ELIOS

INSPECT & EXPLORE

INDOOR AND CONFINED SPACES

Discover the first collision-tolerant drone, designed for the inspection and exploration of the most inaccessible places. Allowing for the first time to fly in complex, cluttered or indoor spaces, Elios unleashes the potential of UAVs in numerous applications where their use was previously too dangerous or simply impossible.

FLYABILITY

COLLISION-TOLERANCE.
400'000'000 YEARS OF EVOLUTION SOLVING INDOOR FLIGHT CHALLENGES

Inspired by the ability of insects to keep their stability after an in-flight collision, the flight concept of Elios is the result of hundreds of millions of years of natural evolution. Using a unique and pragmatic approach, Elios solves the biggest challenges of flying drones indoor in complex and confined spaces or in contact with humans: the risk of collisions and injuries. Privileging tolerance to collisions over the attempt to sense and avoid obstacles, Elios provides the level of reliability that is expected by professionals operating in environments where failure to operate is not an option.
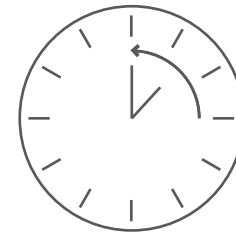
BENEFITS.
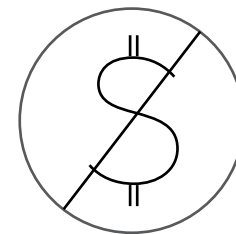## CHANGING THE RULES OF THE GAME
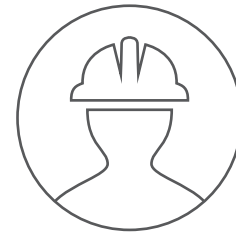
IMPROVE SAFETY

By enabling remote visual inspection in any indoor environments, Elios prevents the need for workers to enter hazardous places or face dangerous situations.

REDUCE DOWNTIME

Elios is deployed and ready to gather visuals within a minute. Performing an entire inspection is no longer a matter of days but hours.

LOWER COST

Scaffolding, rope access, or crane are no longer needed to perform visual inspections. Elios gathers visuals of the most complex and cluttered spaces for you.

FEATURES

INTEGRATED PAYLOAD

Simultaneous full HD and thermal imagery recording, and adjustable tilt angle.

LIVE 2.4 GHZ VIDEO FEEDBACK

Robust digital video downlink for beyond line of sight operation, even in metallic environments.

ON BOARD LIGHTING

Powerful LEDs for navigation and inspection in dark places.

PROTECTIVE FRAME

Carbon fiber structure, collision-tolerant up to 15 km/h. Modular design for easy maintenance.

CONTINUOUS OPERATION

Batteries can be changed in seconds.

