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INFOFLASH

TOWARDS SUPER SOLDIERS? THE IMPLICATIONS OF TECH–INFUSION OF SOLDIERS AND THE CONCEPT OF CONNECTED SOLDIERS ON THE MILITARY LANDSCAPE

WRITTEN BY

PHILIP SÄÄW

EDITED BY

CATERINA PANZETTI

SUPERVISED BY

VICTORIANO VICENTE BOTELLA BERENGUER

Introduction

There is an increasing reality to the fascination of enhancing human beings on the battlefield. What has been dreamed up in arts and television, such as 'The Six Million Dollar Man' in the 1970s or 'Captain America' and 'Iron Man' in the Marvel Cinematic Universe, has been symptomatic of the desire to cross the boundaries of the human body and create a 'super soldier' (Harper, 2016, p. 32). While this fascination was forced into the terrain of Sci-Fi for a long time, both the technological and biological enhancement of soldiers has, since the early 2000s, become a very real object of investment and research in the military sector.

In the case of the latter, biological enhancement has historically gathered an enormous amount of interest that has been coupled with intense ethical scrutiny. Recent research into this type of enhancement has, for example, revolved around harnessing the sleep/wake cycle, preventing the "degradation of decision-making" with attention-enhancing drugs, and hacking the soldier's metabolism to ensure optimal nutrition on the battlefield (Bickford, 2020, p. 35). The increasing intensity with which projects in this area are led signifies the way, as Andrew Bickford (2020, p. 35) argues, the military focuses on the "biology of the soldier," especially in the context of making them 'kill-proof.' However, the significant question of the societal and ethical implications that meddling with human traits brings looms grandly over this issue, putting into question whether circumventing such a taboo could potentially have a grand-scale effect on the international security landscape (Ben Ouaghram-Gormley, 2020). This question is fundamental in the space in which "battles are first fought", described by Bickford (2020, p. 34) as the "space between memory and imagination," a space of anticipation and hyperawareness of "all forms of threat and danger and open to thinking every and all developments that could give you an edge on the battlefield." In this space, the implications of human enhancement matter considerably for the military landscape.

Rather than discussing biological enhancement, however, this paper focuses on how technological enhancement impacts the military landscape. This is partly due to the ethical ambiguities of biological enhancement but equally due to the higher feasibility of technological enhancement. As the then Chief Scientist at the 711 Human Performance Wing of the Air Force Research Lab (AFRL), Dr Rajesh Naik, commented in 2016, "The Defense Department isn't looking to permanently enhance individuals (...), when it comes to understanding US military improve troops' performance, think of Iron Man" (Harper, 2016, p. 35). The Swedish Security & Defence Industry Association's (SOFF) assertion that the concept of tech-infused soldiers, or 'Connected Soldiers,' has emerged as "a pivotal technological trend reshaping the landscape of military operations," points to the greater relevance of technological enhancement in the current military landscape (SOFF, 2024a). Expanding on this assertion, the argument made here is that the constitutive facets of the Connected

Soldiers have the potential to lastingly transform warfare both on and off the battlefield. To that end, this IF will start by outlining more closely what 'makes' the 'Connected Soldier' and what recent developments entailed. This will be followed by an application of these developments to a broader discussion of their implications on the military landscape.

1. Connected Soldiers and Current Developments

In outlining how the 'Tech-Infused Soldier' can lastingly transform the military landscape, it is important to first understand the developments undergoing in this research area. The range and diversity of what is worked towards in this area underlines the increasing centrality of tech-infusion on the battlefield. In trying to make this point clear, this section will outline first the importance of technology on the battlefield. It will then explore how tech-infusion must function to be suitable for warfare before going into detail on how it makes reality easier for soldiers through physical enhancement, particularly through Augmented Reality (AR), and how it changes the role of the soldier by reaffirming the boundaries of reality itself.

One specific way tech-infusion is becoming ever more present is through the parallel digitalisation of everyday life. Technological interconnectedness has become a normality for vast parts of society, stressing the value of effortless communication. Making communication effortless and furthering the interconnectedness of military personnel is one way in which tech-infusion is becoming increasingly central to the role of the modern soldier. Especially in modern peacekeeping, "Military personnel need mission-fit computing and communication solutions that are designed, tested, and qualified for the most extreme environments and tactical scenarios" (MilDef, 2020, p. 1). In that way, specifically, a continuous infusion of technology into a soldier's gear and its persistent improvement is important for the contemporary conditions of the soldier that revolve around being on constant alert and being aware of the changing conditions of their surroundings.

