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5G and the Future of Military Decision Making

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Although much ink has already been spilt to assess the impact of 5G technology on military matters (see, inter alia, Gambuzzi, 2019; Bijlsma, 2022; Bussagli, 2022), this Info Flash (IF) seeks to contribute to this burgeoning literature by clarifying the consequences of this novel technology on military decision making. Given the available data, this IF will focus primarily on the efforts of the United States (US) military. The IF will first provide a brief overview of 5G's and its general military applications to approach this topic adequately. Subsequently, the central matter of 5G's role in military decision-making will be addressed.

Overview of 5G and its Military Application

Generally, 5G or fifth-generation wireless broadband network technology represents, as the name suggests, a technological advancement upon 4G broadband technology. This technological advancement consists of two inter-connected elements: speed and latency (Halpern, 2019). According to some proponents of 5G, the novel technology will be up to a hundred times quicker than its predecessor. This increase in speed is expected to "reduce, and possibly eliminate, the delay—the latency—between instructing a computer to perform a command and its execution." Without getting lost in too many of the technical details, it is important to note that 5G technology relies on a "high-frequency, short-wavelength spectrum" and that it is this so-called 'millimetre wave,' which allows for the unprecedented speeds of more than one Gigabit per second (Gbps) (Gambuzzi, 2019). Naturally, 5G, and the advancement it promises, come with high expectations for consumers, industry, and the military. In particular, 5G is seen as a driver for economic development. As much as "twelve trillion dollars" are expected to be invested in the global economy by 2035 on behalf of 5G technology. This enormous cash infusion into the global economy is expected to occur, not simply because 5G will increase the speed of information exchange but because it will have significant knock-on effects, particularly in terms of the Internet of Things (IoT). 5G is thought to enable the interconnection of "autonomous devices, such as smart homes, self-driving vehicles, precision agriculture systems, industrial machinery, and advanced robotics" (Hoehn & Sayler, 2022). This aspect of 5G technology is referred to as mMTC (massive, Machine Type Communication). Although mMTC is often "overlooked," it is truly revolutionary as it will allow for the interconnection of "up to one million devices per square kilometre" (Gambuzzi, 2019).

Regarding military matters, 5G has a plethora of potential non-civilian applications. 5G is likely to significantly improve existing intelligence, surveillance, and reconnaissance (ISR) systems. Additionally, it will allow for novel command and control (C2) methodologies and enable a more streamlined approach to logistics management. Such improvements rely on 5G's ability to share much "larger volumes of data [...] in close to real-time across geographically dispersed systems" (Medin & Louie, 2019, p. 21). Not only more data will be shared – much quicker – across vast distances, but 5G will also extend the reach of tactical communications to previously deprived domains "by means of airborne or satellite-based 5G systems" (Bastos et al., 2019, p. 4). Fortunately, 5G is also expected to be eminently cost-effective. Thus, the military will be able to deploy 5G technology on a large scale for a relatively low cost. As a 2019 study by the Defence Innovation Board, a US Department of Defence (DoD) linked advisory body, notes: "the battle network of the future [enabled by 5G] [...] will increasingly include a large number of cheaper, more connected, and more resilient systems (Medin & Louie, 2019, p. 21).

A particularly promising application for 5G will be its integration into unmanned aerial vehicles (UAVs, i.e., drones). UAVs have already proven to be an essential, if controversial, part of modern warfare, especially in counterinsurgency campaigns (see Walsh, 2013, passim). Once equipped with 5G technology, UAVs will be able to "transmit and share images in 4K in real-time with C2 centres and units engaged in battle" (Gambuzzi, 2019). This novel ability will allow for "[enhanced] object detection, faster data processing," and an overall boost to reconnaissance. Depending on the UAVs' equipment and operational parameters (e.g., rules of engagement), 4K image transmission, and thus, 5G technology, might allow for greater targeting accuracy in kinetic missions (Walker et al., 2021). Beyond the refinement of transmission speed, 5G technology also allows autonomous vehicles of all sorts (including land vehicles) to be equipped with cloud storage capabilities. Integrating cloud storage into autonomous vehicles could thereby "potentially circumvent on-board data processing limitations" (Hoehn & Sayler, 2022). This circumvention, already desirable in its own right, further has the potential to allow for "new military concepts of operations," such as 'swarming,' which refers to the autonomous cooperation between vehicles in service of a given task.

Nevertheless, the application of 5G is not limited to the domains of space, land, and air but is also applicable to maritime operations. In the context of maritime operations, 5G has the potential to drastically "enhance ship-ship, ship-amphibious and ship-shore connectivity" (Ibid., p. 6). For instance, this could improve response time to pirate activities, both between affected ships and military assets, and military assets of various states.[1]In particular, increased communication speeds might benefit the coordination between the vessels of international military missions, such as the now-defunct Atlanta (see EUNAVFOR, 2022), and the respective navies of adjacent states. Such coordination is necessitated by international maritime law. Naval assets may pursue pirates in international waters and even enter an adjacent state's exclusive economic zone (370 km from shore), but they may not enter a state's territorial waters (22km from shore) (UNCTAD, 2014, p. 10; see also Ahmad, 2020). Accordingly, if a pirate ship escapes into territorial waters, the pursuing naval assets must quickly coordinate anti-pirate activity with the adjacent state's navy or coast guard.

