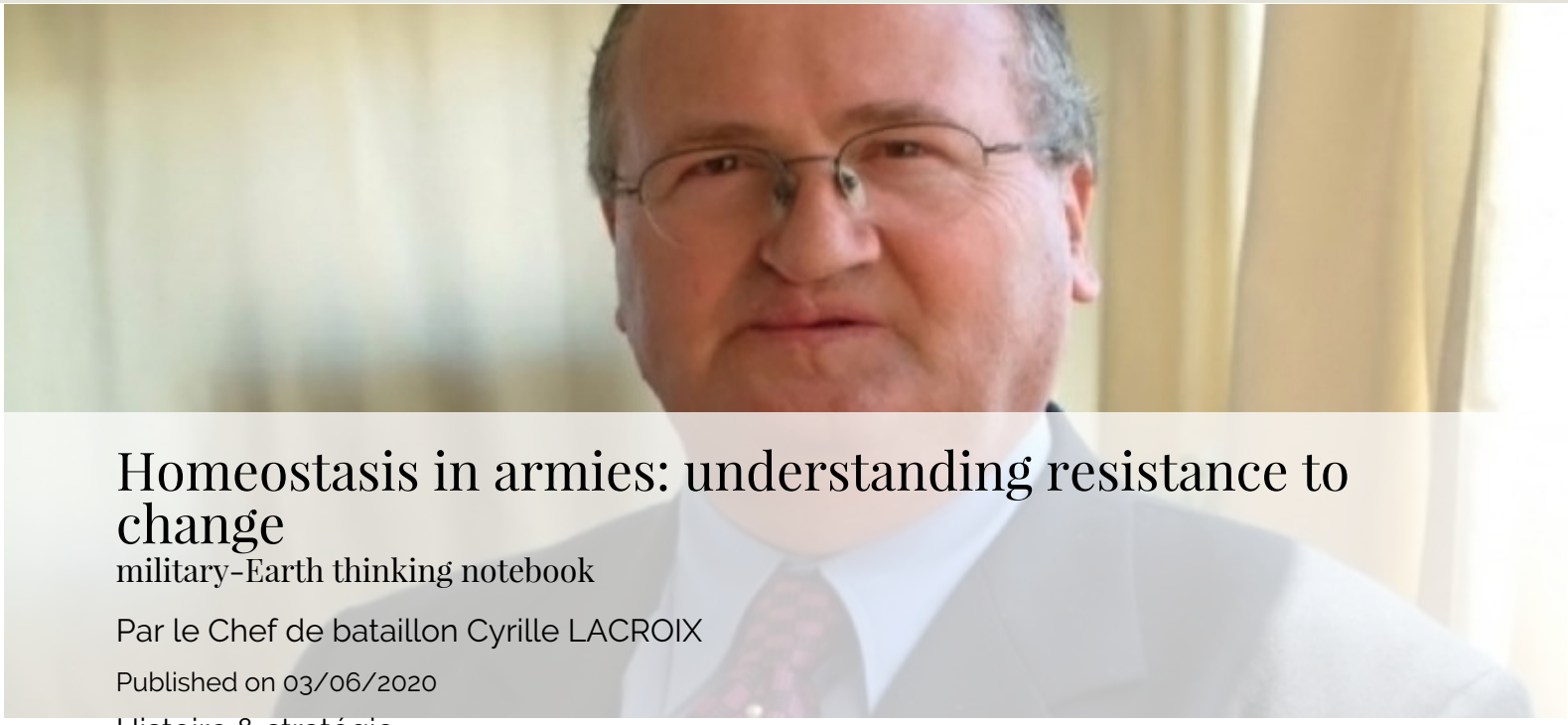

Homeostasis in armies: understanding resistance to change

military-Earth thinking notebook

Par le Chef de bataillon Cyrille LACROIX

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Histoire & stratégie

While technology is a paradigm that armies use to gain the upper hand, there is a certain conservatism in the military. Battalion Commander Cyrille Lacroix describes this resistance to change, or homeostasis, as a necessary property for organizational resilience. It can, however, have negative consequences for operations. This resistance must therefore be taken into account in order to succeed in any strategic evolution based on technological innovation.