POST-MISSION REVIEW

After finishing the inspection flight, our software presents mission data for future reference.
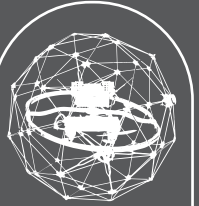
Patented Technology
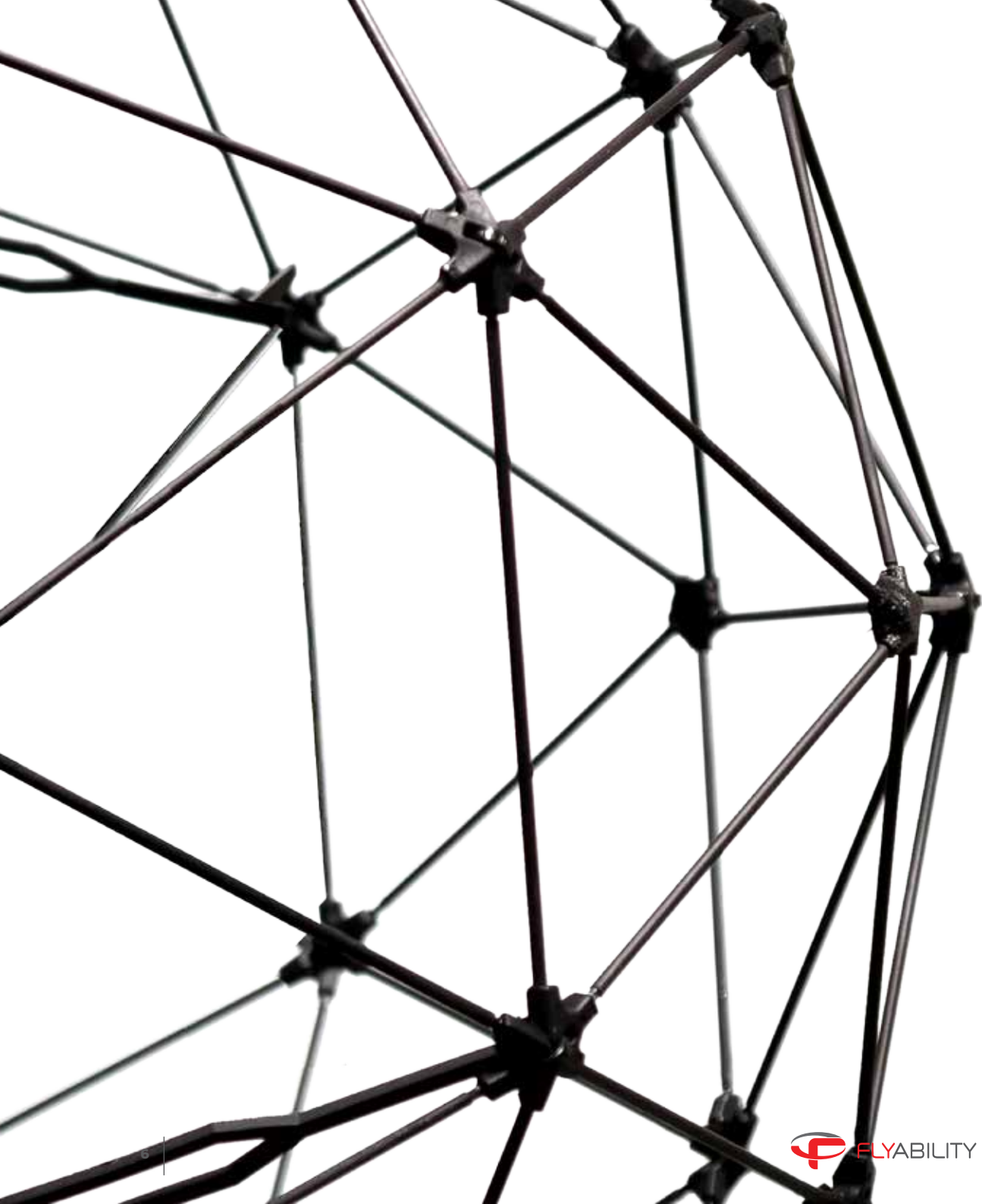
PROTECTIVE FRAME
COLLISION-TOLERANCE.
A REVOLUTIONARY WAY
TO FLY.

Carrying its own protective frame, Elios is collision-tolerant.
This means you can access the tightest spaces without any
risk of crashing. No need to focus on avoiding obstacles,
Elios bounces off and roll on them to find its way. You can
fly close or even in direct contact with humans without any
risks of injuries.

DECOUPLING IS KEY.

The protective frame of Elios is no ordinary one. It is decoupled on three axes from the inner frame – the drone – using a gimbal mechanism. This ingenious decoupling mechanism is what allows Elios to remain stable in the event of a collision.

UNIQUE.

Patented by Flyability, the protective frame is a unique and pragmatic approach to flying indoors, in complex and confined spaces and in contact with people. Discarding the need to sense and avoid obstacles, you can start inspecting and exploring - without waiting – the hardest places to reach.

LIGHT AND ROBUST. RIGHT SIZED.

4m/s
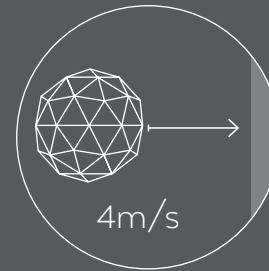
Elios' protective frame is made up of carbon fiber covered with a soft coating. It can sustain collisions, evenly, all around the drone at a speed reaching up to 4 m/s.
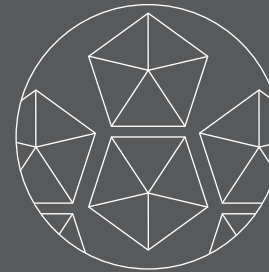
Built with modular subcomponents it eases the maintenance process and offers openings large enough to fit one's hand and access the battery container or SD card compartments.
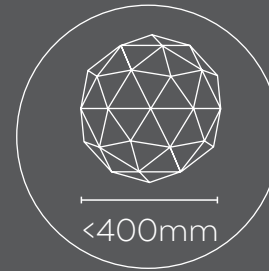
<400mm

