Airbus Autonomy Roadmap

CSDM – Towards smarter and more autonomous systems
Paris December 12-13, 2017

Pascal Traverse, General Manager for the Autonomy Thrust
Airbus Corporate Technology Office
13 December 2017

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Airbus Autonomy – Global Megatrends

Transformative, global forces that define the future of the world with impact on businesses, societies, economies, cultures, and personal lives

- **Technological Breakthroughs**
- **Demographic & Social trends**
- **Climate Change & Resource Scarcity**
- **Rapid Urbanization**
- **Shift in Global Economic Power**

Airbus Autonomy – World Megatrends

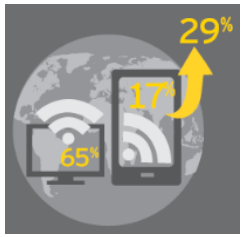
MEGATRENDS

Technological Breakthroughs

IMPLICATIONS

Technology is disrupting all areas of enterprise, driving a myriad of opportunities and challenges

DATA and FACTS



Digital transformation is changing business and revenue models

10s of Billions of Investment a year.

Proliferation of data are changing the business-customer relationship

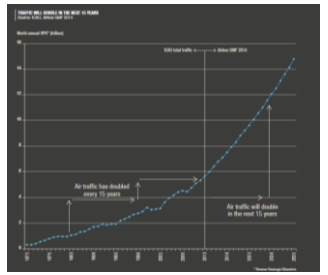
MEGATRENDS

Demographic & Social trends

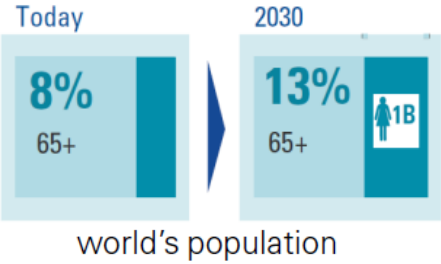
IMPLICATIONS

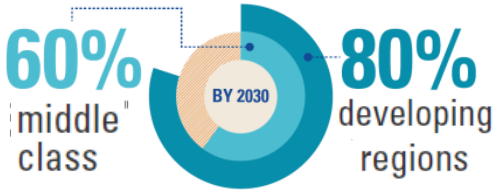
Population growth, Gen Y/Z, aging population and the rise of the middle-class are set to transform the cultural values and practices in society

DATA and FACTS



Commercial aviation traffic is expected to double in the next 15 years





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Climate Change & Resource Scarcity

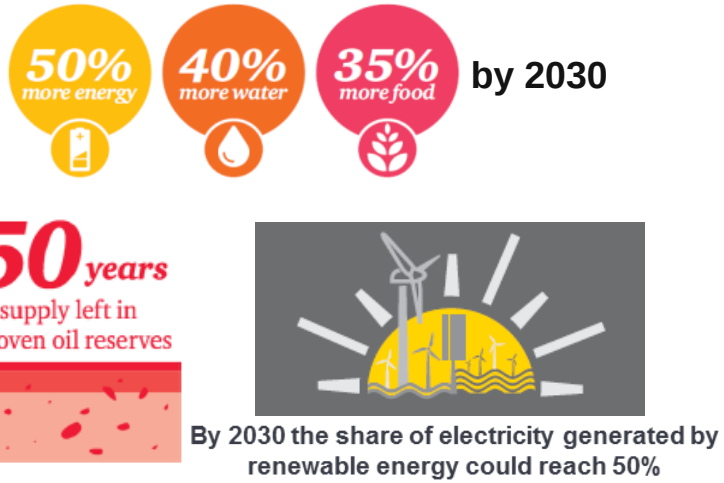
Rapid Urbanization

IMPLICATIONS

Growing demand and shifting supply are driving innovation in the energy and resources space

The number and scale of cities continues to grow across the globe, driven by rapid urbanization

FACTS & FIGURES



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MEGATRENDS

Shift in Global Economic Power

IMPLICATIONS

Economic power continues to shift east and south, driving new patterns of trade and investment

FACTS & FIGURES

By 2030, emerging markets will comprise 63% of global GDP to US$223t

Two-thirds of the global middle class will be Asia-Pacific residents by 2030

Airbus in Bangalore, Beijing and now Shenzhen innovation Centre (≈A3 in SanJose)

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Airbus Autonomy – Autonomy = ?

