

# Test Talk



## The Rise of Autonomous Technology in the Military and What it Means

The integration of 5G technology in the military will influence every aspect of warfare. In particular, it will have a major impact on the implementation of an autonomous force. While creating scenarios straight out of a science fiction movie is a popular narrative, the reality is that autonomous technology will more likely impact intelligence gathering and medical care more than create an army of *Terminator* robots marching on the front lines.

Given the mission critical nature of these use cases, ensuring their operation in the harshest environments is a necessity – and a challenge. That is why those responsible for the design and utilization of these autonomous solutions must establish the proper test process to ensure operation whenever they are called upon.



Figure 1: Autonomous technology is changing modern warfare.

Bleeding-edge technology has become a vital weapon in today's modern warfare faster than previous generations, due in large part to a philosophy of leveraging commercial 5G technology. Helping with this approach is the **Defense Innovation Unit (DIU)**, which has a charter to strengthen national security by accelerating the adoption of commercial technology into the Department of Defense (DoD).

## Autonomy Use Cases

Autonomy is one of six focus areas for DIU in its work with the military. Separately, research has shown that autonomous technology can be used to create benefits in all functions, from intelligence to cyber security and all-domain warfighting. Familiar examples of this include:

*Troop Deployments* – Autonomy will be used on the front lines but not in the way we see it in the movies. Recognizing that the primary benefit of autonomous systems is safety, **one use will be to replace manned reconnaissance patrols**. Autonomous systems have another strategic advantage: They can act as force multipliers. So, the Army can add to its combat power while simultaneously requiring fewer troops.

One application for autonomous technology on the battlefield is for equipment transport. The Squad Multipurpose Equipment Transport (SMET) is a robotic vehicle that trails a dismounted squad carrying much of the 60-120 pounds of gear troops presently lug around. SMET utilizes follow-me and waypoint navigation, with full obstacle detection and avoidance.

Another important effort is the Future Vertical Lift (FVL) aircraft, the next generation of rotorcraft that will operate at faster speeds, have longer range, and higher payloads. Autonomous flight capabilities will be a big element of FVL. SMET and FVL, as well as other autonomous military vehicles may **utilize Vehicle-to-Everything (V2X) communications** to navigate through the terrain and perform their respective mission roles.

*Medical Treatment* – Keeping with the emphasis on safety is how autonomous technology will improve first-aid in the field. Currently, mobile medics are deployed to active zones to treat wounded soldiers. Combining 5G and autonomous technologies allows advanced medical expertise to be sent into those life-threatening environments, when necessary, with far less risk to medical professionals. Research is being done on medical robots to evaluate their ability to assist deployed troops, as well as to establish low latency connectivity in war zones for telemedicine and telesurgery.



Figure 2: Intelligence gathering and monitoring is enhanced with autonomous technology.

*Intelligence Gathering* – Not surprisingly, acquiring and analyzing intelligence will benefit from emerging technologies, including autonomy. It goes beyond the decades-proven advantages of unmanned aerial vehicles (UAVs). One example is autonomous software codes being used to gather intel by monitoring cyberspace.

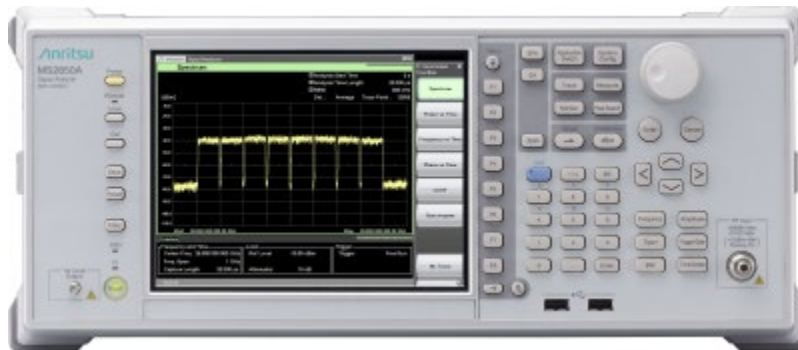
There are also autonomous systems under development by the U.S. Special Operations Command to further improve its full intelligence process. **Autonomous systems are expected to be used for computationally intensive tasks.** It will add reliability and confidence by reducing the chance of human error. Analysts are using autonomous systems to more effectively collect and process data overall, as well.

### Ensuring Operation in Harsh Environments

Similar to military autonomous use cases leveraging emerging commercial technologies, effective test processes will also borrow from established non-military applications. Assessing and understanding key aspects of such operations – especially in a highly dynamic environment – is critical to the success of autonomous systems and their ability to operate as they were designed. Consequently, test solutions must be highly accurate to meet specific testing requirements in autonomous designs. This is accomplished through:

- Connectivity of various technologies to ensure system operation
- Hardware-in-the-Loop (HIL) to create simulations to verify control systems performance
- Data throughput and handovers
- Application of standards and regulatory requirements

Due to the critical nature of these systems, test solutions must have high accuracy and high-end performance. For example, conventional spectrum analyzers have a degraded noise floor above 3 GHz because they use a pre-selector at the 3-GHz basic band, which lowers accuracy. The Anritsu **MS269xA signal analyzers** has a basic band of 6 GHz that eliminates the degraded noise floor and improves measurement results.



*Figure 3: The Signal Analyzer MS2850A has the performance necessary to verify advanced military systems.*

The **Signal Analyzer MS2850A** (figure 1) has amplitude and phase flatness performance over a wide 1 GHz analysis bandwidth that exceeds other signal analyzers. It has a high ADC clipping level over the analysis bandwidth to obtain a wider difference from the DANL. This improved dynamic range performance helps obtain more accurate EVM values when measuring 5G signals.

Further aiding in 5G analysis is the **Radio Communication Test Station MT8000A** test platform that supports Frequency Range 1 (FR1) and Frequency Range 2 (FR2). It can be integrated with SmartStudio software so various functional tests can be performed via GUI without requiring difficult scenario development, so the MT8000A can be easily enhanced to address future military system designs.

5G will play an important role in a new generation of military and defense systems. Anritsu recognizes the military has many specific requirements related to 5G rollout. As part of its commitment to the Armed Forces, Anritsu is a member of the National Spectrum Consortium (NSC), where it collaborates on the research, development, and implementation of 5G-based technologies. As an NSC member, Anritsu works with fellow member companies and senior government officials to help shape 5G and electromagnetic spectrum management, which promotes the development of test solutions to satisfy emerging military designs.