HELICOPTERS

2038… Is it far away?

Sola Conference 2018

Regis Magnac
Vice President Head of Customer Operations

Sept. 17, 2018, Stavanger

AIRBUS

Evolution of Market expectations

I want a high speed helicopter at affordable cost

I want a flying taxi

I want low cost maintenance and improved technologies

I want a less noisy helicopter

I want automatic systems

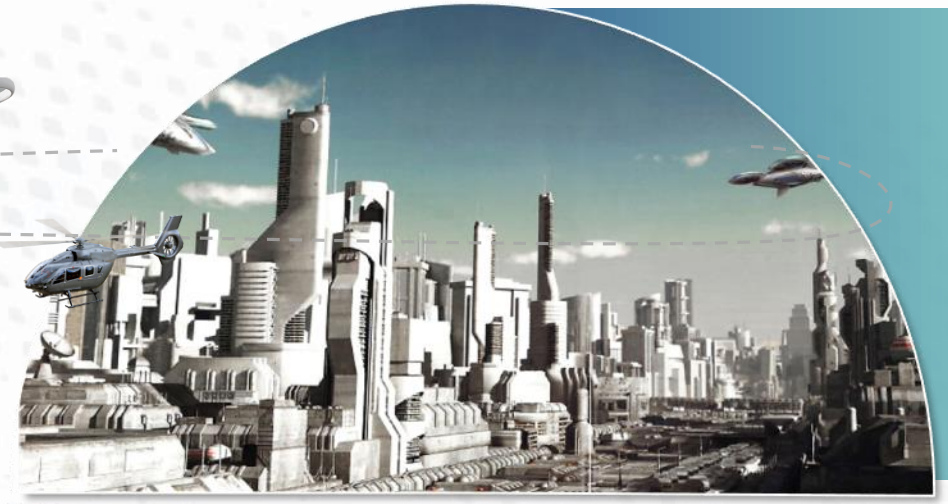
I want a helicopter with gas turbine engine

MARKET EXPECTATIONS

TIME

AIRBUS

2038…



Disruptive Innovations Shaping the future of urban air mobility

Bricks of Technology

Incremental improvements on the current fleet

Welcome to our future

- Mobility solutions for megacities
- New business models & opportunities
- High-speed helicopter
- Protection & autonomy

NOISE & ENVIRONMENT
Bluecopter

What if... we could reduce our environmental impact?

- Reduction in sound emissions 10 EPNDB under ICAO limits
- Reduction of fuel consumption 10%
- Reduction in CO_2 emissions in OEI mode 40 to 50%
- Reduction of power required 15%

MOBILITY
CityAirbus

Customers use an app to book a seat on a CityAirbus, proceed to the nearest helipad, and climb aboard to be whisked away to their destination

The shared economy principle would make journeys in the CityAirbus affordable

What if... we could travel more easily within megacities?

- Up to 4 passengers will share the aircraft.
- A flight would cost nearly the equivalent of a normal taxi ride for each passenger, but would be faster, more environmentally sustainable and exciting
- Low emissions
- Low acoustic footprint
- Multicopter architecture
- Electric vertical take-off and landing air vehicle

PROTECTION
VSR700

The VSR700 is an unmanned reconnaissance helicopter developed according to the most stringent naval requirements

What if... we could be protected anywhere, anytime?

- Deployed from any ship greater than 1,000 tonnes
- A versatile and affordable platform
- Maximum take-off mass around 700 kg
- A balance between performance, operational flexibility, reliability and

What if... we could save more lives?

SPEED
CleanSky2

Ensure full operational compatibility with VIP/Exec, SAR & EMS missions

MORE LIVES SAVED:

- Time to target reduced
- More surface covered in the "golden hour" timeframe
- Shorter time on board for a given

- Reduced vibration by unloading of main rotor at high speed thanks to wing
- Increased customer comfort