"On thewhole, military organizations tend to be conservative in their approach to technological innovation**.**

Martin Van Creveld

"We are ready and very ready. Should the war last two years, our soldiers would not be missing a gaiter button" 2. Thus Marshal Edmond Le Bœuf, Minister of War, used these optimistic words before parliamentarians, just before the beginning of the dark defeat of the French armies in 1870. But it is not the optimistic tone that General du Barail reproaches the Marshal in his Memoirs, "it is for having believed in the reality of military conventions that meant nothing if they were not to ensure us decisive successes for the rest of the campaign" 3.

Homeostasis is a property of living cells that translates into a phenomenon of internal regulation to external variations in order to maintain optimal conditions for survival. The result of biological and physiological research, homeostasis was first discovered by Claude Bernard4 , then studied in detail by Walter Bradford Cannon5 and W. Ross Ashby6. 6 This phenomenon guarantees the stability of a system as much as it induces

resistance to any change coming from an external signal or stimulus. This paradox also deserves to be studied within armies in the context of technological evolution.

In order to study the evolution of strategies in the face of innovations, it is necessary to look at the resistance to change in military organisations. Understanding the notion of homeostasis makes it possible to better apprehend any transformation through the analysis of capabilities and obstacles to innovation.

We will begin by demonstrating that the conservatism of the military organisation, if it is based on a need for resilience, can derive from a simple justification of the established system. This property, which should provide a guarantee of survival, can then prove counterproductive, even harmful to military action. Finally, in order to overcome this paradox, the duality of flexibility/stability induced by civil-military synergy must be considered as a real asset for armies in the field of technological development.

"Resist, prove you exist"[7]

Military conservatism is characterized by two features: it manifests itself as much to ensure the survival of the existing system as to better justify its relevance. To demonstrate this, we begin by explaining how this property of survival exists in any organization, and particularly in the military world. We will then see that the phenomenon of self-justification cannot be ruled out either.

By focusing on systemic analysis8 , Joël de Rosnay explains that every organization, studied as a system9 , has a fundamental property10, a will to survive: homeostasis. In the face of external events that disrupt the optimal functioning of the organisation, regulatory actions (feedback) are carried out. At all levels of the organization, measures are taken to re-establish a known order. In imagining an organization in which this property is highly developed, Joël de Rosnay concludes that "homeostatic systems are ultra-stable; their entire internal, structural and functional organization contributes to the maintenance of this same organization" 11. 11 Even if armies have the structures to make their doctrine evolve, the resistance induced by their conservatism is fundamental. It aims, first of all, to guarantee the resilience of a system that works, in the face of a change in organization that could be premature.

According to Daniel Ventre, who studies strategies linked to cyberspace, "techno-scepticism (or salutary caution) is the order of the day in many circles, and the military is no exception to the phenomenon" 12. 12 And change will only come about if it can be demonstrated that external aggression can take the system to task. Thus, "to have new technology is to have an advantage over the adversary as long as the latter has not caught up by acquiring the same novelties" 13. Beatrice Heuser illustrates this resistance of armies to innovation over time. For the historian14,the transformation of strategy does not take place according to a relationship based on technical evolution: there is no linearity between the two evolutions.

A battle of ideas between supporters of the old model and advocates of new ideas arises with each technological revolution. Béatrice Heuser shows how the study of Napoleonic strategies was at the centre of French thinking before the First World War: "Just as the men of the Renaissance felt the need to call on the wisdom of the ancients and to model their strategies on those of the great generals of antiquity, the imitation of the Napoleonic mode of warfare became the guiding thread of strategy during the period 1860-1918" 15. 15 However, although the important technological advances due to the industrial

revolution were understood, they were not introduced without reluctance: "Their importance was not questioned. However, their consequences were debated. ...] Technology became a hotly debated subject in the mid-nineteenth century and remained so" 16. The adoption of the change is therefore not immediately consequential to the technical invention.

