French Symposium on Soldier Enhancement & Part 3

Editor's note:

A symposium on French army initiatives to enhance soldier capabilities was held in Paris 19 June 2017 at the headquarters of the French Armed Forces titled "The Enhanced Soldier: The Needs and Prospects of Increasing the Fighter's Abilities." The Army University Press at Fort Leavenworth, Kansas, agreed to publish translated versions of the presentations given in seven parts as *Military Review* Online Exclusive articles to promote broader understanding of allied views and initiatives on a subject of intense collective interest. The below is the third of the seven presentations. The other presentations are published in separate documents.

The Hexagone Balard, headquarters of the French Armed Forces and the Ministry of the Armed Forces, 19 December 2015 in Paris. (Photo courtesy of Wikipedia)

Historical Study on the Evolution of the Infantryman's Personal Equipment

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This is a translation of a lecture given during the conference called "The Enhanced Soldier: The Needs and Prospects of Increasing the Fighter's Abilities," held in the Headquarters of French Armed Forces, in Paris, 19 June 2017.

There are five things that should never be separated from the soldier: his rifle, his cartridges, his bag, his food for at least four days, and his pioneering tools.

-Count Charles Tristan Montholon and Gen. Gaspard Gourgaud

n *Napoleon's Art of War,* Napoleon Bonaparte defines personal equipment as all material provided to the soldier that is strictly necessary for accomplishing his missions as well as satisfying his daily needs. Accordingly, modern war administration requires consistently precise regulation of personal equipment. This equipment is traditionally divided into four categories:

- clothing and headgear;
- major equipment related to combat [e.g., weapons];
- small equipment including footwear as well as maintenance and hygiene kits; and
- tools, food, and bivouac equipment.

The choices that have governed the evolution of these materials have aimed to enhance the effectiveness of the infantryman—that is, to optimize his performance and reduce his vulnerability by striking a compromise between mobility, protection, and autonomy. This compromise is itself subject to technological progress, changes in combat, production constraints, and budgetary guidelines, as well as accounting for the moral forces of combatants through their feedback. We will highlight the main developments of individual equipment from the age of the flintlock rifle to mechanized warfare by highlighting the role of an invariant, the fighter himself.

A Scientific Approach to Military Equipment from the Eighteenth to the Nineteenth Century

From the second half of the eighteenth century, the commissions in charge of equipment for infantry, cavalry, artillery, and engineers took advantage of the progress of military medicine by testing new materials and their effects on subjects of different morphologies. This empirical approach gave way to a real scientific approach in the second half of the nineteenth century thanks to the development of military hygiene and a systematic comparative analysis of the equipment available in the various European armies.¹

From the outset, this work aimed to limit the overall weight of the equipment. Equipment distribution and fit had to

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Department of the Saint-Cyr Coëtquidan Schools. be adapted to the infantryman's mobile and static postures. The main goals were to promote ease of walking, limit muscular effort by bringing the center of gravity of the load closer to the body, and avoid obstructing chest expansion movements or compressing the abdomen and large vessels (see figure 1).² Equipment also had to provide effective protection against cold and humidity, particularly in the lower limbs, lungs, neck, and head. All equipment had to be durable, hygienic, easy to maintain, and allow the freedom of movement necessary to use weapons.

Eighteenth-century infantrymen of the Revolutionary Wars and the Empire Wars were dressed in a set that included a vest-jacket, shirt, jacket, trousers, shoes, a pair of gaiters, soft headgear, and a hood [what is known in the U.S. Army as a poncho or parka].³ Straps supporting a knife and a cartridge pouch rested on the infantryman's shoulders and were arranged in an "X"



