GREATER ZURICH AREA

GGBa Invest Western Switzerland

LIVE STREAMING EVENT

Virtual Swiss Drone Industry Tour

Testing and Refinement

07 Monday December 2020

Your Hosts

Matt Julian
Director USA
Greater Geneva Bern area (GGBa)
m.julian@ggba-switzerland.ch

Lukas Sieber
Executive Director North America
Greater Zurich Area Ltd (GZA)
lukas.sieber@greaterzuricharea.com

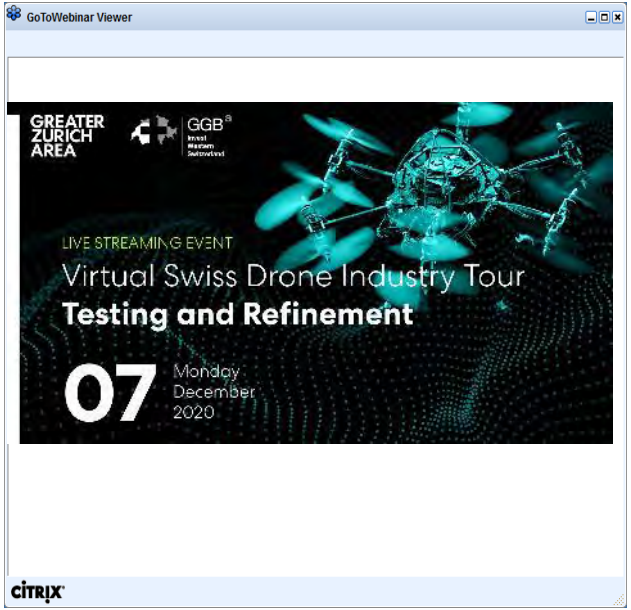
Greater Geneva Bern area & Greater Zurich Area
Your Swiss business concierges

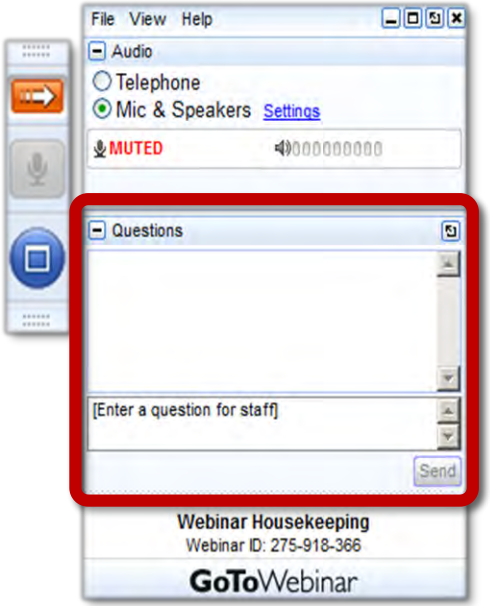
Site selection and visits

Introductions within the local ecosystem

Advice and support

Webinar Housekeeping





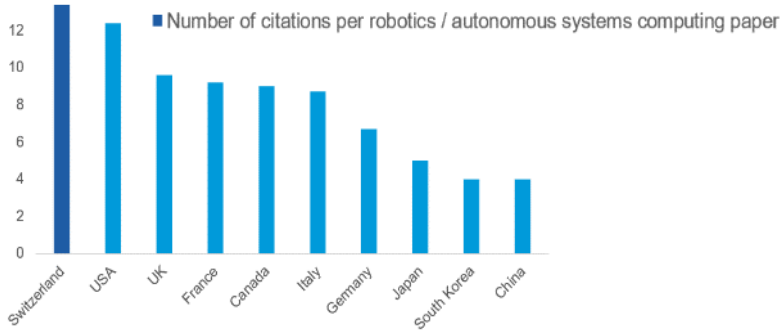
All webinar recordings available on:

greaterzuricharea.com/webinars

ggba-switzerland.ch/en/webinars

“The Silicon Valley of Robotics & Autonomous Systems”

Global #: influential research and development



World leading institutes & initiatives

ETH zürich
EPFL
University of Zurich UZH
SWITZERLAND INNOVATION
Wyss Zurich Translating Science Into Life
IRIS
DIAS Drone Industry Association Switzerland
USI/SUPSI IDSIA
Autonomous Systems Lab
zh aw School of Engineering
swiss aeropole
#Swiss AutonomousValley

Disruptive companies

MATTERNET
AIRMAP
INVOLI
3DR
VOLIRO
TINAMU
senseFly
VERITY studios
WINGS FOR AID
DAEDALEAN APPLIED INTELLIGENCE
WindShape
Inspection Robotics
AEROTAIN
sevensense robotics AG
wingtra
FLYABILITY
Auterion

Largest Swiss hubs!

Sources: Web of Science Thomson Reuters, 2018; CB Insights; Gottlieb Duttweiler Institute, GDI, investiere.ch ranking 2018, EIGE 2018

Jens Henkner

CEO, CertX

PhD in Aerodynamics and Master in Aerospace, TU Munich

Career: responsible manager of EASA 21J and FAR 145 organizations; SVP and chief engineer at Airbus responsible for certification and safety and CTO for Suzlon, a wind turbine OEM; member of AIAA & DGLR and the ASD-STAN working group for drones

jens.henkner@certx.com


CERTX
FIRST SWISS
Functional Safety and Cyber Security
Certification Body

The Challenge of Automation: Functional Safety of Electronic Controls

Effects of a systematic S/W failure in Aerospace:

… 346 people killed in 2 Boeing 737 Max crashes

Source: The ASSOCIATED PRESS

… 19Bn$ loss and counting due to reputation loss

You only notice functional safety if it is too late – because it is missing

The Flip Side of Functional Safety: Operational Cybersecurity

Operational (industrial) cybersecurity may not just mean a loss of revenue or data.

Example of a cyber security incident in the drone domain:

Source:
hackernews.com

Hacking the $28,463 drone with less than $40 of hardware …

…. it may compromise (public) safety with serious or catastrophic consequences

… will become mandatory for all connected systems

We Are:

The First Swiss Certification Body for Functional Safety and Cyber Security accredited by Swiss Accreditation Service (SAS) with international validity

Experts in Functional Safety and Cybersecurity with Swiss DNA and Quality

We co-write the standards for future automated systems, autonomous mobility and cyber security based on deep technical know-how

Innovations at heart, pragmatic in style and close to you – your alternative to TÜV & Co.

CertX – Our Expertise

www.certx.com

Machinery,
Robotics,
Automation

Automotive
Autonmous mobility

Drones,
UAS

Railway,
Signalling,
Train Control

CertX ensures your innovation with unique know

CertX Services

TRAINING & CERTIFICATION of ENGINEERS and MANAGERS

INSPECTIONS of products and processes for e.g. 3rd party test agency for drone parachutes , ISO 26262 confirmation reviews, EU machine directive

CERTIFICATION of PRODUCTS

CERTIFY CORPORATE PROCESSES and ORGANIZATIONS

CertX provides comprehensive safety and security services

CERTX

Drones

Drone Categories

Open:	Specific:	Certified
• Below 25kg • Visual line of sight • Maximum height • System of Zones • No flight over crowds • Pilot must have competence • Several subcategories • CE Marking	• Increased Risk • Authorization by the National Airworthiness Authority based on **S**pecific **O**perational **R**isk **A**ssessment • Standard scenarios with declaration or authorization • Operational Concept of approved operator with privilege	• Regulatory similar to manned aircraft • Certified means certified UAS and certified operator • Certified operations to be defined by implementing rules (yet to come) • Systems for autonomous flight (datalink, sense & avoid) may receive an independent approval.

3 basic categories with many subcategories and some defined standard scenarios

Overview on Standardization / Rule Making: EU

Implementing Act 2019/947: Defines categories, how to get approval ….