URBAN LOGISTICS
Skyways

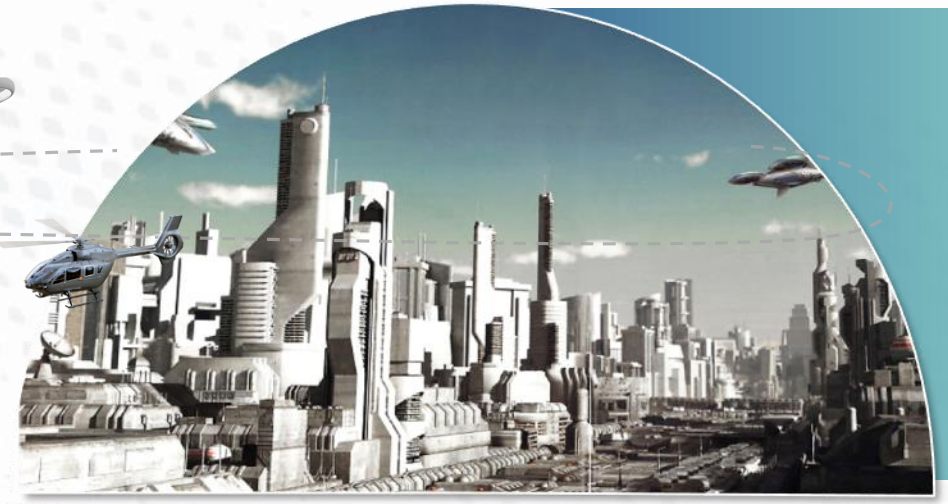
The ambition of Skyways is the seamless integration of UAS into logistics networks and daily life in a safe, secure and economically efficient manner

What if... logistics were no longer a problem?

- Commercial drones that operate safely over
- Enhanced consumer services with economic

AIRBUS

2038…



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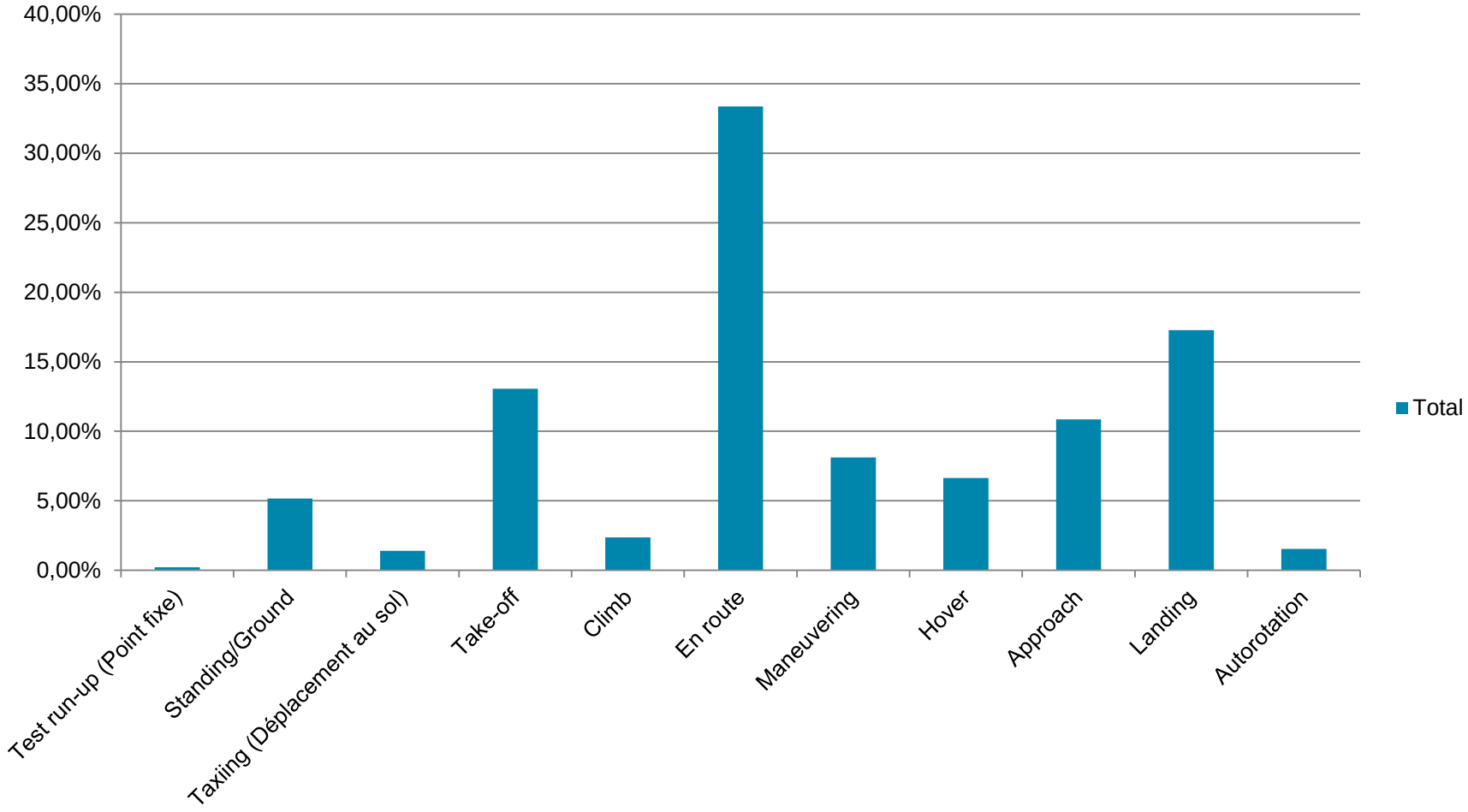
Bricks of Technology

