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Elios: Technical System Description

Flyability R&D – June 2016

Flight Modes

Types:	Manual thrust control, Automatic Altitude Control, High Speed Mode
Availability:	Switch between modes at any time
Fail safes:	Auto-landing on low-battery or signal lost

On-board computing

Type:	Two on-board CPUs
Processor 1:	Autopilot, thermal video and system management
Processor 2:	Safety fallback autopilot (redundancy), motor control
Rx/Tx Module:	Video and Communication, RF engines

Flight System

Type:	Quadcopter configuration
Dimensions:	fits in <400mm sphere
Motors:	4 electric brushless motors
Propellers:	4 propellers, 5 inches diameter
Take-off weight:	700gr incl.battery, payload & protection
Flight time:	Up to 10min
Max.climb rate:	1.5 m/s (in normal mode) 2.5 m/s (in high speed flight mode)
Max.airspeed:	3 m/s (in normal mode) 7 m/s (in high speed flight mode)
Wind resistance:	max 5m/s (in High Speed flight mode)
Flight sensors:	IMU, magnetometer, barometer
Materials:	Carbon fiber composites, magnesium alloy, aeronautical grade aluminium, High quality thermoplastics
Operating temp.:	-10 to 35°C

Wireless Communication

Type:	Digital, bidirectional, long range
	Video and Data downlink to RC
	Command and Data uplink to UAV
Frequency:	2.4GHz
Range:	Up to 5km in direct line of sight

Remote Controller (Ground System)

Type:	Ergonomic
	Joysticks and Payload controls
	Integrated video outputs
Weight:	810g
Operating Temp:	0°C to 40°C
Output Port:	HDMI, SDI, USB
Battery:	6000mAh 2S
Controls:	Payload settings and aircraft control

Optional Remote Controller (Camera operator) with video stream reception on secondary screen, and dual control of camera settings.

System Power

Type:	Lithium polymer battery, 3 cells, 2800mAh, 33.08Wh
Charging time:	1h
Battery change:	< 1 minute

Integrated Payloads

Payload head:	Damped from vibrations
Upwards tilt:	+90 degrees
Downwards tilt:	-45 degrees

Main Camera

Video:	FHD (1920 x 1080) at 30fps, Good low light performance, recorded on board and streamed to pilot and camera operator
Horizontal FoV:	130 degrees
Vertical FoV:	100 degrees
Total vertical FoV:	235 degrees (considering payload up/down rotation)
Control modes:	Auto with EV correction, full manual mode

Thermal Camera

IMPORTANT NOTE: The thermal camera module is disabled until the firmware upgrade to be released September 2015.

Type:	Uncooled FLIR camera core
Video:	160x120 pixels at 9fps, recorded on board
Horizontal FoV:	56 degree

Lighting System

Type:	High efficiency LED, 5 arrays for even lighting in front, top and bottom of the robot
Control:	From Ground system, adaptive light beam controlled by camera pitch, Under development: Intelligent auto mode of the lighting system
Power:	11.4W nominal power for front lighting, 28W total installed max.

Operational Safety & Crashworthiness

Navigation lights:	Green and right lights
Protection cage:	Carbon fiber cage with soft coating, modular subcomponents for maintenance ease. Thermoplastic elastomer suspensions. Size of openings: triangles of about 11cm sides. Allows for hand to access inside to swap batteries
Collision tolerance:	Uniform all around the drone. Up to 3m/s on sharp objects, up to 4m/s on flat objects
Decoupling:	3-axes gimbal system. Carbon fiber composite Ring and transverse beam

Accessories

Transport case:	IATA compliant transport case for checked-in luggage. Dimensions (approximate): 60 cm x 50 cm x 50 cm
Chargers:	3A/35W Lithium Polymer battery balance charger, with charging status indicator. RC charger: 17.4V, 57W, tablet USB charger: 5V

Ground Station Software

Mobile Application used during Flight

Features:	Real Time video and UAV telemetry (under development), status visualization (remaining battery, payload settings, warnings, etc.), control payload settings and various configurations.
Operating System:	Android, optimized for Tablet provided with UAV system

Post Flight Video, Thermal and Log analysis (Flyability Inspector)

Features:	Video and thermal video viewer (frame by frame), flight log analysis including point of interests recorded during flight, screenshots and flight data export.
Operating System:	Windows 8 and 10 only.