French Symposium on Soldier Enhancement

Part 1

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 first 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)

The Enhanced Soldier

The Needs and Prospects of Increasing the Fighter's Abilities

Maj. Gen. Bernard Barrera, French Army

This is a translation of the introductory speech to the eponyme conference held in the Headquarters of French Armed Forces, in Paris, 19 June 2017.

Improving personal performance is an ambition that has inspired mankind since immemorial times. This drive is left over from an archaic, instinctual imperative of our prehistoric ancestors who struggled for survival. It also corresponds to a more contemporary aspiration seen in the athlete who dreams of running faster, jumping higher, hitting harder, and throwing farther.

A soldier must face both challenges: to survive, a constant challenge for humanity since its beginning, and to win, a challenge for any competitor. Historically, the different forms of evolutionary "tools" enabled mankind to achieve advantages in power, in range, in precision, in speed, and in foresight. It has reached the point where a soldier's athletic value has lost its relative importance in the equation that determines the overall effectiveness of a fighting system. In a curious turn of events, owing less to chance than to present an intimate understanding of the mechanisms of life, the soldier has regained the ability to evolve. From now on, it is possible to pierce the glass ceiling of mankind's congenital limits. As physical, psychological, and cognitive barriers diminish, humans are once again becoming decisive instruments of potential operational advantage.

The enhanced soldier is therefore a key subject in developing prospective military capacities. It is fully in line with the dynamic of *Future Land Action* (*Action Terrestre Future*, or ATF), the conceptual document stating a long-term vision for the French army, and resulting program work. Soldier enhancement reflects as well, even with specificities, the requirements of army, navy, and air force.

The subject of the enhanced soldier owes a lot to the research center at the Saint-Cyr Military Academy in Coëtquidan, which is at the forefront of this discussion. The importance of this subject can be evidenced in the June 2015 "founder" conference, followed by the publication of the special issue of DSI (Defense and International Security) in January 2016 and via multiple workdays and exchanges associating the Forces, the General Direction of Armament, the Joint Health Service, as well as industrialists and scholars. During one of those sessions for the conference on 19 June 2017, at which I spoke, there was an additional step noted in this common journey. My speech is largely inspired by the one I delivered on that occasion.

The question is, how can enhanced soldiers meet the needs of the armed forces? Six operational needs justify considering the engagement of an enhanced fighter. In order to be understood, I will place these needs in context and include several recommendations. Future challenges will include

Maj. Gen. Bernard Barrera was the deputy chief, Program Plans, Army Staff, French army, at the time of the "Enhanced Soldier" symposium. He was promoted to lieutenant general in November 2017 and assigned as deputy chief of staff of the Army. In January 2020, he was named as inspector general of the French armed forces.

French special forces deploying by helicopter in Mali. (Photo courtesy of @EtatMajorFR/Twitter)

seizing technological advantages designed to increase the soldier's physical and cognitive skills. However, the soldier, especially at war, requires precautions that would be incidental if one had to merely apply the desired enhancement characteristics to simple equipment. They are essential here.

A Paradoxical Context

The ambition to achieve an enhanced soldier is timeless, but the present era offers unprecented conditions for realizing that goal.

Is research for an enhanced soldier new? It is likely not. It could even be possible to describe soldiers as illustrating the enhanced man: a man who has benefited from technical as well as physical and psychological improvements, now through weapon and operational training. What are night vision binoculars if not the acquisition of a capability previously inaccessible to humans? What is a pilot if not a man capable of accomplishing the oldest dream of humanity? What is the Félin program, if not the overall enhancement of a fighter's individual abilities? [Félin is an integrated infantry combat system for the infantry soldier.] It should be noted, however, that none of these enhancements are intrusive or invasive to the human body.

Today's enhancement research may take advantage of options that did not exist before and from which we must draw a second element of context.

The current period is singular by the conjunction of two facts.

One is that scientific and technological advances in the fields of nano and biotechnologies, in digital science and artificial intelligence, in neuroscience, and in genetics are revealing entirely new prospects. The interdisciplinary combination of these scientific and technological advances allows work on the enhanced soldier to reach new steps.