However, while the solution to change seems obvious at first glance, Joël de Rosnay demonstrates that maintaining the established order may be the most widespread response. Indeed, the non-rejection of an existing model that has worked, the maintenance of a habit in which the entire organization works more quickly, or the willingness, which may seem proud, to impose one's previous choices are very often a brake on any attempt at change. This tendency to focus on what has been achieved and how it works is also found in the military, as history shows.

When Marshal Philippe Pétain was received at the French Academy on 31 January 1931, Paul Valéry recalled his realistic understanding of the power of the machine gun and artillery. However, it was not until the first hecatombes, due to the current doctrine advocating an excessive offensive, that modes of action changed.

"You have discovered this: "Let fire kill..."

Well, I wouldn't say it was ignored until you did. We were only inclined to want to ignore it. [...]

It appeared to you, sir, that the tactical regulations in force did not give this fire that kills a very important idea. The perpetrators saw in it, above all, a lot of wasted bullets, and a lot of time wasted in wasting them. It was taught a little everywhere that fire delays the offensive, that the man who shoots goes to ground, that the ideal would be to advance without firing....

Having made your discovery, sir, you can only draw the consequences. You are making a separate tactic; quite different from the one taught, and whose formulas you give are clearly opposed to the precepts which commanded unconditional movement.

17 Later, John Keegan noted the inadequacy of the means necessary to apply the formidable firepower of the machine gun and artillery gun. Because of the lack of research in the field of communications and the virtual absence of communications security, "the generals then found themselves at the mercy of delays and uncertainties, as in the more remote periods of the war. With hindsight, and despite the optimization of firepower that it promises, it appears that this nascent technique is not sufficiently developed to make a difference. 18 The effects of this resistance do not, however, drag the Allied armies into defeat, and further development will be necessary to achieve victory against an aggressor subject to the same constraints of systemic innovation and resistance. However, it must be recognized that this desire to preserve established procedures can also be understood psychologically as a refusal to accept one's initial mistake. Resistance is then both a necessity for the survival of one's structure, but also a movement to claim the validity of one's opinion, independently or in spite of changes in the outside world.

This resistance to novelty, which does not encourage the emergence of different ways of operating, can therefore be damaging when only innovation makes it possible to remain competitive.

When resistance does not win

Despite its goal of resilience, this resistance to change can, if misunderstood, lead to the loss of the entire system. Indeed, it is undeniable that a reflection on change is necessary to adapt a model to technological developments. We will then be able to establish how too strong an attachment to an existing model can lead to defeat.

Thinking about technological novelty is not a new fact, as we saw earlier with Béatrice Heuser. At a time when the means and uses of connecting and sharing ideas and data on networked computer applications are becoming more widespread, it is natural to call for a general reflection on computing and the new means of communication. However, both the social impact of the invention and the consequences on the organization of society or armies cannot be perceived a priori. It therefore becomes useful, first of all in a systemic vision, then taking into account the inherent resistance of the system, to reflect on the consequences of choices on the durability of its organization. As Martin Van Creveld's analysis of technology-induced transformation puts it, "had it beenrapid, both the process itself and its social consequences would surely have received greater attention.

19 In furthering his study of military command and operations, the historian identifies the dispersion of units as the main factor in the difficulty of commanding. This overall view of combat, particularly in the trenches of the First World War, ultimately relates signals and command capabilities to offensive and defensive capabilities. "Ofthese [factors], the most important was probably extreme dispersion, which caused each soldier and each unit to spread out more than before. Dispersion in its turn led to problems in command and control, particularly on the move and in offensive warfare, when wire-band communication systems could only be used with difficulty, and sometimes not at all. Though, few historians have discussed these problems at any length, they did as much to shape trench warfare in World War I as did barbed wire and machine gun" 20.