Incremental improvements on the current fleet

Helicopter Accidents all segments

Phase of Flight



Civil & Parapublic

Most accidents are en-route

1996 to date accidents

Airbus Helicopters fleet

 Fixed wing accident rate : comparison – source : Airbus statistical analysis of commercial aviation accidents (2017) and Airbus Helicopters global forecast (2016)

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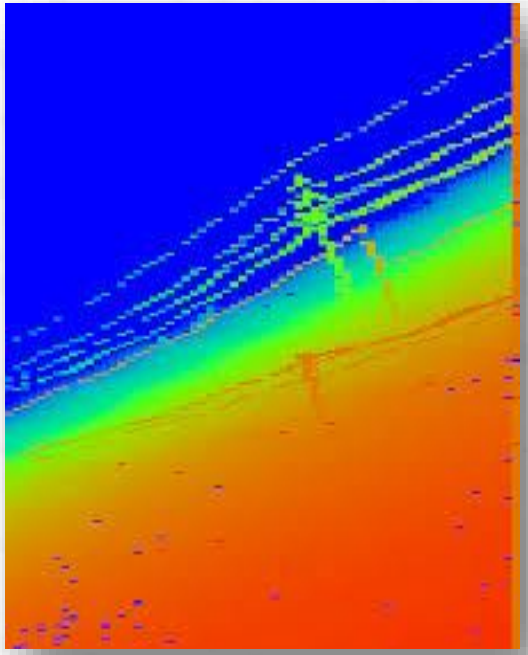
Incremental evolutions
From RSAS to OWS



The market needs light, compact, cheap systems for in-cruise Obstacle Warning Systems

Incremental evolutions
Offshore Windpark Operations

Development of new pilot assistance functions:

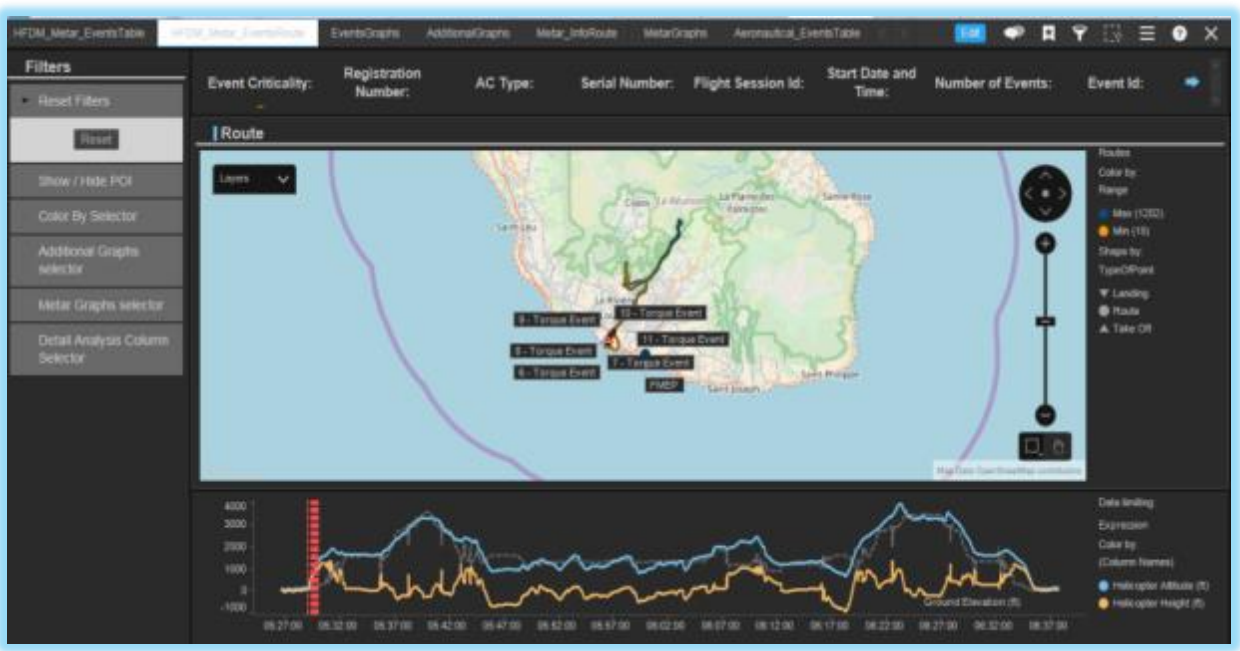
- Head-up display concept and assistance functions
- dedicated offshore IFR approach/departure procedures (PinS)
- intuitive mission planning and trajectory generation
- Connectivity with wind park for real-time information exchange