Open

Delegating Act 2019/945: Defines the technical requirements for the open category

fulfils

Specific

SORA: Specific **operation** approval however drone might have to demonstrate technical capabilities required.
CENELEC might get mandated to develop a standard here too or EU adopts another standard(s) e.g. ISO

Certified

Certification system CS 23 is being reworked to include person carrying UAS.
Draft not before 2022

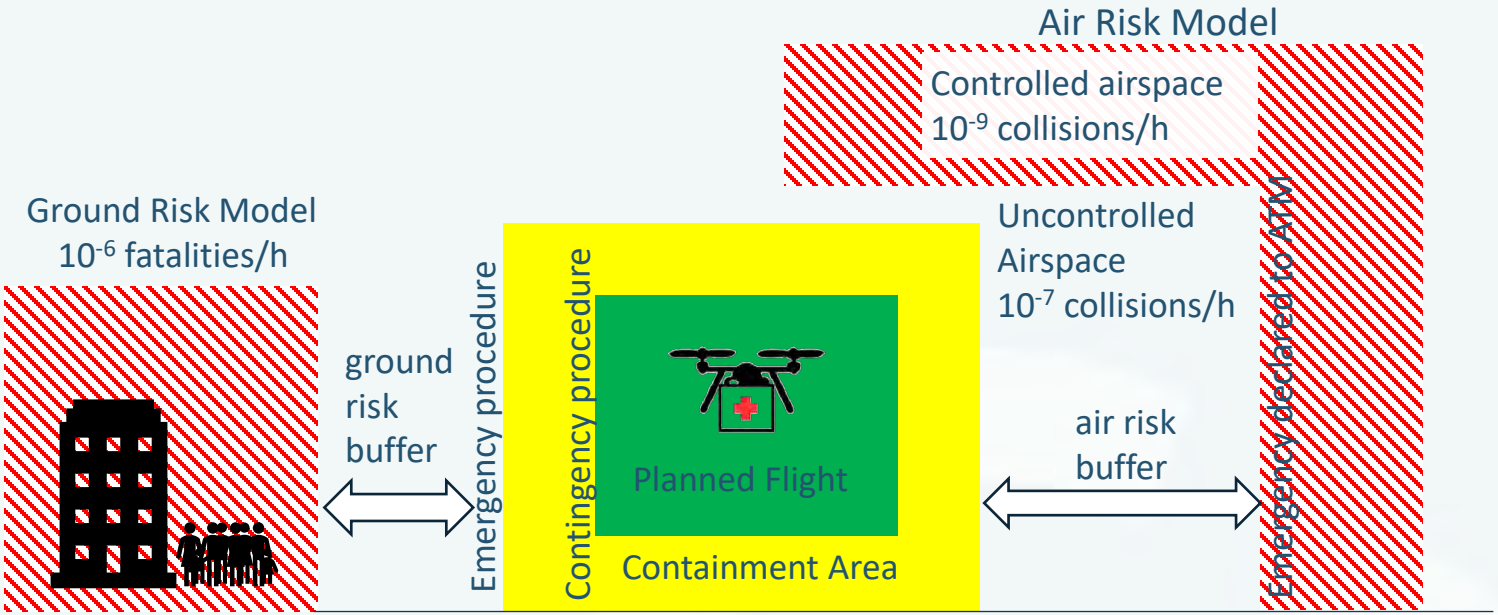
CENELEC & ASD/Stan developing a standard (EN 4709) for drones to be released as draft early 2020.
By applying this standard Drone OEMs may declare the CE conformity

Drones Missions and SORA

SORA (specific operational risk assessment) is a risk assessment (similar to functional safety analysis) based on multidisciplinary view on the specific operation, such as:

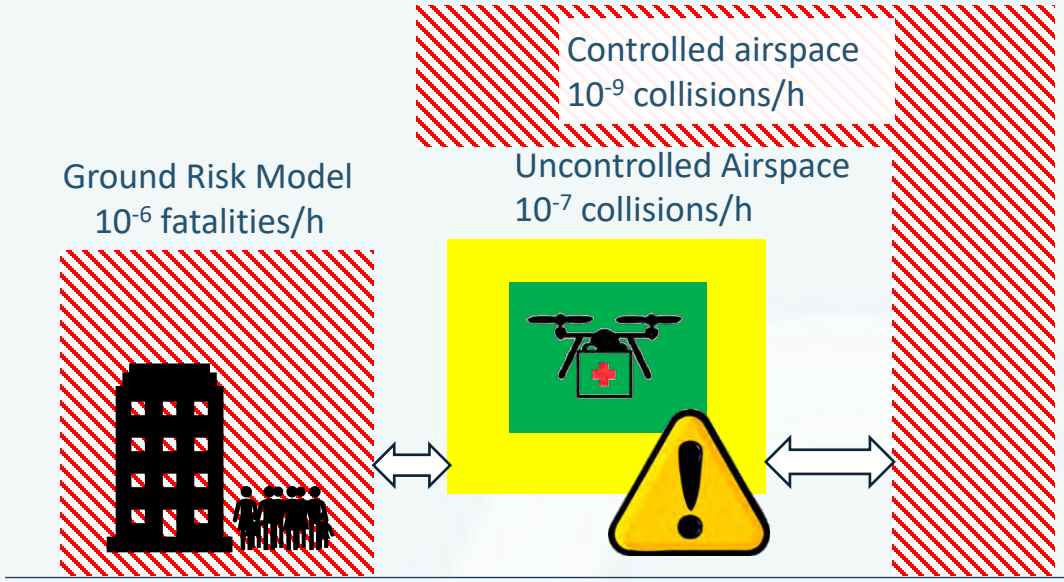
Drone operations in the specific class will be approved based on a SORA prepared by the operator

SORA Risk Model



Robustness needs to be demonstrated = Integrity (Safety Gain) + Assurance (Proof)

What if the mission gets more demanding?



Tighter margins or higher risks drive the need for proving drone capability regarding its sensors, software and manoeuvring capability in the weather conditions defined

Integrity must be higher and assurance will need more verification

Drone Parachutes

Drone Parachutes are a very effective way of mitigating the ground and an ability to abort flight safely.

ATSM F 3322 defines the design principles and test cases to be done.

Test must be surveilled by a TPTA (third party test agency).

CERTX

Cybersecurity

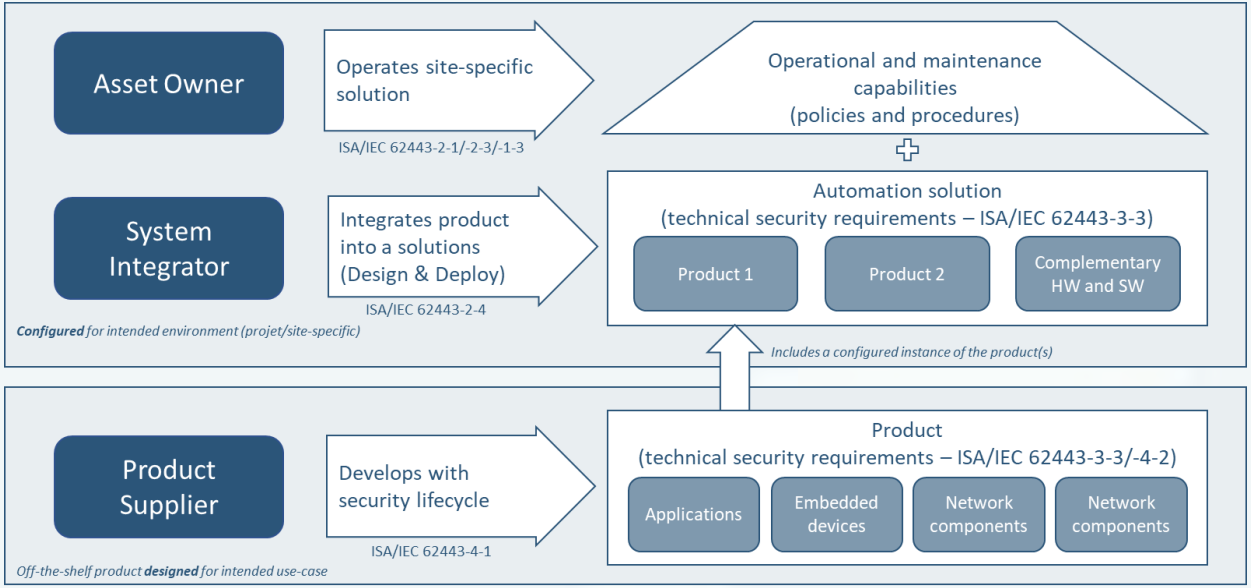
Drone Security Concerns Grow

From public articles of how to hack a drone to a denail of drone operations.
As a drone operator, drone OEM or equipments supplier – cyber security matters