Spherical, the protective frame comes in one size only. With a diameter just below 400 mm, it is slightly smaller than the smallest standard manhole.
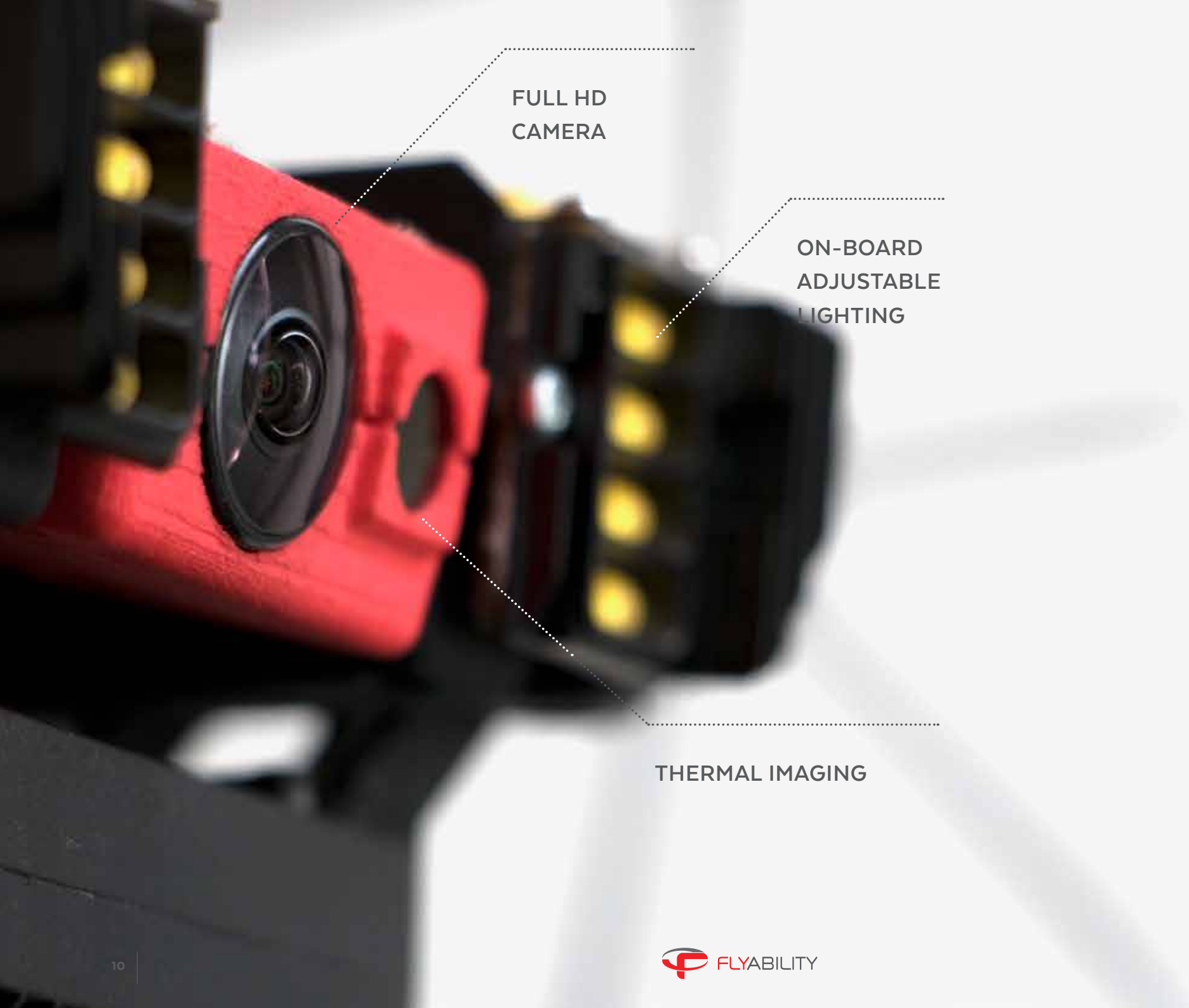
FULL HD
CAMERA

ON-BOARD
ADJUSTABLE
LIGHTING

THERMAL IMAGING

PAYLOAD
DESIGNED FOR
THE PROFESSIONALS.

Elios embeds a full HD camera, a thermal camera, and an on-board LED lighting system with a remotely adjustable intensity. Once you have reached the most inaccessible places, you have all the tools on board to take the best possible shot in nearly any lighting conditions.

FULL HD CAMERA

When flying in contact with a surface, Elios can gather close-up images with a sub-millimeter resolution of 0.2 mm/px.

