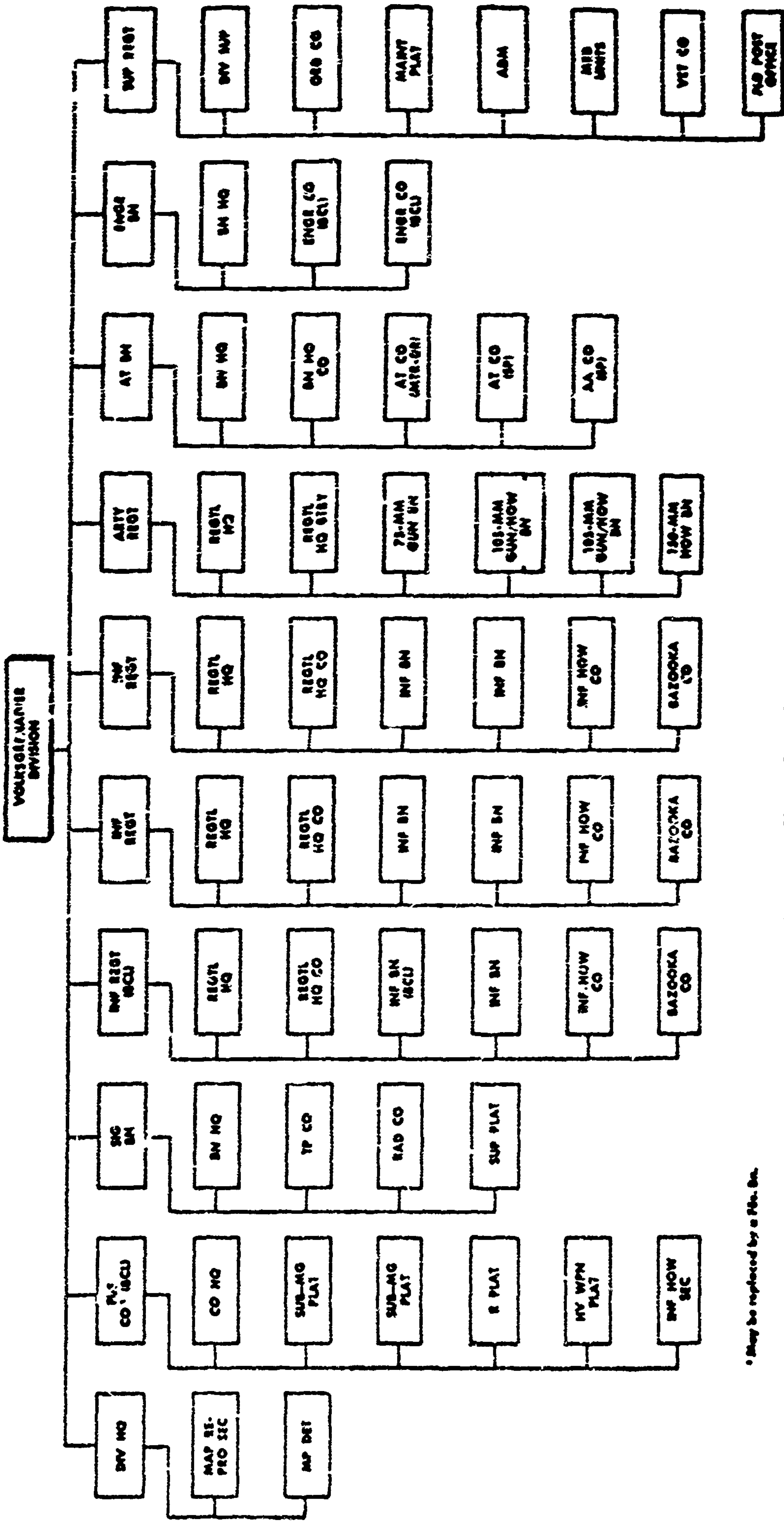


Figure [illegible].—Volks Grenadier Division.

* May be replaced by a Fus. Bn.

UNIT	Offs	NCOs	Pvts	Rs or Clks	Fitrds	Sub-MGs	LMGs	Hv MGs	81-mm Mortr	120-mm Mortr	Bazookas	Flame Throwers	37-mm AA Guns (SP)	75-mm AT Guns (Mbl-Dr)	75-mm AT Guns (SP)	75-mm Inf Howrs	75-mm Guns	105-mm Guns/Howrs	150-mm Howrs	Mtr Vehicles	Wheels	H-Dy Vehicles	Trs	Rs	Bcls
Div Hq	34	87	106	121	92	12	5													32	21		1		5
Füs Co[2]	3	28	169	89	26	84	8	2	2							2					1	19	10	55	16
Sig Bn	14	57	234	266	34	5	11													44	10	12	2	44	4
Inf Regt (Bcl)	46	267	1,598	1,048	269	597	79	16	12	8	72					12				10	10	223	84	524	698
Inf Regt	46	267	1,541	991	269	597	79	16	12	8	72					12				9	10	219	84	430	100
Inf Regt[3]	46	267	1,541	991	269	597	79	16	12	8	72					12				9	10	219	84	430	100
Arty Regt	75	405	1,264	1,405	201	132	45										18	24	12	99	13	285	30	1,062	49
AT Bn	17	119	324	326	140	26	30						9	9	14					100	16		16		
Engr Bn	15	66	361	316	115	11	18	4	4			12								12	14	35	17	68	297
Sup Regt	46	161	868	951	121	3	15													111	12	130	18	388	103
Total	342[3]	1,724	8,006	6,504	1,536	2,064	369	54	42	24	216	12	9	9	14	38	18	24	12	426	119	1,142	346	3,002	1,522

[1] A Fld Repl Bn with a C Sch may be added to any *Volks Gren.* Div.
[2] May be replaced by a Füs. Bn.
[3] Including 49 officials.

Figure 15.—Volks Grenadier Division, total strength 10,072.

UNIT	Offs	NCOs	Pvts	Rs or Clns	Pistols	Sub-MGs	LMGs	Hv MGs	81-mm Morts	120-mm Morts	Bazookas	75-mm AT Guns	75-mm Inf Hows	150-mm Inf Hows	[illegible]	Mtrcls	H-Dr Vehicles	Trs	Hs	Bcls
Regtl Hq	7	1	16	16	7	2									3	3			8	2
Regtl Hq Co	5	28	165	143	26	32	10								5		28	6	84	9
Inf Bn	15	113	380	477	122	127	43	12	6	4					8	5	92	57	165	17
Inf Bn	15	113	580	477	122	127	43	12	6	4					8	5	92	57	165	17
Inf How Co[1]	3	32	149	140	22	27	5						6	2	8	2	22	2	63	3
AT Co[2]	3	29	154	120	51	17	6				36	3			13	5	8	8	10	6
Total	48[3]	316	1,644	1,373	350	332	107	24	12	8	36	3	6	2	45	20	242	130	495	54

[1] Referred to by the traditional designation: "13" Co.
[2] Referred to by the traditional designation: "14" Co.
[3] Including six officials.

Figure 29.—Infantry Regiment, Infantry Division, 1944 Type, total strength 2,008.

UNIT	Offs	NCOs	Pvts	Rs or Cbns	Pistols	Sub-MGs	LMGs	Hv MGs	81-mm Mortars	4.2-inch Mortars	Mtr Vehicles	Motcls	H-Dr Vehicles	Tlrs	Hs	Bcls
Bn Hq	6[1]	13	58	58	8	14	1				1	2	16	4	33	6
R Co	2	21	119	96	22	28	13	2					15	11	27	3
R Co	2	21	119	96	22	28	13	2					15	11	27	3
R Co	2	21	119	96	22	28	13	2					15	11	27	3
Hv Wpn Co	3	37	165	131	48	29	3	6	6	4	7	3	31	20	51	2
Total	15[2]	113	580	477	122	127	43	12	6	4	8	5	92	57	165	17

[1] Including two officials.

Figure 33.—Infantry Battalion, Infantry Division, 1944 Type, total strength 708.

UNIT	Offs	NCOs	Pvts	Rs or Cbns	Pistols	Sub-MGs	LMGs	Mtr Vehicles	Motcls	H-Dr Vehicles	Tlrs	Hs	Bcls
Hq Sec	4	3	10	11	5	4		1	2			4	3
Com Sec		3	22	17		8				4	4	4	
Tn	2[1]	7	26	30	3	2	1			12		25	3
Total	6[1]	13	58	58	8	14	1	1	2	16	4	33	6

[1] Including two officials.

Figure 34.—Infantry Battalion Headquarters, Infantry Division, 1944 Type, total strength 77.

UNIT	Offs	NCOs	Pvts	Rs or Cbns	Pistols	Sub-MGs	LMGs	Hv MGs	H-Dr Vehicles	Tlrs	Hs	Bcls
Co Hq	1	3	8	8	2	3			1	1	2	2
1st R Plat	1	3	29	22	5	7	4		2	2	3	
2d R Plat		4	29	22	5	7	4		2	2	3	
3d R Plat		4	29	22	5	7	4		2	2	3	
Hv MG Sec		3	15	11	4	3		2	3	2	4	
Tn		4	9	11	1	1	1		5	2	12	1
Total	2	21	119	96	22	28	13	2	15	11	27	3

Figure 35.—Rifle Company, Infantry Division, 1944 Type, total strength 142.

UNIT	Offs	NCOs	Pvts	Rs or Cbns	Pistols	Sub-MGs	LMGs	Mtr Vehicles	H-Dr Vehicles	Tlrs	Hs	Bcls
Co Hq	1	5	2	3	5	1					1	3
1st (Com) Plat	1	2	29	23	1	9			6	6	7	
2d (Engr) Plat	1	7	65	53	8	13	6		6		13	2
3d (Mtd) Plat[1]		4	27	20	4	7	3		1		31	
Tn	2[2]	10	42	44	8	2	1		15		32	4
Total	5[2]	28	165	143	26	32	10	5	28	6	84	9

[1] The Mtd Plat may be replaced by a Bcl Plat with 29 Bcls and 2 Hs.
[2] Including two officials.

Figure 36.—Regimental Headquarters Company, Infantry Division, 1944 Type, total strength 198.

UNIT	Offs	NCOs	Pvts	Rs or Cbns	Pistols	Sub-MGs	LMGs	Hv MGs	81-mm Morts	120-mm Morts	Mtr Vehicles	Mcycls	H-Dr Vehicles	Tlrs	Hs	Bcls
Co Hq	1	4	15	15	2	4						1	2	2	5	1
1st (Hv MG) Plat	1	9	45	31	15	10		6					8	6	11	
2d (81-mm Mort) Plat (H-Dr)		10	56	37	23	6			6				15	12	19	
3d (120-mm Mort) Plat (Mtz)	1	7	39	36	5	7	2			4	7	2				
Tn		7	10	12	3	2	1						6		16	1
Total	3	37	165	131	48	29	3	6	6	4	7	3	31	20	51	2

Figure 37.—Heavy Weapons Company, Infantry Division, 1944 Type, total strength 205.

UNIT	Offs	NCOs	Pvts	Rs or Cbns	Pistols	Sub-MGs	LMGs	75-mm Inf Hows	150-mm Inf Hows	Mtr Vehicles	Mcycls	H-Dr Vehicles	Tlrs	Hs	Bcls
Co Hq	1	4	13	14	3	2				1		2	2	5	2
1st (75-mm Inf How) Plat	1	5	30	27	4	6	1	2				5		15	
2d (75-mm Inf How) Plat		6	30	27	4	6	1	2				5		15	
3d (75-mm Inf How) Plat		6	30	27	4	6	1	2				5		15	
4th (150-mm Inf How) Plat	1	5	33	29	5	6	1		2	6	2				
Tn		6	13	16	2	1	1			1		5		13	1
Total	3	32	149	140	22	27	5	6	2	8	2	22	2	63	3

Referred to by the traditional designation: "13th" Co.

Figure 38.—Infantry Howitzer Company, Infantry Division, 1944 Type, total strength 184.

UNIT	Offs	NCOs	Pvts	Rs or Cbns	Pistols	Sub-MGs	LMGs	Bazookas	25-mm AT Guns	Mtr Vehicles	Mcycls	H-Dr Vehicles	Tlrs	Hs	Bcls
Co Hq	1	10	26	29	6	3				1	4			2	6
1st (75-mm AT) Plat (Mtz)	1	4	28	25	4	5	3		3	5	1				
2d (Bazooka) Plat (H-Dr)		5	43	25	19	4	1	18				4	4	4	
3d (Bazooka) Plat (H-Dr)	1	4	43	25	19	4	1	18				4	4	4	
Tn (Mtz)		6	14	16	3	1	1			7					
Total	3	29	154	120	51	17	6	36	3	13	5	8	8	10	6

Referred to by the traditional designation: "14th" Co.

Figure 39.—Antitank Company (partly motorized), Infantry Division, 1944 Type, total strength 186.

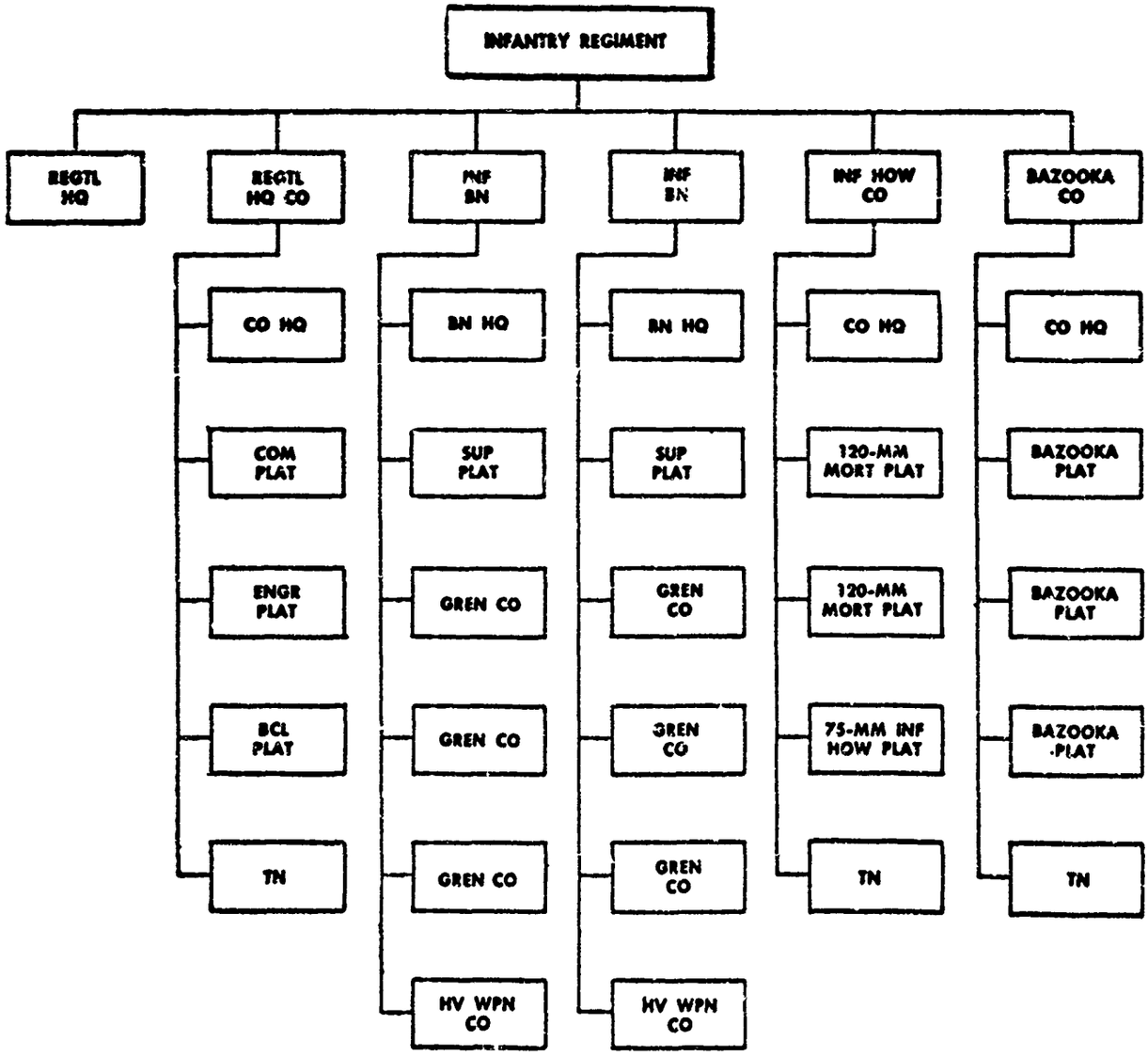


Figure 40—Infantry Regiment, Volks Grenadier Division.

