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The Navigator for
Enterprise Solutions

**DRONE
TECH**
EDITION

JAY CLECKLER,
GM - ARTIFICIAL
PERCEPTION
AND THREAT
AWARENESS
DIVISION

**SCIENTIFIC
APPLICATIONS
& RESEARCH
ASSOCIATES (SARA)**

**REDEFINING
AERIAL
ARTIFICIAL
PERCEPTION
AND
SITUATIONAL
AWARENESS**





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REDEFINING AERIAL ARTIFICIAL PERCEPTION AND SITUATIONAL AWARENESS

In the future unmanned aircraft will play a daily role in your life: inspecting infrastructure, searching for and fighting wildfires, improving the yield of agriculture, delivering goods to your doorstep, and much more. This potential to conduct safer, more efficient, faster, lower cost aviation operations while reducing greenhouse gases is substantial. Currently however, this future is stalled by the challenge of preventing airborne collisions when these unmanned aircraft (often called drones) fly beyond the visual line of sight (BVLOS) of those who operate them. The FAA 's CFR 91.113 states that each person operating an aircraft must do so as to "see and avoid" another aircraft. Modern aviation has

achieved a remarkable safety record and this exacting level of safety must be maintained when BVLOS drones are introduced into our National Airspace, creating the need for a reliable sensor system that can meet FAA requirements.

Most commercial applications have drones operating below altitudes of 1000 feet. For sensors, this low-altitude environment is the messy interface between blue sky and everything else that occurs on earth. Buildings, terrain features, birds, etc. produce a complex and cluttered environment for sensors to interpret and often prevent direct line-of-sight. Sensors need to operate on small unmanned aircraft and detect other aircraft from

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miles away. The need for long-range, low-weight and low-power sensor systems compound the overall challenge. Much of industry is attempting to solve this challenge with conventional sensors. Scientific Applications & Research Associates (SARA) has taken a non-traditional approach. SARA has developed acoustic technology called the Passive Acoustic Non-cooperative Collision Avoidance System (PANCAS™). PANCAS™ is a long-range, low-power, light-weight sensor system that detects possible collision threat aircraft (critically including non-cooperative aircraft that lack transponders) many miles away and commands evasive maneuvers when required, so as to avoid collision.

“When you go outside and try to detect aircraft, it is almost certain that you will hear them first, even if you never see them,” begins Jay Cleckler, General Manager of SARA’s Artificial Perception and Threat Awareness Division. “We have developed an acoustic system far better than the human ear, based on this very observation.”

Acoustic sensing of aircraft also circumvents yet another crucial hurdle required for unmanned aircraft to operate safely, the ability to detect aircraft from any direction. Unmanned aircraft fly more slowly than the manned aircraft they may encounter, and they are so small, pilots cannot see to avoid them. Unmanned aircraft cannot simply detect aircraft in front of them, they must also detect aircraft that might overtake them from the rear, the side, or above or below. “When we look at RADARs, they form a cone of detection of 40 to 90 or 100 degrees, similar to how a camera would see the objects in front of it,” adds Cleckler. Whereas traditional sensors have a limited-field-of-regard, a single acoustic sensor provides detection over 360°. Further more, acoustic sensors do not require line-of-sight to other aircraft in order to detect them. Aircraft may be detected even when they are obscured by the trees and terrain features that are common in low-altitude airspace.

SARA has overcome several hurdles to develop solutions that are cost effective and scalable. SARA scientists developed patented hardware and software to remove the noise of both wind and the host aircraft from detections, which otherwise mask sounds from other aircraft. This allows extended detection ranges and minimizes false alarms. Microphones and audio electronics are already mass-produced through large economies of scale for the audio and cell-phone markets. However, many of these components are not designed to meet more rigorous aerospace requirements. SARA has addressed the engineering and manufacturing necessary for these components to meet demanding aerospace environments, resulting in scalable and low-cost solutions.

SARA’s acoustic systems are not limited to drone integration. Many drones operate within fixed corridors or defined areas. The company has developed the Terrestrial Acoustic Sensor Array (TASA™), ground-based acoustic sensors that communicate together to provide an aircraft surveillance network extending over long corridors or large geographical areas. SARA has been granted two distinct Federal Aviation Administration (FAA) awards with a total contract award of \$3.2 million to install multiple TASA™ node networks at Virginia Tech’s Mid-Atlantic Aviation Partnership and Northern Plains UAS Test Sites beginning this summer of 2020. SARA has also been granted over \$1.5 million in contracts from NASA, NOAA and the Navy to evaluate PANCAS™ in 2020 and 2021.

Together, SARA’s drone-based PANCAS™ and ground-based TASA™ solutions are redefining aerial surveillance by providing cost effective and scalable solutions that address the most pressing technical challenge for BVLOS drone operations, safely replacing the pilot in the cockpit. We may think we see a new drone economy coming, but we should try to hear it first. 

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Scientific Applications & Research Associates (SARA)



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The annual listing of 20 companies that are at the forefront of providing Drone Tech solutions and transforming businesses