The development of wearable technology is significantly influenced by the demands of military applications. Substantial investment made in the area is put into making them 'high speed,' highly reliable, 'lightweight,' 'miniaturised,' and 'ruggedised' for suitable delivery in military environments (Goetzman, 2023). This is particularly important considering the weight load involved, with soldiers already carrying up to one hundred and twenty pounds in total (Goetzman, 2023). To that end, research has taken the direction to, for example, "built rugged rather than ruggedised" and to accommodate the military's need for "more power and data in a smaller form factor" (Goetzman, 2023; MilDef, 2020, p. 2). In thinking about current developments, not only progressing this technology but making it applicable for the soldiers in the most efficient way remains a central aspect of furthering tech-infusion. The crux of current development is not simply to have the best technology, but to incorporate it

into the soldier's gear in a way that fits the battlefield.

Moving on to how technology improves the soldier's life, there is a specific focus on using technology to make life easier by enhancing physical facets, especially to match battlefield conditions. Interesting progress has been made in regard to stealth and mobility, in particular. In the case of the former, SOFF, for example, writes that the integration of sophisticated sensors could lower soldiers' detectability and that, coupled with sensor-jammers and advanced camouflage, soldiers would be able to make it more challenging for adversaries to identify soldiers (SOFF, 2024a). Research into this area has taken shape in forms such as the Massachusetts-based Laboratories Inc.'s electrochromic camouflage that functions similarly to chameleon skin, or the 'Clothing Systems' made by the Swedish company TAIGA that protect from detection across various spectrums such as ultraviolet (UV) radiation spectrum in addition to centring around climate-independent performability (BusinessWeek, 2003; TAIGA, 2021, p. 4).

In the case of mobility, equally impressive progress has been made, especially in the context of exoskeletons and improved boots that improve the soldier's speed, strength and stamina. A great example of this is the research on creating 'molecular muscles,' capable of being used to boost leg strength, but equally to function as a tourniquet, or even as the basis for lighter bullet-proof vests (Talbot, 2002, p. 46). More specific examples include those that resemble exoskeletons more closely, such as the Arizona State University's 'Air Leg System,' which would allow soldiers to run at a sustained speed of 5.5 metres per second, enabling a soldier "to clock a five-minute mile" (Harper, 2016, p. 32), and recently developed, energetically optimised military combat boots, that contribute to metabolic savings that reduce the risk of heat straining and improve the average performance on a two-mile run by eight to fifteen per cent (Ryan et al., 2024). In that sense, in terms of stealth and mobility, technological enhancements are aimed at making reality easier for soldiers. Specifically, they aim to ease the specific strains on soldiers' bodies as well as the strategic challenges that directly impact the human body's limitations.

This is, however, not where tech-infusion ends. Whereas research into stealth and mobility aims to make reality easier, a significant strain of research is put into AR, to try to reaffirm the boundaries of reality on the battlefield. AR differs from Artificial Intelligence (AI) in that it superimposes digital information onto the real environment rather than remaining wholly digital (SOFF, 2024b). One of the main ideas for an application of AR in the defence sector is to develop smart helmets with capabilities that could display critical information, such as maps, mission objectives and enemy positions, directly into the soldier's field of view and, therefore, rapidly enhance situational awareness of soldiers during crises (SOFF, 2024a). The development and improvement of such technology would of course change the military

landscape lastingly. Possessing maps and having enemy positions on display would make decision-making in a military setting far more coordinated and would equally boundlessly improve whole-level communication between soldiers and control. In that way particularly, one can see how tech-infusion and its developments are lastingly changing the defence sector, specifically in how it readapts the soldier's reality.

Therefore, the current developments in tech-infusion have a lasting impact on the role of the soldier. Physical enhancements, especially in mobility and stealth, make reality easier at the very root of the space of limitations—on the soldier's body. Matched with the general need to apply the digitalised world onto the battlefield, by introducing lightweight and ruggedised technology to the battlefield, in addition to augmenting reality as a whole, it can easily be said that the idea of tech-infusion is shaking the military landscape and points to an increasing move towards what we can validly understand to be super soldiers. The following section will build on that and shine a light on the exact implications this has on the broader military landscape.

2. Implications on the Military Landscape

In aiming to highlight the implications on the military landscape, it is necessary to understand the meaning of tech-infusion for the world at large. Specifically, this section aims to highlight why the turn towards Connected Soldiers is not only necessary but how it highlights emerging political and military realities as well. In discussing these themes, the section will begin by discussing the digital necessity of contemporary warfare before addressing the political and strategic considerations that matter for the movement towards tech-infusion.