UNIT	Offs	NCOs	Pvts	Rs or Cbns	Pistols	Sub-MGs	LMGs	Hv MGs	81-mm Morts	120-mm Morts	Bazookas	75-mm Inf Hows	Mtr Vehicles	Mtrcls	H.Dr Vehicles	Tirs	Hs	Bcls
Regtl Hq	6	1	12	4	3	14							2	3			8	2
Regtl Hq Co	5	25	157	133	22	32	10						1		27	6	53	38
Inf Bn	15	95	532	309	80	253	30	6	6			4	2	3	70	32	125	27
Inf Bn	15	95	532	309	80	253	30	6	6			4	2	3	70	32	125	27
Inf How Co[2]	3	32	152	145	21	31	5			8		4	1		33	2	89	4
Bazooka Co[2]	2	19	146	91	63	14	4				72		1	1	19	12	30	2
Total	46[3]	267	1,541	991	269	597	79	16	12	8	72	12	9	10	219	84	430	100

[1] Referred to by the traditional designation: "13th" Co.
[2] Referred to by the traditional designation: "14th" Co.
[3] Including four officials.

Figure 41.—Infantry Regiment, Volks Grenadier Division, total strength 1,854.

UNIT	Offs	NCOs	Pvts	Rs or Cbns	Pistols	Sub-MGs	LMGs	Mtr Vehicles	H.Dr Vehicles	Tirs	Hs	Bcls
Co Hq	1	5	2	3	4	1					1	3
1st (Com) Plat	1	2	29	23		9			6	6	7	
2d (Engr) Plat	1	7	65	53	7	13	6		6		13	2
3d (Bel) Plat		4	27	20	4	7	3		1		2	29
Tn	2[1]	7	34	34	7	2	1	1	14		30	4
Total	5[1]	25	157	133	22	32	10	1	27	6	53	38

[1] Including two officials.

Figure 42.—Regimental Headquarters Company, Volks Grenadier Division, total strength 167.

UNIT	Offs	NCOs	Pvts	Rs or Cbns	Pistols	Sub-MGs	LMGs	Hv MGs	81-mm Morts	75-mm Inf Hows	Mtr Vehicles	Mtrcls	H.Dr Vehicles	Tirs	Hs	Bcls
Bn Hq	4	6	34	21	3	20	1				1	2	4	4	8	3
Sup Plat	2[1]	6	39	42	3	2	1				1		17		42	4
Gren. Co	2	16	101	46	9	64	9						7	4	10	5
Gren. Co	2	16	101	46	9	64	9						7	4	10	5
Gren. Co	2	16	101	46	9	64	9						7	4	10	5
Hv Wpn Co	3	35	156	108	47	39	1	8	6	4		1	28	16	45	5
Total	15[1]	95	532	309	80	253	30	8	6	4	2	3	70	32	125	27

[1] Including one official.

Figure 44.—Infantry Battalion, Volks Grenadier Division, total strength 642.

UNIT	Offs	NCOs	Pvts	Rs or Cbns	Pistols	Sub-MGs	LMGs	H.Dr Vehicles	Tirs	Hs	Bcls
Co Hq	1	5	14	16	1	3		1	1	1	5
1st (Sub-MG) Plat	1	3	29	5	2	26	3	2	1	3	
2d (Sub-MG) Plat		4	29	5	2	26	3	2	1	3	
3d (R) Plat		4	29	20	4	9	3	2	1	3	
Total	2	16	101	46	9	64	9	7	4	10	5

Figure 45.—Infantry Company, Volks Grenadier Division, total strength 119.

UNIT	Offs	NCOs	Pvts	Rs or Cbts	Pistols	Sub-MGs	LMGs	Hv MGs	81-mm Mort	75-mm Inf Hows	Mtrcl	H-Dr Vehicles	Trs	Hs	Bcls
Co Hq		8	15	14	3	7					1	2	2	5	4
1st (MG) Plat		6	22	11	9	9		4				2	1	3	
2d (MG) Plat		7	22	11	9	9		4				2	1	3	
3d (Inf How) Plat	1	7	41	38	5	9	1			4		7		15	1
4th (Medium Mort) Plat		7	53	34	21	5			6			15	12	19	
Total	3	35	156	108	47	39	1	8	6	4	1	28	16	45	5

Figure 48.—Heavy weapons Company, Volks Grenadier Division, total strength 194.

UNIT	Offs	NCOs	Pvts	Rs or Cbts	Pistols	Sub-MGs	LMGs	120-mm Morts	75-mm Inf Hows	Mtr Vehicles	H-Dr Vehicles	Trs	Hs	Bcls
Co Hq	1	4	15	13	2	5					2	2	5	2
120-mm Mort Plat	1	7	44	38	6	8	2	4			9		27	
120-mm Mort Plat		8	44	38	6	8	2	4			9		27	
75-mm Inf How Plat	1	7	44	38	5	9	1		4		8		17	1
Trs		6	15	18	2	1				1	5		13	
Total	3	32	162	145	21	31	5	8	4	1	33	2	89	4

[1] Referred to by the traditional designation: "13th" Co.

Figure 49.—Infantry Howitzer Company, Volks Grenadier Division, total strength 197.

UNIT	Offs	NCOs	Pvts	Rs or Cbts	Pistols	Sub-MGs	LMGs	Bazookas	Mtr Vehicles	Mtrcls	H-Dr Vehicles	Trs	Hs	Bcls
Co Hq	1		2	2	1	1			1					
Bazooka Plat	1	4	45	26	20	4	1	18			5	4	6	
Bazooka Plat		5	45	26	20	4	1	18			5	4	6	
Bazooka Plat		5	45	26	20	4	1	18			5	4	6	
[illegible]		5	9	11	2	1	1	18[2]		1	4		12	2
Total[1]	2	19	146	91	63	14	4	72	1	1	19	12	36	2

[1] Referred to by the traditional designation: "14th" Co.
[2] In reserve.

Figure 50.—Bazooka Company, Volks Grenadier Division, total strength 167.

UNIT	Offs	NCOs	Pvts	Rs or Cbns	Pistols	Sub-MGs	LMGs	Hv MGs	81-mm Morts	120-mm Morts	Bazookas	75-mm Inf Hows	Mtr Vehicles	Mtrcls	H-Dr Vehicles	Tlrs	Hs	Bcls
Regtl Hq	6	1	17	4	3	14							2	3			8	2
Regtl Hq Co.	5	25	157	133	22	32	10						1		27	6	53	38
Inf Bn (Bcl)	5	95	589	366	80	253	30	8	6			4	3	3	74	32	219	625
Inf Bn	15	95	532	309	80	253	30	8	6			4	2	3	76	32	125	27
Inf How Co[1]	3	32	162	145	21	31	5			8		4	1		33	2	80	4
Bazooka Co[2]	2	19	146	91	63	14	4				72		1	1	29	12	30	2
Total	46[3]	267	1,598	1,048	269	597	79	16	12	8	72	12	10	10	223	84	524	698

[1] Referred to by the traditional designation: "13th" Co.
[2] Referred to by the traditional designation: "14th" Co.
[3] Including four officials.

Figure 51.—Infantry Regiment (bicycle), Volks Grenadier Division, total strength 1,911

UNIT	Offs	NCOs	Pvts	Rs or Cbns	Pistols	Sub-MGs	LMGs	Hv MGs	81-mm Morts	75-mm Inf Hows	Mtr Vehicles	Mtrcls	H-Dr Vehicles	Tlrs	Hs	Bcls
Bn Hq	4	6	35	22	3	20	1				2	2	4	4	12	30
Sup Plat	2[1]	6	51	54	3	2	1				1		17		54	24
Gren. Co. (Bcl)	2	16	110	55	9	64	9						8	4	24	130
Gren. Co. (Bcl)	2	16	110	55	9	64	9						8	4	24	130
Gren. Co. (Bcl)	2	16	110	55	9	64	9						8	4	24	130
Hv Wpn Co (Bcl)	3	35	173	125	47	39	1	8	6	4		1	29	16	81	181
Total	15[1]	95	569	366	80	253	30	8	6	4	3	3	74	32	219	625

[1] Including one official.

Figure 52.—Infantry Battalion (bicycle), Volks Grenadier Division, total strength 609.

UNIT	Offs	NCOs	Pvts	Rs or Cbns	Pistols	Sub-MGs	LMGs	H-Dr Vehicles	Tlrs	Hs	Bcls
Co Hq	1	5	17	19	1	3		2	1	6	34
1st (Sub-MG) Plat	1	3	31	7	2	26	3	2	1	6	32
2d (Sub-MG) Plat		4	31	7	2	26	3	2	1	6	32
3d (R) Plat		4	31	22	4	9	3	2	1	6	32
Total	2	16	110	55	9	64	9	8	4	24	130

Figure 53.—Infantry Company (bicycle), Volks Grenadier Division, total strength 128.

UNIT	Offs	NCOs	Pvts	Rs or Cbns	Pistols	Sub-MGs	LMGs	Hv MGs	81-mm Morts	75-mm Inf Hows	Mtrcls	H-Dr Vehicles	Tlrs	Hs	Bcls
Co Hq	1	8	18	17	3	7					1	3	2	11	38
1st (MG) Plat	1	6	24	13	9	9		4				4	2	12	54
2d (MG) Plat		7	24	13	9	9		4				7		21	43
3d (Inf How) Plat	1	7	48	42	5	9	1			4		15	12	37	46
4th (Medium Mort) Plat		7	59	40	21	5			6						
Total	3	35	173	125	47	39	1	8	6	4	1	29	16	81	181

Figure 54.—Heavy Weapons Company (bicycle), Volks Grenadier Division, total strength 211.

UNIT	Offs	Officials	NCOs	Pvts	Ind Hiwis	Rs	Pistols	Sniper Rs	R Grenade Launchers	Sub-MGs	Assault Rs 44	LMGs	Hv MGs	81-mm Mortars	120-mm Mortars	Bazookas	75-mm Inf Howrs	150-mm Inf Howrs	Mtr Vehicles	Motcls	H-Dr Vehicles	Tns	Hs	Bcls
Regtl Hq and Hq Co	12	1	30	165	18	126	26	10	9	46		10							3	3	27	6	61	40
Inf Bn	14	1	95	534	40	284	86	18	35	91	165	30	8	6			4		2	3	70	32	125	27
Inf Bn	14	1	95	534	40	284	86	18	35	91	165	30	8	6			4		2	3	70	32	125	27
Inf How Co.....	3		30	153	14	137	21		4	28		5			8			2	1		34	6	108	3
AT Co	2		19	146	6	91	62			14		4				72			1	1	19	12	30	2
Total	45	3	269	1,532	118	922	281	46	83	270	330	79	16	12	8	72	8	2	9	10	220	88	449	99

Figure 55.—Infantry Regiment of Infantry Division 45, total strength 1,849.

UNIT	Offs	Officials	NCOs	Pvts	Ind Hiwis	Rs	Pistols	Sniper Rs	R Grenade Launchers	Sub-MGs	Assault Rs 44	LMGs	Hv MGs	81-mm Mortars	75-mm Inf Howrs	Mtr Vehicles	Motcls	H-Dr Vehicles	Tns	Hs	Bcls
Bn Hq & Sup Plat.....	5	1	12	79	12	63	6		3	22		2				2	2	21	4	30	7
Gren Co	2		16	101	4	37	11	6	9	10	55	9						7	4	10	5
Gren Co	2		16	101	4	37	11	6	9	10	55	9						7	4	10	5
Gren Co	2		16	101	4	37	11	6	9	10	55	9						7	4	10	5
Hv Co	3		35	158	16	110	47		5	39		1	8	6	4		1	28	16	45	5
Total	14	1	95	534	40	284	86	18	35	91	165	30	8	6	4	2	3	70	32	125	27

[1] *Hilfswilliger (Hiwi)* is a Foreign Auxiliary, usually an Ex-pw.

Figure 56.—Infantry Battalion of Infantry Division 45, total strength 644.

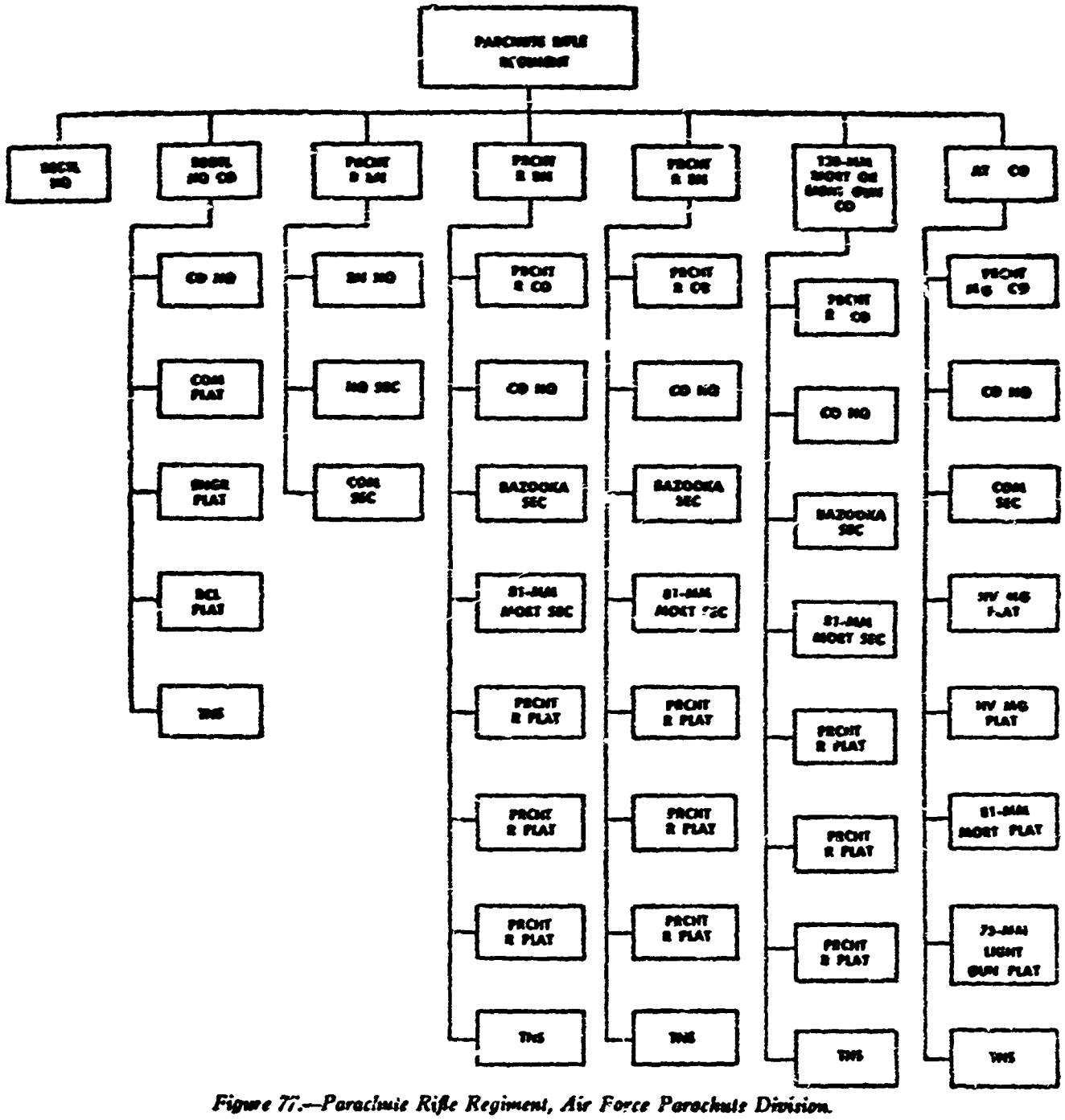


Figure 77.—Paraclmie Rifle Regiment, Air Force Parachute Division.

UNIT	Offs	NCOs	Pvts	Rs or Cbns	Pistols	Sub-MGs	LMGs	105-mm Guns/Hows	150-mm Hows	Mtr Vehicles	Mtrcls	H-Dr Vehicles	Trs	Hs	Bcls
Regtl Hq	5	2	18	17	6	7				3	2			5	1
Regtl Hq Btry.....	4	22	39	64	17	6	1			2	1	29	2	65	3
1st (Light) Bn.....	19	109	424	460	71	38	17	12		7	1	96	8	516	13
2d (Light) Bn.....	19	109	424	460	71	38	17	12		7	1	96	8	516	13
3d (Light) Bn.....	19	109	434	460	71	38	17	12		7	1	96	8	516	13
4th (Medium) Bn.....	19	109	557	604	71	37	17		12	4	1	124	8	697	13
Total	85[1]	460	1,906	2,065	307	164	69	36	12	30	7	441	34	2,318	56

[1] Including ten officials.