Moreover, the perpetuation of a system that does not take into account external developments can lead to the loss of the system. Maintaining a mode of operation overtaken by the possibilities of adverse aggression by simply amplifying the variables of an already proven mechanism can lead to the downfall of the whole system.

organization. Far from being the sole reason for the failure of the German armies in the First World War, we can illustrate this by maintaining an established system of German command means.

The control of information having been a strong point of the previous campaigns for the Prussian armies, the same organization, the same procedures, the same tools lasted between 1871 and 1914. Since the whole had proved effective in defeating France for the first time, the German army thus retained in 1914 a command system that was, however, burdened with profound shortcomings. These shortcomings were not intrinsic, since they did not exist in 1870, but were due to two factors: an unsuitability to the maneuver envisaged and, above all, an over-reliance on technology.

Thus, according to Count Alfred Von Schlieffen, a Prussian general, Chief of Staff of the German armies from 1891 to 1906: "The warlord will be located farther inthe near, in a house with spacious offices, where wire and wireless telephone, and signaling equipment are available. There, seated on a comfortable chair, in a front of a large desk, the modern Alexander will have the entire battlefield under his eyes on a map. From there he telephones inspiring words, receives the reports of army and corps commanders, captive balloons, and dirigibles, which all along the front watch the enemy's movements and register his positions" 21.21 Succeeding Von Schlieffen, despite his reluctance to this

vision, Helmuth Von Moltke (known as Moltke the Younger and nephew of Moltke the Older) launched the German invasion of France in 1914, according to this vision based on technology22. 22 As a result, his headquarters was located well behind the front line in Luxembourg when his troops were fighting on French soil. Doctrine advocates a front-to-back link, leaving a considerable amount of work for the men under fire, slowing down the implementation of telephone and telegraph lines all the more when transmissions are not jammed. Moltke found himself cut off from the command of his armies, unable to send orders and even to know the tactical situation.

Preserving the methods of the past, pushing the existing model to the maximum without realizing the consequences of its maladjustment to the present time leads here to an irremediable error. Having difficulty in commanding, Moltke therefore sent a staff officer, Lieutenant-Colonel Hentsch, to inquire about the tactical situation. Arriving at the front, the latter decided, without referring to the main headquarters, the fate of the German offensive by stopping it, despite careful planning ahead of time. The lack of information led to poor decision-making by a subordinate echelon that could not be commanded.

While signals had played a major role in the victorious German campaigns between 1866 and 1870, blind faith in the old model and an overestimation of technological capabilities nullified this advantage in the First World War.

Having studied the relationship between strategy and technological development, it should be noted that armies also rely on civilian inventive capabilities.

The strength of a model lies in the duality of flexibility and stability

The combination of the flexibility of the civilian world and the stability provided by the military world favours technological development. First of all, let us note that the military world was at one time the initiator of research and development. Finally, let us commit ourselves to the need for a balanced civil-military model, where military objectives remain present in the innovation process.

Nowadays, for many countries, research and development is no longer a state responsibility or prerogative, or even a military one. Nevertheless, in order to ensure the sustainability of their nation, political decision-makers favour the use of innovation for military purposes so as not to find themselves technologically overwhelmed or dependent. In addition to the debates related to the military uses of inventions and the homeostasis inherent in the organisation of armies, defence is therefore a driving force for innovation. In order to implement certain military options in the service of a policy of control of its geopolitical environment, defence is even at the origin of real breakthroughs.