The other lies in the observation that war comes back knocking at the door. The chance of a symmetrical conflict is growing while the soldiers in our armies have become less numerous, and the birth rate of Western countries is waning. As the ATF points out, Western superiority cannot be held for certain, not even technologically. Added to that, recent and ongoing conflicts teach us that fighting wars remotely is not enough to solve crises: we will always need men on the ground, in both quantity and quality. This need will likely continue or even intensify, contrary to attractive but partially misleading speculations about light footprint and shock and awe.

In the short term, therefore, it seems that the more urging question is more about increasing the number of soldiers rather than the capability of each one. However, when considering a return to war on the horizon, the right thing is to keep identifying and incorporating the advanced technologies that will improve the soldier's physical and cognitive abilities. As the balance between mobility, protection, and aggression increasingly withholds dilemmas facing unprotected but highly mobile opponents; as night vision technology-a traditional modern army's asset-is becoming commonplace; in the end, the mastery of situational awareness (knowledge of the situation) improves the ability to survive and the overall effectiveness in an always more complex environment, it is imperative to integrate innovative solutions. They belong by their names to artificial intelligence, robotics, augmented vision and augmented reality, exoskeletons, and flyboards… They will obviously constitute the new decisive advantages.

It is the Army's duty to ask itself whether it should seize the prospects offered by new forms of enhancement, even if they are more intrusive physically and mentally. In the manner of the outrageously utilitarian, why refuse to consolidate the man and the soldier if they are tomorrow's weak links?

The question is all the more acute as the battlefield of tomorrow will present the aerospace systems with unprecedented challenges. Combined with human weaknesses and limitations, these challenges reveal six necessary needs.

Six Necessary Needs

Tomorrow's combat will expose the soldier to long-forgotten conditions; technology allows us to reduce the impact.

Better perception for better reaction on a confusing battlefield. The soldier has limited cognitive skills; he cannot always immediately perceive the complexity of the environment in which he resides, especially when the threat is hidden and coming from all directions. Urban areas provide the more illustrative example. Any soldier, from infantryman to helicopter pilot, is most often required to react with urgency, facing duel-like situations with a few seconds to make the right decision and use the adapted gesture. The soldier's decisions are essentially to be measured relatively, in comparison with those of the adversary. In addition to the challenges faced by basic fighters, tactical leaders at all levels are required to consider multiple variables before executing a specific action.

The soldier's enhancement aims for the improvement of his perception and comprehension skills in preparation phases, during action, and if needed, very early before engagement, or at very higher hierarchical levels within command centers that plan and conduct these operations. Satisfying this first need leads us to consider the animal kingdom, which is rich with examples of enhanced abilities that we would like to apply to soldiers: night visibility or determining the origins of heat, the ability to sense vibrations from a great distance, improved smelling and hearing, expanded field of vision, ability to scale a vertical wall, and others.

Manage stress to confront violence outside the box. The reptilian brain (labeled so by neuroscientist Paul MacLean to describe the part of the brain responsible for survival instincts) allows the individual to mobilize its resources to prepare for exceptional situations. But stress can also reduce the soldier's abilities.

During the action, what combat sports enthusiasts call "the tunnel effect" can occur, described as an excessive focus on a supposed origin of a threat at the risk of losing awareness of the broader view and of the dangers that view contains.

After the action, the soldier can be deeply and permanently marked by an episode, to the point of generating posttraumatic stress disorder several weeks or months after the event. This is especially important during fights within populations that do not care about women or children, or where indiscriminate acts of ultraviolence are common.

The soldier enhancements must therefore contribute to a person's resilience during and after action. They must foster positive stress that strengthens soldiers and limit negative stress, which weakens over time.

Gain power and endurance in fights of unknown intensity or duration. Western armies have been able to imagine "ideal" conflicts in which they would have condensed extreme sequences of violence, both paroxysmal and ephemeral, by the application of an overwhelming and targeted military power. However, we understand that this scheme, while certainly attractive, is only a model. Truths as old as the battlefield will remain: soldiers will carry heavy loads for a long time

under demanding climatic conditions. They will watch vigilantly—in front of a screen or observing the horizon. And they must, at unexpected times, have all their agility and lucidity to give the best of themselves and be "at the rendezvous," reconciling extreme aggressiveness and control of force.