Figure 106.—Artillery Regiment, Infantry Division, 1944 Type, total strength 2,451.

UNIT	Offs	NCOs	Pvts	Rs or Cbns	Pistols	Sub-MGs	LMGs	150-mm Hows	Mtr Vehicles	Mtrcls	H-Dr Vehicles	Trs	Hs	Bcls
Bn Hq	6	3	8	10	7	4			2	1			12	1
Hq Btry Incl Tns.....	4[1]	22	111	126	16	9	2		2		34	2	142	3
150-mm How Btry.....	3	28	146	156	16	8	5	4			30	2	181	3
150-mm How Btry.....	3	28	146	156	16	8	5	4			30	2	181	3
150-mm How Btry.....	3	28	146	156	16	8	5	4			30	2	181	3
Total	19[1]	109	557	604	71	37	17	12	4	1	124	8	697	13

[1] Including two officials.

Figure 107.—Medium Artillery Battalion, Infantry Division, 1944 Type, total strength 685.

UNIT	Offs	NCOs	Pvts	Rs or Cbns	Pistols	Sub-MGs	LMGs	105-mm Guns/Hows	Mtr Vehicles	Mtrcls	H-Dr Vehicles	Trs	Hs	Bcls
Bn Hq	6	3	8	10	7	4			2	1			12	1
Hq Btry Incl Tns.....	4[1]	22	104	108	16	10	2		5		30	2	126	3
105-mm Gun/How Btry.....	3	28	104	114	16	8	5	4			22	2	126	3
105-mm Gun/How Btry.....	3	28	104	114	16	8	5	4			22	2	126	3
105-mm Gun/How Btry.....	3	28	104	114	16	8	5	4			22	2	126	3
Total	19[1]	109	424	460	71	38	17	12	7	1	96	8	516	13

[1] Including two officials.

Figure 108.—Light Artillery Battalion, Infantry Division, 1944 Type, total strength 552.

UNIT	Offs	NCOs	Pvts	Rs or Cbns	Pistols	Sub-MGs	LMGs	75-mm Guns	105-mm Guns/Hows	150-mm Hows	Mtr Vehicles	Mtrcls	H-Dr Vehicles	Trs	Hs	Bcls
Regtl Hq	5	3	7	7	3	5									4	
Regtl Hq Btry.....	4	23	68	74	14	7	1				7	2	15	4	42	4
75-mm Gun Bn.....	18	123	372	416	55	36	14	18			30	1	71	8	267	12
105-mm Gun/How Bn.....	16	87	270	300	43	28	10		12		22	1	56	6	211	10
105-mm Gun/How Btry.....	16	87	270	300	43	28	10		12		22	1	56	6	211	10
150-mm How Bn.....	16	86	277	308	43	28	10			12	18	8	87	6	327	13
Total	75[1]	405	1,264	1,405	201	132	45	18	24	12	99	13	285	30	1,062	49

[1] Including ten officials.

Figure 111.—Artillery Regiment, Volks Grenadier Division, total strength 1,744.

UNIT	Offs	NCOs	Pvts	Rfs or Cbns	Pistols	Sub-MGs	LMGs	75-mm Guns	Mtr Vehicles	Mcycls	H-Dr Vehicles	Trs	Hs	Bcls
Bn Hq	5	3	7	9	3	3			3	1			9	1
Hq Btry	4	24	101	107	13	9	2		3		26	2	90	5
75-mm Gun Btry	3	30	88	100	13	8	4	6	8		15	2	56	2
75-mm Gun Btry	3	33	88	100	13	8	4	6	8		15	2	56	2
75-mm Gun Btry	3	33	88	100	13	8	4	6	8		15	2	56	2
Total	18[1]	123	372	416	55	36	14	18	30	1	71	8	267	12

[1] Including two officials.

Figure 112.—Artillery Regiment, Volks Grenadier Division, total strength 513.

UNIT	Offs	NCOs	Pvts	Rfs or Cbns	Pistols	Sub-MGs	LMGs	105-mm Gun/Hows	Mtr Vehicles	Mcycls	H-Dr Vehicles	Trs	Hs	Bcls
Bn Hq	6	3	8	10	3	4			3	1			9	1
Hq Btry	4	22	83	92	14	8	2		3		26	2	90	5
105-mm Gun/How Btry	3	30	87	99	13	8	4	6	8		15	2	56	2
105-mm Gun/How Btry	3	30	87	99	13	8	4	6	8		15	2	56	2
Total	16[1]	85	270	300	43	28	10	12	22	1	56	6	211	10

[1] Including two officials.

Figure 113.—105-mm Gun-Howitzer Battalion, Volks Grenadier Division, total strength 371.

UNIT	Offs	NCOs	Pvts	Rfs or Cbns	Pistols	Sub-MGs	LMGs	150-mm Hows	Mtr Vehicles	Mcycls	H-Dr Vehicles	Trs	Hs	Bcls
Bn Hq	6	3	8	10	3	4				1			9	1
Bn Hq Btry	4	23	95	100	14	8	2		6	5	29	2	100	
150-mm How Btry	3	30	87	99	13	8	4	6	6	1	29	2	109	6
150-mm How Btry	3	30	87	99	13	8	4	6	6	1	29	2	109	6
Total	16[1]	86	277	308	43	28	10	12	18	8	87	6	327	13

[1] Including two officials.

Figure 114.—150-mm Howitzer Battalion, Volks Grenadier Division, total strength 379.

UNIT	Offs	NCOs	Pvts	Rs or Cbts	Pistols	Sub-MGs	LMGs	Hv MGs	81-mm Morts	Flame Throwers	Mtr Vehicles	Mtrcls	H.Dr Vehicles	Tks	Hs	Bcls
Bn Hq	9[a]	14	61	60	17	7					10	8	3	1	10	37
Engr Co (Bcl)	3	26	150	128	49	2	9	2	2	6	1	3	16	8	29	130
Engr Co (Bcl)	3	26	150	128	49	2	9	2	2	6	1	3	16	8	29	130
Total	15[a]	66	361	316	115	11	18	4	4	12	12	14	35	17	68	297

[a] Including three officials.

Figure 134.—Engineer Battalion, Volks Grenadier Division, total strength 442.

UNIT	Offs	NCOs	Pvts	Rs or Cbts	Pistols	Sub-MGs	LMGs	Mtr Vehicles	Mtrcls	H.Dr Vehicles	Tks	Hs	Bcls
Bn Hq	6	6	8	9	8	3		4	3				4
Tp Co	3	27	112	131	10	1	5	19	3	6	[illegible]	34	
Rad Co	3	17	85	94	10	1	4	16	3				
Sup Plat	2	7	29	32	6		2	5	1	6		10	
Total	14[a]	57	234	266	34	5	11	44	10	12	2	44	4

[a] Including three officials.

Figure 137.—Signal Battalion, Volks Grenadier Division, total strength 305.

UNIT	Offs	NCOs	Pvts	Rs or Cbts	Pistols	Sub-MGs	LMGs	Hv MGs	81-mm Morts	75-mm Inf Hows	Mtrcls	H.Dr Vehicles	Tks	Hs	Bcls
Co. Hq	1	8	18	17	3	7					1	3	2	11	18
Sub-MG Plat (Bcl)	1	3	31	7	2	26	2					2	1	6	32
Sub-MG Plat (Bcl)		4	31	7	2	26	2					2	1	6	32
R Plat (Bcl)		4	31	22	4	9	3					2	1	6	32
Hv Wpn Plat	1	5	34	17	12	11		2	2			6	5	16	29
Inf How Sec		4	24	19	3	5	1			2		4		11	23
Total	3	28	169	89	26	84	8	2	2	2	1	19	10	56	166

[a] May be replaced by a *Füs* Bn similar to the Inf Bn (Bcl).

Figure 141.—Füsilier Company, Volks Grenadier Division, total strength 200.

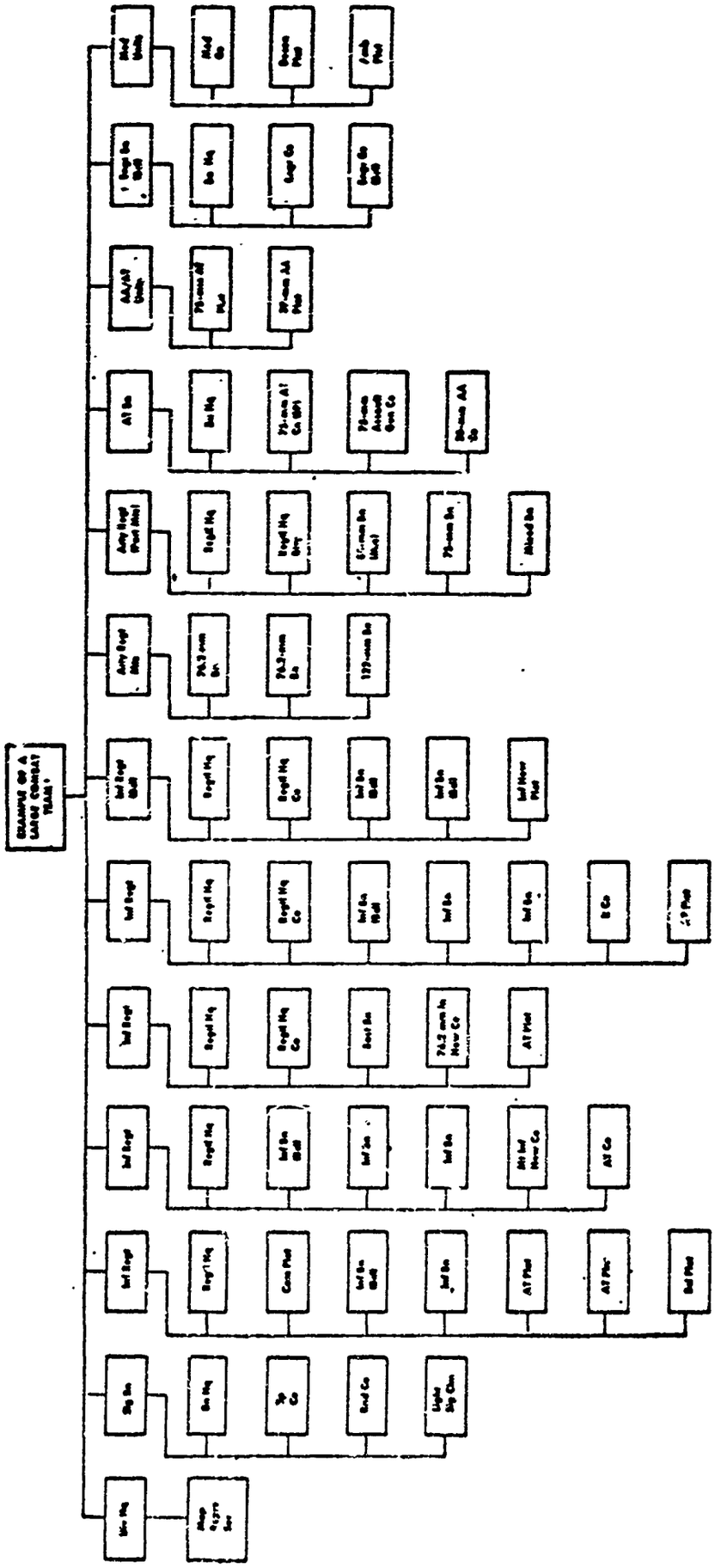


Figure 155.—Example of a Large Combat Team.

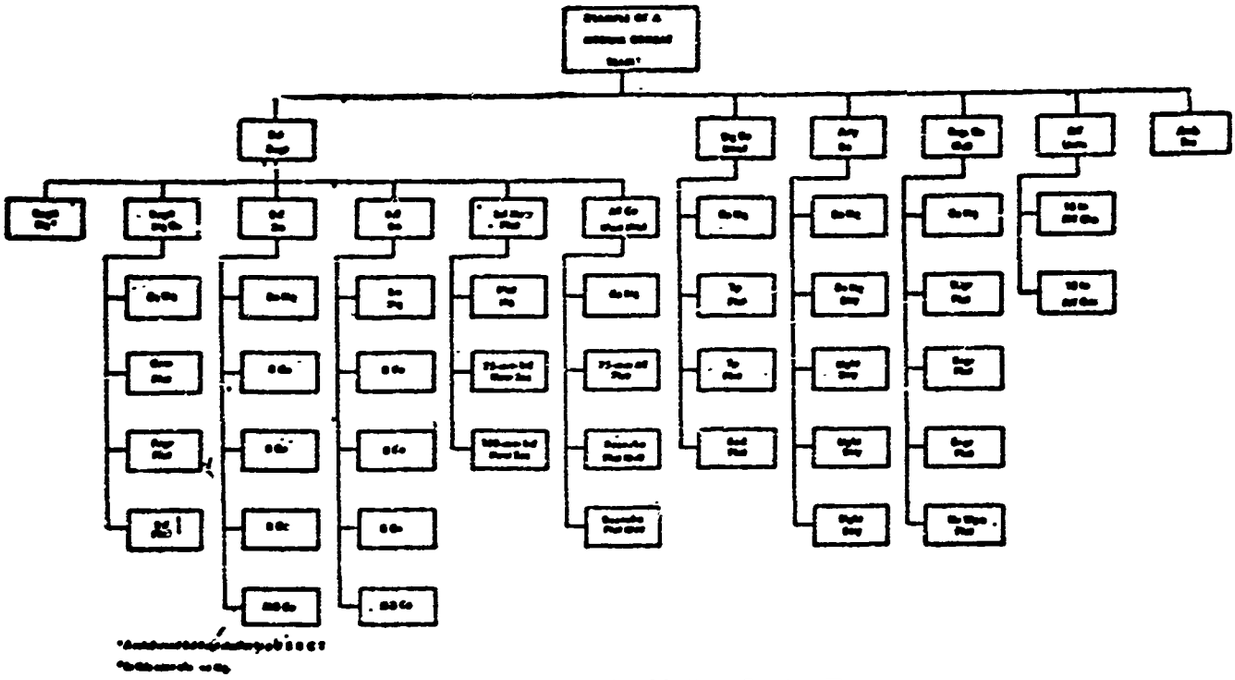


Figure 157.—Example of a Medium Combat Team.

UNIT	Offs	NCOs	Pvts	LMGs	Hv MGs	81-mm Morts	Bazookas	Flame Throwers	75-mm AT Guns	75-mm Inf Hows	150-mm Inf Hows	105-mm Gun/Hows
Bcl Regt	46	278	1,510	91	12	19	34		3	2	1	
Sig Co (Mtz)	1	5	50									
Arty Bn	15	100	400	9								12
Engr Co (Bcl)	3	20	120	3	1	1		2				
MT Units		3	12	2								
Amb Sec		1	4									
Total	65	407	2,096	105	13	20	34	2	3	2	1	12

Figure 158.—Example of a Medium Combat Team, total strength 2,568.

UNIT	Offs	NCOs	Pvts	LMGs	Hv MGs	81-mm Morts	Bazookas	75-mm AT Guns	75-mm Inf Hows	150-mm Inf Hows
Regtl Hq	7	1	16							
Regtl Hq Co	5	28	165	9						
Bcl Bn	15	100	550	37	6	9				
Bcl Bn	15	110	570	38	6	10				
Inf How Plat	1	10	55	4					2	1
AT Co (Part Mtz)	3	29	154	3			34	3		
Total	46	278	1,510	91	12	19	34	3	2	1

Figure 159.—Bicycle Regiment, Medium Combat Team, total strength 1,834.

UNIT	Offs	NCOs	Pvts	Rs or Cbns	Pistols	Sub-MGs	LMGs	Hv MGs	Rkt Pistols	81-mm Morts	Bazookas	20-mm AA Guns	75-mm AT Guns	Mtr Vehicles	Mtrcls	H-Dr Vehicles	Bcls
CT Hq	1			3	1									1			1
Hv Wpn Co	2	4	50	43	8	3	2			2	—	4		5			1
R Co	1	11	75	65	14	9	9	2	6								
AT Co	2	5	38	38	3	4					9		2	5	1	6	3
Total	6	20	163	149	26	16	11	2	6	2	9	4	2	11	1	6	5

Figure 160.—Example of a Small Combat Team, total strength 189.