Figure 1. Infantryman Center of Gravity

pattern [saltire] across his chest. Food and drinks packed in a bag and canister were also worn in saltire. A semirigid and stretchable haversack would eventually be used as a sleeping bag; it normally contained the pack—that is, spare parts as well as maintenance and hygiene kits. Initially, it was to worn by a strap and rested on the lower back in the lumbar region, but it evolved into a less comfortable rigid backpack, and regulations prohibited its grounding during combat. After 1815 and until the First World War, major equipment developments were dictated by feedback from overseas operations as well as the experiments conducted by elite groups such as the corps des chasseurs (light infantry) in France.⁴ The modernization of armament—which included the adoption of the rifled barrel, metal cartridge, and breech loading—as well as new forms of combat highlighted by the Transvaal (1880–1881 and 1899–1902) and Manchuria (1904–1905) conflicts also had a decisive impact on personal equipment. The infantryman no longer fought exclusively vertically, and it became imperative to increase his freedom of movement.

The Problem of Weight

The nineteenth century was marked by a sharp decline in soldier performance. The rifleman of the Revolutionary and Empire Wars covered twenty to thirty kilometers daily, compared to just ten to twelve kilometers for a French infantryman during the 1859 campaign. The fundamental problem remained the overall weight of individual equipment and its distribution. The French military commission of 1861 set the maxi-

> mum load at thirty kilograms based on the standard of the Roman legionnaire of the High Empire. The performance of the legionnaires is noteworthy: forty kilometers per day with a load of about fifty kilograms. The Roman soldier's clothing accounted for 8 percent of this weight, his weapons and tools for 44 percent, and food and utensils for 48 percent; by deducting the weight of weapons and defensive equipment, the commission obtained the reference threshold of thirty kilograms. The French infantryman of the Empire carried a load of twenty-nine kilograms, where clothing and major equipment accounted

for 24 percent, weapons for 36 percent, and rations and bivouac equipment for 40 percent. After the Franco-Prussian War, in the last years of the nineteenth century, the average load of the European infantryman increased from twenty-six to thirty kilograms, or about 50 percent of his own weight. On the eve of the outbreak of the First World War, the French infantryman's load amounted to twenty-nine kilograms, with clothing accounting for 21 percent; armament for 26 percent; and major equipment, personal tools, and packaging for 53 percent.

The large equipment, which then accounted for a major share of the overall load, underwent major changes between the 1840s and 1890s. It included a belt with flexible cartridge pockets at the front to replace



French infantry during the Battle of the Marne River, 1914. (Photo courtesy of la Bibliothèque nationale de France)

the cartridge pouch that had been rendered obsolete by packaging ammunition. Their weight was distributed by suspension [shoulder] straps and was balanced with the equipment distributed around the belt, in the combat pack, and in the haversack. In 1914, the majority of armies carried large heterogeneous equipment in leather and strong canvas that were modified by successive improvements. For the French infantryman, this translated into a collection of equipment adopted over sixty years between 1845 and 1905.⁵ The consequences were disastrous; partial or complete equipment removal was laborious, its wearing prohibited shooting from the prone, it caused pain in the cervical area, and it cut off blood circulation.

As a result, the objective became to limit the load to one-third of the infantryman's weight and to be able to further reduce it as needed into a four-kilogram assault pack with a configuration that optimized walking comfort and the performance of reflexive actions under enemy fire. Between 1907 and 1908, the French army tested, without retaining them, the Mills-Bruzon equipment that perfectly met these specifications. The latter was clearly related to the 1908 Pattern Web Infantry Equipment designed by then Maj. Arnold Burrowes for the British forces. Made of spun cotton, it was easy to clean, and its configuration allowed a complete removal of the equipment by simply unbuckling the belt. It could also be configured in two modes, for walking or for fighting. The first included a suitcase that rested on the lumbar region and a haversack containing the assault pack on the left flank; in the second, the infantryman kept only the haversack carried in a backpack.

Comparatively, in 1910, the Russian infantry opted for a flexible bag worn in saltire that rested on the hip or lumbar region and contained the various items needed by the infantryman including additional ammunition. The package and camping gear were rolled in a hood, which was also worn in a saltire. This apparently archaic solution, which is distinguished by its simplicity and comfort of operation, led to the configuration of some improvised assault packs by the German and French infantry during the First World War.