The camera video stream is recorded on board, on an SD card housed in the payload head. It is also streamed to the pilot at a lower resolution.

The Full HD camera offers a resolution of 1920 x 1080 at 30 frames per second and performs well in low light. Automatically corrected by default, the Exposure Value (EV) of the captured images can also be remotely adjusted, from the ground station.

THERMAL CAMERA
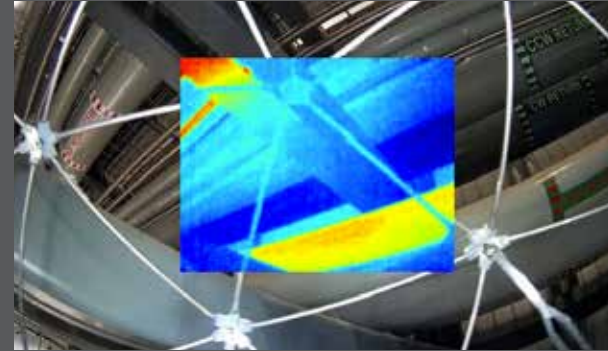
Seeing beyond what a human can see may be crucial in many cases. Detecting a crack that is invisible can help to anticipate potential major degradations. Detecting a body in very poor lighting conditions can simply save lives.

Elios embeds an uncooled FLIR camera core with a resolution of 160 x 120 pixels at 9 frames per second.

A FLEXIBLE VISION. SEE ABOVE AND BELOW.

Mounted on a rotatable head the cameras can capture images looking above and below the drone. The full HD camera offers a total field of view of 215° and a horizontal field of view of 130° while the thermal camera offers a total vertical field of view of 182° and a horizontal field of view of 56°.

ON-BOARD LIGHTING. LET THERE BE LIGHT.

When inspecting and exploring pitch dark environments the onboard LED lighting system becomes very useful. Preventing the need for any additional external lighting, it lights up the scene in all the directions you may be looking.

The intensity of the 5 arrays of high-efficiency LEDs providing even lighting in front, top, and bottom of the robot, can be adjusted remotely using the ground station.

When changing the pitch angle of the camera head, the light beam is adapted, always providing the right lighting.

FLYABILITY

WIRELESS COMMUNICATION.
STANDING THE NEEDS OF INDOOR INSPECTION AND EXPLORATION

The wireless communication system offers a robust digital, bidirectional, long range signal transmission which includes a video and data downlink – from the UAV to the Ground Station – and command uplink – from the Ground Station to the UAV. Using the 2.4 GHz frequency band, the wireless communication system does not require any special authorization to operate and preserve its high-quality even in the most complex and confined spaces. For example, it is possible to fly Elios over 100 meters above the ground in a closed boiler with the pilot safely standing outside next the entrance manhole.

Since every use case has its own specificities, we have put together a table representing standard use cases and the signal coverage to expect.
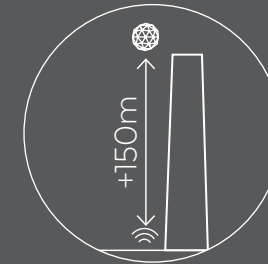
Over 150 m in a chimney while staying at the base.

Tens of meters away in a metallic ballast tank multiple compartments away.
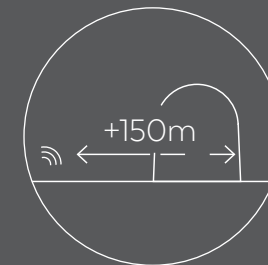
Over 150 m in tunnels comprising small curves.
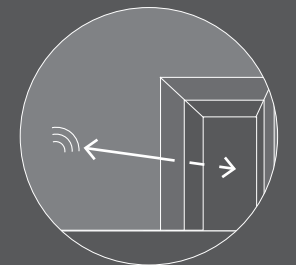
Multiple rooms away in a standard building, up a flight of stairs.

WIRELESS COMMUNICATION
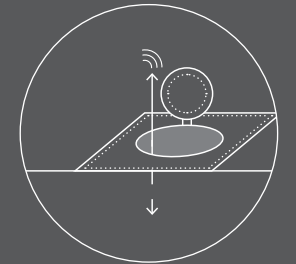### ROBUSTNESS AND PERFORMANCE.

Elios is equipped with a cutting-edge wireless communication system that provides a live video feedback allowing the pilot to bring the drone to the most inaccessible places up to multiple hundreds of meters beyond line of sight.

FLYABILITY

GROUND STATION
EFFICIENTLY PILOT FROM A SAFE PLACE.