UNIT	Offs	NCOs	Pvts	Rs or Cbns	Pistols	Sub-MGs	LMGs	81-mm Morts	Bazookas	20-mm AA Guns	Mtr Vehicles	Bcls
20-mm AA Plat	1	4	37	34	6	3	2		—	4	4	1
81-mm Mort Plat	1		13	9	2			2			1	
Total	2	4	50	43	8	3	2	2	—	4	5	1

Figure 161.—Heavy Weapons Company, Small Combat Team, total strength 56.

UNIT	Offs	NCOs	Pvts	Rs or Cbns	Pistols	Sub-MGs	Bazookas	75-mm AA Guns	Mtr Vehicles	Mtrcls	H-Dr Vehicles	Bcls
Co Hq	1	1	4	4	1	1				1		1
Mun Sec		1	2	1	2				2			
Bazooka Sqd		1	9	9		1	9			—	6	
AT Gun Plat	1	2	23	24		2		2	3			2
Total	2	5	38	38	3	4	9	2	5	1	6	3

Figure 163.—Antitank Company, Small Combat Team, total strength 45.

UNIT	Offs	NCOs	Pvts	Rs or Cbns	Pistols	Sub-MGs	LMGs	Mtr Vehicles	Mtrcls	H-Dr Vehicles	Tlrs	Hs	Bcls
Regtl Hq	8	6	12	18	5	3	1	6	3				40
120 Ton Clm (Mtz)	2	17	95	112	2		2	19	1				
30 Ton Clm	2	12	80	92	2		1			42		100	5
30 Ton Clm	2	12	80	92	2		1			42		100	5
Sup Plat	1	3	60	65	1		1			19		48	3
Ord Co	3	18	67	83	3		1	5	1				10
Maint Plat	2	8	50	58	2		1	6	1		4		5
Adm Co	8	22	134	156	8		3	28	1		11		5
Med Co	10	34	150	167	27		2	16	2	17	2	46	20
Amb Plat	1	5	34		40			21	2				
Vet Co	4	15	100	102	17		2	7	1	10	1	94	10
Fld Post Office	3	9	6	6	12			3					
Total	46[1]	161	868	951	121	3	15	111	12	130	18	388	103

[1] Including eight officials.

Figure 170.—Supply Regiment, Volks Grenadier Division, total strength 1,075.

APPENDIX D

TACTICAL ACTION OF BICYCLE TROOPS

[Excerpts from Cyclist Training(55) and Die Radfahrtruppe...(10)*]

*Translated.

PART II.—WAR.

CHAPTER IV.

TACTICAL ACTION OF CYCLISTS.

98. *General principles.*

1. The tactical methods of cyclists depend on :—
   (i) The nature of the country in which operations are being carried out, and to a lesser degree on the weather and the state of the roads. Lack of suitable roads or paths destroys the mobility of cyclists, whilst bad roads or paths and bad weather retard it.
   (ii) A high standard of efficiency in march discipline. Slowness in deployment and consequent failure to surprise will result from a low standard of march discipline.

In the case of cyclist formations which are allotted to corps and divisional mounted troops and whose rôle, therefore, entails co-operation with cavalry, the principles governing their tactical action depend to some extent on the maintenance of such co-operation. (*See* Chap. VIII.)

2. Cyclists can be used to the best advantage in country where the roads and paths are good and numerous, for under these conditions they will be able to move quickly to the point where their intervention in the fight is required, to deploy rapidly, and to move again to a fresh position rapidly should necessity arise. This power of rapid movement in a favourable country enables cyclists to act suddenly

from any direction more quickly than infantry. Consequently they may be able to deal blows at the enemy's flanks and rear before he has time to meet them, or to bring heavy fire on the heads of his columns before he can deploy.

The power of rapid deployment, which enables cyclists to act quickly on an extended front, makes it difficult for a slower moving enemy to turn their flanks. They can thus deceive an enemy as to the nature and strength of the force by which he is opposed, and are therefore endowed with relatively greater staying power.

It follows then that the chief factors necessary to bring about successful tactical action of cyclists are :—
   (i) Favourable country, which allows rapidity of movement and surprise.
   (ii) Rapid deployment, and the immediate development of *full strength and fire power*, which mystify the enemy and cause him to hesitate and delay.

99. *The approach mounted to the first fire position.*

1. The commander of a body of cyclists who intends to act dismounted should decide, after personal reconnaissance, on his plan of action, and on the approximate place where he intends to deploy. Before moving off along the road he should assemble his subordinate commanders, at a point where the ground over which he is going to act can be seen, explain his plan, and issue his orders. The latter should be short, clear, and complete, in order to ensure rapidity of action and to avoid confusion. Occasions may, however, arise when time will not admit of the commander explaining his plan before he moves forward. In such cases he should be accompanied by his subordinate commanders, and explain the plan and his orders as they move along the road.

APPENDIX D

TACTICAL ACTION OF BICYCLE TROOPS

[Excerpts from Cyclist Training (55)]

When approaching a fire position, the commander, whenever circumstances permit, should ride well ahead of his main body in order to have time to reconnoitre.

2. Whenever a body of cyclists is halted, the commander should have a reconnaissance made of all roads which lead in any direction in which he is likely to move.

3. In order to make full use of their mobility, cyclists should advance mounted to a position of assembly as near to the fire position as is compatible with the necessity for concealment.

100. *Deployment.*

1. The position chosen for deployment should fufil the following conditions:—

(i) It should be close to the firing position.
(ii) It should be possible to reach it mounted.
(iii) It should be concealed.

2. Bicycles will usually be either grounded or placed against the side of the road, and should face in the direction in which it is intended that the next movement should be made.

A high standard of efficiency in march discipline, dismounting, and disposal of bicycles is essential in order to ensure that no time is lost in reaching the fire position and opening fire.

3. The men, after disposing of their bicycles, will fall in as directed, and a guard will be told off to take care of the machines; usually a N.C.O. and four men will be sufficient for the cycles of one company.

101. *Methods of dismounting.*

1. *Shortening the column before dismounting.*—When a body of cyclists, moving mounted along a road, is required to come into action to the front, the length of the column may be reduced by one-half by giving the order *Overlap*.

On this command the second, fourth and sixth platoons, &c., will disengage their heads and will come up on the flank of the platoon immediately in front of them; the whole column will then close up before dismounting. The men will dismount and place their cycles on both sides of the road so as to leave the road clear.

2. *Dismounting half the men.*—In cases where it is not required to move far away from the bicycles, every man may be used in the firing line. But when the men are required to make a long advance on foot after dismounting, as usually occurs when an outflanking movement across country is undertaken, it will often be necessary to leave half the men with the bicycles to bring them on later.

On the command *Right or Left Files for Action—Dismount*, the men indicated will dismount and follow their platoon leader on foot, handing their bicycles over to the remainder. Two section leaders should go with the dismounted party. The platoon serjeant and two section leaders should remain with the bicycles, and will bring them forward as soon as the ground in front is clear. Every effort must be made to avoid sending men back long distances to fetch their machines.

102. *The attack.*

1. The power possessed by cyclists of being able to develop their maximum fire effect rapidly from any direction enables them to envelop by fire an unprepared or slower moving enemy. Enveloping or converging fire has a great moral and material effect and should generally be employed when opportunities occur.

2. When a hostile force is encountered and when the country is favourable, a force of cyclists may be able to push platoons or companies round one of the enemy's flanks.

3. It will frequently happen, however, that owing to the unfavourable nature of the country, cyclists will be unable to make use of their mobility, or that they cannot conveniently turn or envelope the enemy's flank. They must therefore be prepared to carry out a deliberate attack in the manner described in "Infantry Training."

4. When cyclists are acting alone in attack, the retention of a small mounted reserve will often be advisable.

103. *The defence.*

1. Cyclists will often be required to occupy localities temporarily for defence, either in support of cavalry or until the arrival of the slower moving infantry. When so employed they should make full use of their mobility, and by offensive action cause the enemy to deploy prematurely and thus delay his advance. In the defence, as in the attack, concealment and surprise are of great importance, but the paramount consideration must always be to bring an effective fire to bear on the enemy.

Whenever time and means permit, the position should be put in a state of defence, but it should always be remembered that a purely defensive attitude is not all that is required in such circumstances.

2. During the initial stages of a defensive action the commander should employ a minimum number of men, retaining the remainder in readiness to act as circumstances may demand, *e.g.*, for reinforcing his line, for outflanking the enemy, or for a counter-attack, as soon as the enemy has disclosed his dispositions.

3. The value of enfilade or converging fire is as great in defence as in attack, and occasions will frequently occur when a small party, favourably situated on a flank and opening a rapid fire at the right moment, may effectively check the enemy's advance.

4. When the object of the operation is merely to delay the enemy, it will usually be advisable to open fire at long range in order that he may be forced to deploy at some distance from the position; but the chance of surprise should always be kept in view, and the defeat of an enemy may often be attained and be made more decisive by allowing him to advance to within close range before opening fire.

104. *Delaying action.*

1. A force of cyclists, when given a delaying rôle, can usually obtain the best results by vigorously attacking the enemy and breaking off the fight as soon as he has deployed. A succession of such attacks from different points will harass and delay the enemy.

It will generally be advisable to attack the enemy's flanks, not only because they are usually more vulnerable than his front, but also because he will often be forced to turn aside to meet the flank attack, and thus be delayed more than by a frontal attack.

In order to have sufficient depth of ground to fight a delaying action it will often be necessary to push forward to meet the enemy.

2. The movements of the enemy may be impeded by the destruction of stores, *matériel*, railway lines, and railway and road bridges, by the seizure of water, gas, and electric light supply, and by the removal of telephone and telegraph instruments. Commanders of cyclist units, however, should

always receive definite instructions as to how far they are at liberty to carry out the demolition of railways, bridges, and telegraph or telephone lines. As a general principle these instructions will emanate from general headquarters, but very exceptional circumstances may occasionally justify a subordinate commander in ordering demolitions of this description. Such action will be reported at once to superior authority.

Demolitions should always be carried out under the supervision of an officer.

CHAPTER VI.

PROTECTION

112. *The employment of cyclists for protection.*

1. The general principles of protection described in F.S. Regs., Part I, Chapter V, govern the action of all troops when employed in a protective rôle, but the characteristics peculiar to cyclists necessitate certain special principles in addition.

2. Cyclist units may be used protectively either in co-operation with the other arms or when acting by themselves as an independent force.

In the first case, they are most commonly employed as corps and divisional mounted troops in the rôle of "Protective Reconnaissance," and their employment in this work is based on the principles contained in Chapter VIII on the "Employment of Cyclists with Cavalry and Motor Machine Guns."

In the second case they must undertake all duties which fall to the lot of protective troops; but it must be borne in mind that, in any movement over an area of ground which has not been previously reconnoitred, their mobility decreases if there is a lack of good parallel or branch roads

for patrols to move along or piquet, and that they are more liable to be ambushed in such circumstances than cavalry or infantry.

113. *Cyclists employed with cavalry and infantry.*

1. When employed with a force which includes infantry but not cavalry, cyclists will perform the duties which generally devolve on the latter. During a march they will carry out the necessary reconnaissance, will drive back small parties of the enemy who attempt to approach too close with a view to reconnoitring or delaying the main body, and will be the first to meet and delay any large force threatening a determined attack. When the force is at rest cyclists may with advantage furnish both by day and night the standing patrols sent out to watch the principal approaches (*see* F. S. Regs., Part I, Sec. 88), or, if there are suitable roads leading to the outpost line, they may provide a mobile reserve to the outpost troops so that any part of the line may be reinforced rapidly.

2. When forming part of a force which includes cavalry, cyclists may be employed with that arm in obtaining information by day provided the country favours their use (*see* Chapter VIII). They will usually form part of the advanced guard mounted troops, or the rear party of a rear guard in the case of a force retiring.

At night they may furnish the standing patrols when the roads are favourable and the country is enclosed. In these circumstances cyclists are more useful than cavalry, as they can move silently along the roads, and do not labour under the same disadvantages when compared with cavalry as they do by day, in that by night both are tied to the roads.

114. *Cyclists moving independently and alone.*

1. It is impossible to lay down rules either as to the distribution of a body of cyclists when acting independently on protective duties or as to the number of roads it should use. The following points, however, should be considered:—

(i) The first object of cyclists in an attack is to bring every available rifle to bear at once. In close country, therefore, where suitable parallel roads exist, it will usually be convenient to march on more than one road. Moreover, it is more difficult for an enemy to surprise several columns than one, and, conversely, it is easier to find out his weak point and concentrate against it.

(ii) Where parallel roads are few and far between, and means of lateral communication are unfavourable, it will be advisable to move on one road only, as it will be easier for a column which is moving on one road to make a concentrated attack than for several columns which are not in close touch.

The solution of this question depends entirely on the nature of the country, the network of roads, and the existence of a carefully organised and thoroughly efficient system of communication within the cyclist unit.

2. When acting independently, cyclists will observe the principles of protection laid down in F. S. Regs., Part I, Chap. V. In applying these principles cyclists must depend largely upon their mobility for protection against surprise.

115. *Advanced guards.*

(*See also* Secs. 122 and 130.)

1. In such circumstances the advanced guard, or advanced guards in the case of several columns moving on parallel roads, will move forward from one covered position to another by means of successive bounds.

Patrols are sent forward to reconnoitre the next position, and as soon as it is found to be clear the vanguard moves rapidly forward over the intervening ground whilst other bodies in rear gradually close up.

During these movements side roads must be either piquoted or reconnoitred.

The advanced guard commander will usually lay down the limit of special bounds along which lateral communication must be established.

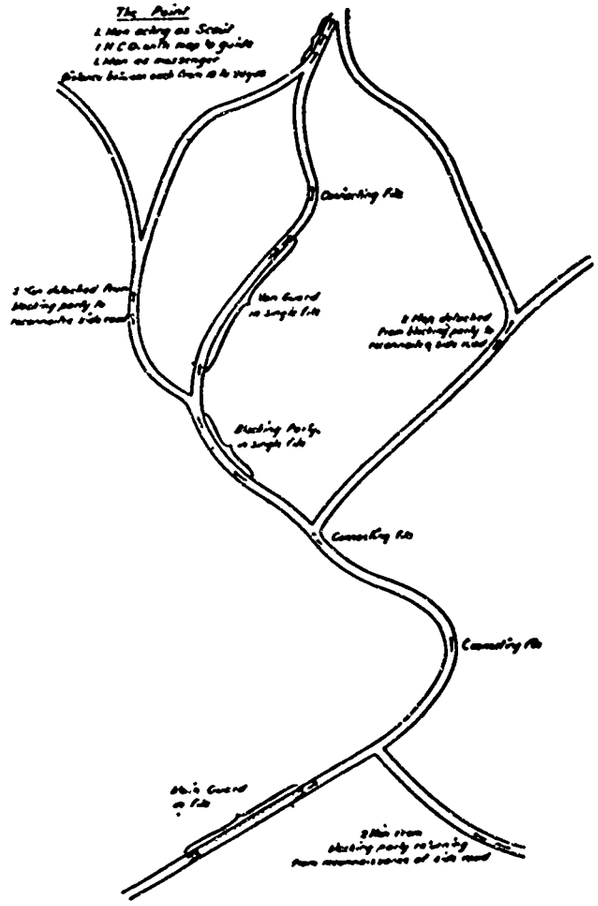
2. A cyclist advanced guard of this nature will move in the formation shown in Plate V. The distance from point to van guard depends entirely on the country; in open country it may be as much as three-quarters of a mile. It is better to have too much than too little distance. Similarly the distance between the rear of the van guard and the head of the main guard can be as much as 1½ miles in open country.

Experience alone will teach what distance should be kept between each component part of the advanced guard. For peace training it is advisable to exaggerate distances. If the roads are good, bodies of cyclists can with safety march at greater distances apart than can bodies of infantry, for reinforcements can be brought up with greater rapidity and cyclist patrols, owing to their mobility, can cover a much wider extent of country than infantry patrols.

3. Connecting files will be reduced to a minimum. It will very rarely be necessary to have more than three between the point and van guard. In open country they may sometimes be dispensed with altogether

PLATE V.

CYCLIST ADVANCED GUARD.



The van guard and point will be about a third of the whole strength detailed for the advanced guard.

The strength of the blocking party depends on the number of side roads that have to be reconnoitred; but in no circumstances should it be large. If there is a great drain on its numbers it can always be replenished from the main guard.