Proven Cyber Security of Drones in Critical Operations is a Must

OT Cybersecurity – CertX Certification Services

www.certx.com



Certification of:

Security Program

Secure Services

Solution Technical Security Capabilities (TSC-Cert)

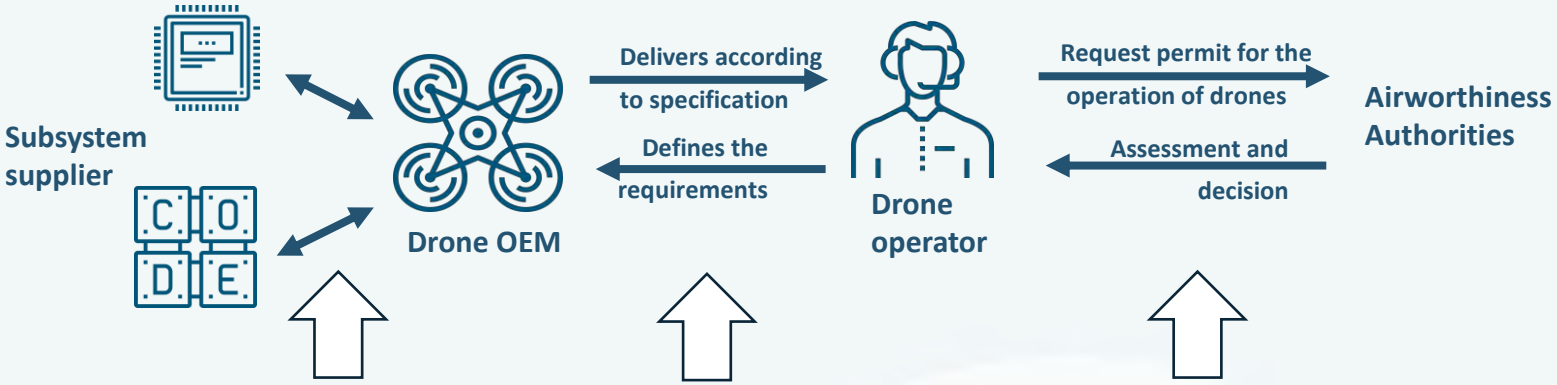
Product Technical Security Capabilities (TSC-Cert)

Secure Product Development Lifecycle (SPDL-Cert)

All level must be tackled in order to minimize the risk of a breach

Drone Services by CertX

www.certx.com



- Assists in defining necessary technical requirements for the drone or subsystems.
- Certifies systems acc. functional and cybersecurity standards
- Verifies compliance to technical requirements

- Assesses the compliance of complete missions together with test partners
- Supports the SORA approval using an expertise from all required domains
- Independent 3rd party test agency (TPTA) for drone parachute acc. ASTM F3322

CertX delivers expert know-how for defining requirement and verification of their compliance

Reliable Results

We look at your product or process

- with an **unbiased** and **independent** mindset,
- a **safety and security** focus,
- with a **unique skill and experience** from all domains
- in a **systematic**, holistic fashion and
- in **confidentiality**

We are your safety and security co-pilot

Route Ancienne Papeterie 106
1723 Marly, Switzerland

www.certx.com

Guillaume Catry

Co-founder and CEO, WindShape

Master of Science in Mechanical Engineering, EPFL

Career: Research Assistant at HES-SO University of Applied Sciences and Arts Western Switzerland; internship and master thesis at CERN Geneva

guillaume.catry@windshape.ch

WindShape

December 2020

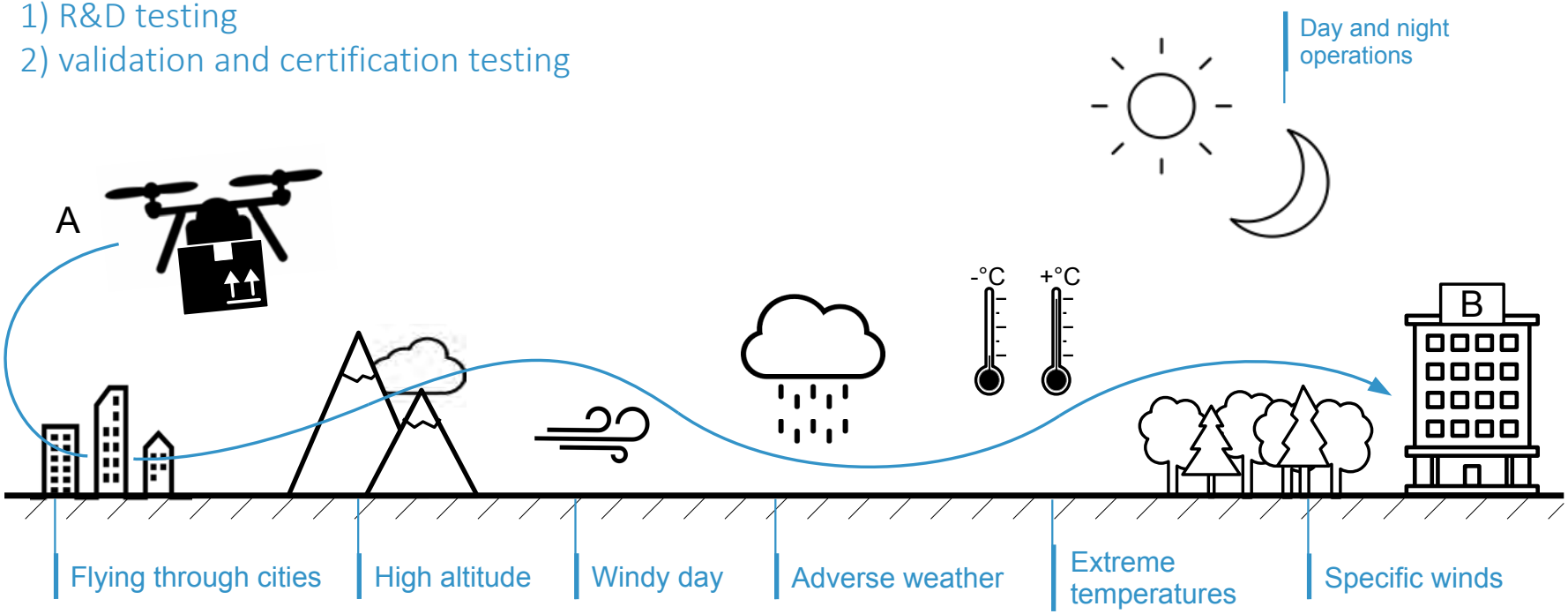
MATTERNET

Drone manufacturers want to develop new applications but need testing capabilities to increase product competitiveness and demonstrate compliance to certification and standards.

