



## AWRFLD

All-Weather Radio Frequency Launch Detection System



### Summary

- Early launch detection in all weather conditions
- Detect missile/rockets that do not break cloud cover (depressed trajectory)
- Find the enemy in complex all weather battlefield conditions beyond effective ranges
- Increase soldier survivability through early warning and launch detection of rockets, missiles, RPGs, ATGMs and mortars
- Mitigate weather and provide Soldiers with actionable intelligence, improved situational awareness and enhanced force protection

**Detect, classify and locate the launch of rockets and missiles in all weather conditions and in complex terrain using radio frequency emissions from weapons.**

AWRFLD provides the capability for early rocket/missile launch detection in all weather conditions. Special emphasis is placed on the detection of rockets/missiles with a depressed trajectory that never break cloud cover. This is accomplished by detecting, locating, and classifying weapons in all weather/environmental conditions during launch or firing. AWRFLD is capable of deployment on multiple platforms (ground vehicles, manned/unmanned aircraft, air ships, possibly satellites) and fixed locations. AWRFLD can detect a broad range of weapons including rockets/missiles, artillery, tanks, rocket propelled grenades (RPGs), mortars and anti-tank guided missiles (ATGMs). Range and accuracy depends on the size of the weapon being fired and the basing of AWRFLD.

## All-Weather Radio Frequency Launch Detection System

### Overview

All-Weather RF Launch Detection is a technology initiative that mitigates the negative effects of atmospheric conditions (clouds, rain, fog, smoke, dust, etc.) on today's sensors to "See the Enemy" and to detect the location of enemy rocket, missile, ATGM and RPG firings. The critical reliance on modern sensors to allow the warfighter to see the battlespace cannot be overemphasized. AWRFLD has demonstrated the ability to detect early launches of rockets/missiles in all weather conditions, to include when the trajectory does not break cloud cover, and to define the means of physically realizing this capability on future battlefields. The launch of rockets/missiles or the expenditure of ordnance creates several characteristic signatures, including the generation of a radio frequency (RF) pulse. Being able to detect, locate and classify this pulse provides warfighters with the ability to detect these launches and to conduct counter-mortar/counter-battery fires. For the individual soldier, it also provides the ability to rapidly find the enemy and return fire regardless of weather or battlefield obscuration. This capability also provides/enhances situational awareness, mission planning, counter-fire targeting, attack operations and, most importantly, actionable intelligence.

### Benefits to Tomorrow's Defense

- Detects, locates, and classifies launches/ordnance events on the battlefield in all weather conditions by detecting RF signature emissions.
- Enhances force protection, improves situational awareness.
- Finds the source of enemy rockets, missiles, tanks, artillery, RPGs, ATGMs, etc.
- Provides actionable intelligence.
- Increases survivability through early detection and location of enemy.
- Improves counter-mortar and counter-battery efficiencies.

The AWRFLD system detects and locates launches and ordnance events in all weather and in complex terrain conditions. It increases survivability by providing an early warning for launch detection. AWRFLD finds the enemy and will provide the Warfighter with enhanced situational awareness, improved force protection and actionable intelligence. It also improves counter-mortar, counter-battery, and counter-strike efficiencies.

### Technical Concept

- Initial database of RF emissions from launch/ordnance events
- Theoretical understanding of RF emissions from launch/ordnance events

- Demonstration of RF receiver capable of detecting launch/ordnance events
- Design of initial operational concept
- Design of initial operational configuration

This program has developed an initial systematic scientific database of RF emissions from launch and ordnance events from rockets, missiles, tanks, artillery, mortars, RPGs, and ATGMs. This was achieved by conducting initial testing and measurements inside an anechoic chamber followed by testing and measurements on an open test range. Measurements were made in both the time domain and the frequency domain over the range of frequencies from 100 MHz to tens of GHz.

The plume of a rocket or missile or the detonation of ordnance is a high-energy event that causes ionization of the atmosphere and movement of charged particles due to the subsequent blast waves. Previous measurements have indicated that RF is emitted over a wide range of frequencies.

Current state-of-the-art advancements in sensitive-selective receivers and the recent advances in digital signal processing allow detection of ordnance events over a wide band from low level signals, even in the midst of other noise sources. Initial testing proved that there are measurable RF emissions detectable by a variety of sensors. This has led to greater viability of this technology for weapon system detection.

The ability to detect and accurately locate these launches and ordnance events on the battlefield depends on the collection of signals from one or more receiving locations and on high speed processing of the data. These signals provide a fingerprint as to the type of weapon. In addition, the time and angle of arrival will provide location information. Algorithms use all available information to determine the location of the ordnance event



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