It rides behind the van guard at such a distance that the patrol which it sends forward reach the several side roads just ahead of the van guard. The blocking party should therefore be under the control of an intelligent N.C.O., who is also a good map reader. He will be careful to send on men in sufficient time to ensure that the van guard is not delayed by the reconnaissance of side roads.

4. There are two methods of securing side roads, viz.:—

(i) The literal blocking of a road by sending two or more men from the blocking party to suitable points on it where they remain, within touch of one another, until the column has passed, when they rejoin the rear of the column.

(ii) The circuitous reconnaissance system, when two or more men from the blocking parties are sent along the side road, and eventually move forward by another route to rejoin the column on the main road.

Of the two systems the latter is more suitable for cyclists, as it enables them to retain mobility and requires less men. But it is a much more difficult method, for the men must be excellent map readers and intelligent scouts, otherwise they are apt to get lost.

116. *Rear guard.*

1. In rear guard work the same principles apply. The need for each party splitting up into component parts, similar to those of an advanced guard, is not so great, because, as one of the chief objects of delaying action is to bring as much fire to bear as possible from the very start at long range, it can be more effectively achieved if each party remains intact, except for the detachments required for local protection and for lateral communication. The bulk of each party can then occupy suitable positions, on which the reconnoitring patrols can fall back; when these positions are evacuated, the necessary number of men can again be left to watch and keep touch with the enemy's movements, while the party itself proceeds to the next previously chosen position.

2. In a country well supplied with roads, cyclists are peculiarly well fitted for rear guard work. Their mobility enables them to withdraw very quickly provided their line of retreat is well chosen. They can, therefore, hold on to their positions longer than other arms and employ a greater proportion of their numbers in the fire fight. Thus they are able not only to cause the enemy greater delay, but also to keep his movement under more prolonged observation.

117. *Flank guard.*

1. F.S. Regs., Part I, Chap. V, Sec. 70, states that a "flank guard may either move parallel to the main body or take up a position on the threatened flank."

2. Of these two methods of protecting a flank the second is more suitable for mobile troops, and cyclists, whether employed in conjunction with other arms or working independently, will normally best achieve their purpose by taking

up a series of flank positions, moving quickly from one to another and remaining in each sufficiently long to protect the main body while passing.

3. If, on the other hand, a body of cyclists, employed as a flank guard, is continuously moving parallel to the force it protects, its dispositions are governed by the principles for the employment of cyclists as an advanced guard.

4. In both methods piquets will be pushed out along all the likely roads for the enemy's advance, and a central support will be maintained between them and the main column.

118. *Outposts.*

1. The duties of outposts are described in Field Service Regulations, Part I, Secs. 75–80.

2. Normally cyclists will seldom be used for outposts at night, as during the march they will be required for the duties of reconnaissance and communication.

3. On the conclusion of the day's march they will, however, be usually required to take up a temporary piquet line, with patrols pushed to the front, in order to cover the movement of the infantry outposts into position.

4. At night, too, a few cyclists can be usefully attached to the infantry outposts either as orderlies or as standing patrols, for which they are specially suitable owing to the silence of their movements.

5 Care must be taken, especially at night, to select suitable places where the cycles can be kept and be easily found In the case of a detached post, cycles should be stacked or grounded on the road close by.

Rifles are on no account to be left with the cycles.

CHAPTER VII.

INFORMATION AND INTERCOMMUNICATION.

(*See also* F. S. Regs., Part I, Ch. VI.)

119. *Cyclists in reconnaissance.*

Cyclists possess certain peculiar advantages and characteristics which render them valuable for reconnaissance work, but it must be remembered that their value is restricted by two limitations, viz. :—

(i) They can move freely only in a country well supplied with roads.

(ii) Their movements at all times are so restricted by the necessity of keeping to roads that they run a risk of being ambushed and captured in an enclosed country.

Therefore, when cyclists are working independently on reconnaissance in an enclosed country, their rate of progress depends on the degree of caution it is necessary to exercise in order to make the risk of ambush as small as possible. But when they are working conjointly with cavalry as corps or divisional mounted troops, this risk can be obviated or minimised by the use of mixed patrols; the mobility of the cyclist can be retained for road reconnaissance, while the search of intervening country, woods, or likely places for ambushes can be made simultaneously by the cavalry.

It is the co-operation of these two arms, in a degree dependent on the nature of the country, that gives the best results in all reconnaissance work.

121. *General principles of reconnaissance.*

1. Strategical, tactical, and protective reconnaissances are carried out by means of patrols or detachments, the movements of which depend upon the nature of the reconnaissance, i.e., whether it is strategical or tactical, or whether it is protective.

In the former case the movements of patrols and detachments should be based on those of the enemy, rather than on those of the force from which they are detached.

In the latter case their movements must be based almost entirely on those of the force whose safety it is their duty to secure.

2. It is usually on the cavalry that the collection of information devolves; but occasions will arise when cyclists will be called on to carry out this duty, both in the absence of, or in conjunction with, the cavalry, or in defence of the coast. A well-arranged service of protection on the part of the enemy or the presence of hostile inhabitants will, however, often stop patrols before they have gained their object. Unless supplemented by larger bodies ready to fight and make an opening for them to advance further, they will often be able to find out but little; or, should they succeed when unsupported in penetrating a protective line, they will be unable to send back their information.

In favourable circumstances skilfully handled reconnoitring patrols and small reconnoitring detachments may obtain information of value without the employment of force; but, as a rule, to carry out an effective reconnaissance cyclists must be prepared to fight, and, to fight successfully, a certain concentration of force is necessary.

3. Throughout the service of reconnaissance economy of strength should be practised. It will be impossible to use

officers as leaders of all patrols; generally speaking they should be employed only to lead those of particular importance.

4. The strength of a reconnoitring detachment should be limited; for the larger it is the more difficult will it be to escape observation. It should, however, be sufficiently strong to ensure that the information gained is transmitted without delay to the superior commander to whom reports have to be furnished.

When a reconnoitring patrol is not strong enough to reach a position from which it can observe, or to transmit its information back, a larger detachment should be sent. The rôle of this detachment is to throw out patrols, to which it acts as a support. It opens the way for the patrols, and forms a rallying point for them if required. It collects information by taking prisoners, seizing telegraph offices, &c., and forms stations for transmitting messages from its patrols to the rear.

The size of these detachments depends largely on the following factors:—The number of patrols and the number and strength of the connecting posts which they have to furnish; the distance they have to go; the resistance they are likely to meet with; and the attitude of the inhabitants.

Their size, therefore, cannot be fixed by rule, but must always be considered with reference to the task they have to perform and the conditions under which they have to work.

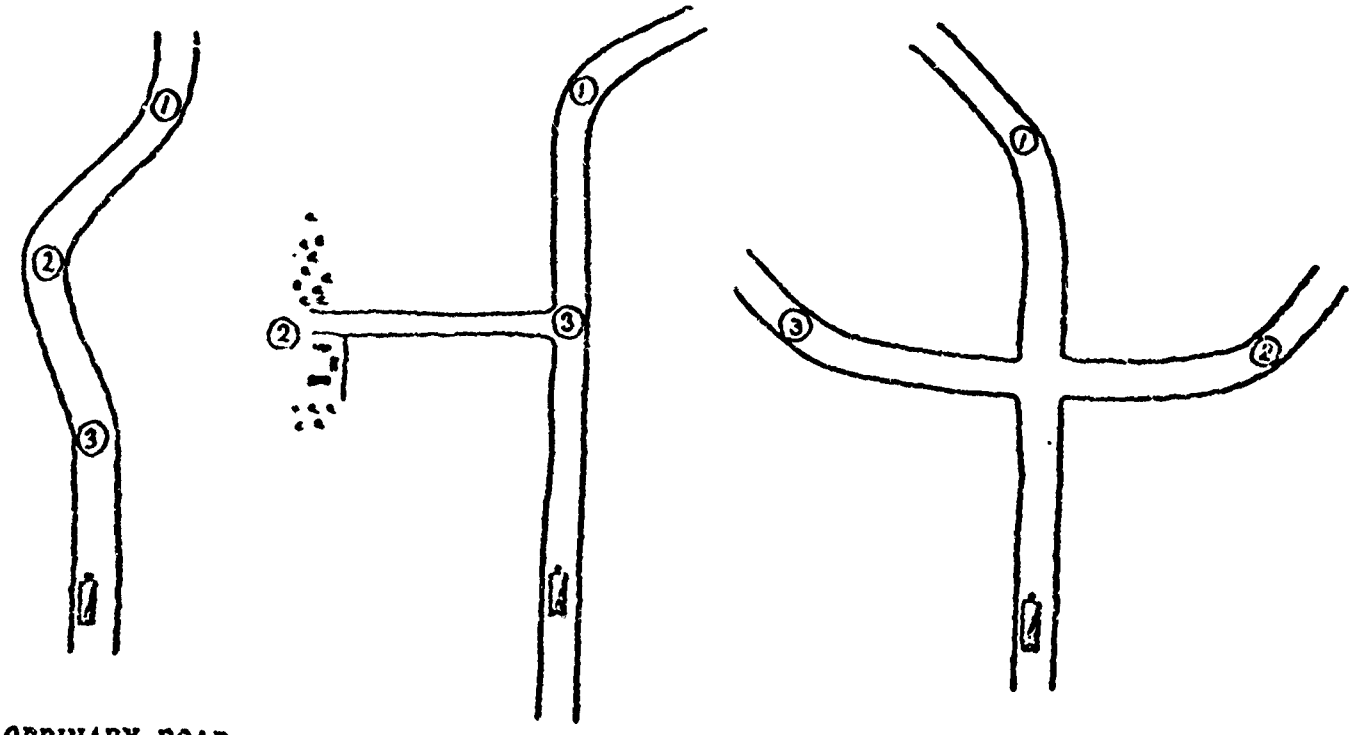
5. The number of patrols and detachments will depend largely on the object in view. If the enemy's cavalry is still a fighting force, cyclists alone will be employed for patrols only in very exceptional circumstances, owing to their vulnerability when moving independently.

To face page 111.]

PLATE VI.

POINT OF AN ADVANCED GUARD OR OF A RECONNOITRING PATROL.

(The 1, 2, 3. System of Reconnoitring Roads.)



ORDINARY ROAD

BY-ROAD.

CROSS-ROADS.

122. *The formation of the point of an advanced guard or of a reconnoitring patrol.*

1. A useful method of reconnoitring a road, known as the 1, 2, 3 system, is given in Plate VI, which shows the distribution on a road of the point of an advanced guard, or of a reconnoitring patrol, and the section or other body in immediate support to it.

2. Normally the point consists of three men, numbered 1, 2 and 3 in the Plate. They are strung out along the road, but must always maintain communication by sight. The distance from one scout to another must be elastic; it will depend to some extent on the distances between bounds (*see* Sec. 115). In ordinary enclosed country the distances between scouts will be about 100 yards, and the support will follow at some 200 yards distance in single file.

3. When a by-road is met No. 2 moves down it, and No. 3 moves up to the junction where he halts. When the advance is resumed Nos. 2 and 3 change places.

4. When cross-roads are met, Nos. 2 and 3 scouts will always reconnoitre the roads right and left respectively. Consequently, in order to maintain touch, two men will be sent up to the cross-roads by the support commander.

These two men replace in the point the two original scouts who remain in observation on the branch roads until the support has passed, when they rejoin the support.

123. *Reconnaissance of villages.*

1. The support of the point will often not be strong enough to make a proper reconnaissance of villages along the route. Assistance must, therefore, be sent up from the troops in rear.

2. When patrols consist of both cavalry and cyclists, the

former will be sent round the outskirts of the village while the latter explore its interior.

3. Patrols must bear in mind the probability that the enemy will have machine guns concealed in buildings for the purpose of enfilading roads through a village.

Until a village has been reported clear by the scouts and patrols, it should not be entered by the troops who are following them.

4. A rallying point should always be arranged before a village is examined. This point should preferably be on the main road a little way on the far side of the village.

124. *Instructions for a patrol or larger reconnoitring detachment.*

1. When time permits written instructions should be given to the patrol or detachment leader.

He should be informed:—

(i) What is known of the enemy and of the area and inhabitants of the country in which he is to operate.
(ii) The probable moves of neighbouring reconnoitring detachments as far as they concern him.
(iii) What information is required.
(iv) Approximately to what distance and in what direction he must go.
(v) About how long he may expect to be away.
(vi) Where reports are to be sent and the means of communication available.

He should be given an opportunity of considering his instructions and of asking questions on any point that is not clear to him.

Scouts when sent out on a mission should receive similar instructions.

The copy of the instructions given to the patrol leader should be destroyed before the patrol or detachment starts.

2. When patrols or detachments have to march considerable distances success will to a great extent depend on the careful arrangements and preparations made by the patrol or detachment leader before starting.

Such questions as the time of starting, supplies, transport, possible positions for connecting posts must all be considered, and a clearly defined plan of action must be adopted.

3. Supplies and stores that cannot be carried on the cycles should be reduced to a minimum, and should be carried on the most suitable transport available.

4. After receiving his instructions and forming his plan of action the leader should explain his instructions and intentions to his subordinates, so that every man may know how to carry on the duty in the event of accidents. Men temporarily detached should be given information as to where they can rejoin.

All ranks should be warned that, if captured and questioned, they should refuse to give any information beyond stating their rank and name, and that in civilized warfare by international custom they cannot be punished for refusing to give any further information.

125. *The leading of a patrol or larger reconnoitring detachment.*

1. Common sense rather than rules must guide the conduct of a reconnoitring detachment or patrol. The leader may employ mobility, deception, force, or extreme boldness in order to obtain information; safety may be sought in mobility, secrecy, or a wise choice of routes. But to obtain

the required information it is essential that the leader must not be drawn away from his mission.

The actual reconnaissance must as a rule be made by the leader of a patrol, the men who accompany him being employed to provide his protection and to transmit his messages.

2. The normal method of advance in daylight is to move rapidly from one suitable position to another, feeling the way forward on each occasion by detaching scouts. By advancing in this manner the patrol or detachment is less liable to be surprised and the leader obtains more time for observation than would be the case if the rate of march were uniform throughout the journey.

The general rate of advance will depend on the proximity of the enemy and the nature of the country; when there is reasonable ground for belief that the enemy is at a distance the time spent in searching ground will be curtailed.

3. Protection should be arranged on all sides, but the commander should keep his men as concentrated as the safety of his force permits. Undue dispersion leads to unnecessary fatigue and to loss of control by the leader. The flanks and rear of a patrol may often be sufficiently protected if different men are made responsible for keeping a look out to each flank and to the rear, both when the patrol is moving and when it is halted.

4. Information will usually be obtained in the daytime; but, when it is impossible to move in daylight without being discovered, it may be advisable to move by night up to the neighbourhood of the enemy, and to observe by day from a concealed position.

5. When moving by day, every means must be taken to avoid being seen by the enemy. Scouts should keep in

the shadows as much as possible by day or night. A bright button or a polished bicycle saddle may disclose the presence of an otherwise hidden patrol. Small reconnoitring parties should not rest in one place, but should remain scattered, so that all will not be captured if suddenly attacked.

Halts for the night should be made in isolated woods or lonely farms, which the enemy's patrols are not likely to visit; when farms are occupied the inhabitants must be seized. If small detachments halt before darkness sets in, they should change their position after dark; it will usually, too, be safer to change the position even when a halt is made after dark. Patrols should be clear of their night resting places before daybreak.

6. No man should carry any written instructions, private diaries or papers that might give information to an enemy.

In the presence of civilians, whether friendly or otherwise, no mention should be made of the direction from which the detachment or patrol has come or of the intended advance; it is often advisable to give the inhabitants false information.

7. A patrol on finding the enemy should as a rule send in a report and then, unless such action would be contrary to instructions, should follow him up, watching from safe hiding places. Detailed information as to his strength, dispositions, and movements should be sent in as soon as obtained.

8. If the enemy is not found where he was expected, the reconnoitrer should consider what his commander would require him to do. Negative information should always be sent back.

9. Although patrols are not sent out with the primary object of fighting, and although they should seldom fight if without it they can attain their object by a careful use of the ground, it must be clearly understood that on suddenly meeting small parties of the enemy the assumption of a resolute offensive will often be the best course of action.

10. If a patrol is cut off by the enemy, its members must make every effort to get away, so that at least one may arrive back with the information already gained; when necessary they will scatter, rallying again at the last halting place if no other place has been pre-arranged. Every member of a patrol must take notice of all landmarks and distances while advancing in an enemy's country, so as to be able to find his way back; but subsequently, when moving back, he should usually avoid the road by which he came, as it may lead him into ambuscades. When in the presence of an enemy, patrols must never cease their attempts to obtain the required information. They must be both bold and cunning, and if stopped at one point they must try again at some other.

