What Roles Will Humans Have in Future Combat Situations?

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The collection of scientific explorations "VISIONS OF WARFARE: 2036" developed as a proof of concept that futurist prototyping would be a useful tool to advance our thinking around the future inspired me for the title of this Thinkbox. I guess that work does not ring a bell, not unlike other of the better transformational products that have passed into oblivion.

Sometimes luck needs a little push. Somebody mentioned that work to me during small talk about transformational concepts. I was pondering on the use of unmanned vehicles within a maritime concept and he advised me to read that work. One of the questions in that document should lead to a discussion about the role of humans in future combat situations. I do not know if those discussions ever had place in our HQ. We should accept the challenge to try to find collective answers that and other hard questions. With this Thinkbox I attempt to tackle one of the many raised in the document.

Every concept developed nowadays should consider the use of unmanned vehicles to have any value. These types of machines are in a steep evolution and on the verge to influence all military activities. The question is not if they will enter the art of war, but what their role should be.

When are unmanned (autonomous) system preferred?

Unmanned systems are not new thing. Depending on the definition, they are amongst us for decades, centuries, if not millennia. By some definitions, a simple trap is an unmanned, rule-based system. Even weaponized unmanned systems are not that new. Naval mines are just one example.

So what changed the nature of the discussion? Artificial Intelligence? Academics and engineers studied the topic decennia ago and wrote about most of its secrets. Putting Artificial Intelligence (AI) into practical use was another matter, because something was missing.

The miniaturization of computing power was the spark that ignited autonomous systems to life. Unmanned systems could leave the path of rule-based logic, even if that logic was a bit fuzzy. An AI system is able to learn by experience; lessons humans are no longer obliged to translate into hard line of software. This deep learning capability comes with a catch, as the certainty on how such system will react in a new situation becomes a wild guess, even in hindsight. However, is that not the case with every learning being be it human or machine?

This article is not about the legal or ethical questions that the military use of such systems could give rise to, but about when and where we could/should use these systems. Remember that there are different levels of autonomy.

Unmanned system in general and autonomous in particular perform best in dull, dirty, dangerous and dear activities:

1. <u>Dull</u> - The first and most obvious category that unmanned systems are best qualified for are "dull," low interaction, high repetition jobs. These responsibilities require very little human thought, and typically involve processes that have a sole objective of bulk efficiency or output. Unmanned systems have the unique ability to work around the clock and streamline "dull" processes, saving money and freeing human capital to pursue more variable, cognitive tasks.

2. <u>Dirty</u> - Another category of job tasks that unmanned systems are exceptionally positioned for are the "dirty," often unsanitary or hazardous jobs that can otherwise have an adverse effect on human health. These are unfavorable roles, but 'somebody – or should we say something - has to do it.' Unmanned systems remove humans from risk and harm in these situations.

3. <u>Dangerous</u> - In addition to preventing the loss of human lives, unmanned systems have the capacity to measure and detect variables beyond the human perception. In the event of a deteriorating situation, unmanned systems will not become under stress and keep the performance at the same level. The sacrifice of an unmanned system advantageous towards accomplishing the mission becomes a non-ethical decision.

4. <u>Difficult</u> - As intelligence, dexterity and the degree of autonomy for unmanned systems develop, these systems are ushering in calculated tasks that require a low margin of error and a high level of detail, precision.

Considering the above-mentioned 4Ds, military activities offer many possibilities to employ unmanned systems. Employing unmanned systems will progress efficiency and effectiveness over time and we should pursue this approach as far as technologically possible. This entails the necessity of continuously developing a range of more efficient, effective and safer systems, launched at long range and readily available in high enough numbers. This is the best warranty for success.

As these systems and their use are quite new, we lack the experience to grips the impact they will have on the battlefield. Science fiction writers and futurists can give us an idea on the possible changes but only hands-on experience will lead us into that uncertain future. It is of paramount importance that we test and field new systems, even when they are not full developed. Operators should get used to their possibilities and are key to developing future concepts.

<u>When are humans preferred?</u>

The 4Ds gives us an idea where the use of unmanned systems will be most beneficial, but I think we are answering the wrong question. We should not ask ourselves when to use unmanned systems, but when we should put human soldiers into the danger zone. When can machines not replace humans?

Nowadays, unmanned systems are not mature enough that they are be able to do it all. I am convinced that for a while humans and unmanned systems will work side by side, each doing what each is best. The work of unmanned systems will start with the dirty, dull, dangerous and difficult. Humans instinctively are not well suited for these jobs, but are still more flexible and dexterous, can think beyond algorithms to come up with unique ways of solving problems, are empathetic, have

emotional intelligence and more. Humans still have to program, repair and teach unmanned systems, for the most part. In separate, unmanned systems and humans cannot reach beyond their inherent limitations. However, together, in concert, unmanned systems and humans will improve capabilities beyond the simple sum of the components.

