

RADIO FREQUENCY DIRECTED ENERGY WEAPONS (RF DEWS) FOR UNCONVENTIONAL ELECTRONIC ATTACK (UEA)

BACKGROUND

The SURVICE Engineering Company is a small business that has been providing the DoD and related customers with high-quality analytical products and services since 1981. Founded specifically to focus on systems survivability, we apply a proven systems engineering approach to support the design, development, testing, and fielding of air, ground, and sea systems. SURVICE has applied this experience to preserve the operational capabilities of DoD systems with various directed energy (DE) and electromagnetic (EM) energy survivability and/or lethality requirements.

THREAT

The DoD is interested in directed energy weapon (DEW) technologies (i.e., lasers, radio frequency [RF], and particle beam weapons) and their potential lethality against an adversary's sensor, communication, and weapon systems, such as missiles, rockets, and computers. Of equal concern is the possibility of an adversary using DEWs to attack friendly

personnel, facilities, and/or equipment with the intent of degrading, neutralizing, or destroying their capability.

SURVICE's focus is on RF DEWs and their potential to couple sufficient RF energy into a target system via intentional (front door) and unintentional (back door) antennas and produce adverse effects on a target's electronics. RF DEWs include high-power RF/microwaves (HPM), electromagnetic weapons (EMW), RF weapons, non-nuclear EM pulses, and electronic bombs (E-Bombs). Because RF DEWs provide a Warfighter with the capability to attack electronic targets, with and without intentional antennas, and produce effects that last long after the RF is no longer present, they offer a new capability of unconventional electronic attack (UAE) that complements traditional electronic warfare (EW).

CAPABILITIES

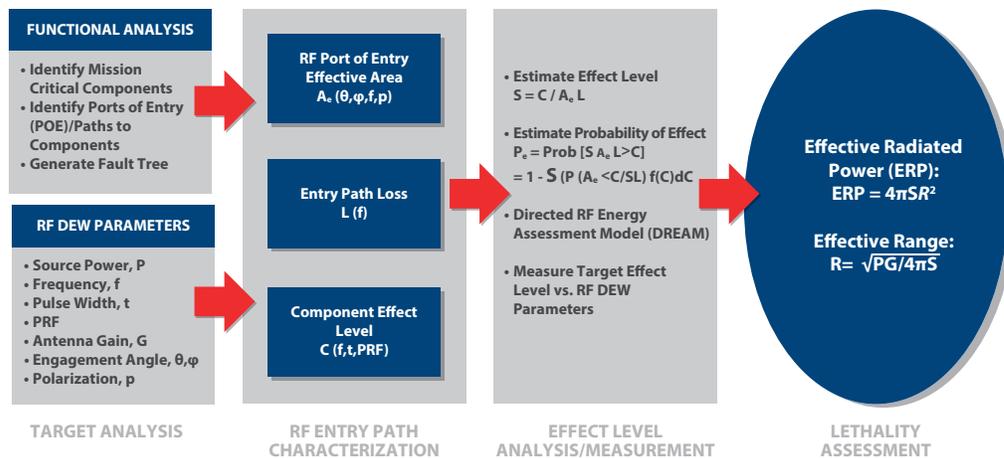
When estimating the lethality of an RF DEW or to harden/protect U.S. military systems and infrastructure from an adversary's RF DEW, SURVICE determines how much RF energy is

required on the target to produce an effect (i.e., system susceptibility/vulnerability level). We first conduct a target functional analysis to identify possible critical mission components. Next, we identify the ports of entry (POEs) for RF energy into the target and associated entry paths to the components. Then we characterize the entry path in terms of the POE's effective area, the entry path's transmission loss, and RF power required to affect the component. Based on these parameters, we can estimate the susceptibility level of a target system. These estimates are useful in helping to guide an experimental evaluation of the target system to measure its susceptibility level as a function of the RF DEW parameters, such as transmitted power, frequency, pulse width and repetition rate, antenna gain, and engagement angle. Finally, we use the measured target susceptibility levels to determine the effective radiated power (ERP) required for an RF DEW to engage a target at a user's desired engagement range.

EXPERIENCE

SURVICE has supported both analysis and testing of target systems to determine their susceptibility levels for lethality and survivability assessments. We have also provided guidance in identifying and using DoD models to help estimate the probability of effect on a target system as a function of RF DEW parameters. Some of the programs/studies we've supported include:

- Assessing Navy aircraft (rotary- and fixed-wing) for survivability in HPM and laser environments.
- Assessing Air Force aircraft design for HPM vulnerabilities.
- Performing an HPM study on the F135 STOVL engine.



Methodology for Estimating Target Effect/Susceptibility Levels That Can Be Used to Estimate Effective Radiated Power of RF DEW and Effective Engagement Ranges