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Company Overview

Based in Boulder, CO and founded in 2011, Black Swift Technologies (BST) is one of the only US domestic companies to develop our own aircraft, avionics, flight control systems, payload interfaces, payloads, user interfaces and ground stations. We design and manufacture purpose-built Group 1 Unmanned Aircraft Systems (UAS) and related Flight Management Systems (FMS) used around the globe for a variety of specialized atmospheric research missions in extreme conditions, including monitoring and assessing volcanoes, tornadoes, hurricanes, and wildland fires. Our customers include the USAF, NOAA, NASA, USGS, and leading research institutions and universities.

BST has been awarded numerous grants to research and develop UAS technologies, including an Artificial-Intelligence (AI)-based automated safe landing system for UAS, a AI-based preventive maintenance system for UAS, a advanced soil moisture measurement package, a vertical take-off and landing (VTOL) fixed-wing UAS to monitor atmospheric conditions for the Air Force and Special Operations Forces, even an innovative aerial solution engineered to deploy UAS from an interplanetary probe designed to study the atmosphere of Venus.

Core Competencies

- Aircraft Design and Control
- UAS Operations in Extreme Environments
- Payload Integration and Deployment - including multispectral and RGB cameras, LiDAR, EO/IR, trace gas sensors, nephelometer, temperature, pressure, humidity and wind sensors, L-band radiometer, to name but a few.
- On-Board Augmented Intelligence - highly capable avionics subsystem with associated ML algorithms for intelligent fault detection predicting system failures before they happen.
- Unified Flight Management System - advanced end-to-end avionics enabling users to control, communicate and command their UAS for fully autonomous flight.
- AI, Machine Learning, and Machine Vision Software Development



Key Differentiators

- All of our UAS solutions are designed, manufactured and serviced entirely in the USA.
- Only U.S. Group 1 UAS manufacturer that has its own flight management system and aircraft design capability.
- Data-Centric Flight Control - our flight management system is a payload-focused control system enabling real-time telemetry and control through its autopilot data link for fully autonomous flight.
- Modular Field-Swappable Payload System - enables rapid changes of payloads in the field using common power, data, and mechanical interface without any specialized tools.
- SwiftCore FMS provides “smart” sensor-based control of the UAS minimizing operator workload while improving the quality of data captured by autonomously modifying the flight path based on sensor inputs.

Existing UAS Products

Black Swift S2 UAS



BST's rugged workhorse, the S2 is a fixed-wing UAS capable of carrying a variety of sensors in its modular, field-swappable payload nose cone. The S2 offers the benefit of having a larger payload capacity (5 pounds) than other vehicles in its class, while having a longer endurance (110 minutes), higher ceiling (6,000 meters or 20,000 feet AGL), and greater range (110 km) than competitive aircraft. Originally designed for atmospheric, volcano research, and aerial mapping, the S2 has proven itself on demanding data collection missions from the Arctic to the Tropics.

Black Swift S0 UAS



The Black Swift S0 is a small, ruggedized VTOL or tube-launched fixed-wing UAS capable of carrying a variety of different sensors including a full atmospheric sampling suite or small, lightweight EO/IR cameras. Use of modern manufacturing techniques makes it more economical to construct, operate, and maintain than manned or larger UAS, enabling low-cost swarm solutions. The S0 originated from a NOAA grant to produce a small, low-cost, electric fixed-wing UAS for air deployment from a P-3 Orion “Hurricane Hunter” aircraft. This purpose-built aircraft was engineered for autonomous flight providing essential measurements in the atmospheric boundary layer of the eyewall of a hurricane.



Existing UAS Products (cont.)



Black Swift E2 Multirotor UAS

The E2 was originally developed for autonomous infrastructure inspection. It features a 35-minute flight duration with a 6.5 pound payload and field-swappable payload capability. It was built for rugged use, in demanding field conditions, including operating in inclement weather.



SwiftCore™ Flight Management System (FMS)

Black Swift's Flight Management System consists of a fully integrated autopilot, a tablet-based ground control station, and an intuitive graphical user interface (GUI). The design and code for SwiftCore FMS was created entirely in-house, allowing it to be thoroughly vetted and secured by experts in the field, as opposed to many of the open source options which contain suboptimal code, estimation and control algorithms. Despite having a sandboxed mission critical core, the SwiftCore FMS maintains an array of open interfaces allowing for integration with third-party components.

Achievement Highlights

Black Swift Technologies has completed numerous Phase I & II SBIRs including:

Phase II NASA SBIR to develop a machine vision automated safe landing system for distressed UAS to increase the safety and viability of operating UAS in the NAS.

Phase II NASA SBIR to develop an AI-enabled predictive and preventive maintenance system for UAS vehicles. Leveraging ML algorithms this system will provide early warning and diagnostics of potential critical system failures on USAF drones, thereby reducing the risk of mission failures. Black Swift's AFWERX 20.3 Phase I SBIR is an extension of the work conducted on this project.

Phase II NASA SBIR to develop a soil moisture management system utilizing a unique L-band radiometer (developed and tested under NASA's SBIR Program) integrated into the S2 fixed-wing UAS and multi-spectral post-processing software to provide a level of detail and resolution previously unobtainable.

Black Swift Technologies current projects include:

AFWERX 20.3 Phase I SBIR to research and develop AI/ML algorithms for predictive and preventive maintenance on UAS aircraft.

Phase II SBIR with NOAA to develop a small, low-cost UAS to be air dropped from a P-3 Orion "Hurricane Hunting" aircraft with an integrated meteorological sensor--the SwiftFlow 3D Wind Probe--to study the boundary layer conditions in the eyewall of a hurricane.

Phase II SBIR with NASA to design and develop a UAS to perform upper atmospheric observations of Venus. The planetary aerial vehicle is engineered to not only survive Venus' harsh wind environment, but simultaneously perform targeted sampling of the atmosphere while continuously extracting energy, even on the dark side of the planet.

Phase II SBIR with NOAA to develop an AI-enabled GPS-denied navigation system to support BVLOS coastal UAS mapping missions.

Commercial project with its Spanish partner, Alerion, to develop a UAS multirotor system with advanced AI navigation enabling autonomous, up-close inspection of wind turbines (even in extreme environmental conditions) using LiDAR and RGB cameras.

Commercial project with a major cell phone provider to use UAS to monitor and map 5G signal strength.

Phase II SBIR with the Air Force to develop a small, low-cost, high performance VTOL fixed-wing UAS to autonomously conduct atmospheric profiling supporting more accurate parachute drops and improved localized weather forecasts supporting Air Force, Army, and Special Operations Forces.

Black Swift Technologies customers include:

USAF	NASA	NOAA	USGS	NREL	IPOZ	Alerion
Leading Research Universities:	CU	CSU	OSU	UVA	UNL and more.	