Using drones for automated aircraft inspections

The story of Mainblades

About me

Michael Sprehe

Background: International Business Management
Drone enthusiast
Marketing Lead at Mainblades

michael@mainblades.com

MAINBLADES
Aircraft Drone Inspections

Topics

History of Mainblades
Our technology
Aircraft drone inspection market
Use cases
Regulations

From student to entrepreneur

- Mark → pilot at KLM + drone entrepreneur
- Dejan/Jochem → TU Delft Robotics Alumni

2014 → Idea for AC inspections with drones

2015 → First demo at KLM

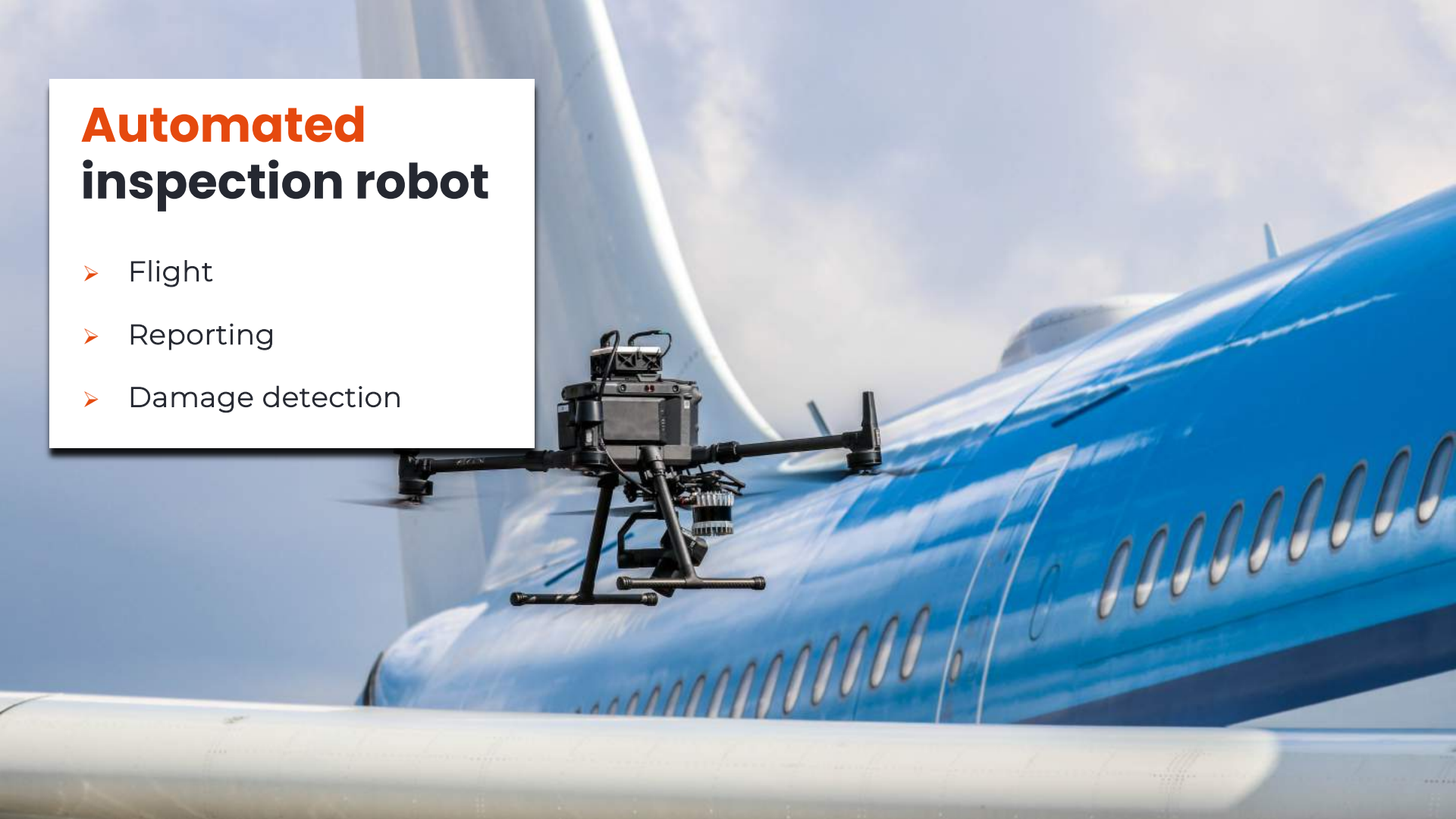
2016 → Test agreement with KLM

2017 → Officially founding MAINBLADES

First prototype

Today's inspection challenges

- Time & labor-intensive
- Limited by hangar, tools, personnel
- Subjective & inconsistent



Automated inspection robot

- Flight
- Reporting
- Damage detection

So...what does this robot actually do?