Elios Ground Station is composed of a remote controller, a tablet and a purpose designed ground control application providing the pilot with live telemetry data, an SD live video stream captured by Elios, and the information and controls that you need to operate it efficiently and safely. In addition to giving you full control over the navigation of the drone, the different buttons of the remote controller let you adjust, in real-time, all the settings of the camera head such as exposure, lighting and pitch angle.

ELIOS COCKPIT.
EVERYTHING UNDER CONTROL.

In addition to displaying the live SD stream received from the drone, Elios Cockpit displays live telemetry data, gives you access to a detailed status of your drone and let you adjust settings right from the application.

LIVE TELEMETRY DATA:

Signal strength

Battery level

Relative heading

Camera exposure

Relative altitude

Flight time

Camera tilt orientation

Light intensity

STATUS & SETTINGS:

Battery life monitoring

Video configurations

Time to next service

Number of robot flights

Total flight time

Pitch & roll trim

FLYABILITY

USABILITY.
BUILT FOR THE REAL WORLD.
ADAPTED TO YOUR BUSINESS.

As it applies to all new technologies, integrating drones into your workflow requires driving changes. However, it is important that these changes have a minimal impact on your own schedule and comply with the singular aspects of your profession.

We made Elios dust and splash resistant, operational in environments between 0° and 50°C, and mistake tolerant so that it can be easily piloted by everyone. Operational after a few hours of training, your personnel will quickly get up to speed with their piloting skills. Designed to fly indoors where few or no drone regulations apply, Elios will be smoothly integrated into your workflow.

PHOTO © RIMS

FLYABILITY

ELIOS INSPECT. EXPLORE.

FLIGHT #1
Reconnaissance flight

FLIGHT #3
Corrosion on the walls

FLIGHT #2
Beams and roof
integrity

BATTERY LIFE.
MULTIPLE 10 MINUTES SLOTS TO CAPTURE ALL THE DETAILS.

A typical drone-based inspection usually starts with a reconnaissance flight which allows finding all the areas of interest deserving a closer look. The experience gathered through missions in boilers, storage tanks, ballast tanks, buildings, chimneys and so on, shows that 10 minutes is sufficient for most infrastructures to perform this reconnaissance flight. Based on the information gathered during the reconnaissance flight, further flights are planned to more deeply inspect defined points of interest through the capture of close up images. Bringing the drone back to the operators after each segment of the inspection allows for reviewing the images in details and refine/update the inspection plan on-the-go based on actual data.

After each flight, batteries are swapped in seconds. Just remove the used one, insert a new one and you are back to flying again.

DATA.
MAKING THE BEST OUT OF YOUR FLIGHT TIME.

Once you're done flying, you can exploit the data recorded on the SD card, embedded on Elios, right away. No post processing or specific software is required. To avoid hurdles, we are using simple video files that can be read i.e. on the tablet of the Ground Station. Flight data, thermal video and selected Points Of Interest (POI) are recorded on a dedicated SD card. By using Flyability Inspector, you can correlate flight data and POIs with both video streams.

FLYABILITY INSPECTOR.
POST-FLIGHT VIDEO, THERMAL AND LOG ANALYSIS.
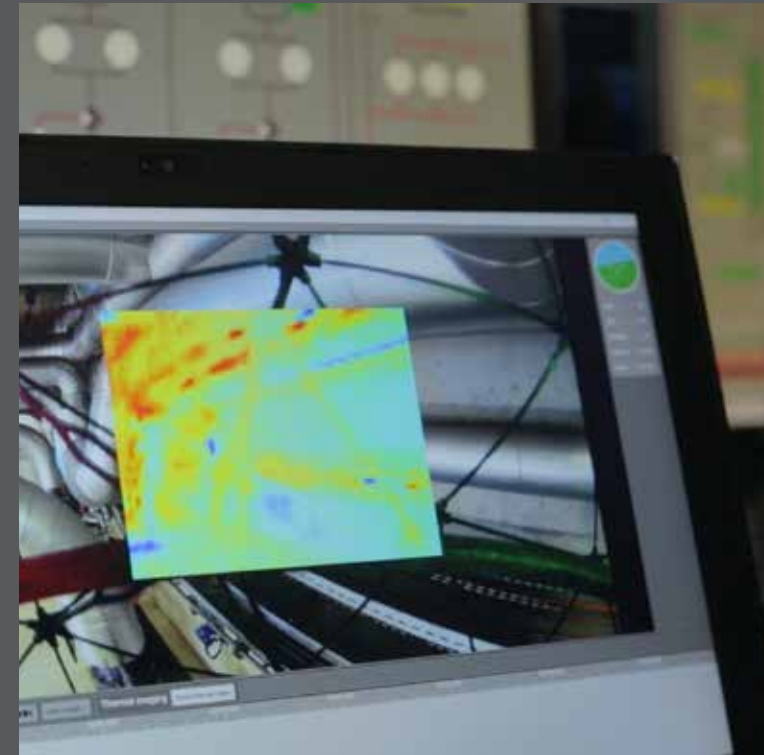
Using Flyability Inspector, you can review your flights, frame by frame, and benefit, on top of the image, from the precious flight information recorded on the log SD card.