11. During reconnaissances when the opposing armies are not far distant from each other it may often be advisable for a reconnoitring detachment to dismount and open fire in order to engage the enemy's attention, while its patrols move forward to suitable observing points, from which the attention of the enemy has been diverted.

126. *Gaining information.*

1. Information may be gained by personal observation of the enemy; by questioning the inhabitants, prisoners and others; by tapping telegraph wires, taking letters and

newspapers from post offices; or by observation of tracks, dust, fires, deserted camp-grounds, uniforms, &c.

Officers and scouts should know what points to notice and what to reject in obtaining information.

2. In questioning prisoners and hostile inhabitants, it is as well that each should be examined out of the hearing of the others. The questioner should endeavour to lead them to suppose that he knows more than he really does about the subject, and give the impression that to many of his questions he already knows the answers, but is putting them to test the truth of the speaker.

3. Men not accustomed to seeing large numbers of troops are apt to exaggerate their strength, a fault which a scout should be careful to avoid.

A scout should know what are the usual formations of the enemy, and what are the normal strengths of the enemy's various units.

Troops moving along a road or defile may be timed passing a certain point. For each minute, the following numbers would approximately go past:—

Cavalry at a walk, in sections	120
Cavalry at a trot, in sections	240
Artillery guns, or wagons, at a walk ...	8
Infantry in fours	200

4. Information as to the uniforms of the enemy, number of regiment on the buttons or badges, &c., may be of great use.

Note.—For details as to messages and reports, *see* Sec. 88.

127. *Transmission of information.*

1. However valuable the information obtained by reconnoitring parties may be, it is of little use unless it reaches

the commander of the force in time for him to act upon it. Great care should be taken, therefore, to ensure that all information is transmitted to its destination safely and rapidly.

2. Skilfully placed connecting posts will much facilitate the transmission of information. Their number and strength will be regulated by the nature of the country, the attitude of the inhabitants, the proximity of the enemy, and the troops available.

If a chain of despatch riding posts is established, motor cyclists should not, as a general principle, be attached to these posts. It will normally be quicker for a motor cyclist to carry a despatch through to its destination.

As a general rule, when a reconnoitring detachment is to proceed a considerable distance its commander should drop his own connecting posts as he advances.

Connecting posts should be carefully hidden, well away from villages and towns, and close to water. In certain circumstances it may be advisable to entrench them or to make them sufficiently strong to withstand the attack of hostile detachments.

Every man in the reconnoitring detachment should know where connecting posts are situated.

3. As a reconnoitring detachment advances the despatch riders, who should be detailed before the party starts, should have their attention drawn to all the roads and other routes likely to be useful on their return journey.

4. The name of the person to whom the despatch is addressed, and the place in which he may be found, must be explained clearly to the despatch rider.

It will often be advisable for despatch riders to work in pairs, for confidence is greatly increased by company.

Important despatches must be sent in duplicate by different routes, and it will sometimes be advisable to employ officers to carry them.

Despatch riders on bicycles or motor cycles, being practically defenceless, should only be sent along roads which are reasonably safe. At night motor cyclists are very vulnerable, and liable to be ambushed.

5. The sender of a verbal message should always make the despatch rider repeat the message before leaving. The despatch rider should usually be told the contents of a written message.

6. All despatch riders, on approaching a body of troops or group of officers, will call out loudly and without hesitation the unit to which the despatch or message is to be delivered, or the rank and name of the officer for whom it is intended. Cyclist despatch riders should always halt at such a distance in advance of the addressee as will allow of sufficient time to dismount, stop the engine if riding a motor cycle, put their machines clear of the road, and deliver the message on foot, before the addressee gets up to them. It is the duty of all troops to afford a despatch rider any assistance he may require to enable him to deliver his message.

A despatch rider after handing over his message to an officer in an exposed position or under fire should lie down.

Despatch riders will, when possible, be given receipts for their messages, and will usually be directed to return to their own units.

CHAPTER VIII.

EMPLOYMENT OF CYCLISTS WITH CAVALRY AND MOTOR MACHINE GUNS.

128. *General principles.*

1. Cyclist units employed with cavalry are intended for fighting purposes. The extent of their employment for these purposes is mainly dependent on the degree to which the nature of the country favours their peculiar characteristics (*see* Sec. 1)

2. The mobility and fire power cyclists possess render them particularly fitted to act as an adjunct to the independent, as well as the protective, cavalry. On the other hand, cavalry, acting across country, will afford protection to the movements of cyclists along the roads and tracks to which the latter are normally confined, and will thus minimise the danger of surprise to which, when working alone on reconnaissance, they are exposed.

129. *Duties of cyclists with cavalry.*

1. Cyclists may be employed either :—
   (*a*) With large bodies of cavalry, *e.g.*, divisions ; or
   (*b*) Supplementary to small bodies, *e.g.*, corps or divisional cavalry.

   The principal duties which they may be called upon to perform are :—
   (i) To assist the cavalry in its protective duties both by day and by night.
   (ii) To cover the assembly of the cavalry, when marching to a rendezvous, either from its billeting areas, or when it is desired to deceive the enemy as to an intended move.
   (iii) To assist the cavalry in its reconnaissance so far as the nature of the country permits, and to establish strong posts to which information can be brought back by patrols, and on which reconnoitring detachments can fall back, if necessary.
   (iv) As a support to the advanced guard, to secure important tactical points and form a pivot for the attack of the main body, or to occupy defiles, river passages, &c., which, even though weakly held by an enemy, often stop cavalry, and prevent or delay it in the carrying out of its mission.
   (v) Where roads are convenient to make wide reconnaissances round flanks when a force is held up.
   (vi) To provide protection at night to a cavalry force at rest.
   (vii) To act as escort to artillery both on the move and at the halt. Bivouacked or billeted near the artillery, cyclists can quickly provide it with the necessary protection.
   (viii) During the battle, in the hands of the cavalry commander, to force the enemy by their fire action either to detach a force against them, or to expose himself to a cavalry attack.
   (ix) In the pursuit, by taking advantage of their mobility, to occupy points which the enemy must pass, and thus to be able to turn a retreat into a rout.

(x) During a retreat, by holding important tactical points, to give their own cavalry time to rally, and prevent the hostile cavalry from approaching too near.

(xi) To provide escorts and moving bases for aircraft, thereby enabling them to descend, report their information, and pick up fresh supplies of petrol without having to fly back to the main body of the cavalry.

(xii) Generally to act anywhere where a horse can be saved by using a wheel, their mobility being at the disposal of the cavalry in either a defensive or offensive rôle.

2. It is essential that every body of cyclists employed with cavalry should have a high standard of march discipline. Lack of good march discipline leads to falls, accidents, and consequently loss of time.

Cyclists will frequently be required to pass a cavalry column on the road; they should then be able to maintain their pace and distances just as well as when marching alone. When passing other troops on a road, it is essential that the head of the cyclist column should not reduce its pace.

3. The cyclist commander should always be in close touch with the cavalry commander, if not actually riding with him.

Events leading up to a cavalry fight succeed one another so rapidly that there is frequently little time for a detailed explanation of the situation and plan, and the success or failure of the cavalry fight may depend on the cyclist commander's knowledge of the situation and the rapidity of his action. If the cyclist commander rides with his unit he will often not have time to reach the cavalry commander.

130. *Advanced, flank and rear guard mounted troops.*

1. In view of the necessity of economy in the employment of corps and divisional mounted troops, their commander is responsible that the duties allotted to cavalry and cyclists respectively are such as suit their special characteristics. In making this distribution of duties, the nature of the country will be a decisive factor. In one direction, for instance, the country may be open but be lacking in roads; here cavalry should be employed. In another direction may be good roads; these should be allotted to the cyclists and the motor machine guns.

2. Reference has been made in Sec. 115 to the system of moving by bounds. The advanced guard commander is responsible not only for allotting the frontage which his force is to cover, but also for deciding the limits of these bounds.

These limits can be decided at times from a study of the ground, *e.g.*, when a conspicuous feature is visible at a suitable distance ahead. Often, however, the decision will have to be made from the map, a line being chosen, some 3–4 miles ahead, for its suitability for lateral communication.

Wherever roads or tracks permit, the patrols used for establishing this lateral communication will be provided by cyclists, who will march as a rule with the van guard.

3. The composition of patrols will depend on the nature of the country (*see* para. 1). As regards the point of the van guard, the section supplying it should be provided by the arm which can move fastest at the time. When moving up-hill cavalry should provide the point; on the level or going down-hill cyclists will be more suitable.

It is always, however, desirable that a cyclist patrol should

be accompanied by a few troopers to reconnoitre ground at a distance from the road which it is using.

4. The facility with which, owing to their mobility, mounted troops can be detached is accompanied by the disadvantage that, once detached, they often cannot be easily collected again. Commanders of mounted troops must be on their guard against this danger. And to this end they should retain under their own hand a proportion of troops suitable to the whole force under their command. With the same object it should be impressed on all mounted patrols and detachments that, once their mission is fulfilled, they must rejoin their unit without delay.

131. *Motor Machine Guns.*

1. The position of motor machine guns on the march requires special consideration. The engines of the motor cars suffer if the pace is reduced to the walk of cavalry or cyclists. Again, they have a difficulty in re-starting when stopped on steep ascents. They must, consequently, be given some latitude in their movements. Their most suitable position is normally between the van guard and main guard, a distance of usually some 2 miles.

Their commander, with his motor cyclist orderly, should ride with the van guard commander. The guns can then, as a rule, be brought into action within ten minutes of orders being sent to them.

2. Motor machine guns, being organised in sections of 2 guns, should not be detached singly if it can be avoided.

3. A suitable escort must be provided for motor machine guns when detached.

CHAPTER IX.

DISMOUNTED ACTION AND HEDGE ROW FIGHTING.

132. *Suitability of cyclist for dismounted action.*

The rapidity with which a cyclist can dismount and come into action, the facility with which a cycle can be concealed, and the fact that it can be left without an escort combine to confer great advantages on the cyclist in moments of sudden crisis when dismounted action is necessary.

133. *Position for dismounting.*

1. The question how far from his cycle the cyclist should fight cannot be decided by hard and fast rules.

2. In all forms of protective reconnaissance, under conditions of Hedge Row Fighting, when cyclists use their mobility to acquire early information, they should dismount as close as possible to the place where they come into action. They may, however, have to move on foot some distance from the road, *e.g.*, to occupy a suitable fire position or to outflank a strongly posted hostile patrol; in these cases they must understand how to regain their cycles as soon as circumstances allow.

On the other hand, they must realise the importance of maintaining touch with the enemy, once it is gained. Consequently, men must be trained in leading cycles, and keeping them under cover on the roads as near as possible to the dismounted men.

134. *Use of cover.*

Cyclists must be taught how to make use of existing cover to conceal cycles from view and fire. Such cover will be still more advantageous if it enables the men to remount without being exposed to fire

135. *Position for cycles.*

Considerable care and attention are required to bring men in and out of action quickly and without confusion. The following points must be remembered :—

(i) Cycles must not be left on the roadway where they may impede other troops.

(ii) They must be kept apart and not piled on or leant against one another; otherwise men advancing or retiring singly will be hampered in their movements.

(iii) They should be left in the best position for remounting and resuming movement.

(iv) Each cycle should have a distinctive mark or number.

136. *Occasional use of mounted action.*

Small bodies of cyclists engaged on reconnaissance may sometimes find opportunities for making a bold dash on their cycles, under cover of the fire of a dismounted party. Such action is usually possible only on broad, straight stretches of road where the covering fire is not masked.

Similar action, however, should be adopted on other occasions, such as when the enemy offers little opposition or when time is an important factor, for, if successful, it will not only exercise a demoralising effect on the enemy but will also clear up a situation much more quickly than outflanking movements c...

CHAPTER X (PROVISIONAL).

EMPLOYMENT OF CYCLISTS IN COAST DEFENCE.

137. *General principles.*

1. The power of rapid movement possessed by cyclists in a country well supplied with roads of fair surface renders them peculiarly fitted for employment as mobile reserves, more or less concentrated at suitable localities in rear of the troops actually employed in guarding the coast.

When so employed (and this must be considered the normal rôle of cyclists utilised for coast defence purposes), the principles of their employment and their tactical action will in no way vary from those which are given in other chapters of this Manual and in the various Regulations and Training Manuals referred to in Chapter I, para. 3.

2. It may, however, be necessary, in special circumstances, to allot cyclist units to certain coastal sectors for the purpose of watching the coast itself.

When cyclist units are so employed, their action will be guided by the principles given in the following sections.

138. *Principles of employment of cyclists allotted to coast watching duties.*

1. The assistance which cyclists, who have been specially trained in reconnaissance and scouting, can render in the defence of a coast line is extremely valuable. Owing to their mobility they can be employed with advantage in watching for any signs of the enemy and in giving instant

warning of his approach; for the same reason they can concentrate rapidly to oppose the enemy at or before the moment of landing, and to harass and delay him if he succeeds in establishing himself on shore.

The effect of a comparatively small number of rifles at the moment when an enemy is attempting to land is greater than the effect of a much larger number when once he has landed; a force in boats is helpless until it has landed, while the guns of an enemy's fleet will have little effect upon such a target as is presented by small bodies of cyclists behind cover.

2. The guiding principles to be observed in the employment of cyclists for coast defence are that the coast line should be watched with the fewest possible number of observation posts, that any hostile attempt to land must be actively opposed from the outset, and that the co-operation of the local naval flotillas and coastguard officers should be secured.

In order to carry out these principles effectively, the commander of each area will arrange:—

(i) A thorough reconnaissance of the allotted area.
(ii) An efficient system of look-out stations and patrols to observe all possible landing stations both by day and night, and to watch for any hostile signalling from the shore or sea, and for hostile aircraft and submarines.
(iii) Such a distribution as will ensure a rapid accumulation of force at any threatened point.
(iv) The rapid transmission of information between the various detachments, the headquarters of battalions, the headquarters of the area and the headquarters of the nearest garrison or higher formation.

Motor cycles and field telephone equipment, when available, can be usefully employed for this purpose.

All ranks of cyclist units employed in coast defence should be trained in the use of the telephone.

3. The situation of neighbouring naval coast-watching, war signal, coastguard and other stations should be known to all coast-watching troops, report centres and area headquarters. The best methods of communicating intelligence to these various naval stations should be familiar to all concerned.

4. Just as in distributing troops to occupy an outpost line there can be no one formula which can be followed in all circumstances, so in arranging the dispositions of cyclists for coast defence there is no pattern of distribution which can be universally adopted. In each case the situation must be considered with reference to the local conditions and the following points should be taken into account:—

(i) The number and extent of the possible landing places.
(ii) The number, condition, and general direction of the roads.
(iii) The local telegraph and telephone systems.
(iv) The nature of the positions covering the landing places.
(v) The facilities for delaying the enemy's advance.
(vi) The organisation of an efficient system of intercommunication by means of the motor cyclists available.

139. *Distribution of the battalion.*

1. A cyclist battalion when employed in watching the coast will usually be organised into look-out stations,

supports, and reserve. The commander will normally divide the line into sections numbered from right to left, to each of which he will allot a company, retaining a certain number of companies in reserve under his own hand.

2. Each company allotted to a section of the coast will furnish a sufficient number of look-out stations to watch the approaches to all possible landing places.

Look-out stations should be located in buildings on or near the coast, and whenever possible at pull-overs, i.e., termini of roads running down to the beach suitable for cycling. The look-out stations furnish observation posts by day, and coast patrols by night.

The remainder of the company, acting as support, will be concentrated in readiness to move to any part of the section that may be threatened.

3. The reserve should normally consist of not less than half the battalion, and will be disposed by the battalion commander as local circumstances demand. But, when the conditions of roads and communication are such that the rapid movement to any threatened point of a central reserve established inland is greatly impeded, the strength of the reserve may be reduced, and the number and strength of the supports or other posts nearer the coast increased.

140. *Distribution of the company.*

1. It is important that a company should be allotted to the section which is nearest to its headquarters and recruiting area, thus reducing to a minimum the time required to take the men backwards and forwards for purposes of instruction, and facilitating the rapid occupation of the section on mobilization.

2. The company commander himself, and so far as is necessary his subordinates, should have a thorough knowledge of every detail of his section, viz. :—

(i) The extent of coast line allotted to the company.
(ii) The position of all possible landing places, and how far their favourability or otherwise is affected by the depth of the water, and the nature of the tides and currents.
(iii) Suitable positions for opposing a landing at any point in the section.
(iv) All systems and methods of information and communication within the section and procedure in the event of attack.
(v) The exact position of his look-out station.
(vi) The direction of all roads and paths in his section suitable for cyclists, and particularly those leading to adjacent sections.

