Vision-Based Aircraft Functions for Autonomous Flight Systems

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AN AIRBUS INNOVATION CENTER

Acubed Embodies the Innovation DNA of Airbus

Situated in Silicon Valley, an epicenter of tech talent and investment, Acubed is a fast-paced machine that accelerates AI and autonomy adoption to increase Airbus' competitive advantage.

Rationale for Autonomy

Today:

An Airbus aircraft starts & lands every 1.3 sec

90% of aircraft operate at <10% of all airports 4B passengers per year at present

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Forecast for 2035:
Growth to 8B passengers per year

A Paradigm Shift for Aircraft Piloting

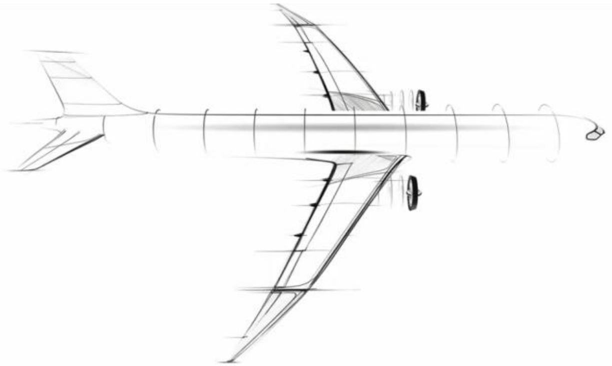
Today

Multiple pilots executing vehicle operation, control, communication

Safety case centered on pilot

Aircraft has varying levels of automation

Next Generation Airbus Aircraft



Highly connected and automated digital platform to ensure safer and more efficient operations

Automatic assistance technologies for pilots, helping them navigate complex operations for increased aircraft safety

