



Digital solutions for automated ATM

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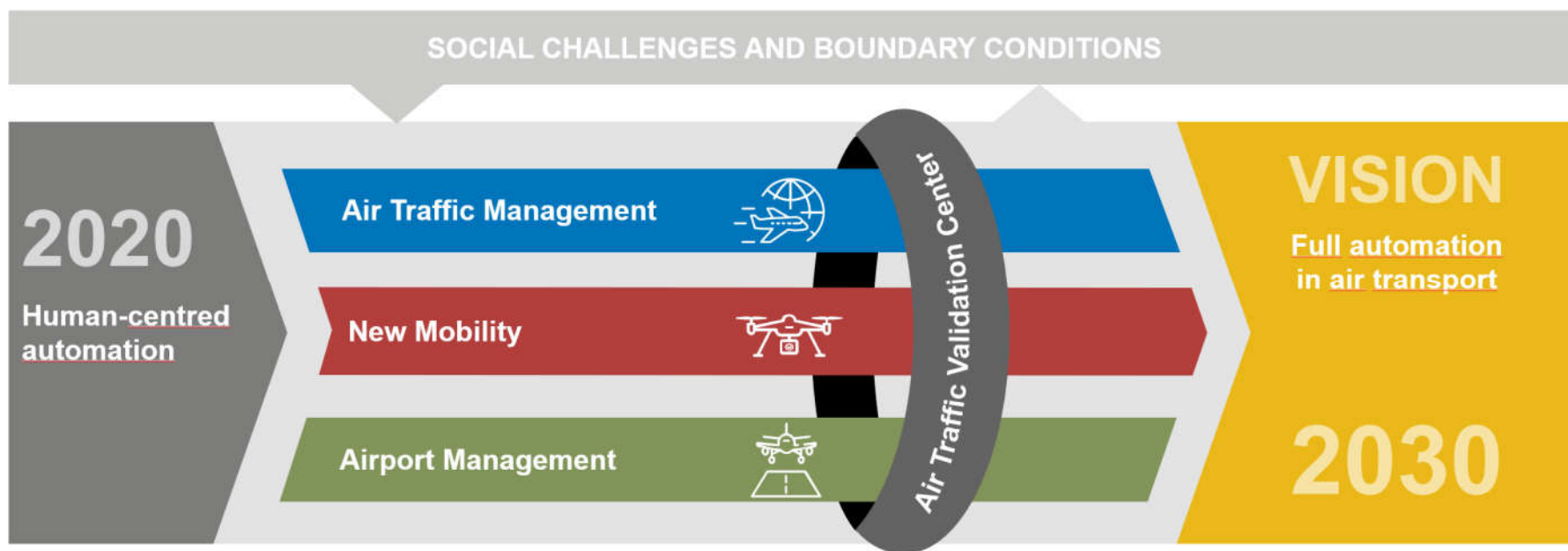


founding members



Research focus of the Institute of Flight Guidance

The vision of full automation in air traffic management



Good Morning!

My name is Helmut Többen, I'm from the Institute of Flight Guidance of DLR.