After Rig'N Fly, Wind'N Fly…

Flyscan Services

Health monitoring

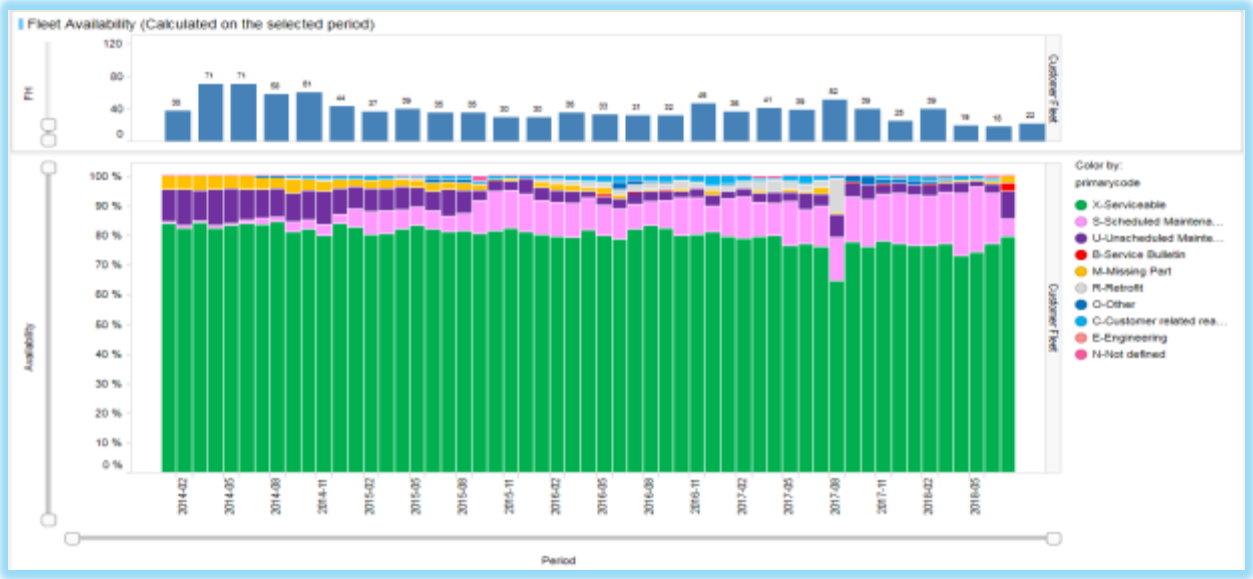
HFDM



Learning more from the front line.

Customer Analytics Services

Fleet Availability optimization



Learning more from the front line.

Customer benefits

Up to +15%	Up to -5%	Up to -2%
Operational availability	Working capital	Operational costs