- Flies autonomously around aircraft
- Takes HD photos
- Analyzes them with AI
- Creates damage report

What is it used for?

General Visual Inspection

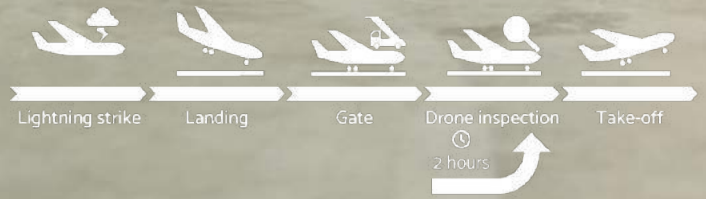
Lightning strikes

Paint checks

Dent/Buckle mapping

Why drones?

- Faster → from 12hrs - 3hrs for a widebody (-75%)
- Safer → no heights or heavy equipment
- Flexible → any aircraft, any area, quick setup



6 times faster

Opportunities

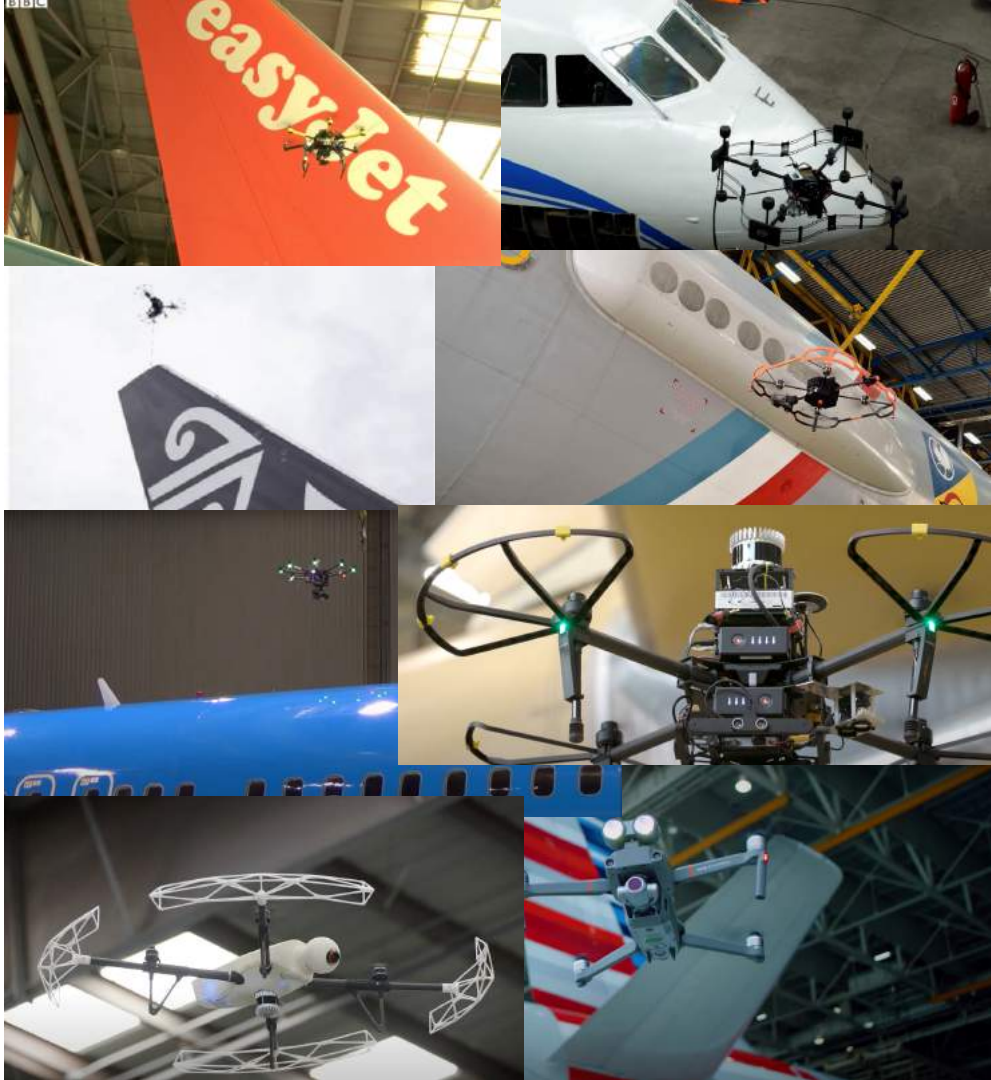