Drone industry challenges

WindShape to **support the market** with unique capabilities for:

1) R&D testing
2) validation and certification testing



The problem

Currently, drone manufacturers only have two bad options for testing their products

Testing Outdoors – 95% choose this	Conventional Wind Tunnel – 5% choose this
- Not repeatable as flight conditions can't be controlled - Inefficient as the drone flies far from the observer, thus it is complicated to gather test data - Expensive as test team needs to chase down or wait for desired environmental conditions	- Not designed for drones: small test section bounded by walls (or way too expensive) - No expertise on free flying drone testing - No control on wind profile - Only a few wind tunnels can implement weather conditions

Our solution

WindShape invented the **Digital Wind & Weather Facility** and offers test services designed for **drone testing and certification**.

Compare to the other alternatives we can generate more test results in less time, thus we help drone manufacturers through their product development and validation.

Reduce time to market

Increase product performance

Lower development costs

Deliver certification

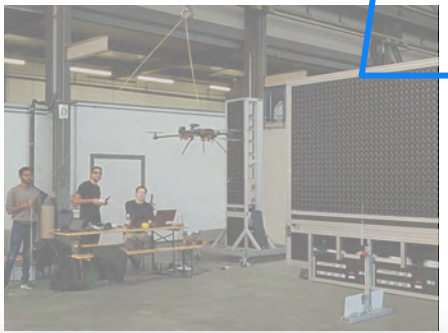
How it works – Our unique recipe for successful tests

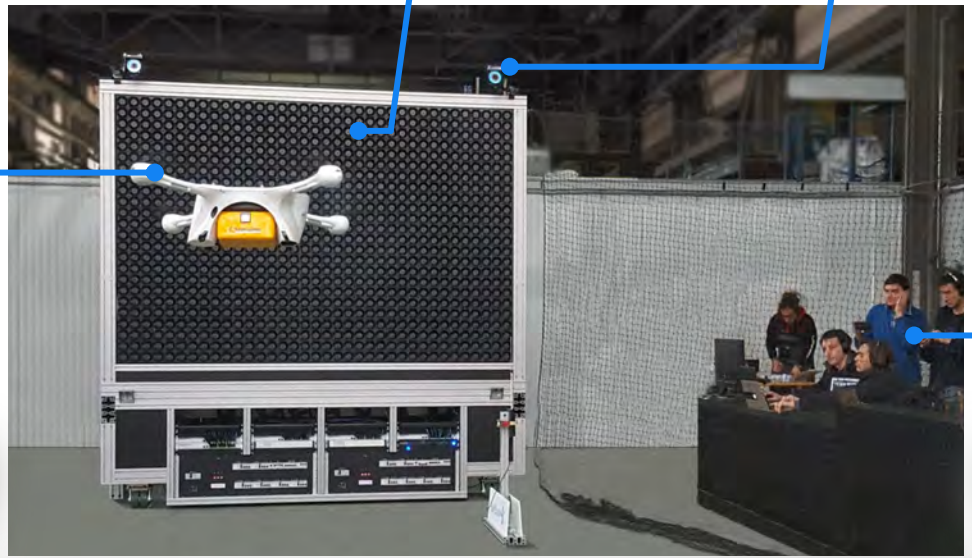
The drone flies in the wind while the GPS emulator generates a position signal to let the drone think its moving

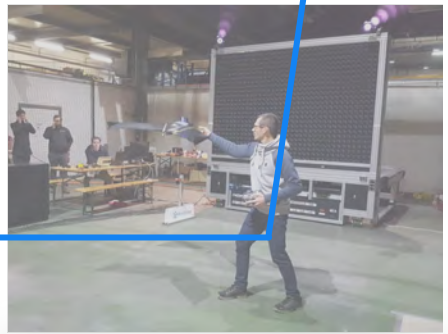
We use WindShape technology to recreate any wind & weather conditions inside a large test hangar

The drone flight behavior is captured by the non-intrusive motion tracking camera system

WindShape team post-processes the test results and generates a test certificate when needed.







WindShape services to support the drone industry

AIRCRAFTS (UAS/UAM) IMPROVEMENTS

- Flight distance
- Stability
- Maximum speed
- Robustness
- Control capabilities
- …

WEATHER RESISTANCE

- Wind
- Gusts of wind
- Extreme temperatures
- Rain
- Snow
- …

CERTIFICATION ORIENTED TESTINGS

- Free fall kinetic energy
- Weather proofness
- Flight stability
- In-flight decision making
- Redundancy testing
- …

Why now

2010 | 2015 | 2020 | 2025

Discovery
First drones by hobbyists and roboticists

Tech Growth
Drones become more and more capable and are used for some applications

Demonstrations and Regulation
Regulation is required to enable new business opportunities

Autonomous Drones
Drones can fly autonomously and their use is extended to new applications

Air Taxis
Autonomous systems can carry people

WindShape is considered a trustworthy partner, actively working to facilitate the drone industry.

The autonomous drone market represents 100 M$ - 200 M$ revenues for testing, inspection and certification centers worldwide.

This new segment could enable new opportunities for additional 100 M$ revenues for testing and certification.

Thank you for your attention

Guillaume Catry
Co-founder and CEO

guillaume.catry@windshape.ch
+41 79 486 45 28

www.windshape.ch

WindShape

Massimo Fiorin

Director Business Park, swiss aeropole

Master in International Economics, The Graduate Institute, Geneva

Career: various marketing and sales management roles at British American Tobacco, a.o. as Senior Planning Manager