Improving the physical/athletic performance of the fighter is therefore a timeless challenge. These improvements must be at least threefold: improved resistance to physical exertion and discomfort (endurance and hardiness); improved resistance to pain and extreme weather conditions; and finally, improvements to raise the functional limit unique to a particular individual, to place him or her at the average level of the population considered.

have sought to unravel the secrets of this combination to appreciate the respective balance. A common trend for many of them is that cohesion owes much to the basic interactions between the individual and the small-scale tactical cell to which he or she belongs (the crew, the section). It is therefore legitimate to wonder if the process of acquiring the "fighting spirit" cannot be shortened and guaranteed, identifying the means of profiling to better characterize individuals, then combining them most advantageously and optimizing their training.

To conserve critical mass, reduce mortality, and recover the wounded in action. Reducing combat mortality in our own units responds to a moral injunction because any leader is accountable for the lives of

> Every leader knows that the esprit de corps and the moral strength of a unit are the fruit of a complex alchemy, long to elaborate but easy to break.

When adopting a resolutely prospective point of view, it is easily possible to imagine limiting the need for water and food; reducing the vulnerability to nuclear, radiological, biological, and chemical attacks; or regulating the thermal signature. But how can one not mention also the long sought after "grail": the drastic limitation, in the long term, of the need for sleep, and the increase in the speed of recovery?

On a battlefield where actions of influence will intensify, guarantee the "fighting spirit." Every leader knows that the esprit de corps and the moral strength of a unit are the fruit of a complex alchemy, long to elaborate but easy to break. And breaking the will of a unit is precisely what the enemy will attempt by taking perceptive actions in the field. The collective strength of a unit is the result of a subtle combination of trust (in oneself, the leader, the value of the group and its equipment, the quality of support and sustainment, and so on) and conviction ("the cause for which I risk my life is legitimate; my action is supported by the national community, which gives me its support and its recognition"). Innumerable sociological studies

his soldiers. This imperative also responds, more coolly, to the pragmatism of an army whose strength is limited or even reduced when compared to other human masses. Evacuating a casualty decreases the potential of the unit in the moment and for a long time afterward. Training a soldier is a long and expensive process. Finally, the political cost of losses, especially if they are massive and simultaneous, is considerable. It can even have strategic repercussions as evidenced by the war fatigue that is observed in some of our Anglo-Saxon allies. Past losses can discourage the use of force again; at the very least, they can disturb thinking. Increasing the survivability of men in case of injury is therefore necessary. This is not enough, however. Before the "enhanced" soldier, efforts must be made to have better "repaired" soldiers, in their flesh, and when possible, in their minds. Rehabilitating the defense community, ideally by allowing our wounded to regain fitness for service, is a reasonable goal, accessible in the relatively short term.

For operational efficiency right away, prepare for "the first time." The high mortality rate of young

recruits has been highlighted several times. And it is only when the first commitments pass and the inurement to noises, smells, and atmosphere of combat is realized that this mortality rate decreases. Instinct then takes over, and senses instantly awaken to adopt the best posture.

Today, despite fierce, frequent, and sometimes long and brutal actions, few fighters can rely on a daily combat experience. Many will return to civilian life before building operational capital that could have become an important component of their self-protection. Accustoming young soldiers before action in combat, since the majority of them will spend only a few years in uniform, is therefore a necessity. It is likely that developments in neuroscience, in addition to more realistic simulations, will help to familiarize combatants with the demands of a war situation.

Caroline Galacteros, a political scientist, perfectly summarizes the needs previously mentioned: the armies would need "bionic men, who run fast, do not need to sleep, eat and drink very little, and can fight permanently."[1] How do we satisfy these needs? By a bionic man, by a hybrid type that cannot be categorized as man or machine? By the development of skills previously unfamiliar to the human species? By an improved, nonbiological intelligence? Anthropotechnics and techniques derived from medicine and nano and biotechnologies allow us to imagine multiple applications. But the subject is infinitely sensitive. The need for definite limits faces a factual observation and a risk at least as great as the one brought by the modification of the human material. When in the chaos of war, the ethical barriers inevitably move and become fragile. Above all, when confronted with an enemy who does not have our scruples, do we not risk letting barbarism prevail by denying ourselves the use of certain techniques in the name of principles whose relevance should be limited to peace time?