5G and Military Decision Making

5G technology drastically increased the speed and volume of data transmissions, as illustrated above, and this has tremendous implications for the efficiency of military communications. Military planners hope to take advantage of this dramatic increase in speed (≈ 1 ≥ Gbps) and volume to improve the pace at which decisions are made and, thus, executed. Such dramatic increases in speed are needed as "future conflicts may require decisions to be made within hours, minutes, or potentially seconds compared with the current multiday process to analyse [sic] the operating environment and issue commands" (Hoehn, 2022). One way of achieving this desired increase in the velocity of decision making is to harness the power of 5G in the service of greater force intra-operability. The basic idea is that 5G backed communications technology will allow all the US Armed Forces branches to exchange messages, data, and intelligence at a much greater pace. This increase in communication, data- and intelligence sharing will allow for the streamlining of C2 decisions.

Fig 1 - Visualization of JADC2 Vision. [Hoehn, 2022]

[1] Even though pirate attacks have currently reached the lowest point since 1994, the Gulf of Guinea and the straits of Singapore remain hotbeds of pirate activity (Spiegel, 2022). Just in late November of 2021, a Danish frigate engaged a pirate vessel in the Gulf of Guinea (Aljazeera, 2021).

Currently, the US DoD is attempting to achieve greater force intra-operability via its Joint All-Domain Command and Control (JADC2) concept (see Fig.1). The JADC2 concept seeks to accomplish a single sensor network and replace the previous approach in which each military service had "traditionally developed its tactical network that was incompatible with those of other services." Previous conflicts have illustrated the importance of a military's ability to achieve and maintain high levels of intra-operability between its various branches. In particular, the lack of coordination between the different branches of the Argentine military during the (undeclared) Falklands War of 1982 was a significant factor in the UK's success. Sir Lawrence Freedman, the UK's official historian of the Falklands Campaign, noted at a recent Royal United Service Institute event that the Argentine military's three branches seemed to be "fighting three different wars" (RUSI, 2022).

To adequately explain the significance of 5G for the future of military decision making and its relationship to concepts like JADC2, it is crucial to situate these developments in their broader geopolitical context. Currently, policymakers and military planners in Washington, DC, are preoccupied with the threat posed by what they characterise as Near-Peer Competitors (Vergun, 2020). Essentially, the term Near-Peer Competitors refers to states, such as China and Russia, who are increasingly thought of as potential future adversaries. A related concept that is steadily gaining traction in Washington circles is the Great Power Competition (Deißner & Fehrenbach, 2020). The corollary is that the US is no longer content with preparing its military for minor wars and counterinsurgencies, such as in Iraq and Afghanistan. Instead, US officials fear that they will soon have to face actors like China, whose military capabilities are closer to their own. Particularly worrying is that "potential adversaries have developed sophisticated antiaccess/area denial (A2/AD) [sic] capabilities [e.g., electronic warfare, cyber weapons, long-range missiles, and advanced air defences]" (Hoehn, 2022). Hence, military leaders have intoned that in future conflicts, such as the one that might erupt over Taiwan, involving a "potential [near] peer adversary[y], a multi-domain approach is required." This multi-domain approach is codified in the JADC2 concept, which is only made feasible by 5G technology, particularly the advancements in data transmission speed and volume.

Even at a more micro-level, military officials involved in developing and testing 5G-enabled military communications technologies are keenly aware of this context. Major General Robert Collins, the US Army's Program Executive Officer for Command, Control, Communications-Tactical (PEO C3T), and Brigadier General Jeth Rey, the US Army's Director of Network Cross-Functional Team, recently spoke on this topic at this year's C4ISRNET conference. General Collins and General Rey highlighted that the development and deployment of 5G technology should not exclusively be understood in terms of technological development for its own sake but also as "keeping pace with [the] threat" posed by adversarial actors (C4ISRNET, 2022).

Nevertheless, the development and deployment of 5G technology are not only crucial for checking the threats posed by potential adversaries but could also be a substantial source of insecurity in its own right. In terms of 5G being a source of insecurity, two factors must be considered. First, every communication between the tactical environment and command comes with a signature. When the volume of communications is drastically increased, as will be the case with the introduction of 5G technology, then emissions might rise to the point that adversaries will easily localise US forces on the battlefield. General Collins noted that emission control is a key concern and that military leaders need to be "careful and mindful" of the enhanced threat potential of this technology (C4ISRNET, 2022). Consequentially, 5G technology must be developed and tested through "soldier-led experimentation." Additionally, there need to be appropriate feedback channels between the military and its partners in the industry. Secondly, 5G networks could be vulnerable to cyber-attacks, even from non-state actors. Again, 5G networks need to be designed from the get-go with cyber threats in mind. However, fortunately, 5G technology relies on short-range signals, which are much harder to intercept (Gambuzzi, 2019).

Lastly, as General Rey highlighted, the changes brought to military decision making under JADC2 also have significant implications for military interoperability. Rey stated that the US military "will never fight alone again" (C4ISRNET, 2022). Accordingly, interoperability concerns are included from the very start in key projects, such as Project Convergence 22, which seek to realise JADC2. In the context of Project Convergence 22, Rey remarked that the emphasis is very much on "data sharing […] operational synchronisation […] and integration with our […] coalition partners […]." Moreover, JADC2 will also include more formalised mechanisms for military interoperability between the US military and its coalition counterparts. In this sense, cooperation would no longer be episodic, but instead 5G would also for a "continuous enduring environment" to exchange interoperability interface standards .

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