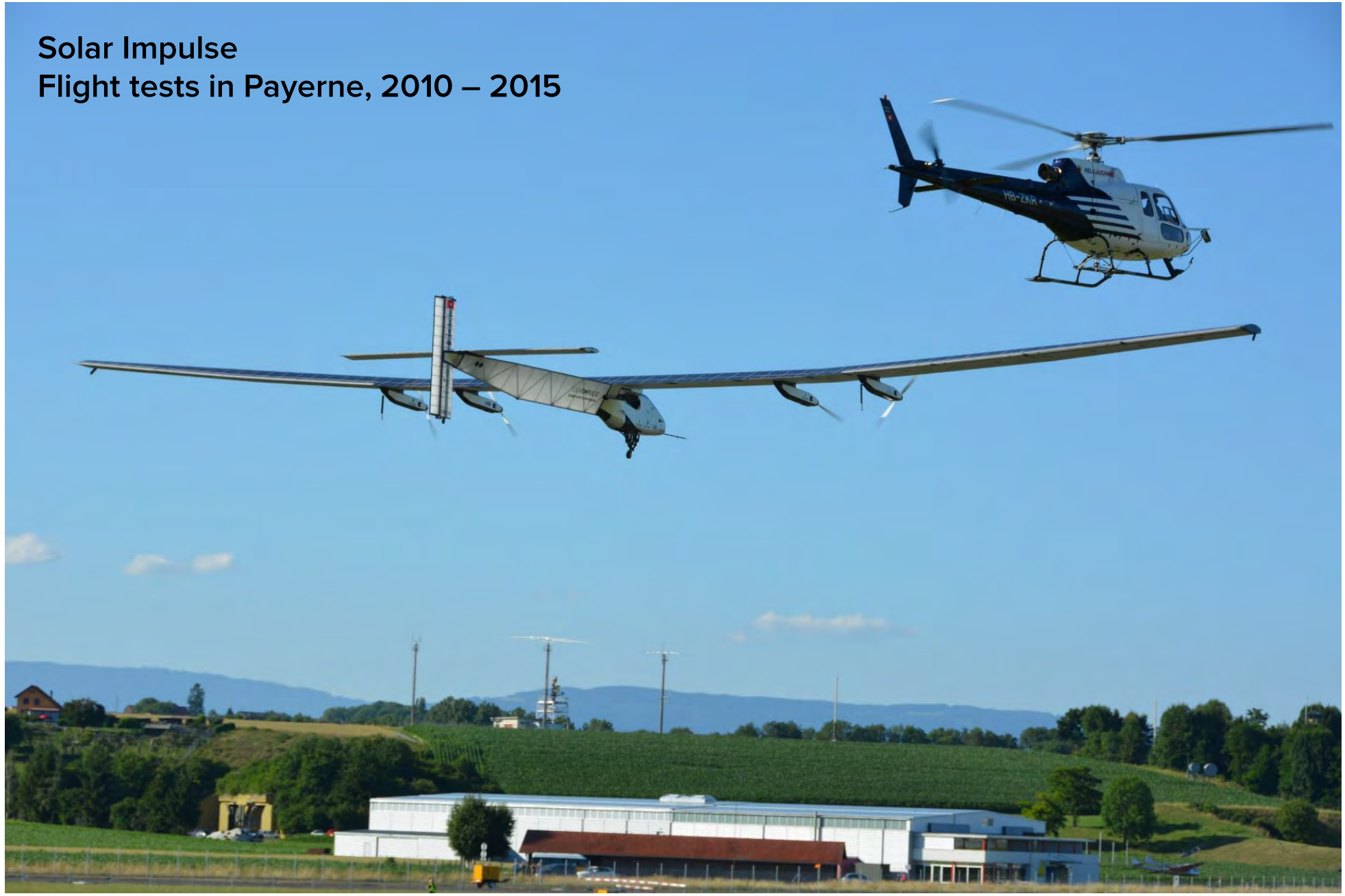
massimo.fiorin@swissaeropole.com

swiss aeropole

WHERE AVIATION INSPIRES CREATION

Virtual Swiss Drone Industry Tour

7 December 2020


Solar Impulse
Flight tests in Payerne, 2010 – 2015

SolarStratos home base since 2016

Payerne Airport

swiss aeropole

A place to dream big

swiss aeropole

New infrastructure

swiss aeropole

Our vision and mission

WHERE AVIATION
INSPIRES CREATION

Payerne Airport

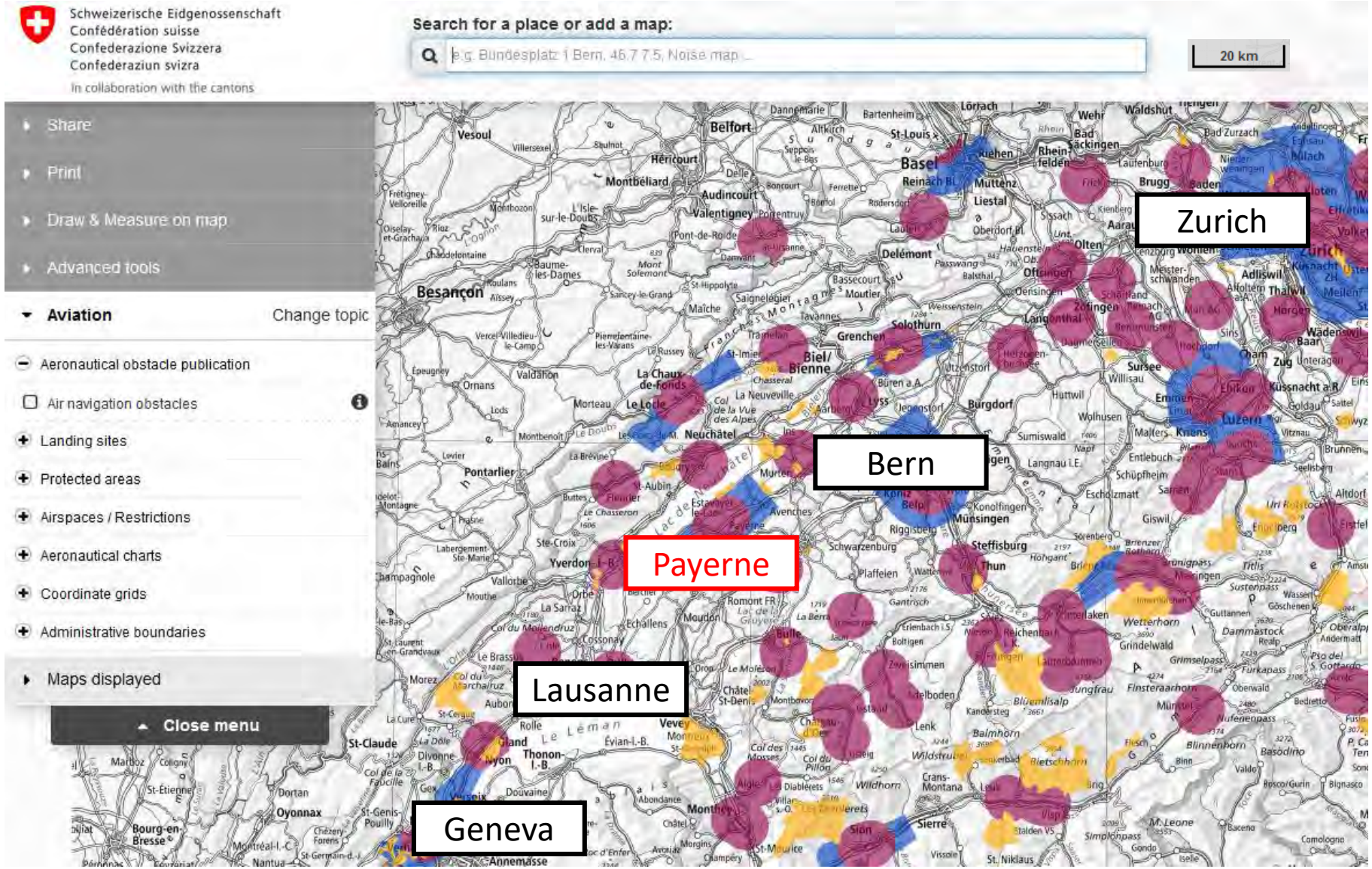
- Civil flight operations
- Management of airport infrastructure

Business and Technology Park

- Development and promotion
- Infrastructure and community management

swiss aeropole

Location on Swiss FOCA's RPAS map



Why swiss aeropole / Payerne Airport?

SPACE TO DEVELOP AND GROW YOUR COMPANY NOW AND IN THE FUTURE

WITH QUICK AND EASY ACCESS TO BOTH THE **LAUSANNE** AND THE **ZURICH** AREA

IN A REGION WITH A GREAT **QUALITY OF LIFE** AND A **REASONABLE COST** OF LIVING

WITH ACCESS TO A **TALENTED AND DIVERSE WORKFORCE**

WITHIN A GROWING COMMUNITY OF **AEROSPACE COMPANIES**

WITH THE ASSISTANCE OF A **NETWORK** OF SUPPORTIVE AUTHORITIES AND INSTITUTIONS

Note: the list above is non-exhaustive ;-)

swiss aeropole

swiss aeropole

WHERE AVIATION INSPIRES CREATION

MERCI !

massimo.fiorin@swissaeropole.com

Barry Koperberg

Founder and GM, Wings for Aid

MSc. and MBA in Knowledge Management, Erasmus University Rotterdam

Career: business consultancy for various European manufacturers; co-founder One Planet Architecture institute; co-founder and chairman NexTechnician Foundation; partner and public/private partnership specialist at Waardestromen consultancy.