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Incremental evolutions

Data evolution - HUMS towards Dynamic Maintenance

From HUMS recording to advanced anomaly detection

In-service data analytics
Epicyclic train monitoring & diagnostic/prognostic

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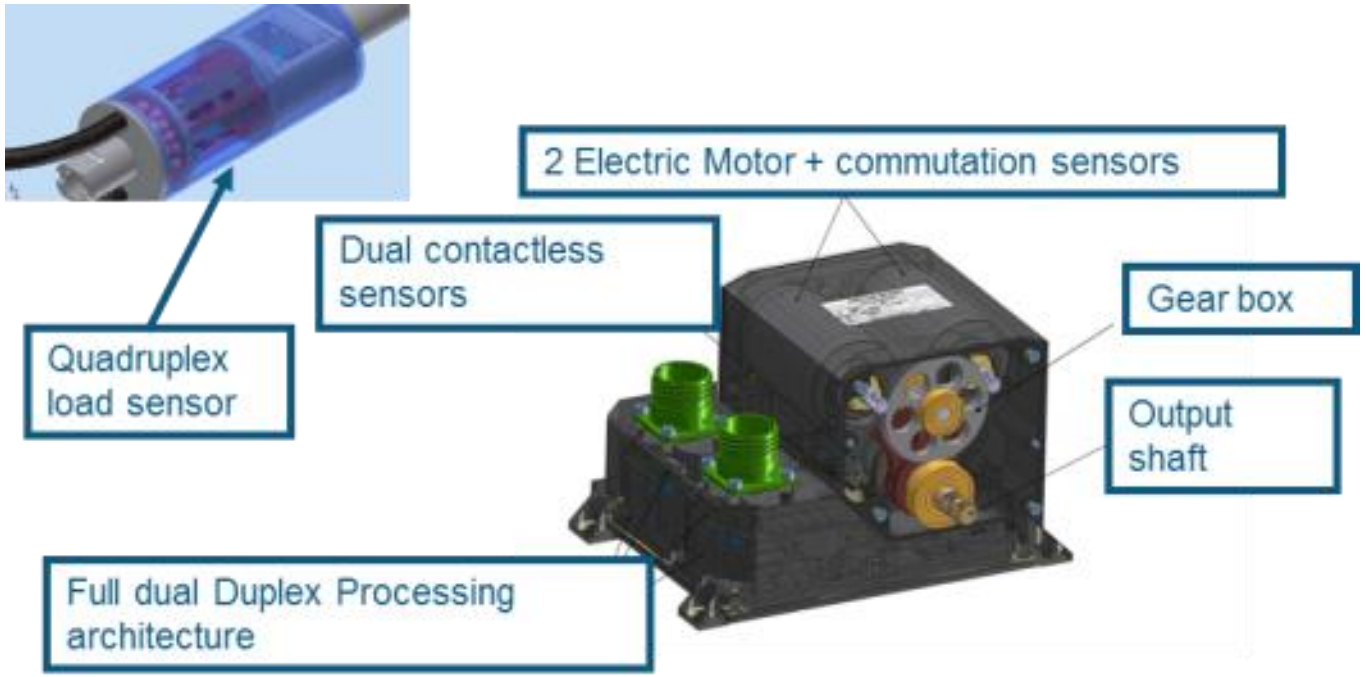
Incremental evolutions

EAGLE

ACTIVE TRIM

Incremental evolutions

Active Trim – improvement for all phases of flight

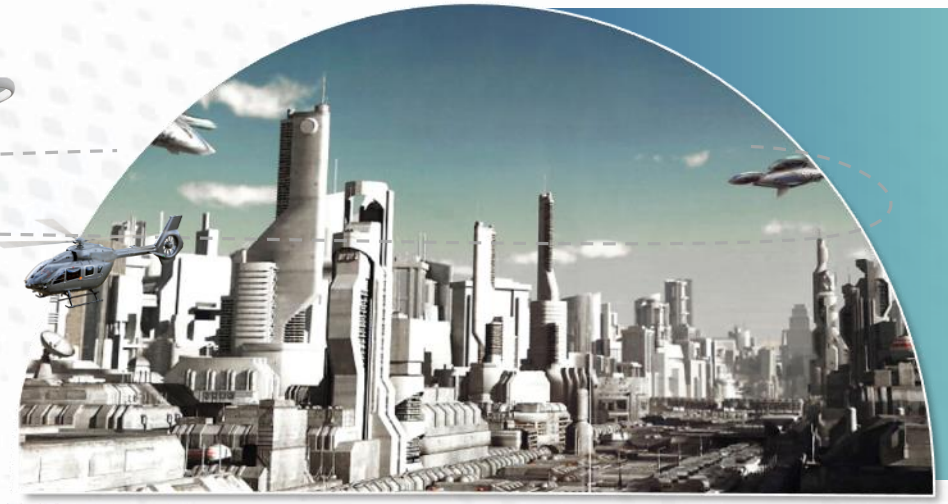


Add electric motors inside the pilot commands (collective and Cyclic axes) in order to bring smart functions to pilot to increase safety .

Incremental evolutions
Active Trim video

Incremental evolutions
Eagle video 1 and 2

2038…



Disruptive Innovations Shaping the future of urban air mobility

Bricks of Technology

Incremental improvements on the current fleet

Bricks of technology paving the future

Pilars driving the strategy

Simplicity
From complex operations to **intuitive use**

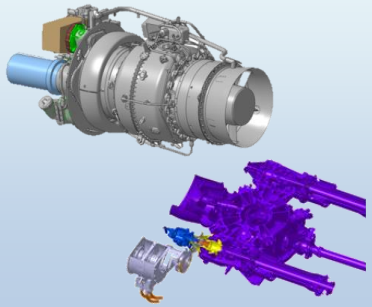
Digitalization

Anytime, Anywhere
From helicopter availability to **mission success**

Citizen Friendly

Customer Experience

Bricks of technology paving the future
Propulsion system



Hybridisation:

- Additional OEI performance
- MTOW increase
- faster restart

High compression engine

- Lower fuel burn
- Lower CO2 emissions
- Better hot & high performance
- Lower DMC on engine