More efficient operations

Consistent data output

Less discussions and groundings

Lots of attention

- Drones came a long way
- Many years of trials and tests
- EasyJet, AirFrance, Avianca, Airbus, AAR, Air NewZealand, FedEx, American airlines ran experiments
- All about efficiency, cost savings, digitalization

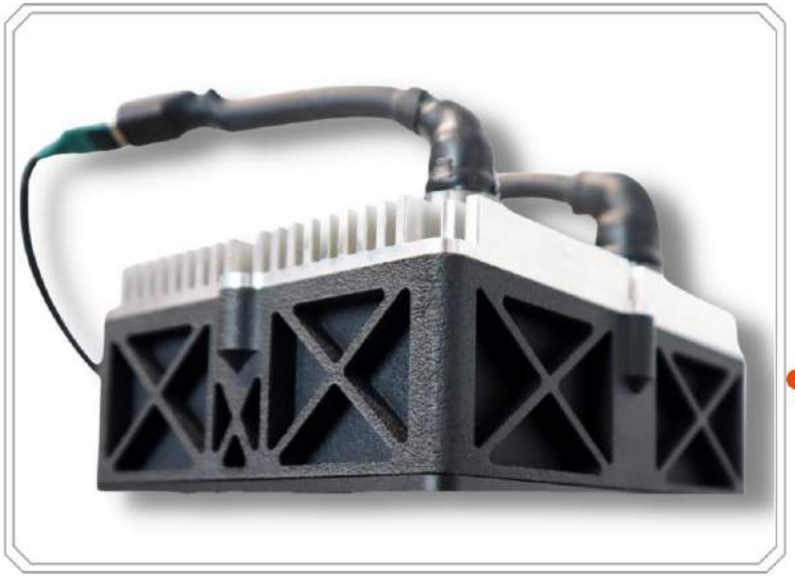


Lots of different approaches

vs

Custom-built	Off-the-shelf
Camera	Lidar
Indoor	Outdoor
One-size-fits-all	Modularity