A system starts to be autonomous when it takes decisions that do not need crew acknowledge or initiation.

	SAE level of driving automation	Informal definition derived from SAE J3016	What it could means for aerospace (tentative)
Automation	0	Warning	Stick shaker
	1	Hands-on	Yaw damper (automatic damping of limited oscillations)
	2	Hands-off	Auto-pilot, flight management system
Autonomy	3	Eyes-off	Flight envelope protections, failure reconfiguration
	4	Mind-off	To Be Defined ☺ Human for strategic decisions only
	5	Cockpit-off	To Be Defined ☺ No human involved, neither in flight nor on ground

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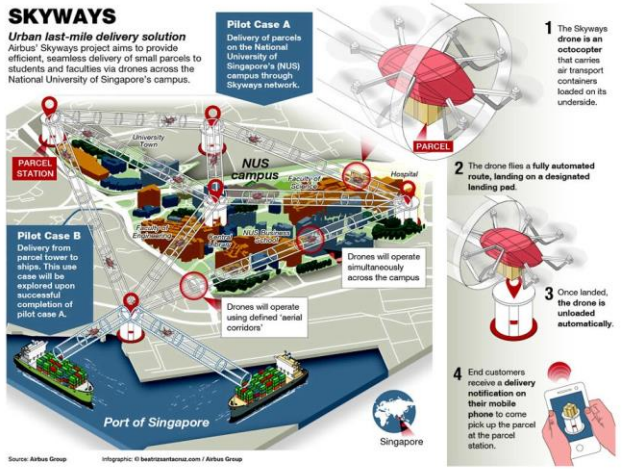
Airbus Autonomy Applications – ISR, Cargo

Autonomous Mission Management

Autonomous Coordination of Vehicles



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Airbus Autonomy Applications – Urban Air Mobility

Urban Air Mobility
Total System,
from customer to vehicle,
traffic management

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Airbus Autonomy Applications – Single Pilot Operations

Human as the Strategic Decision Maker

Focus on Crew Workload and Awareness

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Airbus Autonomy Technologies – Competence of future Operators

Humans are and will remain essential to ensure safety of operations

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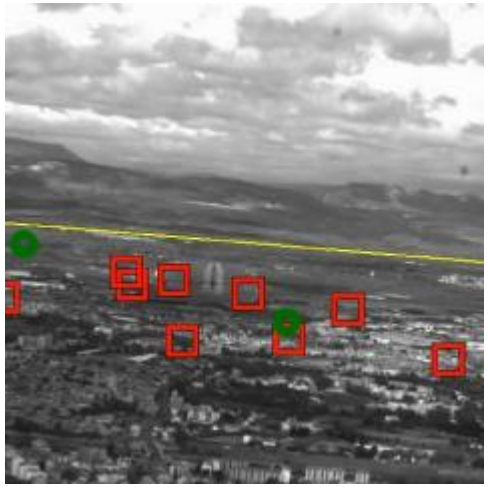
Airbus Autonomy Technologies – Image Processing



How to be confident
in algorithms that have "learned"
or even would continue learning after their entry into service?

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Airbus Autonomy Technologies – Machine Learning

What about the non-prescript cases
The “unknown-unknown”
?

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Airbus Autonomy - Conclusions

- Anticipating the competences of operators by mid-century
- Trusting systems that have not been designed in a classical way but by learning
- Trusting systems that are continuously learning
- What to do with unprescript cases, the unknown unknown?

- Social acceptance
- Time, Cost and Quality
- ….

Airbus is interested in cooperating with the CSDM community to solve autonomy challenges to systems engineering

https://www.youtube.com/watch?v=frRUfpMsQYM&index=1&list=PLJItpHUetWvGDMY-5Uu1Csxi-MliI9O3t

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Thank you

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