

Fly safely with FlightHorizon. Detect and avoid aircraft when flying beyond visual line-of-sight.

Do your commercial unmanned aircraft operations require beyond visual line-of-sight flight, FAA Part 107.205 Line-of-Sight waiver, 333 Exemption Certificate of Authorization to fly beyond line-of-sight or other authorizations? Do you need autonomous self-separation assurance? Do you need to fly above 400', fly near airports, at night or over water? FlightHorizon, designed by NASA, provides a complete autonomous collision avoidance solution for both piloted and fully autonomous unmanned aircraft to deliver situational awareness, self-separation commands, and collision avoidance for both piloted and autonomous unmanned aircraft.

PRODUCT BACKGROUND

Vigilant Aerospace Systems, Inc. provides the FlightHorizon family of products which use data from standard aviation transponders and radar to allow unmanned aircraft to autonomously self-separate from other aircraft and avoid mid-air collisions. This function is critical to allowing unmanned aircraft to fly beyond visual line-of-sight.

The system is based on an exclusively licensed NASA patent ([#9,405,005](#)) and prototype which has been extensively tested and which provides a unique autonomous "detect-and-avoid" function.

In addition, the software provides unmanned aircraft pilots with a 2D map-based view and 3D synthetic cockpit view of the airspace and full sensor fusion across aviation transponders, radars and online data feeds. The system is designed to help operators maintain flight safety, achieve beyond visual line-of-sight flight authorizations and comply with [FAA Part 107.205 waiver requirements](#) and upcoming [RTCA SC-228 Phase II MOPS](#).

The company also provides integration and development consulting in addition to testing, training and compliance services for unmanned aircraft flight operation departments and fleet managers.

PRODUCTS

- [FlightHorizon GCS™](#) – Uses an aviation transponder and, when available, ground-based radar attached to a laptop or workstation at the ground control station to provide collision avoidance commands and situational awareness to the ground-based unmanned aircraft pilot.
- [FlightHorizon AIR™](#) – Uses onboard transponder data and, when available, radar data, delivered to the ground control station over a radio control channel to provide collision avoidance commands and situational awareness to the unmanned aircraft pilot.
- [FlightHorizon PILOT™](#) – Uses onboard FlightHorizon computer, transponder data and, when available, radar data, to send self-separation commands directly to the onboard autopilot.
- [FlightHorizon FLEET™](#) – Cloud-based online unmanned fleet management system that collects flight logs from multiple FlightHorizon installations to provide centralized reporting, license management and flight replays for fleets.

AWARDS AND AFFILIATIONS

- Winner of the FLC's National Excellence in Technology Transfer Award 2017
- Winner of the FLC's Far West Region Outstanding Commercialization Success Award 2016
- Member of the NASA Unmanned Traffic Management (UTM) Collaborative
- Invited Test Partner in the FAA's ASSURE UAS Center of Excellence Research Program

ADDITIONAL TECHNICAL RESOURCES

- Technical journal publications, white papers, and presentations about FlightHorizon are available online at www.VigilantAerospace.com/resources
- Product videos are available online at www.VigilantAerospace.com/video

OVERVIEW

Vigilant Aerospace provides consulting services to ensure the smooth integration of FlightHorizon into your flight operations. Services include installation, configuration, system integration, software customization, user interface customization, testing, training and compliance consulting for companies using FlightHorizon products.

SERVICES



Systems Integration – Equipage and purchasing advice, equipment installation and configuration, software configuration and other services related to the use of FlightHorizon for detect-and-avoid



Software Development – Development of specialized hardware integration modules, new user interfaces and new software functions for equipment and mission-specific client needs



Testing – Testing of installed FlightHorizon systems, including especially transponder and radar installation testing, systems integration testing and software testing



Training – Training of personnel to use FlightHorizon for flight safety, situational awareness, self-separation and collision avoidance in routine flight operations



Compliance Consulting – Advice on how to meet equipage and performance-based regulatory requirements using FlightHorizon and related hardware, systems and processes