Current setup

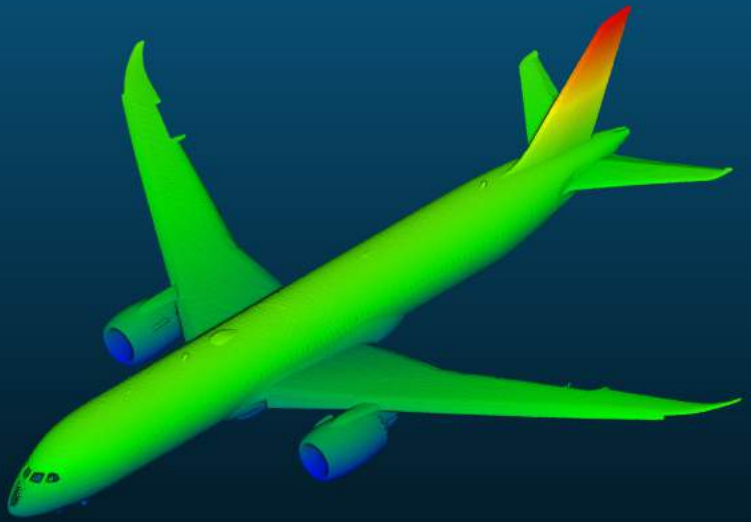


Onboard computer ISAAC

- Drone agnostic “brain”
- Indoor & outdoor proof
- Running smart algorithms

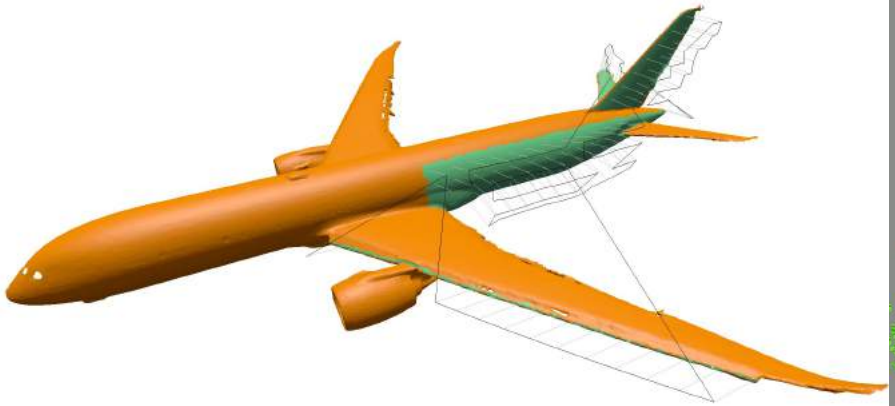
High-precision Lidar sensor

- “Eyes” of the drone
- Creation of 3D aircraft maps
- Navigation + obstacle avoidance



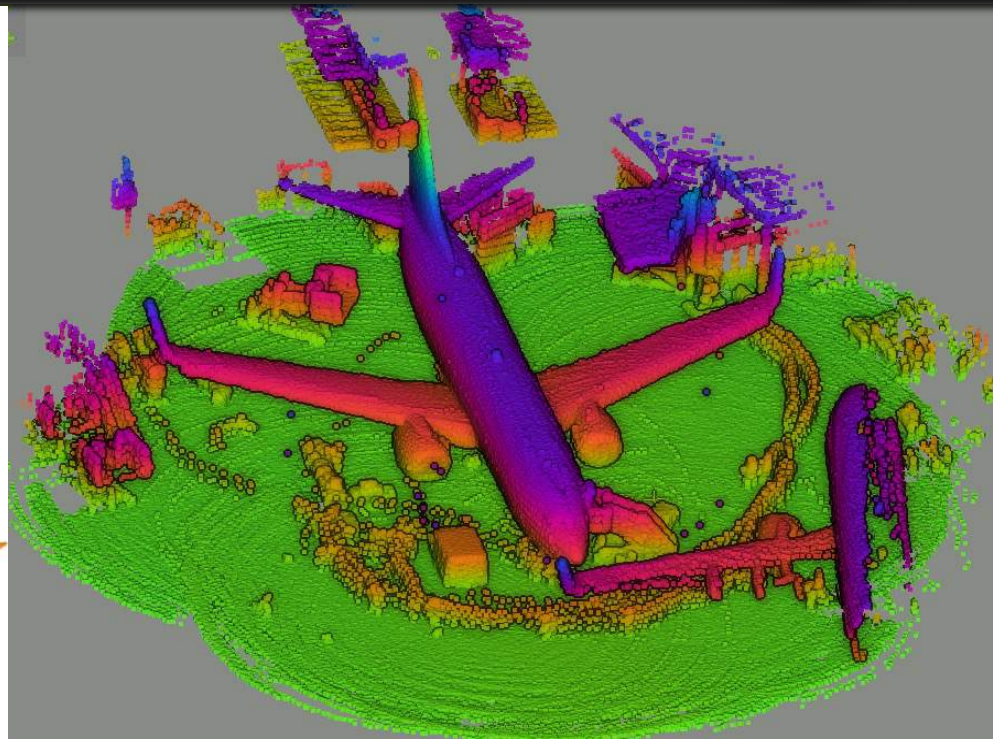
Any aircraft

- Wide body, narrow body, regional
- Model must be mapped once
- Flight paths based on inspection type



Any area

- Indoor & outdoor
- Aircraft can be positioned anywhere
- Maintenance ops continue normally

