

US military imagines war without GPS

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With GPS-guided bombs, armed drones beaming footage via satellite and spy cameras scooping up intel from the heavens, America's military machine is growing ever more reliant on space-based technology.

But what would happen if an enemy were to target the military's satellites, or somehow jam their signals?

The disastrous scenario is one the Pentagon knows all too well could happen, and for which it is actively preparing.

"Our force structure today is built around the assumption that we have GPS and we have <u>satellite</u> communications. We are very lethal when we have those things," said Colonel Richard Zellmann, commander of the 1st Space Brigade based in Colorado.

"But when you start taking away those combat multipliers, we need to go back then to the days of the industrial-age army where you have to have three times as many people as the adversary does."

About 70 percent of the Army's major combat systems depend on signals being beamed from space, Zellmann said, a fact that has not slipped the attention of other countries.

"Militaries around the world have begun to understand the advantages that the US has enjoyed because of uncontested access to the space domain," Zellmann recently told reporters.

Russia and China are both developing satellites capable of maneuvering through space, potentially allowing them to smash into another orbiting object. America, too, has acquired satellites that can move in orbit and inspect or monitor other space objects.



But Zellmann noted it is far cheaper and simpler for an enemy to disrupt or damage US <u>military satellites</u> than to develop their own orbital platforms.

For instance, low-cost jammers placed at the right location can wreak havoc with incoming GPS signals, which are often quite weak.

Sailing by star

Already, the Army has brought back training to keep soldiers current on how to read paper maps, and the Navy is teaching sailors how to navigate by the stars with the help of sextants, first used in the 18th century.

Army operations centers have map boards that show where troops are on the ground, so if a "Blue Force tracker" that watches soldiers with GPS is disrupted, "we still know where all of our units are," Zellmann said.

The old-school, analog technologies are also being augmented by new science designed to replicate satellites, only from Earth.

The military's Defense Advanced Research Projects Agency, better known as DARPA, which innovates and develops new technologies for the Pentagon, has stated it wants a new generation of precise navigation and timing tools that can work without GPS.

One such system uses "pseudolites"—ground-based devices that beam GPS-like signals and are already being used in the commercial sector.

Another technology that is used in aircraft is an "inertial navigation system" that deploys a series of sensors and gyroscopes to calculate a plane's—or a missile's—location.

But the accuracy of these systems is prone to drift a bit over time



without calibration, usually done by GPS, something which the military is attempting to improve.

The Pentagon is also investing in a <u>new generation</u> of satellites that will provide the military with better accuracy and have better anti-jamming capabilities.

Lieutenant General John Thompson, commander of the Space and Missile Systems Center based in Los Angeles, said space has become crowded, and the military is all too aware that the days of having superiority in orbit are over.

"Our weapon systems of today were built primarily anticipating a benign space environment (that)... is now contested and congested," he said.

"We have to be able to operate in that domain."

President Donald Trump on Monday unveiled his first National Security Strategy, which specifically addressed the military importance of America's space infrastructure.

"The United States considers unfettered access to and freedom to operate in space to be a vital interest," the document states.

"Any harmful interference with or an attack upon critical components of our <u>space</u> architecture that directly affects this vital US interest will be met with a deliberate response at a time, place, manner and domain of our choosing."

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