Bricks of technology paving the future Rotor

New Rotor systems

Greencopter

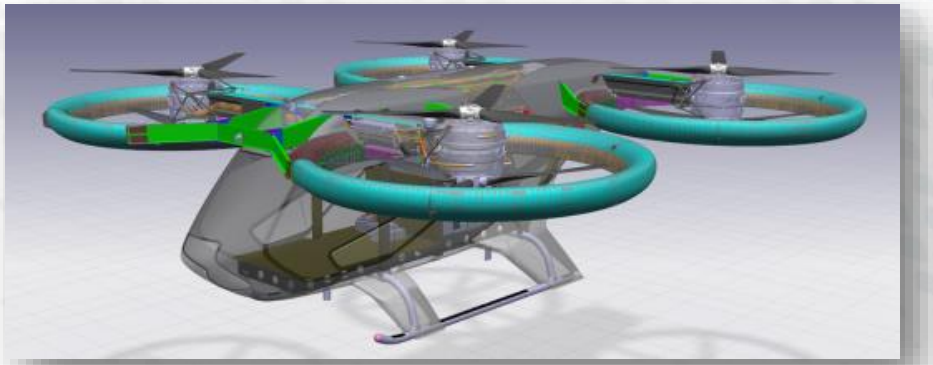
Bricks of technology paving the future Rotor

New Blades

Avanced blades concepts:

- **Enhance natural de-icing**
- **Performance increase**
- **Noise reduction**

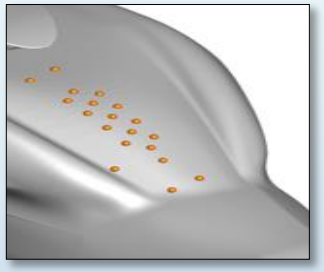
Bricks of technology paving the future Rotor

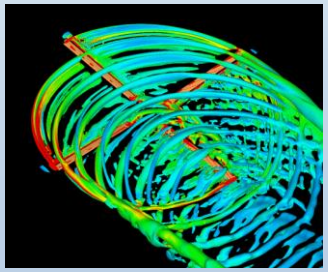


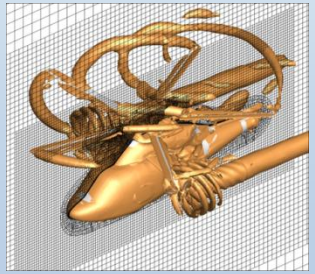
New architectures

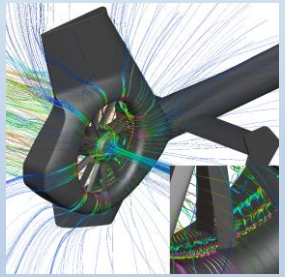
New VTOL configurations
Lateral propellers

Bricks of technology paving the future
Aeromechanics





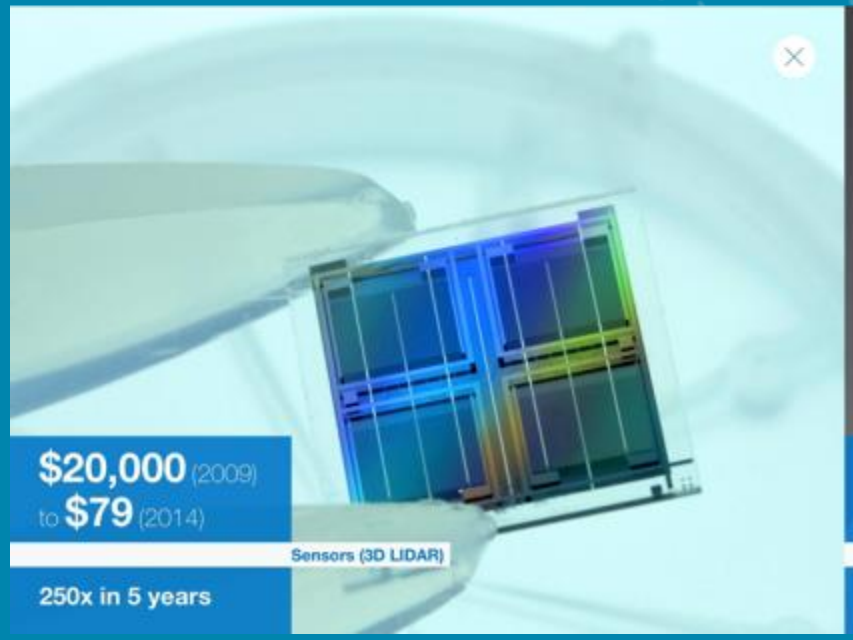




Future configurations anticipation:

Aero – thermo – mechanic – acoustic of helicopter and coupling effects

The pace of disruption is higher than ever



From real to digital world or from digital to real world…

What is the difference?