Life and Food during a Military Campaign

The armed forces had also been working to optimize the autonomy of the infantryman on the front lines by studying his supply of food, bivouac equipment, and technical equipment. The evolution of the haversack brought the introduction of a blanket, possibly a sleeping bag, and a modular shelter tent in the equipment. During the First World War, the German solution became more widespread as it provided the tent with a neck cord and a belt so it could be worn as rain gear.

Until the 1830s, the infantryman carried four days' rations. During the rest of the century, the constraints of overseas operations sometimes led to doubling this allowance. However, in 1914, the metropolitan (non-colonial) infantryman's allotment was brought back to a conventional four-day ration. In the cantonment, the French soldier received a normal ration, but it was replaced by a strong [higher calorie] ration for combat periods and supplemented by a reserve ration, consumed on order in the event of a supply shortage. Normal and strong rations, consisting of fresh food, differed only in their proportions. They included bread, meat, bacon, dried vegetables, rice, coffee, and wine, and they provided more than 3,600 calories from the strong ration. The reserve ration consisted of the same products packaged

toward the adoption of an individual mess kit. Various innovative solutions were considered such as an individual Norwegian-style bowl to cook food during the travel phases and aluminum machining to reduce weight. In France, the system adopted by Intendant Gamelle Bouthéon in 1887 briefly replaced the 1852 bowl model and the classic collective endowment, but it was finally abandoned when the soldiers complained about the excessive consumption of fuel, the multiplication of chores, and especially the degradation in the quality of the dishes.

Technical Equipment

The provision of technical equipment follows a fairly similar trend. From the eighteenth century onward, the basic infantry unit received a collective supply of earthmoving tools (shovels, picks, etc.) and destruction tools (axes, saws, hammers, etc.) in order to reduce its dependence on sappers and to carry out its own route clearing

Enhancing Soldiers, A European Ethical Approach is a compendium of the proceedings of a symposium sponsored by the International Society for Military Ethics in Europe, held 16 October 2019 in Paris, that provided a venue for the presentation of papers by a variety of international scholars discussing research on topics related to initiatives associated with efforts to enhance soldier capabilities. The symposium revisited and updated issues that were previously examined in a similar symposium titled "The Enhanced Soldier: The Needs and Prospects of Increasing the Fighter's Abilities," sponsored by the French army 19 June 2017 at the headquarters of the French Armed Forces. The compendium is available online at: <u>https://www.euroisme.eu/images/Documents/pdf_cahiers/ Le%20soldat%20augmenté%2019-06-2020-web%20VFinal.pdf.</u>



or entrenchment. But the Russian-Turkish War of 1877-1878 demonstrated the need for a new piece of technical equipment; a robust, handy, and small individual tool that allowed the infantryman to quickly construct hasty entrenchments under enemy fire.⁶ The shovel [entrenching tool] patented by Danish infantry Capt. Mads Johan Buch Linnemann in 1869 was the perfect answer to this program. It was adopted into the Austrian and German forces in 1870

in sachets and preserves, supplemented by rum, brandy, and chocolate; it provided about 3,000 calories.

The utensils used to prepare food were made of tinned wrought iron; they were resistant to wear and corrosion but were particularly heavy, so a collective allocation was preferred at the basic-unit level. The limits of this solution were obvious: the group was penalized in the event of failure or loss of a single member. Following the example of the German, British, and Russian forces, the majority of European armies moved after 1870 and 1874, and its use became widespread in all European armies after 1878.

After the Russian-Japanese War, the various technical Arms committees among western armies studied universal tools that combined drilling and cutting capabilities, but they were totally incompatible with operational use, which required ease of implementation and easy maintenance. The solution adopted by the majority of European armed forces therefore favored providing an assortment of individual destruction tools (axes, hammers, shears, articulated saws) and diggers (infantry shovels, and hatch axes) at the basic-unit level, with an emphasis on the latter.