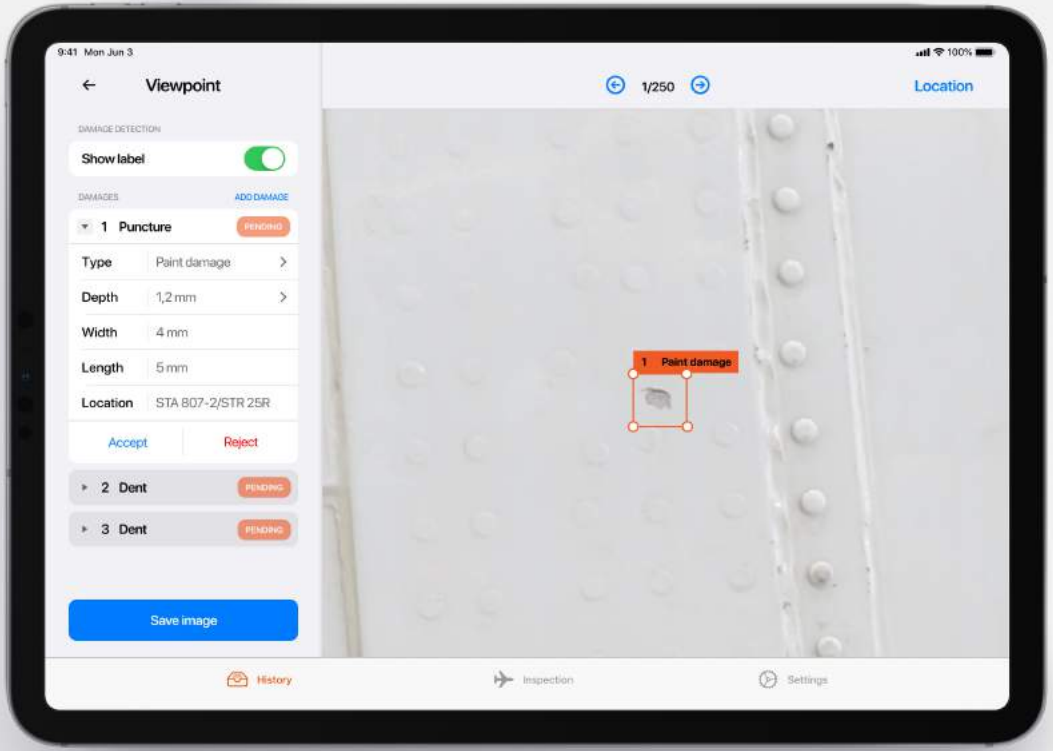


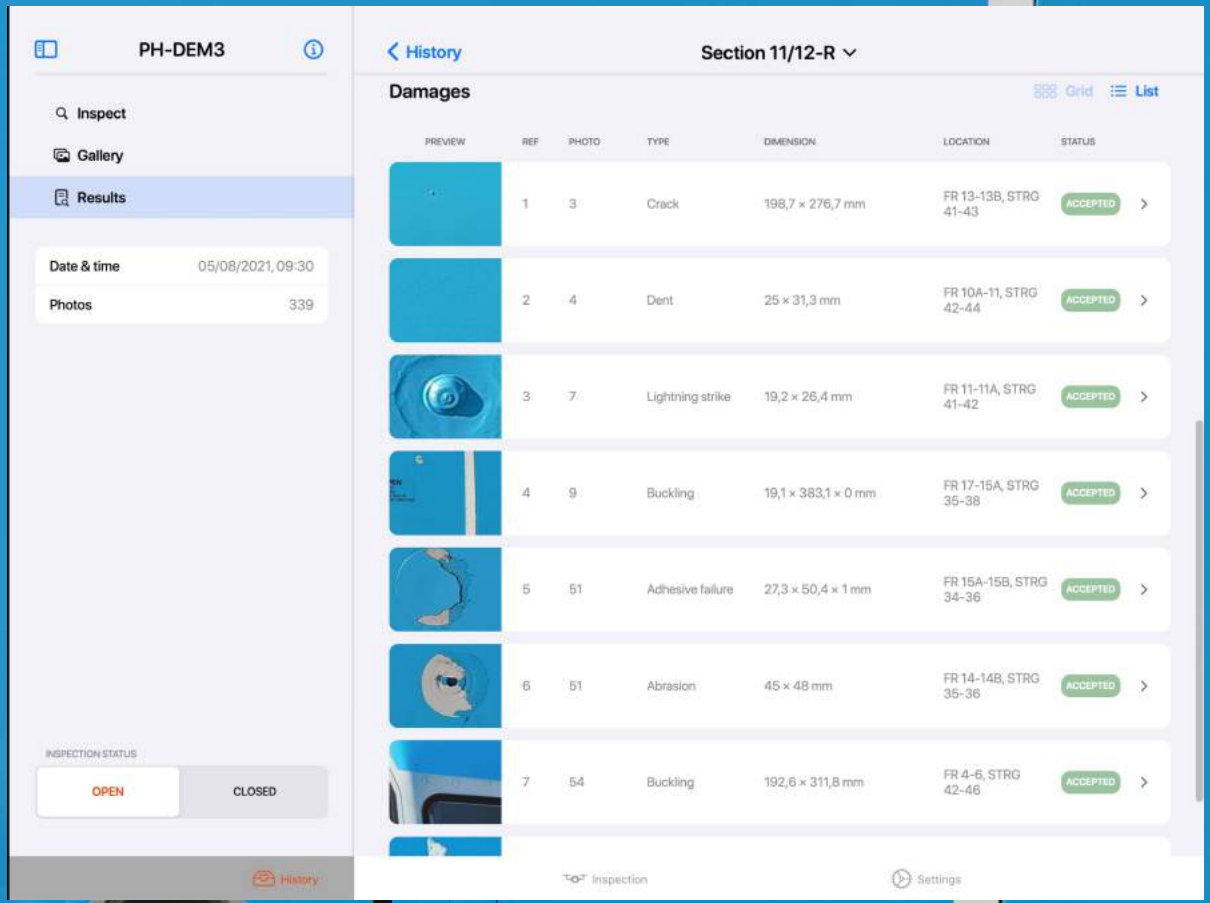
BOEING

AIRBUS

Mainblades
Flight App

- Overview of all damages
- Location estimate
- Measurement of dimensions




PH-DEM3
Inspect
Gallery
Results
Date & time 05/08/2021, 09:30
Photos 339
INSPECTION STATUS
OPEN
CLOSED
History
History
Section 11/12-R
Damages
Grid
List
PREVIEW REF PHOTO TYPE DIMENSION LOCATION STATUS
1 3 Crack 198,7 × 276,7 mm FR 13-13B, STRG 41-43 ACCEPTED
2 4 Dent 25 × 31,3 mm FR 10A-11, STRG 42-44 ACCEPTED
3 7 Lightning strike 19,2 × 26,4 mm FR 11-11A, STRG 41-42 ACCEPTED
4 9 Buckling 19,1 × 383,1 × 0 mm FR 17-15A, STRG 35-38 ACCEPTED
5 51 Adhesive failure 27,3 × 50,4 × 1 mm FR 15A-15B, STRG 34-36 ACCEPTED
6 51 Abrasion 45 × 48 mm FR 14-14B, STRG 35-36 ACCEPTED
7 54 Buckling 192,6 × 311,8 mm FR 4-6, STRG 42-46 ACCEPTED
Inspection
Settings

Lots of concerns…

- Safety
- Accuracy
- Job losses
- **Regulations / certifications**

Regulations / Certifications

SORA

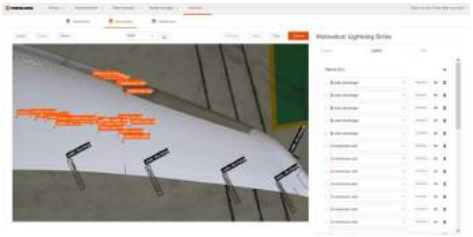
- New EASA legislation → open, specific, certified
- More room for operators to fly at active airports
- ConOps, Ground Risk, Air Risk, Adjacent airspace
- Operations manuals ; coordination ATC , airport, SOP, checklists, training, maintenance etc.

Supported by

AirHub

Part-145

- MRO's internal assessment for new tools
- Validation by Engineering, clearance by QA, okay from aviation authorities
- 20-30 comparison inspections → human vs drone
- Investigated with Corendon and now go through it with KLM E&M



Supported by

HACE

Michael Sprehe
michael@mainblades.com
MAINBLADES