That is until general AI becomes reality. Imagine technology evolves to a point where (almost) everything is possible; when would we use humans in the fight?

When a human interfacing with machines could bring an advantage to the battlefield, the distance between that battle and the human will depend on the physical and virtual security of the communication link. Capabilities to severe this link will determine if future battlefields will be a machine-only area or still, although very rare, a place of human encounters. Anyhow, there will be a future adversary that will bring the fight to where the human element of the command and control is situated, be it a centralized HQ or a loose connection of delocalized staff officers. If we think that humans will be needed in the heat of battle as a failsafe against communication ruptures because they have an advantage over machines, than we should be able to pinpoint that need.

The first that comes to my mind is creativity. Unmanned systems cannot (yet) think beyond algorithms to solve creatively problems. Even if that algorithm is a deep learning neural network. We consider the ability to transfer knowledge in an abstract way to another domain and to use it to solve problems as something unique to humankind.

Is that really so? Are machines not thinking in an abstract way? Do they think in any other way? Although we appreciate the creativity as the basis of a perfect and innovative solution to a problem, we forget that such a solution is in most cases the result of trial and error. Is trial and error not the basis of machine learning? At a much higher speed? Even in the field of art, genius-painters make tens or even hundreds of sketched before they produce a masterpiece of creativity. As a human I have a hard time to believe that machines will one day be creative, but as an engineer I have no doubt that that day will arrive sooner than later.

Another human trait is intuition; gut feeling. Something that cannot be programmed into the electronic brain of a machine. Well, studies have shown that the intuition of experts is the quick assessment of a situation based on detecting similarities in other experienced settings. It is a collection of learned pattern recognition similar to deep learning techniques enhanced with the ability to fill out the blanks. Nothing superhuman about it and nothing a machine cannot do.

What about the advantage humans have over machines: unpredictability. Doctrine, tactics and procedures are no guarantee to predict the reaction of a soldier to a certain situation. Humans have to tendency to appreciate similar facts in different ways. Machine do not possess that quality and it is imaginable that an adversary will exploit this predictability. To counter that, we could build a certain degree of randomness into the AI to circumvent this flaw. Are we ready for that?

The human machine is a formidable one. We are able to do things that machines are not able to perform. A machine confronted with a job out of its design specification needs a human support to solve it. It is not a coincidence that robot designers study human anatomy, but they also study the animal world. With increasing diversity and enhanced dexterity, robots will soon close the not-designed-for gap. The time will come that no job will be impossible to handle, by machines.

War is a human encounter. Unless, the objective is total annihilation of the other population, a goal that will – unfortunately – be more precisely achievable with autonomous weapons, the key for success will stay the fight for the hearts and minds. The best and quickest way to win humans over is by interaction with other humans. When the fighting happens in populated areas, human soldiers will have to interact with the people living there. Of course, the soldier knocking on the door must still look like a human and not like a knight in a modern, hi-tech armor. Although humans are capable of connecting with robots, this kind of bonding demands more time than building a relationship with other humans. Machine reading of human interactions and emotions is still hard, but that will change too.

We may still assume that a machine will not come up with the idea to wage war. That decision will stay in the realm of humans. However, it is an assumption that does not limit the number of people to be involved in that decision, that is the lower limit. One person owning a factory of unmanned soldier-robots could decide to go to war against a population not caring about winning the hearts and minds.

Reading the result of the above-mentioned search of elements, there is not that much that justify humans on the battlefield. At a tactical level, it seems that the possibility for contact with non-combatants is in the long term the only good reason and that is assuming that people will not get accustomed to interacting with machines. If the latter becomes a socially accepted practice, even that element disappears and the way to robot wars lays wide open.

<u>At another level</u>

In a 2015 open letter on autonomous weapons, artificial intelligence and robotics researchers including Elon Musk and Stephen Hawking warned that, with these technologies, "the stakes are high: autonomous weapons have been described as the third revolution in warfare, after gunpowder and nuclear arms." These systems will have a tremendous impact on warfare. The question is: will we use them as gunpowder or as nuclear weapons?

Will we evolve towards conflicts wherein robots are fighting until one side loses his mechanical army and surrenders guaranteeing its warm-blooded troops? Moreover, if we evolve towards that kind of robot wars, how long will it last until a third party decides not to abide by those gentlemen-like rules?

There is one shortcut in this reasoning: to have a robot-only battle, the other side must engage with robots too. What will happen if they send out an army that includes humans? Even if that practice at tactical level does not make sense. This would lead to epic battles like in the films "Star Wars" or the "Terminator". The sympathy will not go to the army of machines, but to the human underdog. Beating human soldiers by engaging unmanned systems can turn a won battle into a lost war. A tactical victory into a losing strategy. Could we turn that asymmetric feature by using other means? Should the right to wage war be earned by putting human soldiers at a minimum risk?

However, these are ethical questions.