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From Drones to Golden Domes: How Technology is Reshaping the Defense Industry

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From Drones to Golden Domes: How Technology is Reshaping the Defense Industry

Advances in technology are reshaping the entire aerospace and defense industry and will continue to do so at a rapid pace. This is particularly evident in three general areas: The rise of smart, low-cost weapons, the increased use of advanced systems integration, and the advent of Artificial Intelligence.

Armies around the world are using smart, low-cost weapons and advanced systems integration to increase the efficiency and effectiveness of their fighting forces.

Using Artificial Intelligence, humans and robots will now be able to operate together but think independently, taking warfare and the aerospace and defense industry to levels never experienced before.

I learned to fly airplanes when I was fifteen years old. That was quite some time ago. At the time, airplane

cockpits were full of dials and flight instruments that looked like the faces of classic wristwatches, not Fit-bits or Apple Watches. I remember having to plot routes on foldable paper maps, as GPSs did not exist. If we look at the cockpits of most modern aircraft nowadays, the smattering of countless individual instruments is neatly displayed on a handful of interactive screens. Additionally, airplanes have become much more automated, greatly alleviating the pilot's workload. No longer do I have to plot flight routes on paper; I can just program them into the onboard GPS and the plane could even navigate itself to my desired destination. Technology has not only revolutionized aviation, but it is also reshaping the entire aerospace and defense industry and will continue to do so at a rapid pace. This is particularly evident in three general areas: The rise of smart, low-cost weapons, the increased use of advanced systems integration, and the advent Artificial Intelligence.

The Rise of Smart, Low-Cost Weapons: It is said that necessity is the mother of invention and nowhere is this truer than on the battlefield. The conflict between Russia and Ukraine is a good example. Russian military planners expected that a traditional attack would quickly overwhelm Ukrainian forces. However, they were not ready for the effectiveness of the irregular warfare tactics employed by the Ukrainian military, which relied heavily on the use of drones and other smart portable weapons used in hit and run operations. Russian military doctrine operates under the assumption that bigger is better, relying heavily on the use of traditional weapon systems like tanks and artillery. However, advances in drone technology have increased the use and effectiveness of this platform, allowing Ukraine to quickly adapt and use this low-cost weapon system with deadly results. Consider this, the Switchblade family of drones, manufactured by AeroVironment (AVAV), can be used for anything from surveillance to attack. With price tags ranging anywhere between \$10,000

and \$150,000, this weapons system represents a relatively low-cost alternative to wage war. Now consider that Russia's main battle tank, the T-80, costs about \$3,000,000 to build. By employing smart, low-cost, portable drones Ukraine has been able to effectively eliminate large numbers of Russian tanks with drones that cost approximately 5% the price of a new tank. **The armies of many countries with relatively small defense budgets are increasing their use of such weapons systems, sometimes employing them in what is known as "drone-swarms" in order to overwhelm their enemies' defenses in attempt to level the playing field in times of conflict.**

Increased Use of Advanced Systems Integration:

Simply put, systems integration means having a group of weapons systems seamlessly communicate with each other and work together as a team. This is not an easy task. During previous conflicts, most coordination was done through traditional radio communications. Nowadays, weapons system operators such as aircraft pilots can communicate with each other through their airplanes' computer systems, sharing information such as target lists and coordinating the most efficient plan of attack. In fact, systems integration is what makes Lockheed Martin's (LMT) F-35 Lightning II fighter/attack aircraft one of the most advanced airplanes currently in service on the planet. The plane boasts of new generation capabilities such as stealth and supermaneuverability, but what truly makes this aircraft remarkable is its ability to quickly communicate large amounts of information with other aircraft, allowing it to efficiently coordinate attacks in ways that most other aircraft cannot. The specifics of this program remain classified. Although the F-35 is impressive, advanced systems integration on a much larger scale is now on the horizon. Last month, President Trump announced the creation of the Golden Dome defense system to protect the United States against enemy missile attacks. The Golden Dome missile defense program rep-

resents a level of advanced systems integration never seen before. At this point the system is expected to cost close to \$175 billion; however, the Congressional Budget Office expects that it could cost between \$160 and \$540 billion over the next two decades. This weapons system attempts to integrate air, land, sea, and most importantly, space assets to track, coordinate, and destroy enemy missiles, including hypersonic missiles. The program will require the seamless integration of airplanes, ships, land-based radars, and satellites to communicate and operate in perfect coordination in mere seconds. This will involve large amounts of investment in new technology from a large group of defense companies including Lockheed Martin (LMT), Boeing (BA), L3 Harris Technologies (LHX), RTX (RTX), Northrop Grumman (NOC), Palantir (PLTR), SpaceX, and Anduril Industries among others. Successful coordination and integration between the various companies' systems will be key for the success of this program.

Artificial intelligence: Most of us have seen videos of SpaceX's Falcon 9 rockets landing by themselves, ready to be re-used for their next mission, yet many of us do not think much of it. However, when we consider that just fifty years ago engineers could barely even get rockets to stay up by themselves, having ones that can go to space and land back on Earth on their own is mind-boggling. Fifty years seems like a long time, but if we think about it, most people reading this were either alive or know someone who was alive at the time when rockets could barely stand by themselves. How is it possible that rockets are now landing themselves when they could not even take off fifty years ago? The answer is artificial intelligence.

The benefits of artificial intelligence are no secret. However, when it comes to the defense industry the benefits are even greater. To start, AI is making complex systems work more efficiently, in some cases reducing the workload of a weapons platform opera-

tor and allowing him or her to focus on more important tasks. In other situations, AI is completely replacing the human operator, and this is where the benefits of AI can really be felt in this industry. **By replacing the human operator, not only is AI allowing a weapons system to be more efficient, as an automated system does not need to eat or rest, but it is keeping the human operator out of harm's way. By doing this, AI is proving to be a safe and efficient force multiplier, which is what every army in the world wants.** In fact, the NGAD (Next Generation Air Dominance) program awarded to Boeing (BA) earlier this year is best on that premise. Boeing's new F-47 fighter aircraft will have all the attributes of current aircraft like stealth, supermaneuverability, and advanced system integrations. However, the F-47 will be able to operate with clusters of drones flying alongside it, seamlessly dividing tasks and coordinating attack plans. This is where next generation weapons platforms are taking technology to the next level. Drones

and advanced systems integration are already a reality, one that continues to get better. **However, using Artificial Intelligence, humans and robots will now be able to operate together but think independently, taking warfare and the aerospace and defense industry to levels never experienced before.** Many of the companies mentioned above are leading the charge in the integration of Artificial Intelligence into tomorrow's weapons platforms, and many more are likely to join as this industry continues on its never-ending path of modernization.

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