Necessary Recommendations

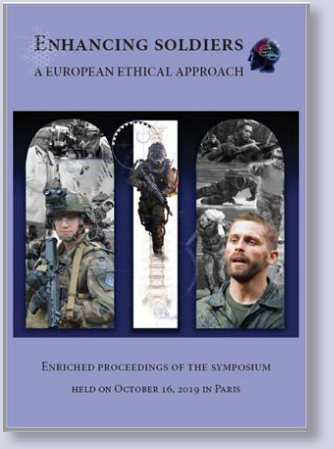
Keep close link with what founds a civilization. To try to see more clearly and provide ethical answers, some recommendations seem necessary. They outline a first regulatory layout, admittedly provisional but coherent with what we believe to be the deep project of our civilization.

The imperative of pragmatism: do not give away the shop for a sixpence. The search for operational efficiency, far from making us potential Frankenstein doctors, leads us on the contrary to proceed with a great deal of caution (which the development of in-depth ethical reflection requires) and asks us to avoid two pitfalls.

The first would be to abandon the idea of less invasive enhancement solutions. There are still substantial productivity margins to be exploited in terms of physical training; for example, by further personalizing the preparation of soldiers. Being less invasive can also mean finding alternative solutions, by developing automated systems that will not change the man but will help or replace him. The gains to be hoped for are considerable, especially in terms of endurance.

The second pitfall would be to "weaken" the soldier by collateral effect. Explaining the deficiencies of the soldier—that enhanced capabilities would make up for—should not overshadow the innumerable qualities that must be preserved; maybe even including a few "weaknesses" such as crying, to quote a reflection of

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 https://www.euroisme.eu/images/Documents/pdf_cahiers/Le%20soldat%20augmenté%2019-06-2020-web%20VFinal.pdf



Lead Medical Officer Eon. As we said, the soldier is the fruit of a complex alchemy. The functioning of the human brain is still largely unknown. Any "enhancement" may therefore cause a modification or a "weakness" that is not otherwise controlled. It would be unacceptable, therefore, for the soldier's discernment, equanimity, and empathy to be altered by benefits that would then lose much of their meaning.

The imperative of responsibility: do not forget that the material is a man. Biotechnologies are not acceptable under all circumstances and without precautions. In the current "temperature and pressure" conditions, the enhancements of the combatant seem to us to have to meet several criteria: to be granted by the individual and accepted by society; to be targeted to meet a specific operational need; to remain without physical and psychological consequences, in the short term obviously, but also in the long term, because the soldier is a future civilian; and finally, to be reversible. It is good to put the human at the heart of our considerations so that we will be certain not to go astray.

The imperative of interaction, including with the adversary: remember that the means of which a society is equipped with say something of itself and of its defense in particular. Of course, we must keep in sight the purpose of military action: to impose physical force on an adversary, to defend our major or even vital interests, or simply to stabilize a crisis area. Therefore, first, we must win: the enhancement of the soldier can thus be justified. But then we must stabilize, normalize, support the return to the political, economic, and social life of peacetime. In this context, should the "enhanced" soldier not remain deeply human? Keep in mind that the dehumanization of the combatant—a risk that could increase as a result of enhancement—will fuel a spiral of violence. It is therefore reasonable to consider at this stage that mankind, as opposed to the machine or even the "hybrid" man, must remain at the origin of any decisive action on the battlefield.

Conclusion

What/who will the enhanced soldier be tomorrow? An improved, transformed, modified soldier; a hybrid being; a new Prometheus? Will he be the combination of several improvements or the consequence of a more specific enhancement? This file of the National Defense Review will help to outline answers. One thing is sure though; the right enhancement lays probably in a moderate position. It is probably less urgent to acquire new capabilities than to seek to compensate for the weaknesses of the combatant, then to allow all the soldiers to have the extraordinary physiological capabilities that are found in some privileged "natively endowed." Seeking new abilities will only follow that first step. In other words, let us focus on the main vulnerability of each operational function, and on the point that will allow it to gain efficiency exponentially. Finally, let us not forget that technical developments respond to a need, without omitting that they influence the way we express them. This dialogue will continue for the long term. It is up to us to continue this reflection which, intermingling more intimately than other technological, operational, and ethical considerations, requires more clear-mindedness and intellectual courage. ■

Notes

1. Caroline Galacteros "Enhanced Man, diminished will (interview)", Inflexions 32 ("le soldat augmenté"), 2016, p117-122, http://inflexions.net/revue/numero-32

US ISSN 0026-4148