OVERVIEW

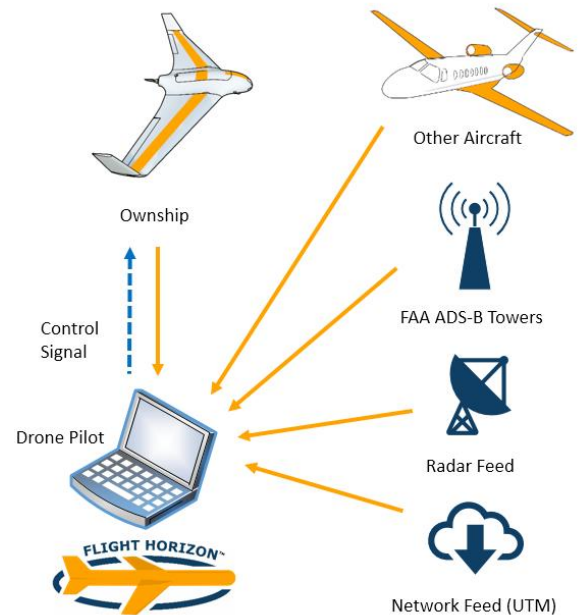
FlightHorizon GCS™ (Ground Control Station) is a complete solution to allow unmanned aircraft pilots to detect, track, predict and avoid other aircraft. The software sends self-separation and collision avoidance commands to the unmanned aircraft pilot to avoid conflicts quickly and efficiently.

Based on a patent and software developed at NASA, the system uses algorithms and flight rules to achieve safety and regulatory compliance when flying beyond visual line-of-sight.

FlightHorizon GCS™ is installed on a laptop or workstation at the ground control station for the unmanned aircraft and uses an ADS-B receiver at the workstation and a transponder on the aircraft to track the unmanned aircraft and all other nearby aircraft in real-time to provide situational awareness, traffic alerts, collision warnings and collision avoidance commands. Available add-on data sources include ground-based radar and networked air traffic control feeds (Unmanned Traffic Management - UTM).

The user interface for unmanned pilots provides 2D map views, 3D synthetic cockpit views, and specific traffic warnings and avoidance commands in the form of audible, textual and visual guides.

FlightHorizon GCS™ is designed to meet the FAA's Part 107.205 waiver requirements for beyond visual line-of-sight flights and the anticipated RTCA SC-228 Phase II Minimum Performance Standards.



FEATURES & BENEFITS



Proprietary and patented avoidance algorithms



Traffic awareness and visualization for beyond visual line of sight (BVLOS) flights



Real-time detect-and-avoid with traffic alerts and specific avoidance commands



Real-time traffic data collected from aviation receiver and other data feeds, as an add-on



Integrates with multiple receiver models including uAvionix and Stratux



Runs on tablet (touch-friendly), laptop or workstation



Well-tested user interface design, including 2D map and 3D synthetic cockpit views and interactive geo-browser with high-resolution aerial photography



Air-traffic control zones, and navigational and sectional charts



Detailed flight and traffic logging and full replay of flights

OVERVIEW

FlightHorizon AIR™ is a complete solution to allow unmanned aircraft pilots to detect, track, predict and avoid other aircraft. The software sends self-separation and collision avoidance commands to the unmanned aircraft pilot to avoid conflicts quickly and efficiently.

Based on a patent and software developed at NASA, the system uses algorithms and flight rules to achieve safety and regulatory compliance when flying beyond visual line-of-sight.

FlightHorizon AIR™ is installed on a laptop or workstation at the ground control station for the unmanned aircraft and uses data received by the *onboard* transponder to track all nearby aircraft.

The data is delivered over one of the aircraft's radio control channels to the ground-based FlightHorizon software to provide situational awareness, traffic alerts, collision warnings and collision avoidance commands to the unmanned pilot. Using the onboard receiver, detect-and-avoid functions can be provided at any distance from the ground control station. Available add-on data sources include ground-based radar and networked air traffic control feeds (UTM).

The user interface for unmanned pilots provides situational awareness, 2D map views, 3D synthetic cockpit views, and specific traffic warnings and avoidance commands as audible, textual and visual guides.