In a recent article, the Swedish defence company SAAB writes, "Military drones are changing the way wars are fought, shortening the kill chain and putting enemy eyes deep into previously protected territory" (SAAB, 2024). In their attempt to showcase their new training capability, they make a critical point regarding modern warfare—it is in the process of being fully digitalised. In the accompanying video, SAAB (2024) highlights that drone usage has skyrocketed in the past years. What SAAB tries to purvey is the clear uncertainty with which soldiers meet drones on the battlefield, they pose the question of how you, as a soldier, would react to the buzzing sound of a drone. That is precisely the question that tech-infusion, particularly in the context of the Connected Soldier, can answer. The focus on technology that eases cross-level communication makes detection harder and is capable of augmenting reality in such a way that makes it easier to navigate the complex environment of the modern battlefield not simply to advance the soldier, but to adapt the soldier to the digitalised realities of it and readjust the 'kill chain'. In that way, the implications of

tech-infusion reach beyond merely the will to reach beyond the limits of the human body to match the digital prowess of modern warfare.

There is an added factor in terms of the political considerations that need to be considered for the implications of the tech-infused soldier. It is clear, that alongside technological developments, "competition for global control" has become an essential facet of technological enhancement (Sawin, 2006, p. 105). This struggle for control is exemplified by the growing investment into wearable technology, spurred exponentially by the rise of drones and growing geopolitical tensions, as Research and Markets (2024) write. They showcase this through a market report that projects an annual growth rate of 10.58% of the wearable technology market, growing from $7.8 billion in 2023 to $19.2 billion globally in 2032 (Research and Markets, 2024). Consequently, it is essential to recognise the political implications of the integration of technology in military personnel. Gaining advantages in this emerging market and field of development that can be rightfully labelled as part of a 'Human Enhancement Revolution' would be an immensely important political advantage (Caron, 2018, p. 3).

This is highly related to strategic considerations for militaries and states in the short and long term, specifically in terms of rising tensions and staying on top of responses to military developments such as the increasing usage of drones. As Bickford argues, it is important for soldiers to project images of "strength and invincibility" and to have the ability to be able to cause a similar projection of "shock and awe" as the US military did in Iraq in 2003 solely based upon the technology worn by soldiers is not only strategically wise but could be a useful tool in deterrence amid rising tensions (Bickford, 2020, pp. 15-16). In the same way, this could be useful for deterrence in territorial disputes and similar political contexts as the aid for Ukraine during Russia's invasion. To have highly modern technology at hand, that can give such a clear advantage on the battlefield would prove to be an undeniably advantageous diplomatic tool. Strategically, as in most cases, the implications of tech-infusion can thus be seen as a potential tool for deterrence, a factor that is becoming increasingly important.

The wide-reaching implications of tech-infusion and the concept of the Connected Soldier must be considered as having significant effects not only on the military landscape but also on the political arena. It must be clear that the role of the soldier cannot be perceived without a technological lens, and that both the usage of technology and the digitalisation of the battlefield is a given for the future of the defence sector. Further, it is key that this digital necessity must be considered from a political and strategic perspective. Amid rising global tensions, the emergence of the Connected Soldier cannot merely be seen as a progression towards what humanity, only a few years ago, might have seen as a sci-fi fantasy of

super-soldiers, but a creeping reality, that this is a very real future, with very real implications.

Conclusion

Considering the entire topic, one can readily perceive that the future of soldiers will not be limited to what the human body alone allows them to do. Tech-infusion and the increasing capabilities granted by developments in technology-related communication, bodily improvements such as exoskeletons and body protection through stealth, in addition to the emergence of AR as a component on the battlefield, paint a picture of what has previously been reserved for action or sci-fi movies. So far, tech-infusion does provide a way of making super-soldiers a reality. Yet, to stand in awe simply of the technological capabilities would be short-sighted, considering the very real implications on the military landscape and its political impact. It is important to recognise, that much of the technology that enhances soldiers is equally a response to weapon systems that are human-independent. Tech-infusion will likely have the effect of giving infantry a better fighting chance against such weaponry. Equally, the more sinister fact of increasing spending in this area reminds us of the rising tensions worldwide. Research into tech-infusion cannot merely be seen as technological prowess, but as a necessary condition to remain a player in an increasingly uncertain world.

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