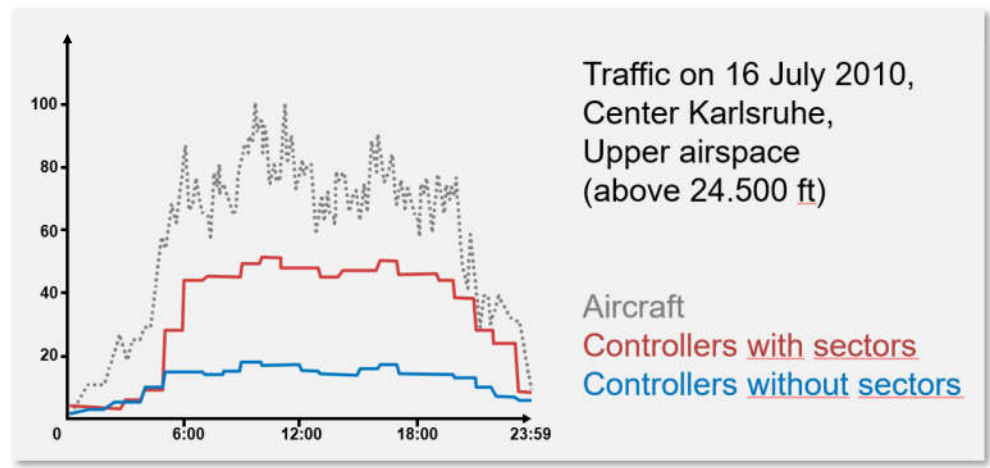
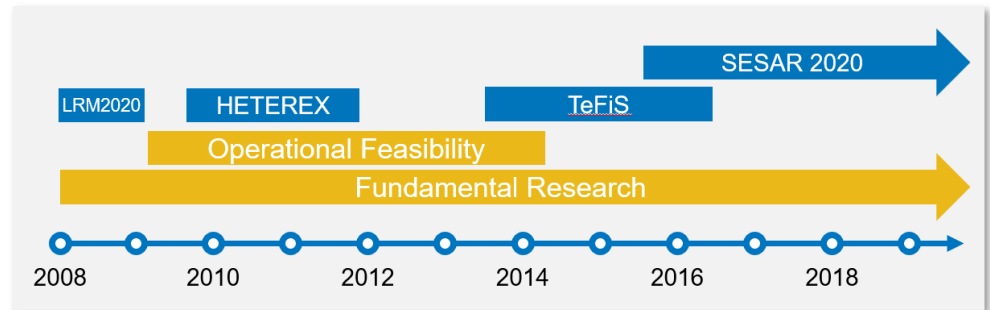
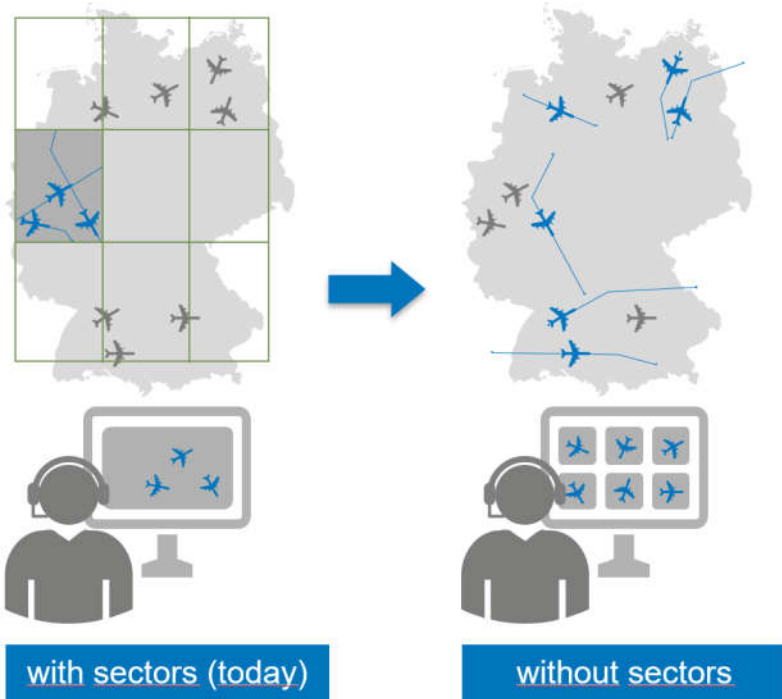
At the Institute of Flight Guidance we are developing strategies how to get from human centred automation in ATM to the vision of a fully automated ATM system in the future based on three main pillars.

Those three pillars are future ATM concepts (like flight centric ATC, formation flight or others), new mobility (drones and air taxis and other new entries like for example high altitude or space traffic) and a more sustainable performance based airport management.

A major role in this development is played by our air traffic validation center providing all different kinds of validation methods from fast time simulation, over human in the loop simulations up to flight trials or field trials at airports.

I would like to pick two examples of our current developments which are sectorless air traffic management and speech recognition for ATM applications.

Sectorless air traffic management Flight Centric ATC



Nowadays sectored airspace has two major disadvantages:

- One is the high difference in workload, some sectors are heavily crowded while others have very low traffic.
- Secondly if the traffic increases in one sector the sector is split up in two sectors to allow for more traffic but this can only be done a few times otherwise the sectors get too small.

Therefore in 2008 the idea was brought up to do the whole traffic management sectorless.

The sectorless idea is not totally new as it was used by military already at that time

Without sectors one controller is controlling the one or more aircraft which are geographically independent from entry until exit.

This allows for an equal share of workload between all the controllers.

If the traffic is increasing you simply add more controllers.