FlightHorizon AIR™ is designed to meet the FAA's Part 107.205 waiver requirements for beyond visual line-of-sight flights and the anticipated RTCA SC-228 Phase II Minimum Performance Standards.



FEATURES & BENEFITS



Proprietary and patented avoidance algorithms



Traffic awareness and visualization for beyond visual line of sight (BVLOS) flights



Real-time detect-and-avoid with traffic alerts and specific avoidance commands



Real-time traffic data collected from aviation receiver and other data feeds, as an add-on



Integrates with multiple transponder models including uAvionix, SageTech and GDL-88/90



Runs on tablet (touch-friendly), laptop or workstation



Well-tested user interface design, including 2D map and 3D synthetic cockpit views and interactive geo-browser with high-resolution aerial photography



Air-traffic control zones, and navigational and sectional charts



Detailed flight and traffic logging and full replay of flights

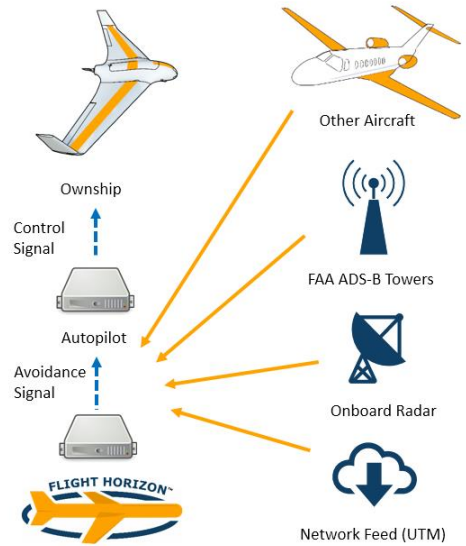
OVERVIEW

FlightHorizon PILOT™ is a complete solution for fully autonomous unmanned aircraft, enabling them to detect, track and predict other aircraft and send avoidance commands to an onboard autopilot to self-separate from conflicts quickly and efficiently.

Based on a patent and software developed at NASA, the system uses algorithms and flight rules to achieve safety and regulatory compliance when flying beyond visual line-of-sight.

FlightHorizon PILOT™ is installed as an independent flight computer or as a software module on a primary flight computer onboard the unmanned aircraft and uses the signal from an aviation transponder (ADS-B) on the unmanned aircraft to track in real-time all other nearby aircraft. The software then provides self-separation and collision avoidance commands in the form of waypoints to the autopilot. Add-on data sources include onboard radar and networked air traffic control feeds (UTM).

FlightHorizon PILOT™ is designed to meet the FAA's Part 107.205 waiver requirements for beyond visual line-of-sight flights and the anticipated RTCA SC-228 Phase II Minimum Performance Standards.



FEATURES & BENEFITS



Proprietary and patented avoidance algorithms



Real-time detect-and-avoid with traffic alerts and specific avoidance commands



Real-time traffic data collected from aviation transponder and other data feeds, as available



Integrates with multiple transponder models including uAvionix, SageTech and GDL-90-compatible devices



Integrates with multiple autopilots using multiple protocols including MAVLink



Can be run on an independent flight computer or as a software module on the primary autopilot flight computer, depending on equipage



Detailed flight and traffic logging and full replay of flights



OVERVIEW

(COMING SOON) FlightHorizon FLEET™ brings all the power and compliance features of FlightHorizon into a central location for management of a corporate drone fleet.

FlightHorizon FLEET™ is software for managing flight logs and data, replaying flights, managing inventory, equipment, operator info and FlightHorizon licenses across multiple installations. The system runs in the cloud and is delivered as a web application. It automatically synchronizes and collects data from all connected FlightHorizon systems, providing an aviation department with detailed reports, flight tracking and visual replay of flight logs in a 3D synthetic cockpit view.