3. The company commander is responsible for the compilation and custody of rolls and distribution forms showing the detailed dispositions of his company for coast defence.

These rolls will be carefully kept up to date, under lock and key, at the company headquarters, and will show :—

(i) The personnel of look-out stations, patrols, reliefs, and supports.
(ii) Method of warning, collecting, and accommodating the company on mobilisation.

141. *Look-out stations.*

1. Look-out stations should whenever possible be near a telegraph or telephone station, but a despatch rider must always be ready to take any important message by road in the event of the telegrapl or telephone failing.

2. In each section the stations will be numbered from right to left.

3. They will usually consist of a N.C.O. and from six to nine men. One man will be posted as a look-out; one man will be at the telegraph or telephone; and, if the look-out is at a distance from the station, a man will be employed as orderly between the look-out and the station.

4. The commander of each look-out station should be told:—

(i) The position and extent of possible landing places within view of his station.

(ii) The situation of possible anchorages within view and the channels by which they can be approached.

(iii) The number of his station and the positions and numbers of the stations on his right and left.

(iv) The positions of the support and of battalion headquarters, and the best means of access to them.

(v) The positions of all coastguard stations, coast-watching stations, war signal stations in his area and the nearest police station to each.

142. *Supports.*

1. No rule can be laid down as to the position of the supports, but the most important factor to be taken into consideration is that the support should be able to reach any threatened point, along the line for which it is responsible, with the greatest possible rapidity. This condition may be fulfilled where a good coast road exists, and the support should then be brought forward and placed on it, if possible near a likely landing place.

2. It is advisable to keep the support intact at the headquarters of each section, but the position of the roads may make a division of the support necessary.

143. *The reserve.*

The position of the reserve depends on the roads, communications, and the number of possible landing places in the area, and, as in the case of the supports, it must be chosen with due regard to the facility with which any threatened point can be reached.

144. *Headquarters of the area.*

The headquarters should be established where the telegraphic or telephonic communication admits of an effective control over the whole area; for instance, the telephone exchange of a centrally situated town would be a suitable position. It is advantageous, but not indispensable, that the headquarters should be with the reserve.

145. *Concentration.*

1. A system of signals for warning and for concentration must be adopted in each battalion area. Each system will vary with the local conditions, but, in order that the best possible one shall be evolved, close co-operation between the coastguard officers and the battalion commander is essential.

2. An enemy attempting to land in Great Britain will probably endeavour, by means of feints, to draw off the watchers from the point where the real landing is intended. It must, therefore, be clearly understood that the object of the look-out station is observation, not resistance, and that the men must remain at their stations until the last possible

moment so as to give warning to the battalion commander and the supports of any change in the enemy's movements. The look-out stations will only be withdrawn on the order of the battalion commander when it is clear that a serious landing is being attempted.

3. As the duty of opposing the enemy's landing will fall in the first instance upon the supports and reserves, the roads by which they are to concentrate to any given point must be definitely fixed when the scheme of defence is being arranged.

In order to ensure that any change of orders is rapidly circulated, each unit on its way to the place of concentration should, if the road passes any coastguard station, post office or detachment headquarters where there is a telephone or telegraph, call for or give the new orders. Orderlies, too, should be sent, if necessary, to the nearest look-out station to intercept units when necessary. Concentration should be frequently practised both by day and by night.

146. *Night patrolling.*

Possible landing places must be patrolled at night. It will usually be convenient to patrol between look-out stations from right to left of each section, and between sections when necessary. Especial vigilance is required at night, as an enemy may be expected to endeavour to approach the coast under cover of darkness and to try to land parties to cover his main disembarkation. Patrols should work in pairs and when no road is available they must work dismounted.

An efficient system of checking patrols must be instituted to ensure that the duty is fully and regularly carried out.

147. *Reliefs.*

As the work of look-out stations is exacting and responsible and may last for long periods, a regular system of reliefs must be organised. Men should be allotted permanently to look-out stations, and should be formed in two reliefs, one relief being with the support while the other is at its station. A relief should not be on duty for more than 24 hours, as in bad weather, owing to the noise of the sea and the buffeting of the wind, the strain of patrolling by night is very great. The sense of hearing may be of little use and the patrol or sentry may have to rely on vision alone.

In the case of look-out posts on high cliffs, where watch huts are provided as a protection from weather, reliefs need not take place so frequently.

Companies should be exchanged between the supports and reserves at regular intervals.

148. *Covering positions.*

Wherever an enemy may land he will probably seek to secure a position with the first troops landed, from which they can cover the disembarkation of the remainder. It is therefore the duty of cyclist battalions to make themselves familiar with such positions in their area, to know their strong and weak points, and the best method of preventing their occupation by an enemy.

149. *Delaying action.*

In order to fulfil their rôle of delaying the enemy's advance, cyclist battalions must be familiar with areas which lend themselves to delaying action. They must ascer-

tain by careful reconnaissance how the defensive capabilities of such positions can be improved and what local material is available for the purpose. Rallying to selected rendezvous from look-out stations should be practised both by day and by night.

Should an enemy succeed in landing, cyclist patrols should at once establish pickets on all roads radiating from the landing place. The duties of these patrols will be to keep in close touch with the enemy, to ascertain and report his movements, and to prevent his reconnoitring parties from getting through.

The general requirements of delaying positions for cyclists are given in Sec. 103.

Excerpts from Die Radfahrtruppe...(10)*

5. Combat

The bicycles, before combat, are placed into the road ditches and camouflaged carefully. They are rarely taken into combat away from the road. This permits the men to find their bicycles rapidly and to still use the terrain efficiently. If the combat is interrupted and the trip is resumed, the men must immediately come back to the road. These points, the return to the bicycles, are very important. The problem is not so easily solved if the officer in command has still a reserve on bicycles. After the interruption of the combat, this reserve can be used to continue the task, while the parties in combat go for the bicycles and then follow. Or the reserve can be used in fetching the bicycles of the soldiers active in combat, one man can easily advance half-way with two bicycles on good roads. The officer in command must decide each time how he will use the reserve, and this use is determined upon the position or the situation.

The disadvantage involved in this return to the bicycles is so great that in most cases it justifies the maintaining of a reserve on bicycles.

The duty of each leader to maintain a reserve as long as possible is very important for the officer in command of a bicycle unit, if one takes into account its own independence.

If the cyclists' leader has no longer any reserve on bicycles, then it would be wise to interrupt the combat with the entire unit and to come back to the bicycles. On the contrary, as soon as the combat permits, he will have to detach a reserve and send it to the bicycles. This reserve, in the sense of the above explanations, can then be used, according to the situation, to bring the bicycles or to continue the mission on bicycles.

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* Translated.

Coviously, under such conditions the choice of the place where the bicycles are placed is very important. Numerical data cannot be given. The task and the position involved are decisive factors as in all combat actions. Laying down the bicycles too soon increases the distance between men and bicycles. Laying them too close exposes the bicycles to the enemy intervention and to losses. It is better to drop the bicycle sooner than later. The returning to the bicycles and mounting them (packing the means of the combat) constitute a moment of weakness. The place where the bicycles are deposited must be covered.

The tactical position exerts much influence on the choice of this place. In pursuit and especially in forward movements, where only rather weak enemy action exists, the bicycles can be brought quite close, often quite in the fire line in order to have them ready when the mission is being continued. In the reverse case, the place where the bicycles are deposited must be further backward and well covered. The return to the bicycles must be performed at the same time by the unit in combat only when an enemy intervention is not possible. As a rule one party will always cover the return of the other and the covering party will go back when the other party has reached readiness for action.

In addition to the mechanics, a few people of each company remain near the bicycles, if the entire unit is used. These few people must protect the bicycles and back the unit especially. They maintain connection with the unit, taking care of the supplies of ammunition and materials, of the transmission of information, and orders of the evacuation of the wounded. The versatility and importance of these duties show the mastery for a "reserve on bicycles." Isolated bicycles in a road ditch do not need special camouflage. Camouflage is needed when many bicycles are there.

During receiving and assimilation tasks, the bicycles must not betray the appearing of the cyclists.

Whereas the direction of the retreat of the infantry remains free, the cyclist is obliged by the bicycles to perform his retreat in a certain direction in order not to lose all the bicycles as was the case with the Italian cyclists at Meata in 1916 or with the French cyclist at Roye in 1918. The bicycles, under certain circumstances, lower cyclists' fighting power.

The transportation of the bicycles on the trucks is important. If enough trucks are present and if it is permitted by the tactical position, all bicycles are brought at the same time. Only half may be forwarded, then the trucks bring the cyclists to the bicycles left in the rear and moves after the cyclists with the bicycles.

VII. 12 Examples of Exercises

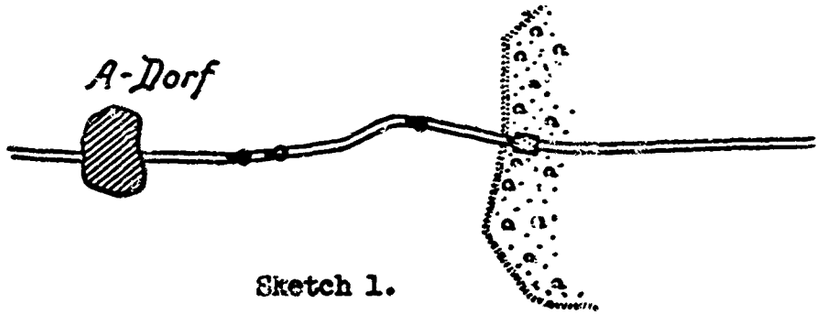
All the exercises of the bicycle unit must be arranged basically so as to maintain close connection between the action in combat and the advance on bicycle. Separation from the bicycle and coming back to it must be the lasting element of all exercises and must be reastically executed.

The longer the bicycle is used in approaching the enemy, and the quicker the return to the bicycle in order to continue the movement, the more efficiently the combat mission is performed from the viewpoint of the bicycle unit.

A few among many, the following exercises have been selected as patterns for other instances of similar situations and exercises.

1st Example: Combat March of a Group on Reconnaissance Duty

The group (Sketch 1) has advanced on bicycles up to the edge of the wood and has A-village in front. A-Dorf is found to be occupied by the enemy.

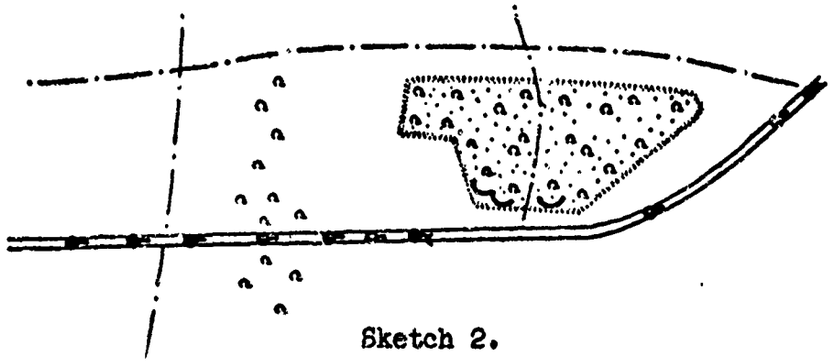


Sketch 1.

The group remains under cover in the wood. The group leader sends two cyclists, one following the other within call, toward A-village in front. Within seeing distance, these two cyclists are followed by a contact (or several) with the Group. In front of the locality, the two cyclists dismount, and continue their reconnaissance on foot. If the locality is free from the enemy, it is reported back by the contact, and the following group brings the bicycles of the two cyclists along. If the enemy is still in the locality, the entire group deploys in foot combat and clears the locality. Once the enemy is dislodged, half the group is sent back. This group brings the bicycles back two by two.

2nd Example: A Group Falls into an Ambush

In most cases the enemy will allow individual advancing cyclists to go by in order to capture them. This must always be expected.

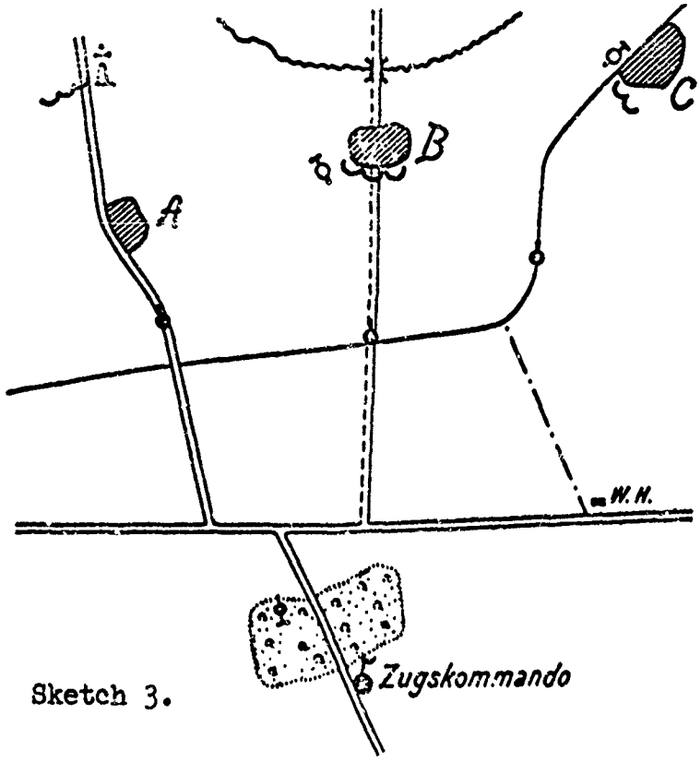


Sketch 2.

If the enemy allows the first three cyclists to go by at the edge of the wood (Sketch 2), then he fires at the group. The group then deploys immediately for combat; due to loose march formation, this movement is easy. Bearing the noise of the combat, the three foremost cyclists turn back immediately and join in the fight. Thus the enemy is attacked from two sides. The three foremost cyclists or the last cyclists in the group can also pass round the wood and attack the enemy in the rear. A rather large unit should be used for this exercise.

3rd Example: Patrol and Messenger Exercise

Each cyclist in the bicycle unit must be able to report the facts obtained by reconnaissance accurately and reliably. The very decisions of the leader are based on the correctness of the reports of the foremost reconnaissance units; hence the usefulness to undertake patrol and messenger exercises even at night.

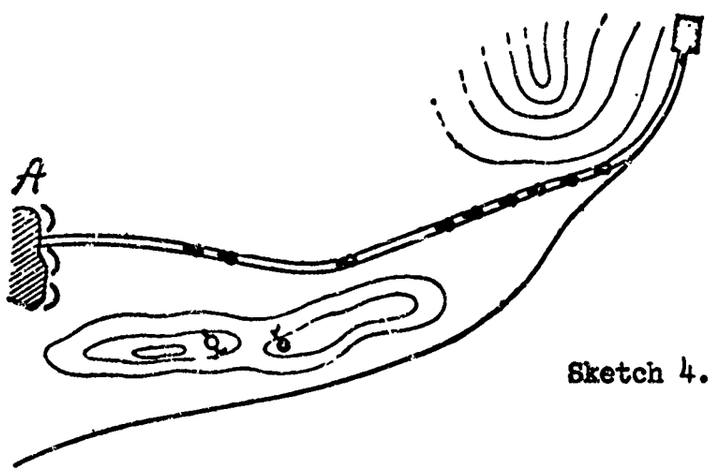


Sketch 3.

A reinforced cyclist platoon (Sketch 3) with 1 machine gun and 3 groups of riflemen must scout out of the small wood, where the enemy stands along line A-B-C as reported by an aircraft. The three dispatched patrols behave as in the first example; after observing the enemy they remain near him, and send messengers to the platoon leader to report the result of the reconnaissance, according to the existing possibility, orally only, or with the help of very simple sketch. At night, connection is established by flare signals. The messengers coming from A, B, C, must be exchanged for others who are sent back, and must bring all the patrols to the Army.

4th Example: Attack of a Half Company in Persuit Action

Locality A, occupied by a small enemy rear guard, must be cleared. (Sketch 4). At first, only a machine gun with a group of riflemen is enough, according to the leeder's estimation.



