



A Letter from the Director

» **Autonomous systems are becoming increasingly important for a wide range of defense** applications, including cyber security, air surveillance, missile defense, undersea sensing, and force protection. The supporting technology has been changing rapidly with significant advances in computing throughput, data scale, and algorithm complexity. These advances enable defense operational capabilities with much faster decision speeds, greater complexity of action, improved persistence and endurance, and stronger human-machine collaboration. A Defense Science Board Summer Study report on autonomy released in June 2016 concluded that “DoD must take immediate action to accelerate its exploitation of autonomy while also preparing to counter autonomy employed by adversaries.” To aid the DoD in accomplishing this vision, Lincoln Laboratory is developing autonomous system technologies in nearly all of its mission areas.

The focus of the Laboratory’s autonomous systems research and development covers systems “at rest” and “in motion.” Areas of work include the prototyping of new machine learning algorithms for rapidly analyzing massive amounts of data, development of robotic vehicles that can search chemically contaminated spaces, and demonstrations of unmanned airborne vehicle (UAV) swarms that can self-assemble and adapt for advanced operational needs. Some of the prototype systems have already been used to support operations around the world.

This special issue of the *Lincoln Laboratory Journal* describes several of our autonomous systems programs across the spectrum of our mission areas. Some of the research is at the fundamental research level, and some covers new applications that are already in use. We expect the scale of autonomous systems work to increase over the next several years, and we have been making many investments in new laboratories, new platforms, and education programs for our staff. We will continue to work closely with our sponsors to rapidly transition new autonomous systems technology to address current and future national security threats.

We hope you enjoy this special issue of the *Lincoln Laboratory Journal* and gain an appreciation for the national-level importance of this area of research and development.

A handwritten signature in blue ink that reads "Eric D. Evans". The signature is written in a cursive, flowing style.

Eric D. Evans
Director, MIT Lincoln Laboratory