Southwest Research Institute Matures Cognitive EW for USAF

By Richard Scott

Southwest Research Institute (San Antonio, TX) is approaching the halfway point in an 18-month US Air Force (USAF) research contract exploring cognitive electronic warfare (EW) algorithms and techniques able to accurately detect, and respond to, previously unknown enemy radar threats in real time.

Awarded in October 2023, SwRI's current $6.4 million contract runs through to March 2025. The end goal, according to the institute, is to provide the Air Force with a robust and reliable algorithm that will advance its cognitive EW capabilities and so protect aircraft and their crews.

Traditional EW processes hinge on prior collection of emitter characteristics in order to produce pre-flight mission data that can populate an emitter threat library. However, this method is incapable of identifying threats not previously encountered – whether a brand new threat emitter or a software-enabled waveform modification or mode change introduced to an existing threat.

Cognitive EW techniques are designed to overcome this shortfall by using an Artificial Intelligence/Machine Learning (AI/ML) approach to instantaneously identify new signals that are not already in an EW system's threat library. SwRI's approach is to develop an algorithm that can analyze its environment the same way as the human brain, but with higher accuracy and faster reaction times.

SwRI engineers have adopted a two-phased approach. The first phase, known as feature extraction, uses AI/ML processes to extract specific features of threat radar signal. This data is

then used in the second phase to group millions of pulses and highlight signal lethality and vulnerabilities.

A discriminating feature of SwRI's approach is the implementation of feature extraction algorithms on advanced platforms, including neuromorphic processing hardware. Neuromorphic computing systems use spiking neural networks to emulate how the human brain retains "memories," so making processing faster, more accurate and efficient: SwRI believes that this is the first implementation of neuromorphics in hardware for use in an operational combat environment. In the AOC's "From the Crows Nest" podcast episode released on March 27, Dr. Joseph Guerci talks with host Ken Miller about cognitive EW and the potential benefits of neuromorphic chips.