b.koperberg@wingsforaid.org

WINGS FOR AID

REACHING PEOPLE ANYWHERE

Virtual Swiss Drone Industry Tour

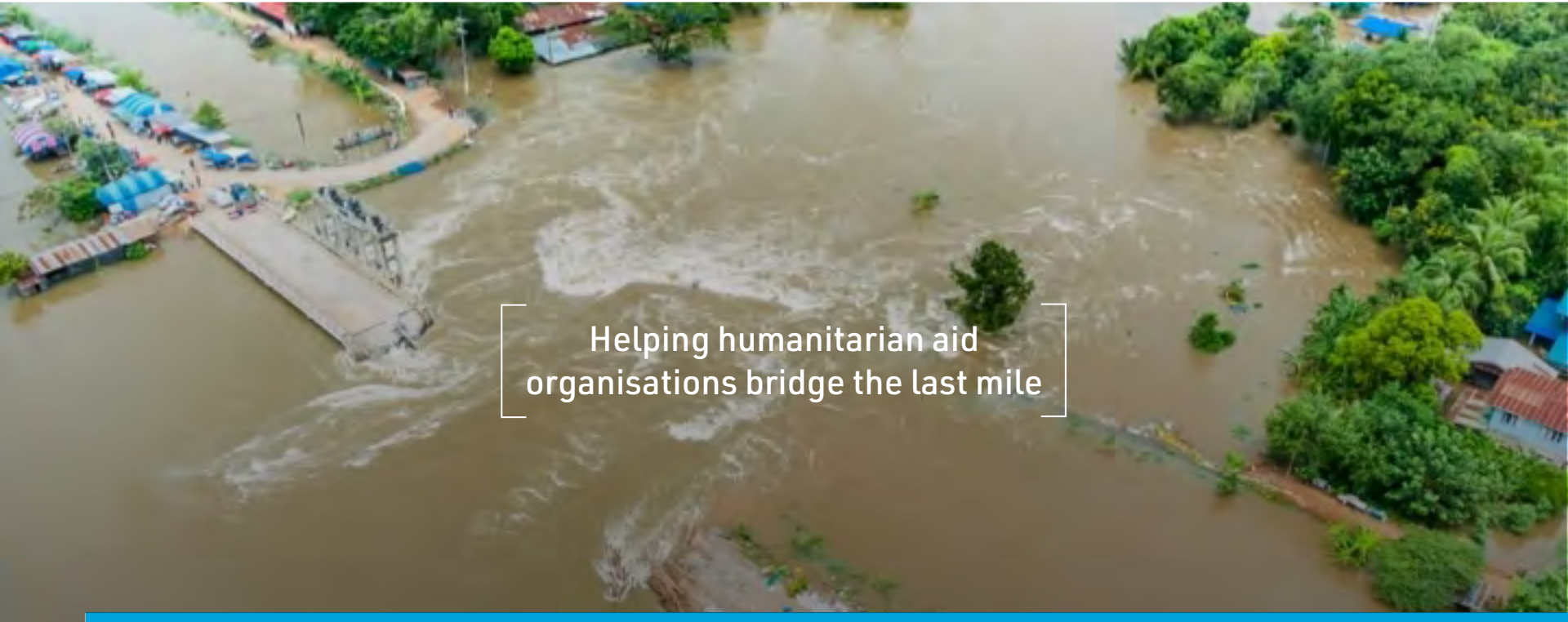
Testing and Refinement

07.12.2020

Barry Koperberg
Founder & General Manager

WINGS FOR AID

REACHING PEOPLE ANYWHERE



Helping humanitarian aid organisations bridge the last mile

OUT OF REACH

HAITI

DISASTER-PRONE, POOR AND VULNERABLE INFRASTRUCTURE

SOUTH SUDAN

CONFLICT COMPROMISES EFFICIENT AND SAFE ACCESS

NEPAL

LONG RESPONSE TIMES FOR ISOLATED COMMUNITIES

PHILLIPPINES

COMPLEX TRANSPORT LINES COMPROMISE PREDICTABILITY AND ACCESS

WINGS FOR AID

REACHING PEOPLE ANYWHERE

100 MILLION
PEOPLE IN NEED

20 MILLION
PEOPLE OUT OF REACH

SOLUTION

- Cargo Drones (RPAS, GPS guided)
- Precision air drops without parachute
- More predictable, safer
- Competitive cost

No airplane landing zone required: Controlled drop area “tennis court size”
Cover 250 km from a temporary forward operating base
Delivery of 8 x 20 kg per flight in card board boxes (patented)
Competitive when compared to current practice (helicopters, distributed airdrops)

DELIVERY BOX PROTOTYPE TESTING

OPTIONALLY PILOTED TEST AIRCRAFT

OPTIONALLY PILOTED TEST AIRCRAFT

EGG-DROP FROM 100M

DEMONSTRATION DROPS - CURACAO

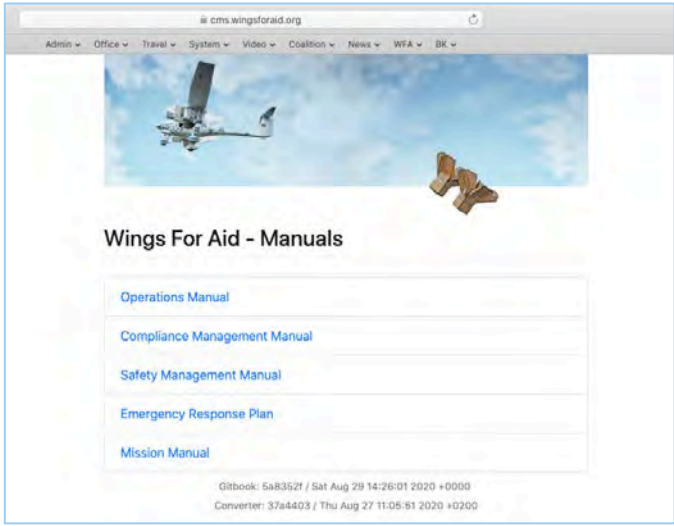
https://wingsforaid.org/public_downloads/20200115_WFA_Curacao.mp4

Wings For Aid MiniFreighter 8/500FW

SETUP HOME BASE AT LSPF SCHAFFHAUSEN

Centre of Excellence

- **Test activities**
  - Including Maiden Flight Mk-1
- **Training activities**
  - Pilots and ground crews
- **HomeBase for flight operations**
  - Fleet and equipment to be positioned at ROB's



SMART LOGISTICS

Four UAV units can deliver **1.000 kg of goods per day, within a 250 km radius** from base. This equals...

