

Automation and artificial intelligence help warfighters in high-stress situations



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Many operations are experiencing some degree of data automation or AI enablement, and the usability of that data is key to decision making.

What it means to be in-the-loop, on-the-loop, and out of the loop has significantly improved when it comes to decision making due to warfighters having access to automation and artificial intelligence. With those tools, they can keep pace and make sense of the ever-growing mountain of data so decisions can be made on accelerated timelines.



Tim Heiser is director of defense programs at Teague.

“Today’s threats are ever increasing, along with the number of decisions that need to be made,” said Tim Heiser, director of defense programs at Teague. “The challenge is in designing automation and AI systems that prioritize data that aligns with the values and priorities of the commands and their missions.”

Effective user experiences (UX) and user interfaces (UI) make it possible for warfighters to strategically employ automation and AI, and [Teague](#)—a firm with 99 years of experience pioneering human-centered design within complex systems and emerging technologies—is making that possible today in aerospace and defense.

In, on, and out of the loop

The three levels of human involvement in autonomous systems are part of the control theory that governs machines and physical/engineered processes.

Warfighters in the loop that have AI enablements to fuse data from multiple sensors, for example, have the option to use the software to improve their command and control decision-making process by proposing certain scenarios or battle plans. Here, commanders control the situation and would need to opt in to any of those battle plans and adopt it as a plan of record. Today, warfighters remain in the loop when there are ethical concerns, long-term implications, or lives at stake.

Being on the loop, on the other hand, becomes more of a veto or opt-out scenario. In a time-constrained situation that a fighter pilot might encounter an incoming missile threat, for

example, automation software activates defensive maneuvers and countermeasures, and if the pilot does not intervene or override that maneuver then they’re automatically executed. The pilot has enough visibility to veto the action, but the system will take action otherwise. This sort of automation has been in place for many years.

Unlike being in or on the loop, out of the loop refers to complete automation, with no human approval process. This level of automation is rarely seen today, especially in military contexts.

Regardless of the position of the individual within the system, automation and AI are here to stay and the human-machine interface will be a vital ingredient in accelerating all OODA (observe, orient, decide, act) loops.

“That’s been happening in pockets for some time but more and more we are hitting a critical mass where many operations are experiencing at least some degree of autonomous operation or AI enablement,” said Clint Rule, principal director of design, Teague. “There’s clear acknowledgement that these capabilities will transform doctrine.”



Clint Rule is principal director of design at Teague.

It’s accelerated by the Defense Department’s embrace of commercial technology and best practices that bring industry knowledge and innovation to the challenges presented by adversaries such as China and Russia. Enabling architectures like Joint All Domain Command and Control demand that capabilities be developed with the speed and agility that’s seen in the commercial marketplace—where innovation is measured in months, not years.

“The threats of today and tomorrow are at varying levels of technology and speed,” said Heiser. “Having the capability to quickly understand each threat and make the decision to engage or not is critical. Today, the decision loop can be quite long, with built-in checks and balances that don’t necessarily add value to the task at hand.

On the cover: Air Force Special Tactics operators observe the range before conducting close air support training during Emerald Warrior 23 at Eglin Range, Fla., in 2023. Emerald Warrior is the largest joint special operations exercise involving U.S. Special Operations Command forces training to respond to various threats. (Photo credit: Air Force Staff Sgt. Jerreht Harris).



An XQ-58A Valkyrie launches for a test mission at Eglin Air Force Base, Fla., in 2023. Artificial intelligence algorithms, developed and trained by the Air Force Research Laboratory's Autonomous Air Combat Operations, were integrated into the XQ-58A. The algorithms used neural networks to fly the vehicle against simulated opponents using simulated mission systems and mock weapons. (Photo credit: Air Force 2nd Lt. Rebecca Abordo).

“By simplifying the system to keep only the most important decisions in the loop and move oversight tasks to a more automated level, our warfighters will be more effective.”

Attention to design in autonomous tools

In a defense world where automation and AI become increasingly relevant, improving the warfighter's UX/UI will lead to prioritized and more straightforward decision making.

Teague's value in this respect comes in understanding norms and best practices on how humans engage with systems and data.

“We research the ‘people side’ of a problem first, before moving to a technology solution,” said Heiser. “That’s because the real-life users should inform the design of the tech, not the other way around. It hasn’t typically been that way, in defense.

“Without user engagement up front during design, you’re going to lose the ability to create systems that work better for users in, on, and out of the loop. What makes Teague unique in this journey is understanding how people engage with data to make decisions and then designing for those situations specifically.” A growing acknowledgement of the importance of UX/UI in systems design is part of a broader disruption happening in defense where commercial best practices in software development, for example, has made the use of DevSecOps mandatory for defense systems that need to be updateable as threats evolve. Integrated air and missile defense fits that bill, as does Joint All Domain Command and Control (JADC2), as well as satellite payloads for intelligence, surveillance, and reconnaissance.

“With the current conflicts on different irregular battlefields, there’s a general sense that we have to move faster than we have in the past,” said Rule. “Software is a very different beast than what the military has been dealing with when it comes to procurement and setting requirements.”

There’s also a growing sensibility around the tools that users and warfighters are required to engage with on the job. People are experiencing what some call the Sunday-Monday divide where the tools they use on the weekend are at a significantly higher level of capability with better ease of use than what they’re utilizing during their work week.

By not ensuring a good UX/UI in the development of those tools—especially those used in kill chains where lives are at stake—warfighters can be hindered in their ability to take full advantage of the technology and the data it generates. Non-intuitive systems also take longer for warfighters to train on, with more personnel required for some tasks.

“Teague provides human-centered design for technology,” said Rule. “We work on autonomous tech with defense suppliers, tech companies like AWS, and large automotive companies and startups.”

“Teague is able to bring in expertise from different organizations working across cutting edge technology to better understand how humans operate in complex environments. This is a perfect fit for the precipice that the military is currently at as technology, automation, and artificial intelligence explodes for them.”