

Overview

The Fixed Wing Aircraft (FWA) is a new unmanned aircraft system (UAS) from Kairos Autonomi. It is based on a commercially available EPO foam airframe to allow for low costs and rapid development. The fixed wing design gives the aircraft much longer flight times and range than a multirotor UAS platform of



Figure 1: The FWA in flight.

similar weight.

The complete system consists of two aircraft per case. The aircraft and supporting equipment pack into a single ruggedized Pelican case and can be easily assembled in the field. The entire FWA assembles with just 6 thumb screws; no delicate electrical connections are required during assembly (see Field Assembly Instructions, page 5). Attached to the case lid are step by step assembly instructions with pictures. Simply assemble the aircraft, create and load a waypoint-based course using a Toughbook laptop (included in the kit), then launch the aircraft. The FWA is light enough that it can be easily thrown for hand launches. No pilot experience is needed for autonomous operation, though it can be optionally equipped with an RC transmitter and receiver for manual flights and tethered semi-autonomous flights.



Figure 2: Pelican Protector 1780 Case used for transport (Left). Fully packed system (Right)

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Flight Software

The FWA is powered by Kairos' American-made flight controller running the open-source Ardupilot firmware. This is the same hardware and software used on other Kairos UAS and small UGVs. As with all Ardupilot based systems, all data and flight controls are accessible via the MAVLink protocol, allowing the drone to be controlled through an on-board computer or a remote radio system.

Kairos' own on-board computer is used to provide application-specific features as well as a simplified interface for basic operations separate from MAVLink.

Optional Configurations

- **Battery** : KA 8400mAh Lithium-Ion 4S3P or hobby grade 5,000-15,000mAh 4S LiPo.
- **Autonomous Landing**: All configurations are capable of autonomous landing. Parachute landing capability is not currently supported, but can be developed upon request.
- **Automatic Launch System**: All configurations are capable of autonomous missions from a hand-thrown launch. Optionally included is an OLED readout and keypad that adds intelligent launching features.
- **Warder Puck**: The KA Warder Puck has a rich feature set that enables safe autonomous operations including geofencing and estop capabilities. For a full writeup, see the KA Warder/Warden datasheet.
- **Manual Transmitter Control and Telemetry Radio package**:
 - **Transmitter**: FRSky Taranis Q7S with RFD900 TX Mod
 - **On-Board Telemetry Radio / Receiver**: RFD900X Telemetry Radio
- **Generic I2C/Serial Device mount**: The top of all FWA are loaded with a breakout board and mounting plate that allows devices to be easily attached externally and communicate with the flight controller (Figure 3).

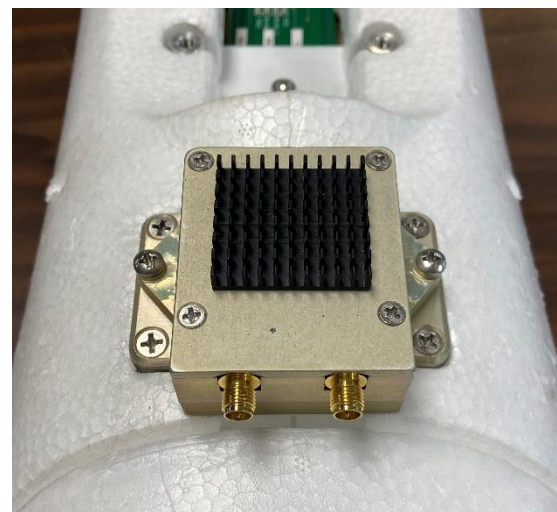
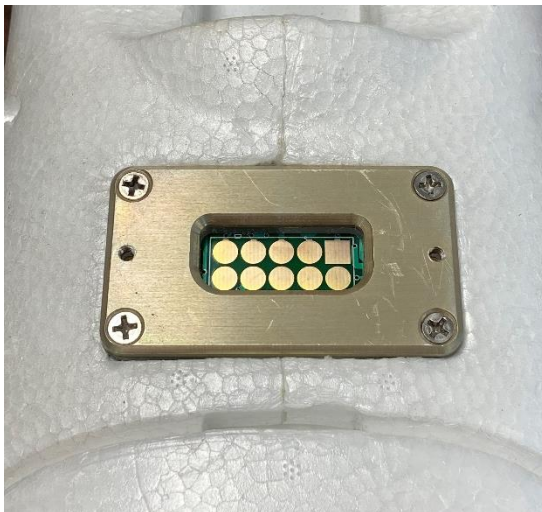


Figure 3: I2C/Serial device mount (Left). Rugged RFD900X radio on mount (Right)

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Payload

The interior of the fuselage has room for a payload of approximately 4 x 8 x 2 in. The payload must not increase the weight of the plane beyond the maximum weight of 7.7lbs. Increasing the weight will have the following effects on the plane:

- Reduced flight time
- Increased landing, takeoff, cruise, and stall speeds.
- Decreased maximum speed

Specifications

Parameter	Min	Typical	Max	Unit	Comments
Wingspan	-	71	-	in	
Length	-	55	-	in	
Takeoff weight incl. battery & payload	4.3	5.2	7.7	lb	
Battery weight	1.0	2.0	4.0	lb	5000mah - 25,000mah 4S LiPo
Payload weight	No payload required.	No typical payload.	2.5	lb	Battery size must increase for large payloads.
Payload volume	-	-	4 x 8 x 2	in	Approximate. Payload area is shared with battery.
Flight duration	Not measured.	40	100	min	
Service ceiling	-	-	15,000 (est.)	feet	
Maximum A to B distance (calm winds)	Not measured.	22	40	miles	
Cruise Speed	25	33	40	miles/hr	Weight dependent.
Stall Speed	15	20	25	miles/hr	Weight dependent.
Never Exceed Speed	65	70	75	miles/hr	Weight dependent.
Transport Case Exterior Dimensions	-	44.9 x 25.3 x 16.5	-	In	Pelican 1780 Protector Transport Case

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Component List (per airframe)

Component	Description
Frame	SonicModell Skyhunter 1800mm
Motor	3542 1000kV BLDC outrunner
Propeller	11x7 electric or electric pusher APC style prop.
Telemetry Radio	RFD900X or none
Radio TX/Telem Rx	RFD900 TXMOD w/ Taranis Q7 or RFD900X or none.
Battery	Kairos Autonomi 8400mAh 4S3P lithium-ion
Servos	Three 9g-15g metal gear servos
ESC	Flycolor 4S 60A ESC or alternative
Airspeed Sensor	Mateksys ASPD-4525 Airspeed Sensor
Current/Voltage Sensor	Analog shunt & voltage divider, 90A, 16.8V compatible
Flight Controller	Kairos Autonomi KAF4 Flight Controller
GPS	Kairos Autonomi GPS/Magnetometer Module (UBlox M8N/QMC5883)
Transport Case	Pelican Protector 1780 Transport Case

Version History

Name	Date/Version	Description	Reason
Nicholas Ronnie	7/30/2024	Re-formatted	

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