10.000
MEALS A DAY
* based on nutritional values of a 300g high energy bar

20+
VILLAGES PROVIDED WITH VACCINES

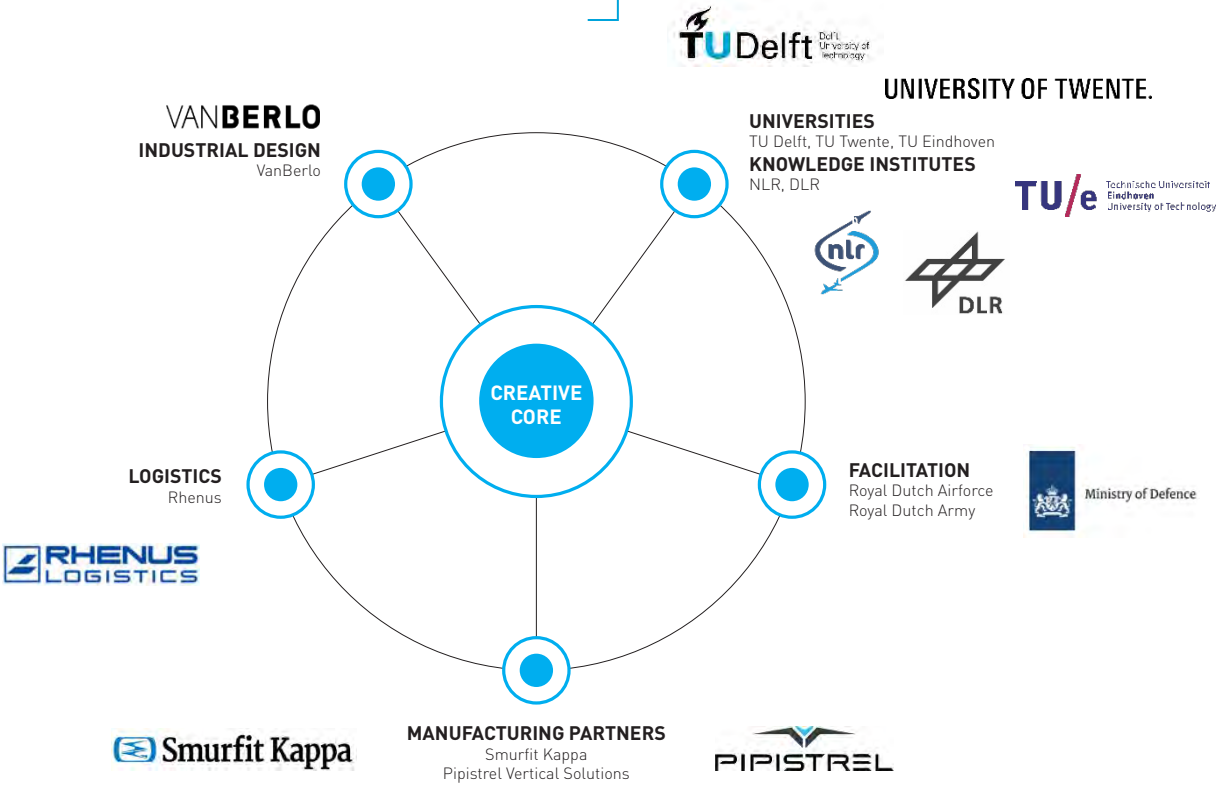
1.000
LITERS OF WATER

50
COMPLETE UN SHELTER KITS

AGILITY + PRECISION require a 'flock' approach in which the RPAS work together as a team
The safe operation of such a 'flock' requires Swarming technology which NL can provide

ONE BOX CAN CONTAIN UP TO 200 PACKS OF HIGH ENERGY BISCUITS (=200 MEALS)

OUR 'MISSION-FIRST' COALITION



Co-funded by:


MINI FREIGHTER
WFA 8/500 FW
Thank you
& see you in Schaffhausen!

WINGS FOR AID

REACHING PEOPLE ANYWHERE

Autonomous · Timely · Predictable · Targeted · Flexible

Anna Chernova

Co-founder, CPO and pilot, Daedalean

BSc in Physics, Mathematical Biology and Bioinformatics, State University of St. Petersburg

Career: research scientist at University College London; Quantitative Analyst at Google; helicopter and fixed- wing pilot

ac@daedalean.ai

Daedalean

Autonomy in the air

November 2020

Founded in 2016 in Zürich, Switzerland

Creating autonomous flying control software for General Aviation and Urban Air Mobility

Luuk van Dijk

Co-founder and CEO

PhD in Physics (UvA, RuG)

Google: Gmail, Maps Suggest.

SpaceX: flight software - telemetry systems for F9/Dragon

Anna Chernova

Co-founder and CPO

BSc in Physics (SPbU), mathematical biology (Oxford) and bioinformatics (NIMR-MRC)

Google: Quantitative Marketing, Maps

Helicopter pilot (PPL(H) FAA)

47 staff

8 PhDs

7 Pilots

SPACEX · Rolls-Royce · FLARM · Honeywell · DLR German Aerospace Center · Google · CERN · Imperial College London · Carnegie Mellon University · STANFORD UNIVERSITY · UNIVERSITY OF OXFORD · ETH zürich

SWISS AI AWARD 2020

Aviation industry challenges

Safety

General Aviation had 200 times more fatal accidents between 2008–2017 than commercial air transport.

Capacity

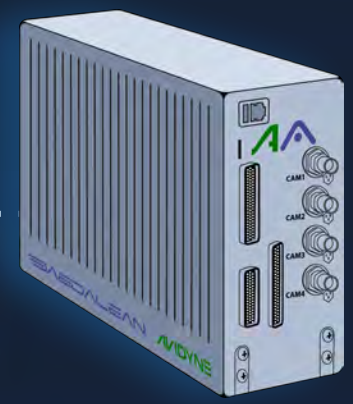
Despite COVID-19's effect in the short-run, in the long-run 255,000 new airline pilots needed for next decade. Freight and business aviation face same problem. ATC and airspace at capacity limits.

Economics

Urban Air Mobility providers must reduce setup and operations cost to make scale-up affordable for customers and attractive as a business.

The first certified airborne system using Deep Learning and Computer Vision

integrated avionics-grade cameras with MEMS IMUs



DO-178C DAL-C (software)

DO-254 DAL-C, DO-160G (hardware)

Weight 4 kg

Launch Dec 2021

First market-ready products

to be launched in 2021 addressing safety visual challenges

Where am I?

Visual Positioning

High-precision positioning in GPS-denied situations

Launch 2021

Where can I fly?

Visual Traffic Detection

Detection of cooperative (e.g. planes) and non-cooperative (e.g. drones, bird flocks) airborne hazards

Launch 2021

Where can I land?

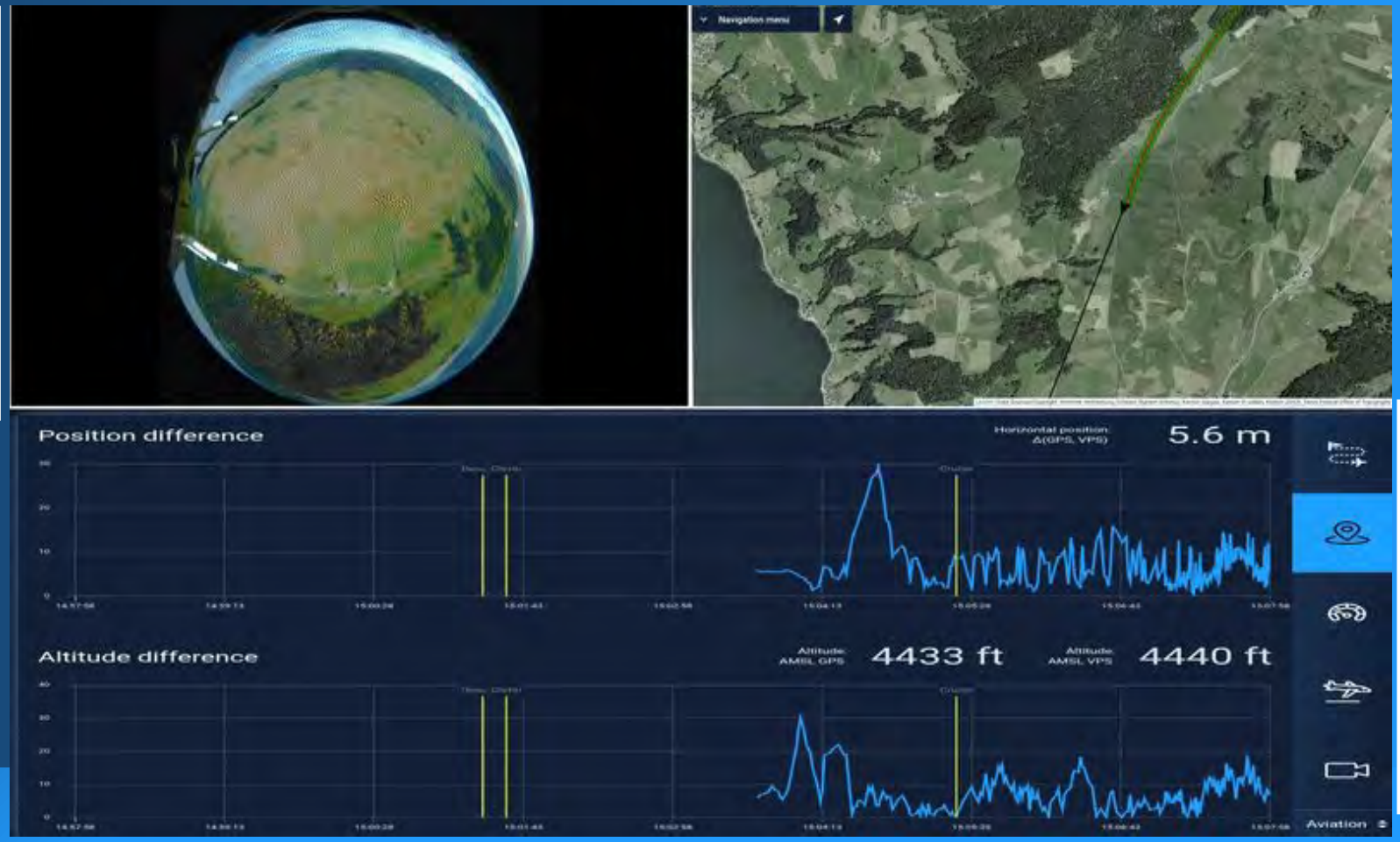
Safe Landing Guidance

Continuous real-time emergency landing spot advisor

Launch 2022

Visual Positioning

Camera-based navigation and landing guidance



Functions

- Continuously outputs position, heading, velocities, height above ground, landing guidance and corresponding uncertainties