What about Airbus?

Data revolution

2025

NATIVE DIGITAL CONTINUITY

DIGITAL TWIN

NOW

RE-BUILT CONTINUITY

DIGITAL SHADOW

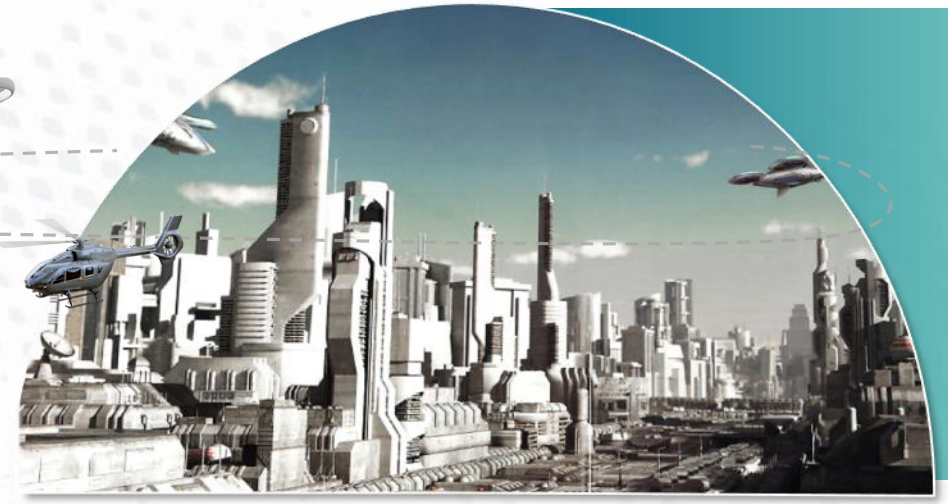
SUPPLIERS **DESIGN** **MANUFACTURE** **SUPPORT** **CUSTOMERS**

AIRBUS

Parts of these improvements are for Airbus factories

Hololens video

2038…



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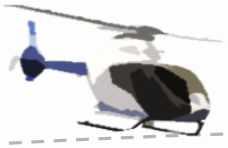
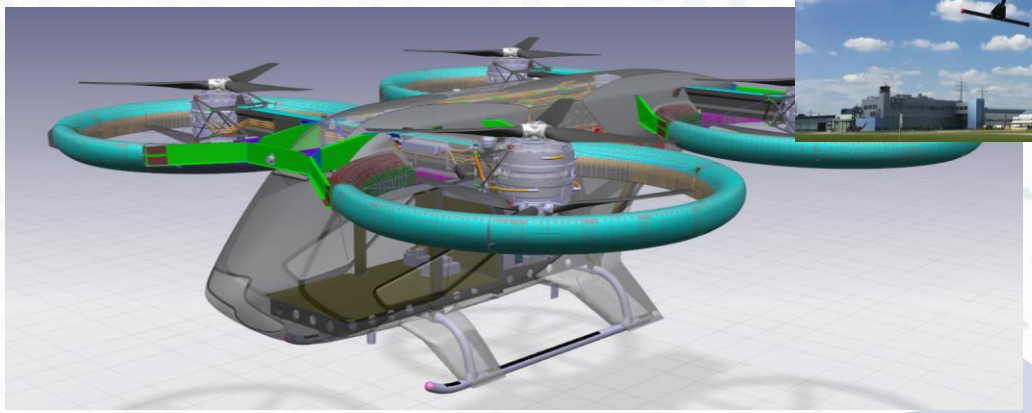


From bricks of technology to a disruptive design

Three whirltower campaigns



1 – Scaled Drone

2– Components and system tests

3 – Iron bird

=multi-system tests

4– Demonstrator

α–demonstrator Maiden flight

AIRBUS

RACER

The demonstrator builds upon the configuration validated by its precursor X^3 and takes it closer to an operational configuration.

A simple architecture - combining fixed wings, innovative lateral rotors and a main rotor- is key for to achieve higher speeds without increasing operational costs.

