



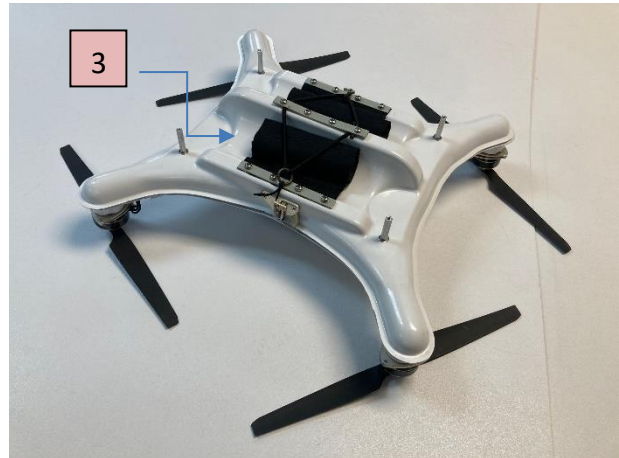
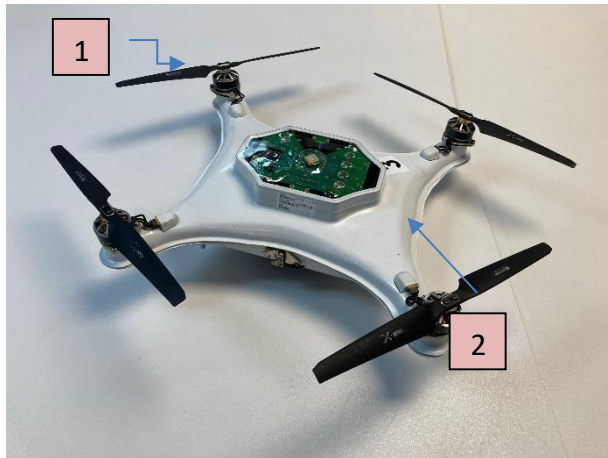
Sturnus (Rev A) Ready to Fly Drone Kit

With a brand-new approach to wholly US based drone manufacturing, Kairos' Sturnus is top of its class in manufacturability and manufacturing speed, allow for rapid manufacture, rapid deployment, and firepower dominance on the battlefield. And while being cost-effective and easily manufactured, the component that sets the Sturnus apart is the munition applique fabric dropper payload system, allowing an operator to deliver a wide variety of payload options on target. This one innovation transforms every Sturnus made into a platform for any imaginable use case. With flight software that walks the line between autonomous and manned flight, little attention is required to keep the Sturnus airborne and in position. Opensource GPS waypoint software enables even a novice user to successfully execute a send-and-return mission with critical accuracy.

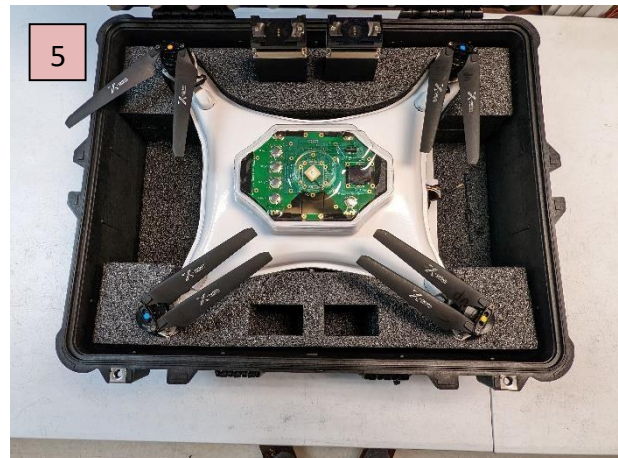
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Key Features:

- Hover time exceeding 20 minutes (no payload)
- Carries Payloads of 4+ pounds
- Highly stable and precise position holds in 3D space.
- Two stage Arming and Firing of any payload
- Designed for simplicity and reliability.



1. Drone motor with mounted prop
2. Battery/Flight Controller access lid
3. Integrated Fabric Dropper



4. Accessory kit with 2 batteries, charger, and Warder safety puck
5. Sturnus Pelican transportation case

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Operation Details:

The Sturnus uses components manufactured in Salt Lake City, Utah. The following is a short description of the primary components.

- Flight Controller:** Following the PixHawk6 standard, Kairos has several flavors of FC base on STM32 components. The core flight software is open source Ardupilot. Customers can reflash with their own flight control software. The INU and Baro are located on the FC and the GPS plugs in. MavLink is the primary communications protocol. Kairos is porting ArduPilot to the PIC32 processor for much higher availability.
- GPS:** Based on the Neo-N8M module from uBlox of Switzerland. Kairos built a carrier board that also contains the compass and indicators
- ESC:** Kairos has built its own ESC that is based upon the open source Simon K firmware using an ATmega8A processor. The ESC is scalable by sizing the 3-phase bridge for the expected motor and battery combination.
- Motherboard:** This base board handles the power management with push button on/off. Battery and ESC plug into this board. Independent safety systems such as the Kairos manufactured Warder/Warden safety pucks integrate here as well as the Kairos Robotic ITESS receivers.
- Air Frame:** The primary airframes are vacuum formed shells, bonded together. The dropper mechanism is integrated into the bottom shell. There are a number of different sizes and shapes of airframes.
- User Interface:** The top pcb seen in the pictures has a simply keypad and display as well as a Commander board. The command board translates human missions into MavLink commands for flight operations. It is based upon a dsPIC33E processor and entirely written by Kairos in C. MavLink over Ethernet is handled by the commander.

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GPS based dropping missions can be uploaded to the commander with an SD/USB card, ethernet or KA radio. A button sequence is executed on the keypad and the Sturnus flies to a desired GPS location and drops its payload.

This Kairos technology was partially developed by the ADAPT SBIR Phase I/II sponsored by ONR.

Many other components exist that are manufactured by Kairos for usage in our drones or other UxS. These include:

Apium Swarm Dongle for usage in swarms using the Apium Swarm Pilot

10/100 Embeddable Ethernet 5/8 Port Switches with Passive POE power

Forward and Downward Cameras for flight and bomb site

Frequency Agile Video Transmitter, 27mhz to 850mhz, CVBS Input

Frequency Agile Video Receiver, 27mhz to 850mhz, CVBS Output

Low latency CVBS video server, passive POE interface.

MPU5 based interfaces for Ethernet and dismount UxS controls

Kairos designed and supported LoRa and FSK radio sub-systems

Universal Trigger board to enable usage as a Munition Robotic Applique.

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Aircraft Specifications

Length – No Props	17 in. / 43 cm.
Width – No Props	19 in. / 48 cm.
Height	7 in. / 18 cm.
GNSS	GPS
Takeoff Weight – No Payload	4.8 pounds / 2.18 kg
Flight time – No Payload	20 minutes
Power Consumption - Hover	300 Watts
Power Consumption - Max	600 Watts
Max Payload	4 pounds
Max Ascent Speed	8.2 feet/s / 250 cm/s
Max Horizontal Speed	41 feet/s / 1,250 cm/s
Power Supply	2 – 3300 mAh 4 cell LiPo Battery (14-17 V)
Operational Radius	1 mile / 1.6km
Operational Ceiling	1000ft AGL
Max Operating Wind Speed	30 Mph

Version History

Name	Date/Version	Description	Reason
Nicholas Ronnie	V1.0.0	Document Created	

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Name	Date/Version	Description	Reason
Nicholas Ronnie	V1.1.0	Flight Statistics Updated	

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