For example, real technological leaps have in fact taken place in the course of research to obtain a credible and resilient nuclear fire capability. It is from this perspective that the United States of America, through its defence, played a major role in the birth of cyberspace. Engaged in a showdown of power against the Soviet bloc (the Cold War), the American defence wanted to have the ability to command from all command posts located throughout the country by imagining the destruction of one of them. In this confrontation where nuclear weapons were brandished as the first and last response, the ability to command, and therefore to direct the strikes, was a priority at the time. Two major advances in the field of communications, stemming from DARPA23 research,were therefore the result of the constraints on the use of nuclear weapons: the Internet and the Global Positioning System (GPS) . ARPANET24, the technical forerunner of the Internet25, technically meets the needs of armies to communicate data remotely between computer

terminals. Similarly, in order to be able to accurately locate the launchers of the submarine component of the nuclear deterrent force and to target targets with the same precision, DARPA has participated in research on geographical positioning using satellites. These revolutions, now amplified and generalised for civilian use, were originally the result of research carried out for military purposes.

As we have shown, and as Martin Van Creveld26 has written, it is thenature of war, its unpredictable nature, which requires military organisations to rely on rigid structures: subordination, discipline, hierarchy. Innovation, for its part, will be fostered by a flexibility of minds and organisations. Thus, in the case of dual technologies between the civilian and military worlds, while benefiting from a fertile breeding ground in public research centres or private companies, invention can be based on the rigid military structure. The advantages are significant: testing capacity, long-term project, state financial power, etc.

The civil-military duality of technological development is above all a duality of properties: flexibility of the civilian world, which can rely on the stability of the military world, before being a duality of use and economic opportunities: deployment in armies and reinvestment for civilian use. In this complementarity lies both the need for armies to acquire superiority over the adversary by means of technology, and the necessary conditions for costly research.

Beyond the assessment of risks, future threats and the monitoring of promising technologies, a true mastery of this innovation implies including the definition of a vision on future uses in the armed forces. It is not only a question of thinking about tomorrow's tools, but also the intrinsic uses and implications on command, operations to be carried out on the enemy and induced vulnerabilities. In its 2014 final report on the Vulnerability and Resilience of Modern C2[27]The Foundation for Strategic Research not only provides a fairly exhaustive mapping of the means of command and action on networks, but also the consequences on processes or effects related to the densification and complexity of the information environment. According to this study, the benefits of communication and IT tools are real for operators, who see an improved speed of their actions. For higher levels, where information accumulates and becomes ubiquitous, the improvement in the speed or timeliness of decision making is less obvious. Whether by entryism, tunnel effect28 or the suppression of formal relationships, command would be constrained by a technology that would not bring with its deployment instructions, limitations, a capacity to work in degraded mode and a simulation capability to apprehend its environment.

Endorsing the conclusion of Victor Hugo in his "Story of a crime"We resist the invasion of armies, we do not resist the invasion of ideas"29 , we are concerned here with demonstrating howarmies are invaded by new ideas. In order to promote the emergence of these new ideas, and their ability to impose themselves, it is necessary to understand the forces of military conservatism. The latter, which is useful for ensuring the resilience of a system, can also produce harmful effects without being questioned in the face of changing times.

Homeostasis is therefore a perennial property within armies that must be used to transform and adapt to future challenges. Changing within armies means accepting stability, the foundation of their legitimacy, as well as the rigidity it induces and the invitation to flexibility in contact with the civilian world. In this context, a fair balance between the civilian and military worlds helps to ensure a convincing and accepted evolution.

In 1948, in his work establishing cybernetics as a science, Norbert Wiener described homeostasis as "an important physiological application of the principle of feedback",30

which "proves to be even more essential for the continuation of life" than any other form of feedback. At a time when the term "cyber" is no longer in the media and security spotlight, it may become interesting to look at other contributions of the principles of cybernetic thinking to technological evolution.

At the end of the Special Military School of Saint-Cyr, promotion "General de Galbert", Battalion Chief Cyrille LACROIX chose the weapon of signals. He spent the first part of his career in the 40th Signals Regiment, then in the 5th Signals Regiment. Patented

of the War School, promotion "Général Gallois", the Lacroix Battalion Chief is currently studying at Télécom ParisTech.

1 "In general, military organizations tend to be conservative in their approach to technological innovation." Editor's translation, in van Creveld Martin, "Technology and War, From 2000 BC to the present"Simon and Schuster, n.c., 2010, 352p. , p.223.