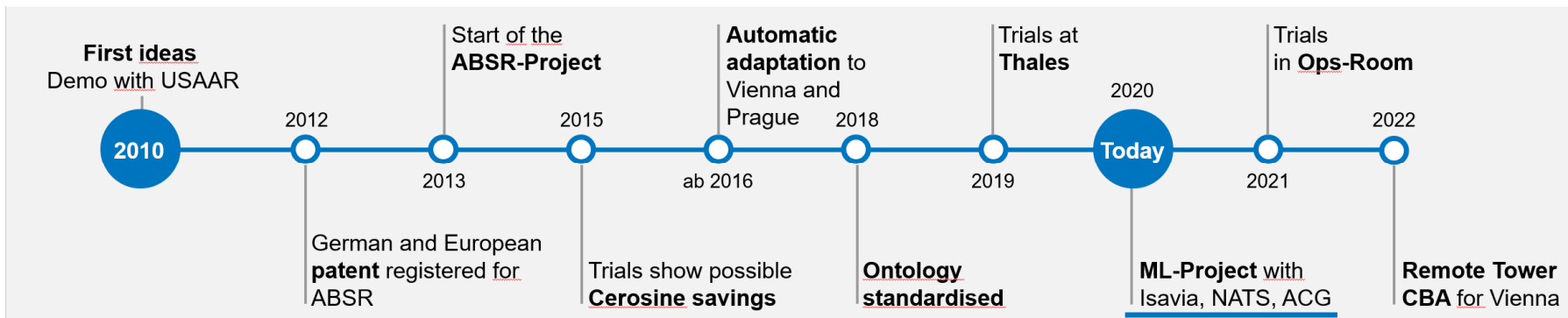
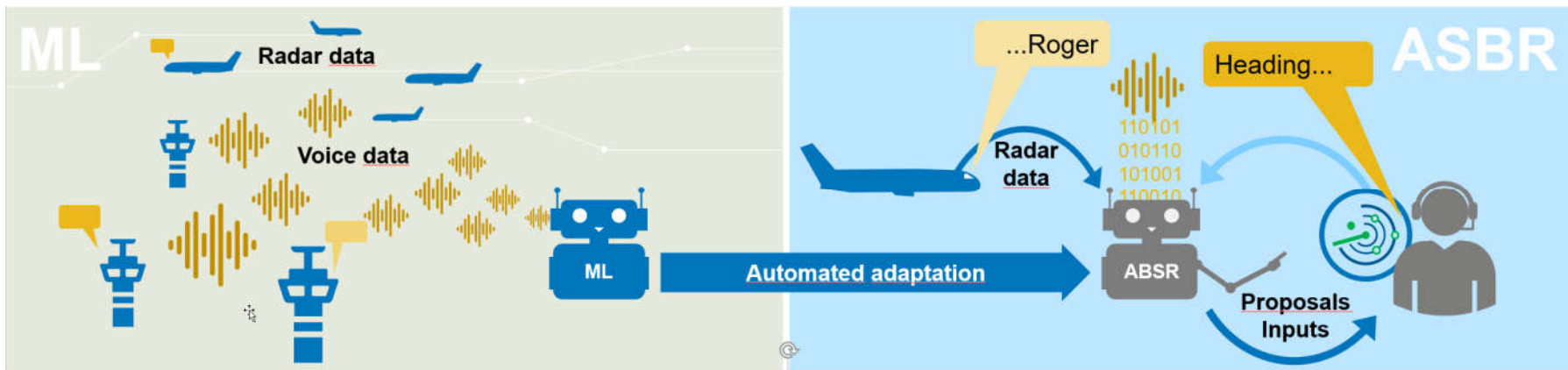
In the upper airspace it could already be shown that this can at least double the efficiency.

We are now looking into this topic since 12 years and there are still some questions open.

Just for comparison, for the remote tower it took 13 years from the idea to the first implementation in 2015.

Assistant Based Speech Recognition (ABSR) in ATM-Environment

Development of speech recognition and machine learning (ML)



Even if data communication between ATCOs and pilots is getting more and more important it will not be able to completely replace radio communications in the near term.

But the voice communication has a major problem with respect to higher automation in ATM as voice information is not digitized and therefore not accessible for machine analysis.

Therefore we started the first project in 2010 with a state of the art voice recognizer.

By adding the ATM context knowledge we were able to improve the recognition rate so that it was feasible to be used in an arrival manager.

Nowadays we improve and adapt the voice recognizer by means of machine learning.

This lead us to a reliable, error resilient and adaptable voice recognition solution which can automatically transcribe voice commands issued by air-traffic controllers and its read-back confirmation provided by pilots.

The digitization of controller and pilot voice inputs can be used for a wide variety of safety and performance related benefits:

- Pilot read-back error detection.
- Modelling and foreseeing controller and pilot behavior.
- Pre-filling electronic systems like flight strips or radar labels or whatever.
- Estimating the controllers pilots workload.

This will largely improve safety and can also reduce controllers' workload at the same time.

Questions:

Airspace User perspective - How can we create a sustained shift in the ATM mind-set, from capacity to sustainability and now, thanks to COVID, scalability and resilience?	Swiss
Artificial Intelligence for better airport operations - How do you ensure a human-like and ethical approach when implementing Artificial Intelligence?	Aeroports de Paris
Disruptive technologies for Air Traffic Control (Speech recognition and flight centric) - If the ultimate goal for ATM is a flight centric network, what can we do to ensure this becomes a reality in the short term?	DLR
Virtual Centres and airspace capacity on demand - How can we ensure safety/cybersecurity in the required wide geographic area data exchanges?	Frequentis
Digital Towers - What will the future look like for digital towers?	Hungarocontrol
U-space, the ecosystem for unmanned flights - What are the key challenges to make U-Space a reality, and what role can regulation play in speeding up the implementation?	Unifly

If the ultimate goal for ATM is a flight centric network, what can we do to ensure this becomes a reality in the short term?

- Reliable geographically independent voice and data communication infrastructure among Europe and accurate weather forecast are needed as technical enablers
- Definition of tools/procedures for demand and capacity balancing and Air traffic flow management in a Flight-Centric ATC
- Transition aspects between flight-centric and sector-based ATC must be cleared
- A further challenge is the fact that controllers have to cope with a completely different situational awareness, where the existing spatial presentation of the information is replaced by the outcome of system based solutions and proposals