Clothing

In terms of clothing, the hood, the main clothing effect after 1815, was reserved for bivouacs or cold seasons and replaced for walking and fighting by the tunic and then by the jacket. Smokeless powder also made it imprudent to wear clothing with distinctive shades; it became a matter of blending into the battlefield environment. The neutral shades, previously used exclusively by the light and colonial troops, were generalized to all forces. Troops from the United Kingdom and the British Empire adopted khaki between 1900 and 1903, and between 1907 and 1912, the majority of European armies adopted slate-gray, gray-green, blue-gray, or yellowish brown field uniforms.

The French infantryman stood out by keeping an appearance very close to that of 1870, despite the robust conclusions of serious experiments carried out

between 1898 and 1911.7 The maintenance of the traditional cut and colors of the French uniform was motivated by budgetary, ideological, and doctrinal considerations. The Budget Committee was against a costly generalized clothing reform, which was also perceived as a renunciation of French military traditions and an attack on the moral forces of the troops by distorting their perception of combat. Urged by the new reality of war, while keeping the hood as a main item of clothing for the infantryman throughout the conflict, the French army nevertheless adopted the horizon-blue cloth, drawing inspiration from the tricolor sheet studied before entering the war. This unsatisfactory emergency solution resulted in a dirty, visible, and unstable color. The footwear of most infantrymen included two pairs of Neapolitan boots (with laces) combined with a pair of chaps or gaiters tightened over the trousers to protect



An infantryman of the Worcestershire Regiment on the Western Front in 1916, wearing the 1908 Pattern Webbing Equipment, a Brodie helmet, and puttees. (Photo by John Warwick Brooke, courtesy of the Imperial War Museum)

the legs from moisture. The models in use at the beginning of the conflict evolved to optimize strength, waterproofness, and protection of the ankle, and the gaiters, following the British example, were replaced by soft strips considered more comfortable.

Personal Protective Equipment

The First World War, characterized by its duration, static fronts, the predominant role of artillery, and the introduction of chemical weapons, made it necessary to review the protection of the combatant.

The headgear available when the war began proved ineffective in protecting the skull from fragments and shrapnel; 77 percent of the wounded suffered head injuries, 88 percent of which were fatal. The belligerents then launched the study of a metal helmet offering ballistic protection of the skull, neck, and upper face, and with ergonomics that allowed shooting while standing or lying down. The Adrian, Brodie, and Stahlhelm helmets were designed using two different approaches. The French

model, the Adrian, was the result of a pragmatic approach led by the stewardship; it favored lightness, proven materials, and machine technology production that allow a massive supply as soon as possible. The German and British models, designed by engineers and surgeons, were made of a single piece by successive stamping from an alloy sheet, an innovative but poorly mastered technology. These helmets were introduced later, and their design posed vibration and hygiene problems.

Protection against chemical munitions was a separate matter: French chemists favored the efficiency of a neutralization solution while Germany favored the performance of the filter medium.⁸ In the spring of 1916, French soldiers received the M2, a multipurpose breathing apparatus offering full protection of the respiratory tract and eyes against all chemical agents for four hours. It was much better than the German Gummimaske, whose interchangeable filter cartridge was nevertheless a major technological advance. Thus, in 1917, technological transfers led to the widespread adoption of materials offering in-

tegral protection and equipped with a filter cartridge containing neutralizing substances and filters based on activated carbons: the small box respirator, the Lederschutzmaske [Germany's replacement for the Gummimaske], and the special respiratory apparatus (the forerunner of contemporary protective equipment).