FEATURES & BENEFITS



Synchronizes FlightHorizon flight log data from multiple aircraft for storage and review in FlightHorizon FLEET



Logs and reports vehicle ID, flight time, date and flightpath, vehicle encounters and pilot comments



Produces compliance reports regarding equipment and flightpaths near other aircraft and near restricted airspace



Centralizes flight planning and distributes pre-flight plans to individual FlightHorizon stations



Incident reporting and report submission from FlightHorizon stations to FlightHorizon FLEET



Provides full flight log replays including 2D map views and 3D synthetic cockpit views



Centralizes account and license management for FlightHorizon software



Logs pilot hours and vehicle hours for quality control and maintenance



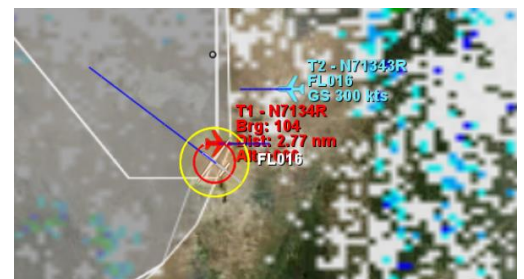
Syncs offline operations data to FlightHorizon FLEET at next online connection

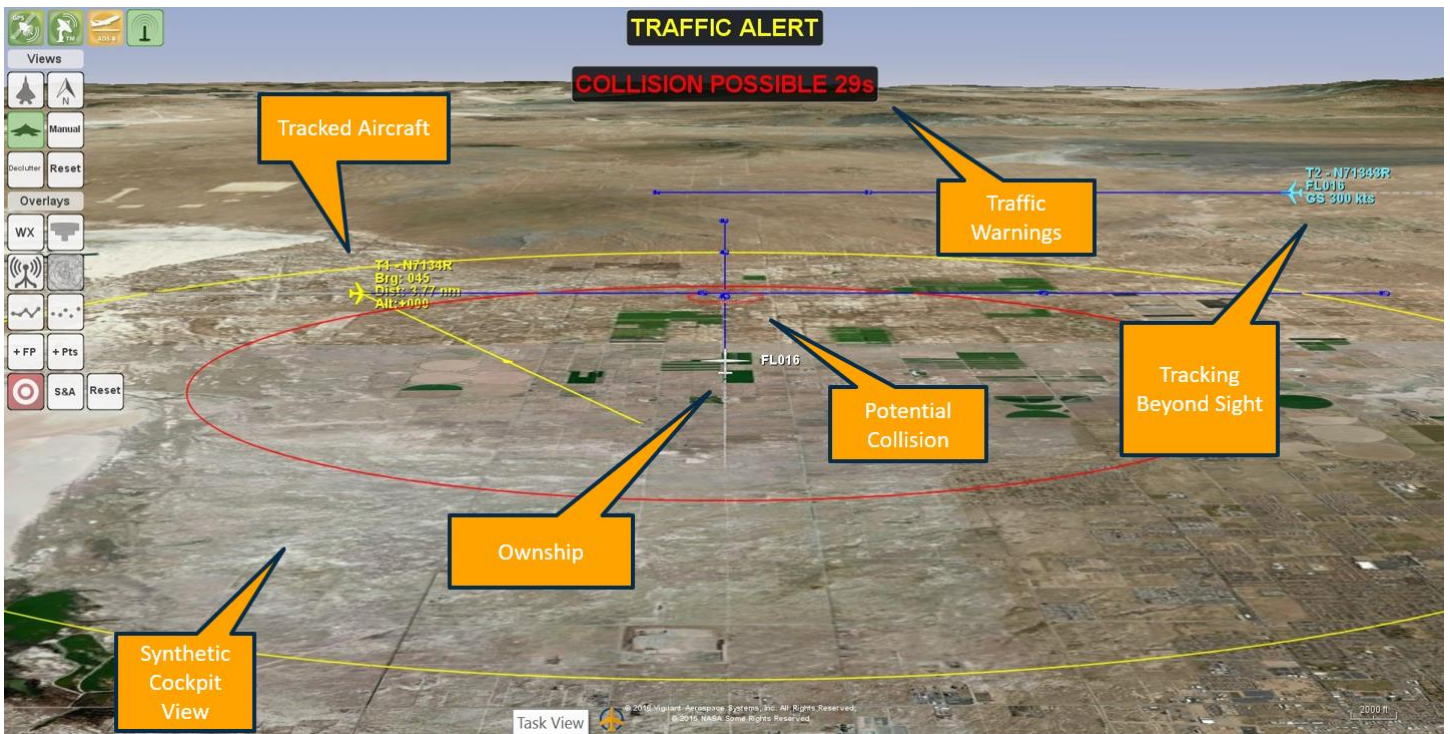
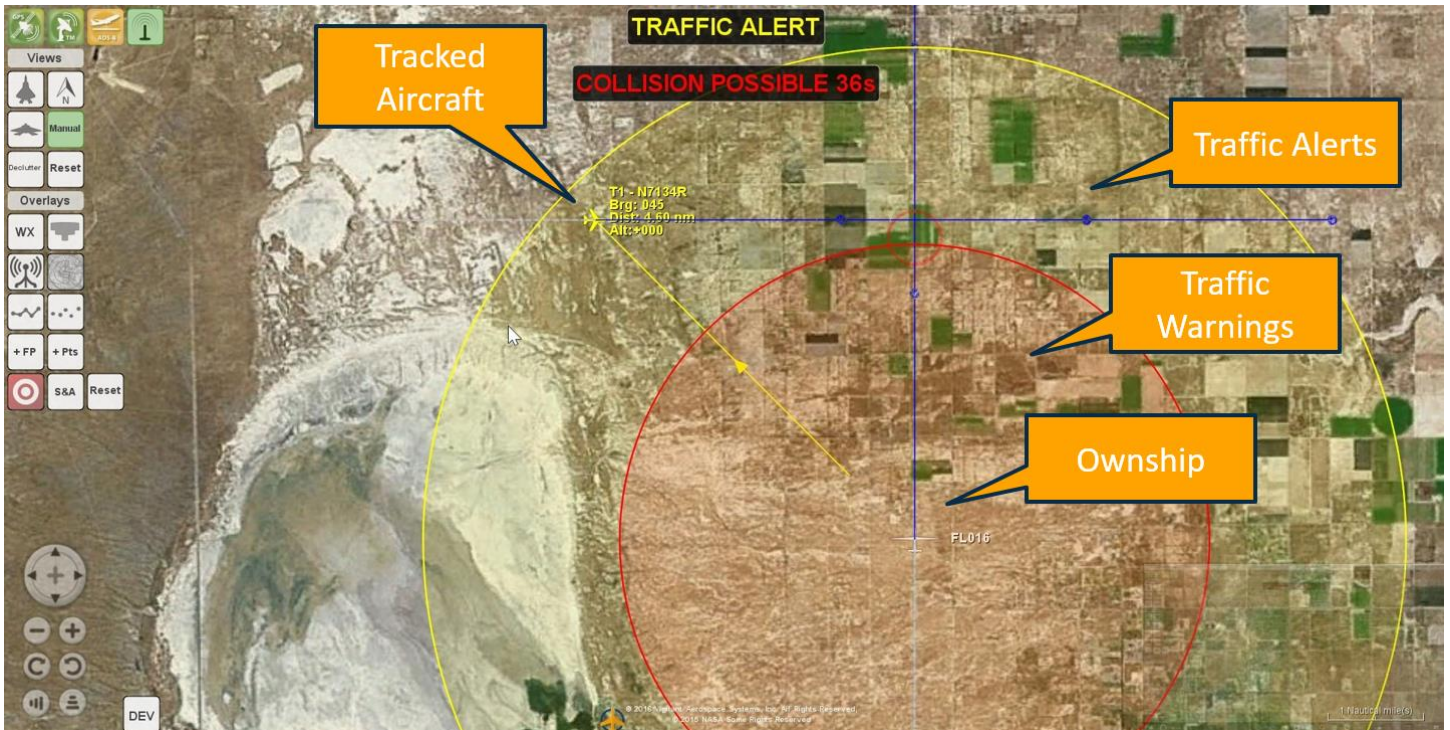


Provides vehicle inventory and payload control tracking



Runs in the cloud as a web application





This buying guide will help you select the correct product based on your operational needs.

