

Nobody Asked Me, But...

Electromagnetic Warfare: The Matrix Before The Matrix Was Cool

BY COL BY JEFF FISCHER, USAF (RET.)

FOR DECADES, EW experts have advocated for greater awareness, efforts and funding for warfare in the Electromagnetic Spectrum. The results aren't stellar. Senior DoD leaders have failed to truly grasp the importance of managing, controlling and fighting in the EMS, and their under-resourcing has created a persisting dilemma. The good news? Technology may have finally caught up to enable Matrix-style warfare in the EMS, and it's none too soon.

For historical reference, I leverage my US Air Force knowledge base, but I am quite certain from listening to fellow EMS warriors in sister services that they have quite similar stories. Within Air Operations Centers, it was often frustrating to see a handful (5-10) EMS warriors assigned as the EW Battle Management Cell. While hundreds of airmen, contractors, and joint and coalition servicemembers scurried around to ensure a fully planned and efficiently executed operational air campaign, these EW battle managers were tasked to manage an EMS domain. Might I note, a domain that was exponentially more challenging than any other warfighting domain typically managed by hundreds of folks. Think about it: the air domain exists in three dimensions (x, y, & z axis). When adding "time," it becomes four. Electromagnetic warfare in the battle space is also three dimensions, but also at every point in that 3D array, another full dimension exists: the operational frequency range from 1Hz up to Ultraviolet. Add the dimension of time, and the problem set becomes five dimensions. It's almost ludicrous to think Air Force leaders demand hundreds of personnel to manage four dimensions, but believe a handful of EWOs can manage five (we're good.... But perhaps not that good.)

I realize many of the terms I used above have changed. I am also excited in knowing that the 350th Spectrum Warfare Wing is making great strides in EW Battle Management. That said, a

part of me believes that even with hundreds of personnel (like the air domain), the problem set of planning and real time management of the spectrum is perhaps beyond human capacity. To be clear, I'm not saying it isn't possible, but the task of EW Battle Management might be best served by a hybrid of Artificial Intelligence and humans.

Imagine a future military where every transceiver (comms, radar, etc) all have internal computers that are real time linked to a massive EW Battle Management computer. Further, every COMINT/ELINT asset is also linked. Much in the way Dr. Andrew Carpathy crafted his AI system (a computer that learns by billions/trillions of "decisions"), the EW Battle Manager AI would also "learn" over a period of observing decisions. Red Flag, Green Flag, Weapon School's Mission Employment Phase, and simulation environments would craft excellent opportunities to 'teach' the computer. True, at first, the software would be wrong, requiring human override. But, over time, the computer becomes an EW battle manager, eventually surpassing a human in speed and efficiency. In effect, it's what Tesla has done with its self-driving software. In 2014, YouTube videos of their vehicle's errors were hugely comical. Today, Tesla robotaxis are driving autonomously in Austin, Texas. 'Dojo,' or Tesla's super-computer, has (or will soon have) mastered driving.

The possibilities of an EW AI Battle Manager are monumental. The computer could recognize jamming in a given region (or knowledge of imminent friendly jamming), evaluate the geospace impacted, identify all friendly systems in that area and RF range, then instantaneously chattermark, or shift away from any jamming – completely autonomous from the pilot's command or knowledge. Conversely, a radio could autonomously report RF degradation – some form of meaconing, intrusion, jamming or inter-

ference (MIJI) – back to the EW AI battle manager. The EW AI battle manager would rapidly use SIGINT assets, identify a usable frequency, and immediately direct all net users to the new freq – again, completely transparent to the radio operator. Decisions like this, as well as hundreds of others, could be executed via AI in milliseconds. For more critical decisions, software could elevate the matter to human intervention.

Does it sound farfetched, this Matrix 2025 technology? Sure. Is it possible? Absolutely! A Ukrainian soldier crafted a rudimentary system which maps the spectrum and 'learns' as it progresses. Interestingly, the idea was pitched to the OSD Joint Rapid Acquisition Cell, which was strongly supportive. However, the system is not compatible with existing US radios and collectors which is a massive problem and perhaps an article for another day. But, yes, it's possible.

The alternative to this EW AI Battle Manager Matrix war, however, is continuing with the dozen of great EWOs in the AOC's EW Battle Management Cell – that, and whatever the Air Force's new Spectrum Warfare Wing pushes forward. We all should wish them huge success. Spectrum Warfare needs it.

About the author: Col Jeff "Fisch" Fischer is a retired US Air Force EWO who has served in a variety of roles during his Air Force career. After graduating from Indiana University, he became a navigator in the EC-130H Compass Call, where he was an instructor and weapons officer. Later, he was selected for an exchange with the US Navy flying EA-6B Prowlers off the USS Constellation from 1996 through 1999. He also served as Electronic Attack Branch Chief, Air Force Requirements at Headquarters Air Force. He served in Operations DENY FLIGHT, PROVIDE PROMISE, DELIBERATE FORCE, SOUTHERN WATCH, ALLIED FORCE, ENDURING FREEDOM, and IRAQI FREEDOM.