2 Du Barail, François-Charles, General, "[translation].My Memories, Volume 3,1864-1879"11 ed. Plon, Plon, Paris, 1897-1898, 616p., p. 148.

3 Id. at 148-149.

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5 Cannon, Walter Bradford.The Wisdom of a body"", 1932.

6 Ashby, William Ross, "Principles of the self-organizing dynamic system" in Journal of General Psychology, Volume 37, pp.125-128, 1947.

7 Berger, Michel, Résiste, 1981, song performed by France Gall.

8 Systemic analysis is used "to define the limits of the system to be modelled; to identify the important elements and types of system, and to identify the most important elements of the system.interactions between these elements, and then to determine the linkages that integrate them into an organized whole" in Rosnay, Joël (de), "....The Macroscope, Towards a Global Vision"Paris, Seuil, 1975, 376p., p.101.

9CICDE, Joint Doctrinal Reflection RDIA-008_AS "Elements of Systems Analysis for Operational Planning", 2012.

10 Rosnay, Ibid . p.128.

11Id.

12 Ventre, Daniel, "Cyber Attack and Cyber Defence"Lavoisier, Paris, 2011, 312 p., p.205.

13Ibid. p.203.

14 Heuser, Béatrice, "Thinking Strategy from Antiquity to the Present Day"Picard, Paris, 2013, 434 p., p. 134-151.

15Ibid. p.134.

16Ibid. p.135.

17 Reply by M.Paul Valéry to the speech of MrMarshal Pétain, https://fr.wikisource.org/wiki/R%C3%A9ponse_de_M._Paul_Val%C3%A9ry_au_discours_de_M.

Le_mar%C3%A9chal_P%C3%A9tain, consulted on 24 January 2017.

18 Keegan, John, "The First World War"Perrin, Paris, 2003, 560 p., p.34-35.

19 "If they had been quick, both the process itself and its social consequences would surely have received more attention". Editor's translation, in van Creveld, Technology and War, op. cit, p. 218.

20 "Of all these factors, probably the most important was the extreme dispersion, which resulted in an unprecedented spread of soldiers and units. Dispersion, in turn, led to command and control problems, particularly in the movement and offensive phases, when wired communication systems could be used only with difficulty, and sometimes not at all. However, although few historians have discussed these problems in any way, they were as much a part of shaping trench warfare in the First World War as barbed wire or the machine gun". Editor's translation, in ibid. at 265.

21 "The warlord will be located well away from the front line, in a house with large offices, where wired and wireless telephones, as well as transmission equipment, will be available. ...] There, sitting in a comfortable armchair, in front of a large desk, this modern Alexander will have the entire battlefield before his eyes, on a map. From this place, he will telephone his good advice, receive reports from army and corps commanders, captive balloons, airships, which, all along the front line, will monitor the enemy's movements and record his positions". (Editor's translation), quoted by van Creveld, Command in War, USA, Harvard UniversityPress, 1985, 339p., p.153.

22Ibid. p.153-154.

23DARPA: Defense Advanced Research Projects Agency.

24ARPANET: Advanced Research Projects Agency Network .

25 Waldrop, Mitch, DARPA and the Internet revolution, published on the DARPA website and available athttp link: //www.darpa.mil/attachments/%282O15%29%20Global%20Nav%20-

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26 Van Creveld, "Technology and War"op. cit. p.220.

27 Gros P., Joubert V. and Coste F., "Vulnerabilité et résilience du C2 moderne", report n°305/FRS/C2 of 2 July 2014.

28 Tunnel effect: focusing human attention on a reduced number of information channels when there are too many sources of information.

29 Hugo Victor, "History of a crime"Éditions Abeille et Castor, Angoulême, 2009, 505p.

30Wiener, Norbert, ".Cybernetics, information and regulation in the living and the machine"Paris , Seuil, 2014 (1948 text), 370p., translation and presentation of Le Roux Ronan, p.215.

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