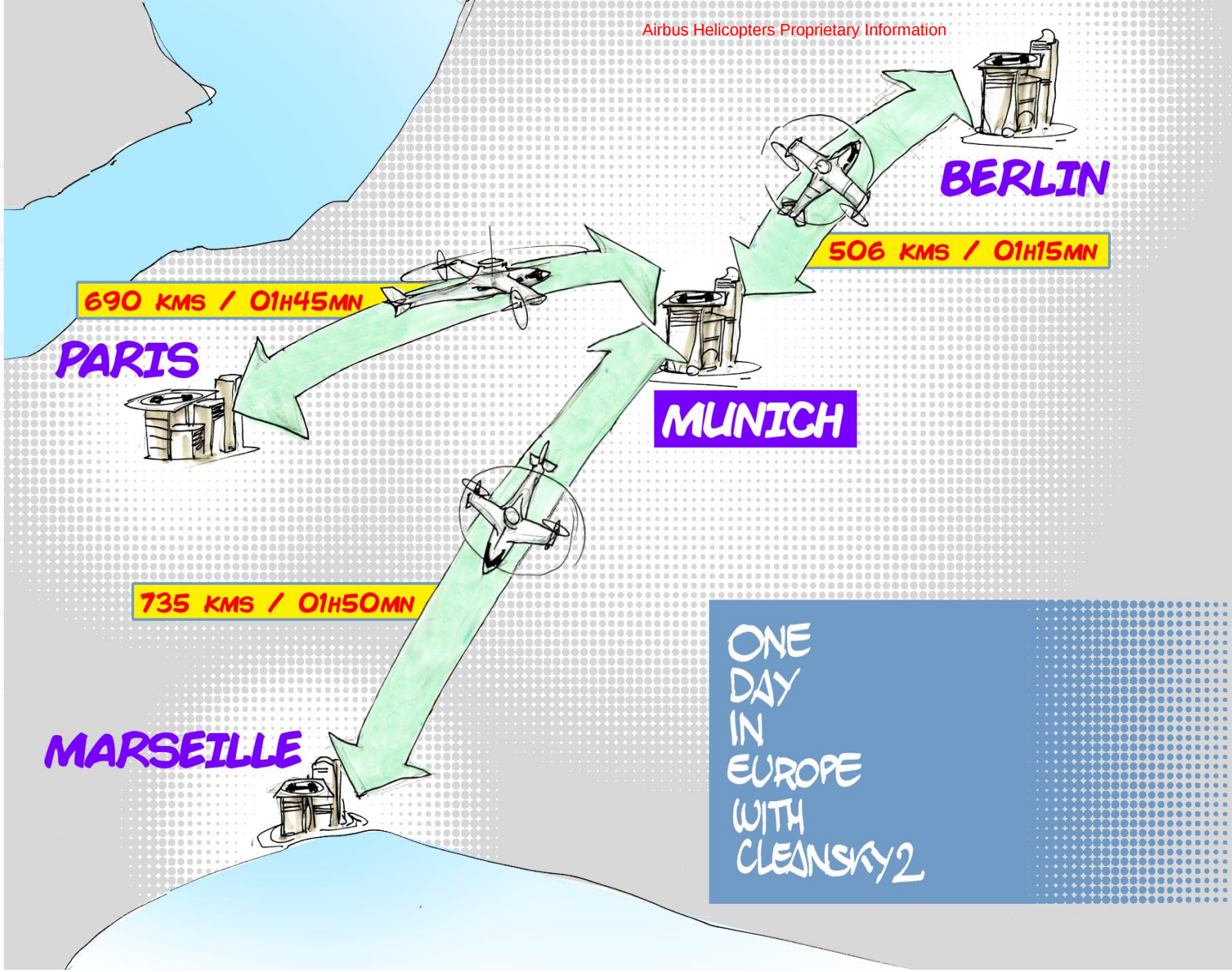
RACER - Missions

HELICOPTERS

PARAPUBLIC

PASSENGER TRANSPORT

EMS / SEARCH & RESCUE



AIRBUS

Racer – rapid and cost-efficient rotorcraft

Enhanced **Main Rotor** optimized for drag & maintenance

2 x RTM322 **engines** equipped with “eco-mode” system for increased efficiency

Specific **tail parts** designed for enhanced handling quality

Hybrid metallic/composite **airframe** designed for low weight & recurring Costs

Pusher **lateral rotors** optimized for performance and low sound levels

Box-wing patented concept, for optimised aerodynamic higher stiffness, weight reduction and passenger safety

Mechanical **flight controls** capable of smart functions with low-cost flexballs and new smart actuators

Wind tunnel tests

Scale 1:1 mock-up propeller + wing test

- **Performance, loads, acoustics**
- **Instrumented propeller blades**
- **Wing / propeller interaction**

CityAirbus

- Urbanization is a clear megatrend
- Electric (distributed) propulsion could lead to disruptive aircrafts that are safe eco-friendly and more cost efficient
- Autonomous operation will increase safety and reduce pilot qualification
- Business models could change

CityAirbus

Movie