New technologies support health and well being of pilots

Critical Flight Functions

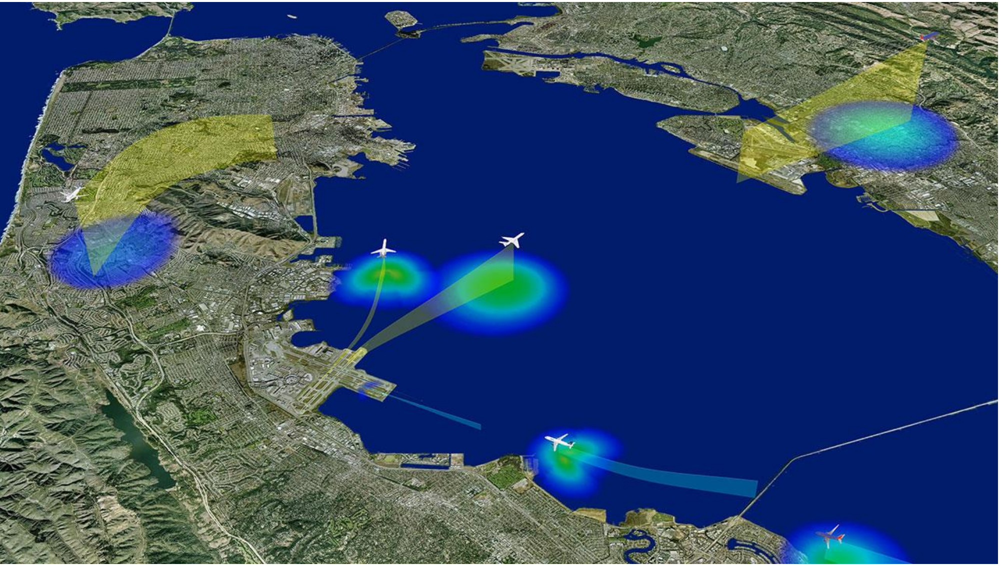
Taxi

Approach & Landing

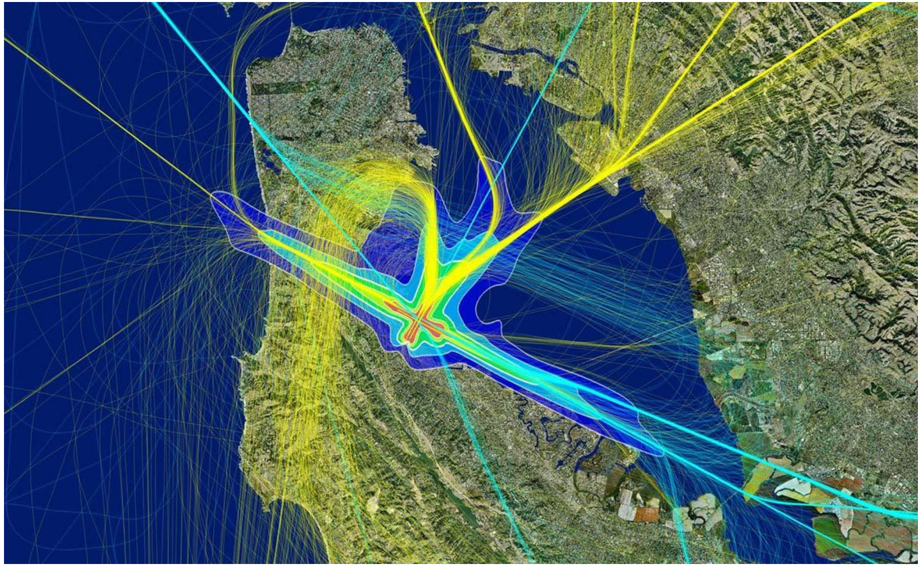
Takeoff

Obstacle

Airport Traffic



Traffic snapshot



Aggregated traffic

Source: www.tetratech.com

How hard can this be …?

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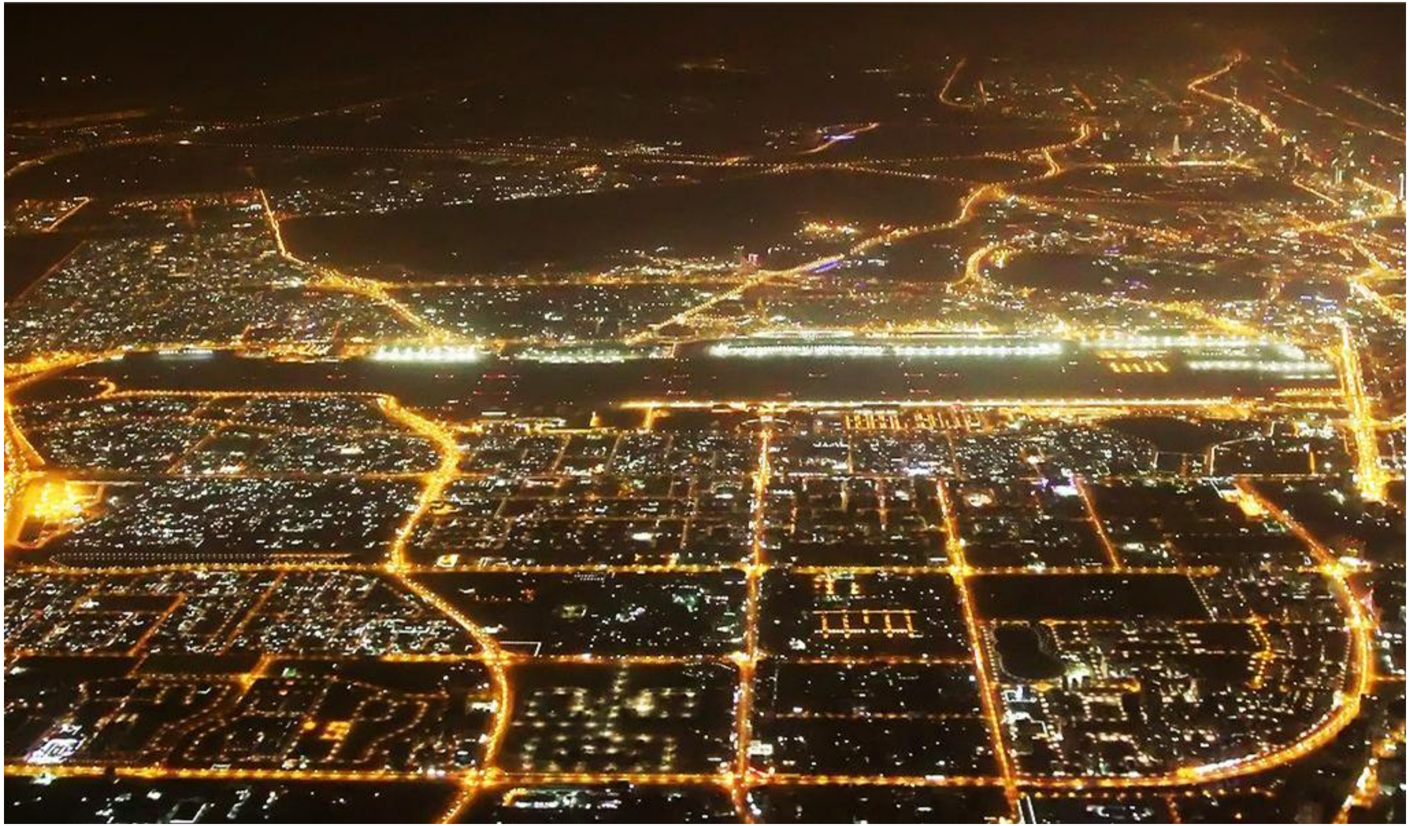