You can recover the Points Of Interest (POI) marked during a flight, and only extract the still images of interest for your mission.

Recorded as well on the log SD card, the video stream recorded with the thermal sensor is displayed as an overlay of the Full HD video stream, providing you with additional information.

FLYABILITY

TECHNICAL SPECIFICATION

FLIGHT MODES

TYPES:	Manual thrust, altitude hold, pro mode (high speed)
AVAILABILITY:	Switch between modes at any time
FAIL SAFES:	Auto-landing on low-battery or signal lost

ON-BOARD ELECTRONICS

AVIONIC-BOARD:	Autopilot, thermal video and system management
POWER-BOARD:	Motors control

FLIGHT SYSTEM

TYPE:	Quadcopter configuration
DIMENSIONS:	Fits in <400mm sphere
MOTORS:	4 electric brushless motors
PROPELLERS:	4 propellers, 5 inches
TAKE-OFF WEIGHT:	700 g including battery, payload & protection
FLIGHT TIME:	Up to 10min
MAX.CLIMB RATE:	1.5 m/s (in normal mode) 2.5 m/s (in pro mode)
MAX.AIRSPEED:	3 m/s (in normal mode) 7 m/s (in pro mode)
WIND RESISTANCE:	Max 5m/s (in pro mode)
FLIGHT SENSORS:	IMU, magnetometer, barometer
MATERIALS:	Carbon fiber composites, magnesium alloy, aeronautical grade aluminium, high quality thermoplastics
OPERATING TEMP.:	0 to 50°C

WIRELESS COMMUNICATION

TYPE:	Digital, bidirectional, long range Video and data downlink to RC Command uplink to UAV
FREQUENCY:	2.4GHz
RANGE:	Up to 500m in direct line of sight

REMOTE CONTROLLER

TYPE:	Ergonomic Joysticks and Payload controls Integrated video outputs
WEIGHT:	810g
OPERATING TEMP:	0°C to 40°C
OUTPUT PORT:	HDMI, SDI, USB
BATTERY:	6000 mAh 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:	+65 degrees
DOWNWARDS TILT:	-60 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:	75 degrees
TOTAL VERTICAL FOV:	215 degrees (considering payload up/down rotation)
CONTROL MODES:	Auto with EV correction, full manual mode

THERMAL CAMERA

TYPE: Uncooled FLIR camera core

VIDEO: 160 x 120 pixels at 9fps, recorded on board

HORIZONTAL FOV: 56 degree

VERTIFCAL FOV: 42 degree

LIGHTING SYSTEM

TYPE: 5 arrays of high efficiency LEDs for even lighting in front, top and bottom of the robot

CONTROL: From remote controller, adaptive light beam controlled by camera pitch

POWER: 11.4W nominal power for front lighting, 28W total installed max.

OPERATIONAL SAFETY & CRASHWORTHINESS

NAVIGATION LIGHTS: Green (starboard) and red (port) 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: 3 A / 35 W Lithium Polymer battery balance charger, with charging status indicator. RC charger: 17.4 V, 57 W, tablet USB charger: 5V

GROUND STATION SOFTWARE

MOBILE APPLICATION USED DURING FLIGHT

FEATURES: Real time video and UAV telemetry, 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 7, 8 and 10 (64 bits only.

FLYABILITY

Flyability is a Swiss company building safe drones for inaccessible places. By allowing drones to be used safely inside cities, buildings, and in contact with people, it enables new interactions and services with UAVs and solves the two most critical issues of one of the fastest growing industries: collision and injury risks. The company's main market is in industrial inspection where it avoids sending people in dangerous and confined spaces for the inspection of Power Generation, Oil & Gas or Maritime infrastructures. It is also active in Search & Rescue and Security to assess emergency situations without putting humans at risk.

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