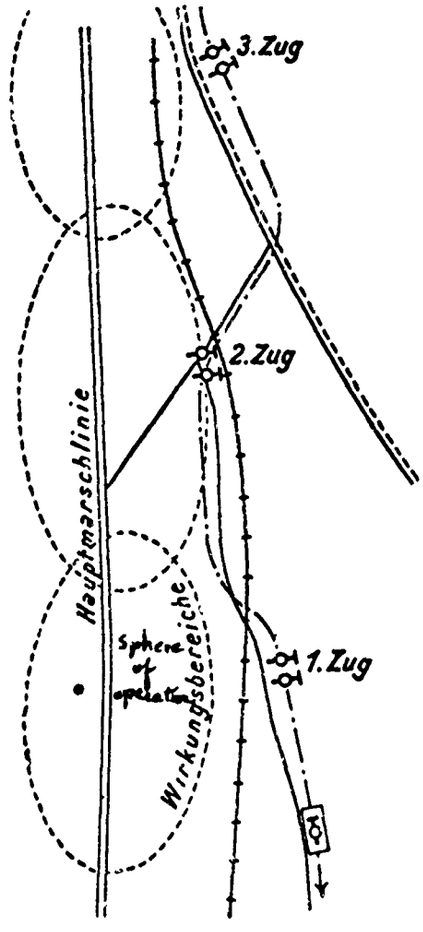
Sketch 4.

He orders the machine gun group to the hill south-east of A. Under the fire protection of the machine gun, the group of riflemen must seize A. The bicycles of the machine gun group are laid down behind the hill; those of the group of riflemen along the road toward A. Once the attack has been successfully performed,

the groups not yet used bring along the bicycles left behind by the group of riflemen. If all the groups have to be used, half the personnel must come back, in order to bring the bicycles. If the situation is not cleared, only half the fire power is advantageous. Often, the enemy is no longer there, and deploying the entire force would be useless. Then coming back to the bicycles is twice as long.

5th Example: Antiaircraft Defense of a Machine Gun Company by Sectors

Bicycle machine gun units are very suitable for antiaircraft defense by sectors along extensive march columns. Eight machine guns are present; three platoons are in position, while the fourth platoon is just starting ahead. Air raid protection is most effective if carried out from a march line parallel to the main march line.



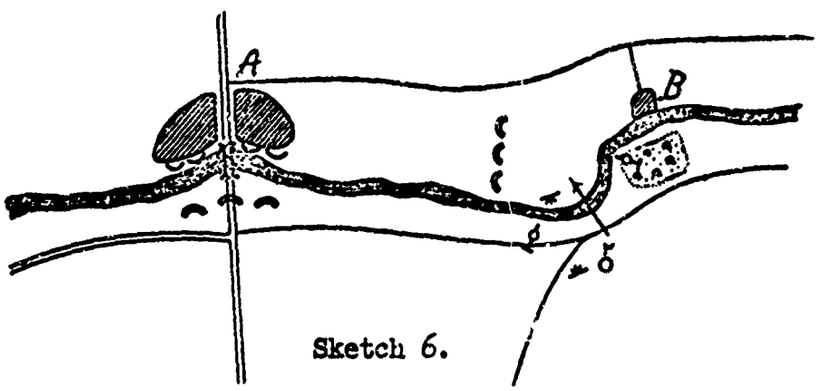
Sketch 5.

Many times poor roads must be chosen in order to be able to move into correct gun positions. In each fire position different air defense firing problems must be analyzed. Such an advance by sectors is successful, if bicycle units are arranged as side guard of marching columns.

6th Example: Crossing a River Obstacle (A Stream)

A pursuit by 1 bicycle company, half a bicycle machine gun K, 1 bicycle engineer platoon and 1 bicycle blinker squad is involved.

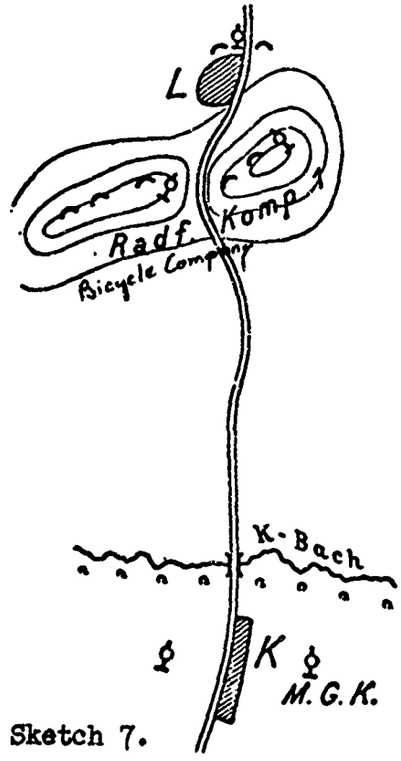
The enemy holds the north bank at A occupied (Sketch 6).



Sketch 6.

The bridge is destroyed. In face of the enemy, crossing cannot be made at A. Hence, 1 platoon remains in front of A on the south bank in order to contain the enemy. The remaining platoons of the company cross west of B under the protection of the machine gun, and attack, after dislodging the enemy sentries along the bank, with the help of one machine gun platoon. Only the machine gun bicycles are taken along, the guns being transported on them. The bicycles are walked. Once the aggressor has been repelled, first the platoon crosses from the south bank at A with bicycles and begins the pursuit immediately. Then the 2nd machine gun platoon with bicycles reaches the north bank; finally the bicycles of the units, which crossed at first without bicycles, are transported to the other side.

7th Example: A Rear Guard Withdraws from the Enemy

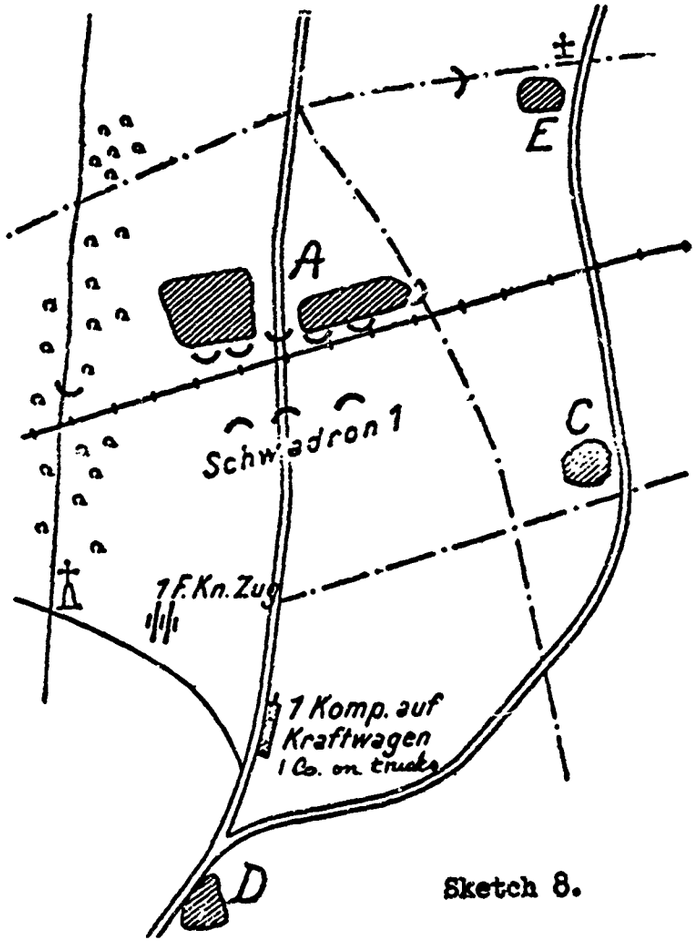


Sketch 7.

At the same time, this rear guard destroys a bridge. One bicycle company, half a bicycle machine gun company, and half a bicycle engineer platoon receive the order to hold the heights south of L up to x o'clock, then to detain, as long as possible, the enemy following up behind the K stream. The bicycle company has its bicycles in the vicinity. The machine gun company acts from space K with indirect fire. First the aggressor is held north of L by an advanced covering party which again has sent scouts ahead, then the aggressor is detained on the heights. After withdrawing from the enemy, the bicycle company wins a big start. This company is already behind the K stream, while the enemy is still detained on the height by a rear guard. During such tasks, the bicycles must be deposited very close to the combating units. This exercise can very well be performed at night.

8th Example: Encircling an Enemy Position

This is carried out by cyclists, cavalry, artillery, and motorized infantry.



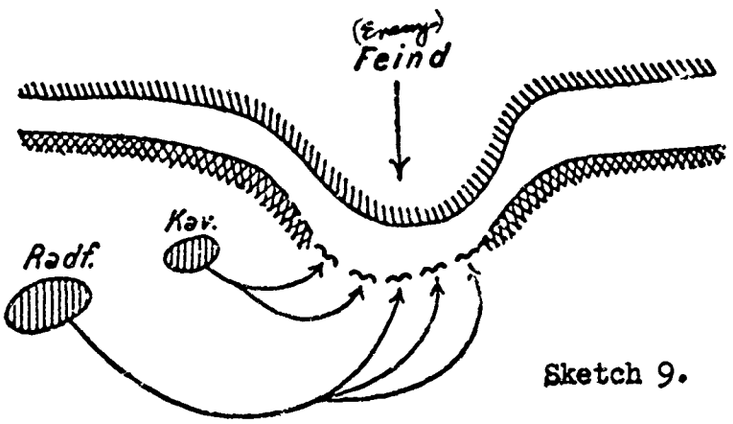
Sketch 8.

The enemy holds the railroad line south of A occupied. Squadron 1 which remained in front of the railroad line finds itself in front of a superior force. The motorized infantry company (trucks) arriving for reinforcement is detrucked north of the road fork and placed on the left of the squadron. Two bicycle companies are marching up at D. Their leader assumes command over the entire combat group. Passing near the monument on the wayside, the leader wants to attack the flank of the enemy, but is detained with his foremost parties at the crossing of road and railroad south west of A. A reconnaissance patrol reports that C and E are free of the enemy. The leader leaves 1 platoon only at the road-and-railroad crossing and

rides with the two companies to C and E through D. West of E he encounters the enemy, beats him back and arrives at his back. The bicycles are brought up with trucks.

9th Example: Cavalry and Cyclists as a Mobile Reserve When Situation is Important

The enemy has penetrated our own combat front. To close the gap, the mobile reserve of cavalry and cyclists is used. Although they are farther from the point of penetration, the cyclists have to lock up the more remote part of the breach space, since they have more marching speed than the cavalry. This exercise is eminently a forced exercise with definite timing, connected with reconnaissance and active liaison activity. It should be repeated at night.

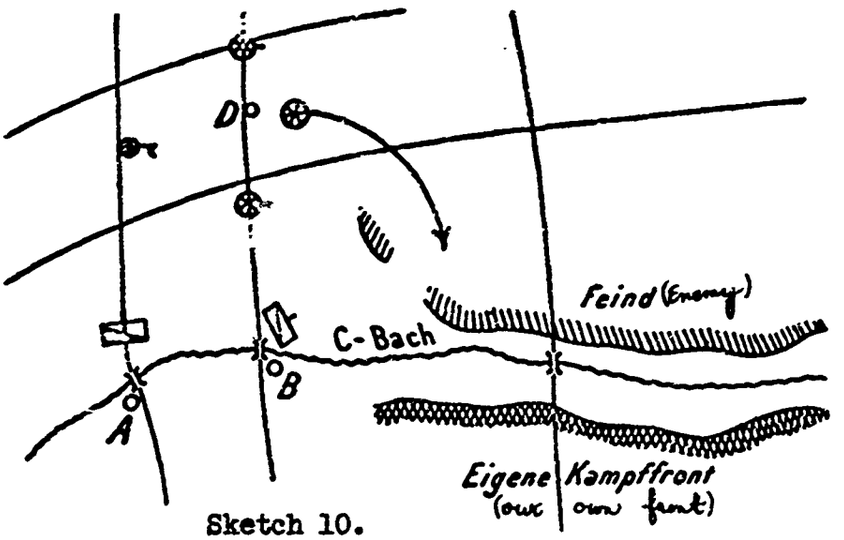


Sketch 9.

10th Example: Action Against the Flank of the Enemy

In mobile warfare, there will exist rather frequent opportunities to advance against the flank, or even in the rear, of the enemy. Bicycles and cavalry are very suitable for such tasks.

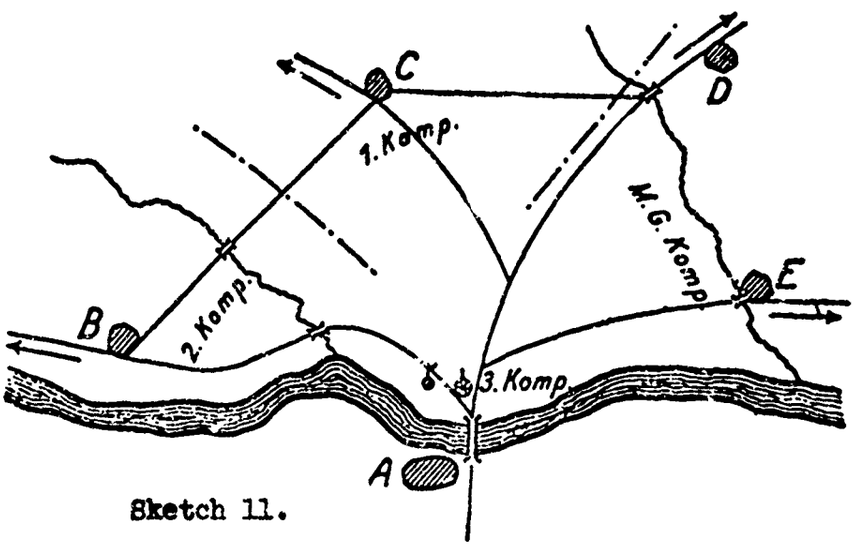
One bicycle battalion and two squadrons must advance against the right flank of the enemy. The leader of the bicycle battalion orders the two squadrons



Sketch 10.

to occupy and protect the passage at A and B. With two companies he remains provisionally in the line B-D, and with two companies he carries out the first thrust against the enemy flank. Once this has succeeded, the other companies and the squadrons follow the attack right away. During all this one's own rear cover should not be neglected.

11th Example: Maintaining a Passage Open

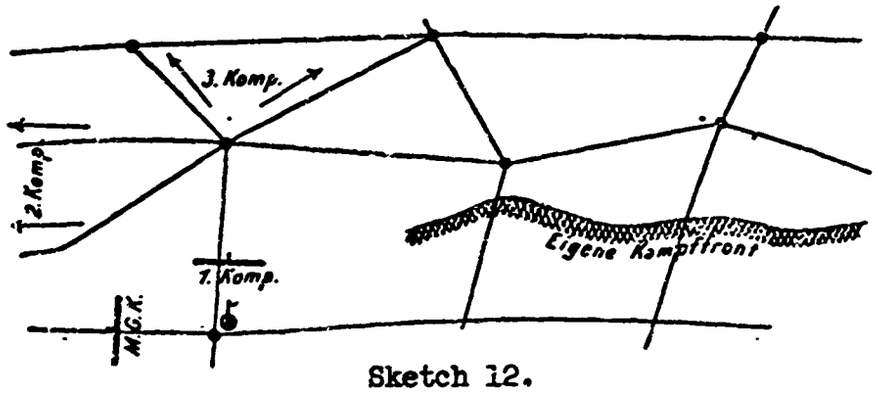


Sketch 11.

Until the arrival of the main forces, a bicycle battalion must maintain the passage at A open. Keeping a reserve, the battalion occupies a bridgehead position, but thrusts forward with reconnaissance groups up to the enemy (marked). It determines the enemy position, comes back slowly in delaying combat to the bridge.

12th Example: Flank Cover

The bicycle battalion entrusted with the flank cover task will form a wing cover with 1 company and 1 machine gun company; with the other two companies it will determine the position of the enemy, engage, delay, and mislead him.



Sketch 12.

The purpose of Examples 11 and 12 is to teach the bicycle unit always to use strong forces in seeking contact with the enemy, to always ride toward him and thus never to remain, in formation, waiting for him, and to use small forces in occupying the space to be immediately protected. Faithful to its own basic purpose, the bicycle unit must learn to attack far ahead in order to save time.

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13. ABSTRACT

The report presents a history of the use of bicycles for transportation by combat troops prior to World War I, during World War I and II, and more recently the use of bicycles in guerrilla warfare. The armament, mobility, speed, distance, design, and load-carrying capacity of bicycles for transportation in remote areas and guerrilla warfare are discussed. The effect of terrain on the utilization of bicycles, the organization, strength, and tactics of bicycle units, and the training of combat troops using the bicycles are also considered.

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Guerrilla Warfare	9					
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Design	8					
Load-Carrying Capacity	8					
Organization	8					
Military Tactics	8					
Military Strength	8					
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