The Outbreak of the Second World War

In general, the equipment of the European armies of 1940 had changed little since 1918. One of the few innovations concerned camouflage. The French army had acquired a certain advantage in this field during the First World War, but limited its use to equipment, positions, etc. In 1929,

the Italian army introduced the first camouflage effect in individual equipment, the tela mimetizzata. It was a colorful square with a slit in the center that could be used as a shelter tent or a poncho. This affordable system allowed a large-scale test without contesting current equipment effects. The Italian example was followed by the German army, which adopted the Zeltbahn in 1931 (see figure 2).⁹ Following the same principle as the tela mimetizzata, the Zeltbahn is a triangle made of Egyptian cotton with buttonholes and eyelets that can be used as a shelter tent, rain gear, a float, or to transport injured people. The model was perfected in 1938 by printing an autumn-winter camouflage on one side and a spring-summer motif on the other.

But among the various belligerents, only the U.S. Army was conducting a thorough study to adapt its infantryman's equipment to the requirements of mechanized warfare. The Office of the Quartermaster Corps initiated a major metamorphosis of personal effects and



Figure 2. Zeltbahn, 1931

equipment in conjunction with scientists, academics, and industrialists between 1938 and 1941.¹⁰ As early as 1940, experimental platoons were set up to integrate feedback from European campaigns. Their conclusions allowed

the large-scale production of new personal equipment as early as 1941, while the study of specific outfits, particularly for airborne troops, continued and resulted in a new equipment issue in 1944. The American infantryman received three outfits, including the field service dress and the fatigue dress, the latter, originally intended for exercise, was standing as a spare campaign outfit, especially during summer. The M41 field jacket, the main item of campaign clothing, was inspired by civilian manufacturing and made of cotton poplin. Practical and lightweight, it was nevertheless insubstantial, and the campaign outfit was redesigned along the lines of the airborne combat jacket and the fatigue dress.

The new field combat dress M43, ample and ergonomic, had a tremendous effect on the morale of the fighters. It consists of cargo pocket pants and a four-pocket jacket, adjustable with a drawstring at the hips and easy to close or open. It also has a removable hood and lining. This campaign clothing was a real breakthrough and became the model emulated by the majority of armed forces in the second half of the twentieth century.

The American infantryman initially kept the Combat Equipment M-1910/1928 pack made of spun cotton, comprising a belt with suspension straps, dressing bag, canteen, a watch, and the infantry pack. This pack was an original solution for making a bag whose axis remained as close as possible to the body. A fully foldable canvas acted as a haversack; it had a bowl pouch fixed on its flap and, in the lower part, a box containing the camping kit and spare items of equipment, all maintained by the individual. At the end of the conflict, it was

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replaced by the Packfield Combat M1944, which perpetuated the two-part concept of separated the field-life equipment from the assault package. Protection against splinters and shrapnel was provided by the steel helmet M1. The main innovation of this helmet was the mesh fiber liner, which solved the hygiene problems observed with traditional leather and horsehair headgear.

A further innovation of the U.S. Army concerned the soldiers' food. Rations A, B, C, and D differed little in principle from what was mentioned above, and they delivered nutrient values between 1,800 and 2,400 calories. However, of most interest was the K ration, developed by Dr. Ancel Keys of the University of Minnesota's Subsistence Research Laboratory. The K ration was a precursor to modern rations. It was packaged in three waterproof cardboard boxes corresponding to breakfast, lunch, and dinner, and delivered a nutritional value of 3,000 calories in a contained weight of 2.4 kilograms.

Conclusion

This brief study highlights that any reflection on the infantryman's equipment must take into consideration the physiological and physical limitations of the soldier. Developed by militaries until the nineteenth century, the equipment design involved an increasingly larger panel of specialists as it became more complex: doctors, surgeons, chemists, nutritionists, academics, engineers, industrialists, and others. It is precisely thanks to this multidisciplinary approach that today's infantryman has the equipment to overcome the challenges of modern warfare. Moreover, combining new technologies will eventually bypass the body-imposed limits.

Notes

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