Operational needs...	Requirements...	Product...
<ul style="list-style-type: none"> Unmanned flights within 20 miles of the ground control station Simplest and most economical solution 	<ul style="list-style-type: none"> Requires unmanned aircraft pilot Requires onboard transponder No onboard systems integration required Ground-based radar unit option Networked traffic management option 	FlightHorizon GCS™
<ul style="list-style-type: none"> Unlimited range from the ground control station 	<ul style="list-style-type: none"> Requires unmanned aircraft pilot Requires onboard transponder Requires integration to onboard transponder to deliver signal to ground control station over a radio control channel Onboard radar unit option Ground-based radar unit option Networked traffic management option 	FlightHorizon AIR™
<ul style="list-style-type: none"> Fully autonomous detect-and-avoid solution Unlimited range from the ground control station 	<ul style="list-style-type: none"> Requires onboard transponder Requires installation of FlightHorizon flight computer and integration to autopilot Onboard radar unit option Networked traffic management option 	FlightHorizon PILOT™
<ul style="list-style-type: none"> Tracking of multiple flights, multiple aircraft, multiple pilots Centralized storage and management of flight logs Centralized reporting and auditable data Replay of stored flight logs 	<ul style="list-style-type: none"> Web-based management interface requires high speed internet connection 	FlightHorizon FLEET™
<ul style="list-style-type: none"> Systems integration and testing Software and hardware integration to onboard control radio and autopilot Custom software and user interface design and development 	<ul style="list-style-type: none"> None 	FlightHorizon Consulting

Detect-and-Avoid UAS System Successfully Trialed Beyond Line of Sight

1 Feb 2017

“The flights tested the system’s DAA algorithms, hardware integration and user interface performance. Eighteen different scenarios were flown multiple times using two DJI Phantom 4 drones; one aircraft acted as the primary ownership, and the other acted as an intruder aircraft.



Vigilant Aerospace says its system successfully detected and tracked the intruder aircraft and provided warnings on 100% of air traffic during the encounters. The scenarios triggered the system’s traffic alerts, threat alerts and collision warnings – in turn, allowing the drone pilots to avoid collisions.” – Betsy Lillian

DJI Phantom 4s used in sense-and-avoid testing

1 Feb 2017

“But, significantly, the scenarios were beyond the visual line of sight. Those flights, ... simulated real-world scenarios in which visual detection of approaching aircraft by ground-based unmanned pilots might not be possible due to distance, weather, altitude and speed. [...] These weren’t just simple tests. The FAA’s senior UAV regulator was on hand to observe, as was an FCC observer whose task was to monitor radio transmissions.” – Scott Simmie

**Vigilant Aerospace Completes BLOS Test at NASA Armstrong**

30 Jan 2017

“To demonstrate the system’s BLOS capabilities, a variety of flights were conducted, including ones where ground based unmanned pilots were possibly unable to see approaching aircraft due to a variety of factors such as distance, weather, altitude and speed.



In total, almost 100 scripted encounters between UAS under different realistic flight conditions were flown to test several of the system’s primary functionalities, including its DAA algorithms, user interface performance and hardware integration.” - Staff

Who Benefits from Airmap and its Digital Certificates for Drones?

10 March 2017

“There are other solutions for aircraft identification that don’t involve certificates or a digitally enabled UTM system. For example, Vigilant Aerospace completed beyond line-of-sight flight testing of its new FlightHorizon collision avoidance system for drones at NASA Armstrong Flight Research Center in the Mojave Desert without a complex system.” – Colin Snow, The Drone Analyst

**Vigilant Aerospace Partners with NASA on UAS Traffic Management System**

5 Aug 2016

“The partnership allows the company to integrate UTM flight plans and traffic data into its FlightHorizon avionics software and provides NASA with access to the company’s flight test data and system development advice and feedback. FlightHorizon provides UAV operators with air traffic visualization and detect-and-avoid commands for integration into the national airspace and beyond line-of-sight flying. The software is based on technologies the company exclusively licensed from NASA’s Armstrong Flight Research Center earlier this year.” - Staff