Properties

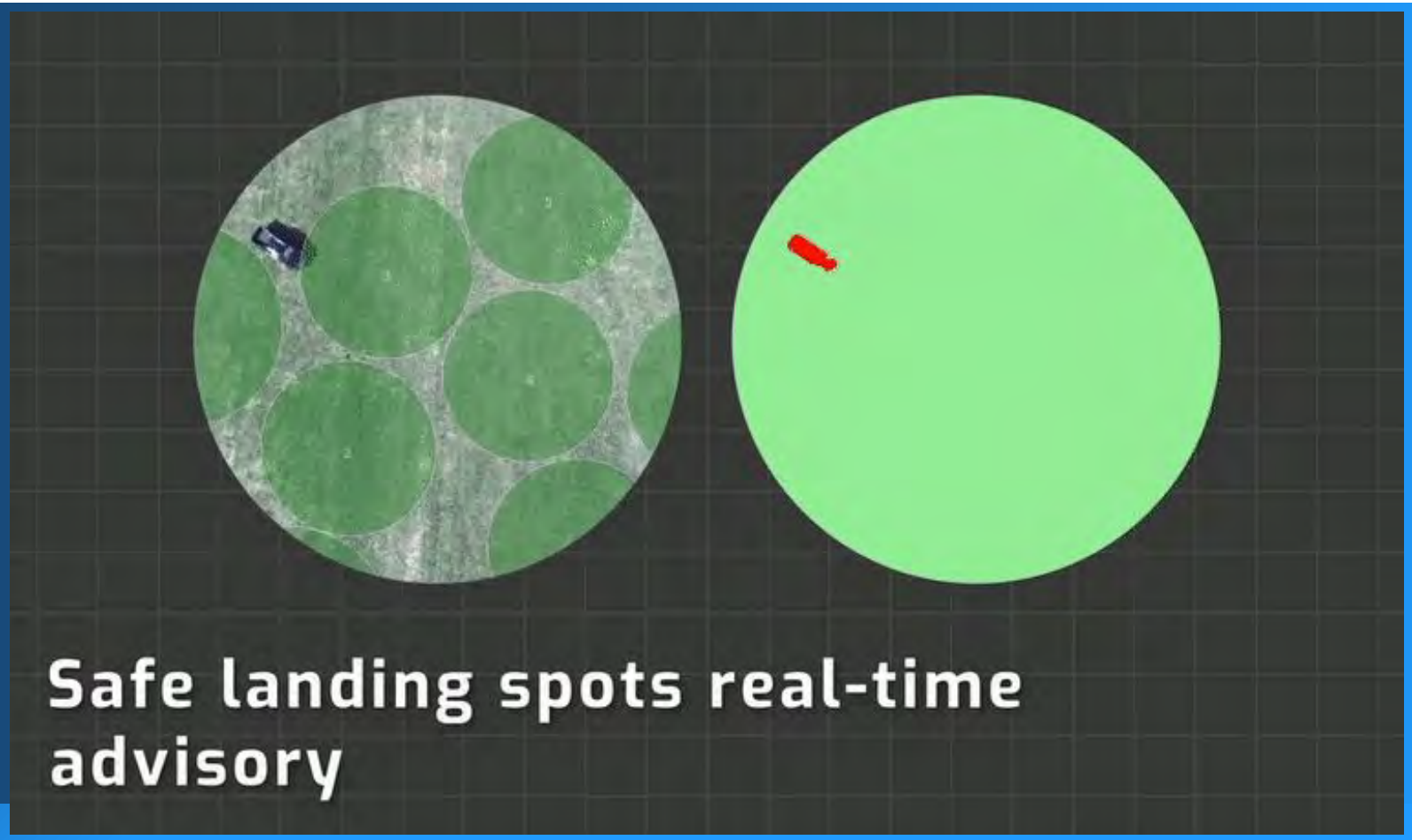
- Navigation data on par with high-end INS/GNSS and ILS is designed to integrate with existing INS-/GNSS-based navigation systems while being dissimilar

Safety certification level

- DAL-C+

Safe Landing Guidance

Onboard GNSS-independent landing guidance for VTOL and fixed-wing aircraft



Functions

- lists areas in sight suitable for emergency, precautionary and normal landing
- confirms the intended area is safe to land by real-time monitoring of ground obstacles

Properties

- continuous real-time semantic segmentation of the environment
- no equivalent instrument exists

Safety certification level

- DAL-C+

Visual Traffic Detection

Noticing all fixed wing, rotorcraft and drones in time

Functions

- Detects and tracks traffic
- Classifies traffic
- Identifies size, position, direction of movement, time to collision

Properties

- Better accuracy than human pilots
- Detection range up to 3.5 km
- Up to 10 Hz
- Integration with existing flight deck instruments as a pilot-aid

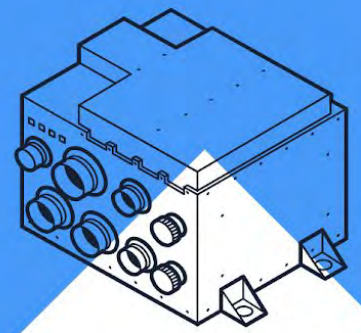
Safety certification level

- DAL-C+

Our products are based on in-house developed Convolutional Neural Networks algorithms

System level

Cameras



Aerospace-grade computing hardware

Environmental Conditions and Test Procedures for Airborne Equipment and Design Assurance guidance followed

DO-178C **software**

DO-160 and DO-254 **hardware**

Updated path plan

for the aircraft navigation computer

Control

Software level

Camera

Preprocessing

Convolutional Neural Network

Postprocessing

Daedalean is paving the way for certifying the use of AI in safety-critical applications in aviation

Daedalean & EASA announcing the report "Concepts of Design Assurance for Neural Networks", March 2020

Our achievements

Jan 2020: EASA and Daedalean published the first report outlining the steps necessary to ensure a safe and accurate deep neural network software development.

The report was presented to the FAA, EUROCAE WG-114 / SAE G-34, RTCA SC-228, Honeywell, FOCA.

Jan 2021 (expected): Daedalean's use case serves as an example for the first AI/ML guidance for level 1 (human assistance/augmentation) by EASA.

Daedalean proposed demonstrations to the FAA and other aviation authorities.

Federal Aviation Administration

EASA
European Union Aviation Safety Agency

Daedalean

Autonomy in the air

November 2020


Q&A

Virtual Tour Future Dates

Partner and Deploy

Monday, December 14, 2020 (11am EST / 8am PST / 5pm CET)

Partner with Swiss companies and regulators and become one of the pioneers in deploying new drone technology.

Have we left one of your questions unanswered? Contact us and we'll be in touch shortly.

Greater Geneva Bern area (GGBa)
United States: +1 512 301 3337
Switzerland: +41 21 644 00 90
info@ggba-switzerland.ch

ggba-switzerland.ch

Greater Zurich Area
United States: +1 646 586 5507
Switzerland: +41 44 254 59 59
info@greaterzuricharea.com

greaterzuricharea.com