Detect-and-Avoid System with ADS-B Avionics for Unmanned Aerial Systems
NASA Armstrong Flight Research Center

**What is Detect-and-Avoid System with ADS-B Avionics?**
A unique collision-avoidance algorithm and sophisticated display options that exceeds FAA requirements for unmanned aerial systems (UAS) to fly in National Air Space (NAS).

**Key Features**
Crucial capabilities previously nonexistent for UAS
- Collision-avoidance algorithm keeps aircraft on a "well-clear" path with specific avoidance commands
- Provides unmanned pilots situational awareness and can provide autonomous avoidance for auto-pilots

Dramatically increases safety for the UAS itself, other aircraft in the airspace, and persons and property on the ground.

**Technology Transfer**
Cost-Efficient Marketing
- NASA Armstrong TTO developed an online listing to broadly communicate technology during its development
- TTO won an FLC Far West Outstanding Technology Development Award, boosting the tech’s credibility

Building Market Interest
- Inventor actively networked at the FLC Far West meeting and met director of Cimarron Capital Partners
- At Cimarron’s invitation and with TTO support, inventor presented technology and its potential impact on the aviation industry at WBT UAS Open Innovation Forum

Launching a Startup
- Cimarron recruited a CEO and provided financial capital to launch Vigilant Aerospace Systems, Inc.

Developing/Negotiating License
- TTO was highly responsive when startup had questions about license application and commercialization plan
- TTO negotiated a fair upfront payment and royalty rate and a partially exclusive license to maximize tech’s benefit via other fields of use
- License signed on February 25, 2016.

Collaborating on Flight Tests
- Inventor supported flights on a small UAS over four flight days and 70 encounters in December 2016
- During 3 hours of FAA-observed flights, the system successfully avoided collisions between two small UAS and maintained safe and efficient flight operations—a crucial step forward in national airspace integration

**Benefits to Aviation**
This technology is a major step forward in safely integrating UAS into the NAS. UAS are safer and less expensive for:
- Traffic monitoring
- Forest fire management
- Search-and-rescue
- Border/Law enforcement
- Mapping/Photography
- Package delivery
- Surveying farmland, pipelines, etc.
- Communications and broadcasting
- Civilian general aviation
- Data collection: Ecological, agricultural, environmental, weather

- Safer: Enhances UAS sense-and-avoid capabilities
- Effective: Provides critical command-and-control elements
- Regulation Ready: Satisfies federal requirements for ADS-B Out to be installed on all aircraft by 2020
- Efficient: Provides crucial environmental situational awareness, conflict detection, precise navigation
- Easy to Implement: Uses existing components and complements and enhances the use of existing aircraft avionics and air traffic control system

**ADS-B: 21st Century Radar**
Uses GPS satellite signals and aircraft avionics to automatically determine and transmit position, speed, etc. Allows aircraft to be tracked by ground stations and by each other in the air.

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