SIMULATION ENVIRONMENT AND FLEET MANAGEMENT SYSTEM

Product Overview

The Top Flight Technologies' Simulation Environment and Fleet Management System is a full-life cycle solution set for UAV pilot training, autonomous mission development and testing, and remote fleet operations and mission data repository.

The system addresses the following key processes, roles, and responsbilities:
• High-fidelity UAV physics and environmental models for accurate vehicle performance and mission operation for any UAV.
• UAV pilot training in fully simulated 3-D environments.
• Robust autonomous mission planning development (primary missions and contingency actions).
• Testing of autonomous missions including onboard sensor field-of-view.
• Simultaneous operation of multiple UAVs in real and simulated environments.
• Real-time flight data monitoring and post mission analysis.
• Fleet management data analytics dashboard for detailed analysis of fleet operations.

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Top Flight Technologies® Simulation Environment

The Top Flight Simulation Environment enables UAV pilots and operators to operate real drone hardware in a simulated environment. It is a multifunctional tool for businesses to preview missions, train pilots, and test software updates in a simulated environment.

Key Features:
• UAV pilots and operators train using actual hardware, software, and avionics systems used on real autonomous flight systems. This reduces time to achieve required level of proficiency for safe operation.
• Simultaneous simulation of multiple UAVs in high-fidelity photo-realistic environments teach pilots and operators how to safely operate in real-world highly congested settings.
• Real-world location models of infrastructure, terrain, and dynamic weather conditions.
• UAV models are developed using as-built physical and aerodynamic properties of flight vehicles to replicate realistic flight characteristics. Test software and hardware changes prior to operating a real vehicle.

TOP FLIGHT
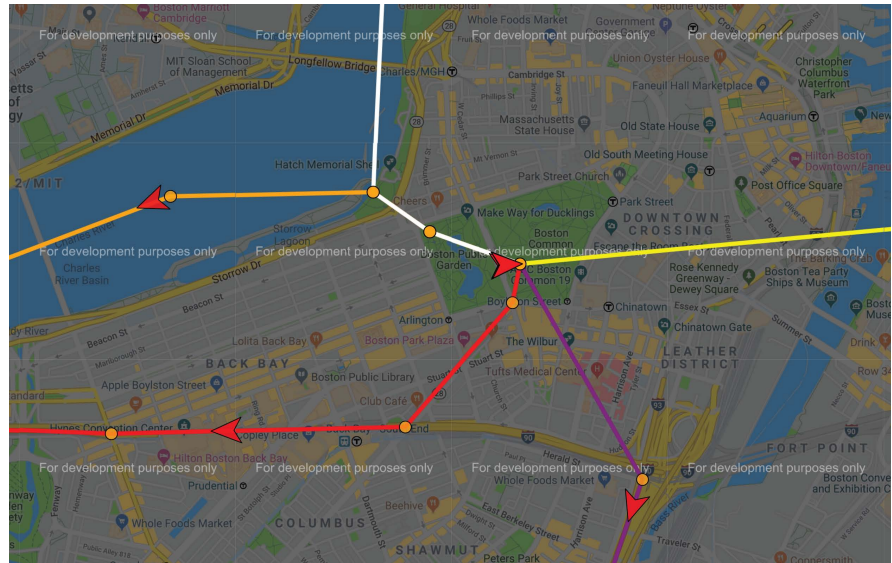TECHNOLOGIES®
MASTERY. INNOVATION. RESULTS.

Top Flight Technologies®
Fleet Management System

The Fleet Management System (FMS) is designed for fleet-operator businesses, providing them the tools for easy setup, operation, and remote monitoring of UAV fleets operating simultaneously over diverse locations. Top Flight's FMS allows business units to focus on operations, rather than the details of piloting individual UAVs.

Key Features:

• Allows one operator to remotely manage multiple UAVs simultaneously from a remote location. Fewer operators reduces your costs for training and operation.

• Mission interface to develop verified and validated missions and flight routes accessible to fleet managers. Emphasis on safety, reliability, accuracy, and repeatability.

• Review post-flight data and mission objectives in a detailed analysis system. Maintains historical records for the entire fleet.

• Configurable dashboard interface for fleetwide statistics and operational oversight.

Vehicle		Mission	Flight Plan	State	Command	Action
1	uav3	Round-trip delivery	Harvard Stad...	Running	Start Mission	UPDATE
2	uav5	Round-trip delivery	Distribution ...	Running	Start Mission	UPDATE
3	uav2	Round-trip delivery	Zoo Vet. Clinic	Running	Start Mission	UPDATE
4	uav6	Select option	Medical Facil...	Running	Start Mission	UPDATE
5	uav1	Round-trip delivery	Fenway	Mission Loaded	Load Mission	UPDATE
6	uav4	Select option	Select option	Idle	Select option	UPDATE
7	uav7	Select option	Select option	Idle	Select option	UPDATE
8	uav8	Select option	Select option	Idle	Select option	UPDATE
9	uav9	Select option	Select option	Idle	Select option	UPDATE
10	uav10	Select option	Select option	Idle	Select option	UPDATE

UAV Design Integration in Top Flight Technologies® Simulation Environment and Fleet Management System

Top Flight's model-based design approach of characterizing any UAV used in this prodct allows newer versions of the Airborg® or other manufacturer UAVs to be utilized in this system. In addition, when customers are designing new UAVs, this approach accelerates the systems engineering life-cycle process by enabling continuous feedback throughout the entire design process using simulation. Key benefits include:

Reducing Design Time and Cost
- Enabling rapid systems engineering trade studies in response to design iterations and changing requirements.
- Reducing costly hardware development iterations and costly flight testing of early prototype/subscale vehicle designs.

Getting It Right the First Time
- Capturing errors early helps eliminate redesign in later stages of development.
- Designing and testing interfaces prior to production reduces costly integration time.
- Automating regression testing of design iterations exposes masked integration issues.
- Evaluating corner-cases that are hard to replicate on the physical system.
- Easily visualize and communicate system design and performance to engineers, management, and potential customers.

An Integrated Software Solution

The Top Flight Technologies® Simulation Environment and Fleet Management is driven by a software stack and underlying mathematical models that engineers can contionously update and that ultimately creates the functionality for training simulation, mission design, fleet management, and post-flight analytics.

Vehicle design engineers use Industry Tools (1) in conjunction with the Top Flight's Physics-based Simulation Environment (2) to rapidly iterate a vehicle design and its flight performance. Pilots and operators (3) use the the Top Flight Simulation Environment (2) for training, mission-based planning, evaluation and post-flight analytics for a single mission or fleet of vehicles. The Top Flight Simulation Environment is continuously fine-tuned with comprehensively logged flight data (4).

Industry Design Tools (1)	**Top Flight Technologies High Fidelity Physics-based Simulation (2)**	**Pilot & Fleet Operations (3)**
Computer Aided Design	Realistic Flight Environment	Training
Structural Analysis	Systems Model	Fleet Management
Extended Vortex-Lattice Model	Aerodyamics Model	Mission Design
Computational Fluid Dynamics	Power Plant Model	Analytics
Controller Design	Propulsion Model	Payload Integration
	Avionics Model	

Flight Test Data (4)