Corner Cases

Core Capabilities

Perception | **Decision Making**

AI Function Development Framework

Machine Learning / Algo Development

Verification & Validation

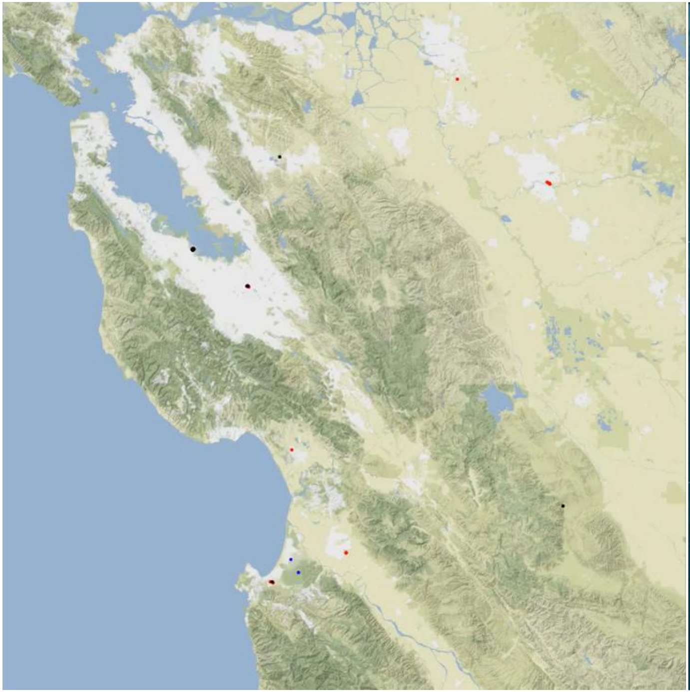
Deployment

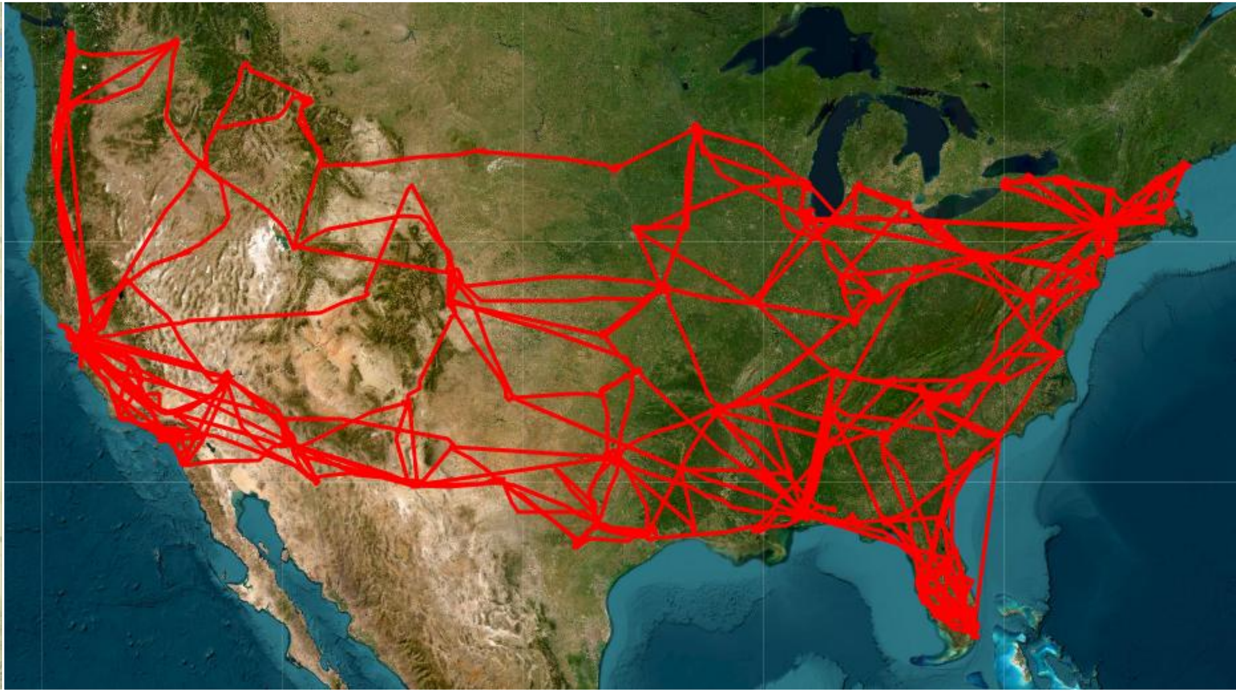
Certification

Real-world Data + Synthetic Data
Expansion of Operational Envelope

Flight Lab for Development of AI Functions

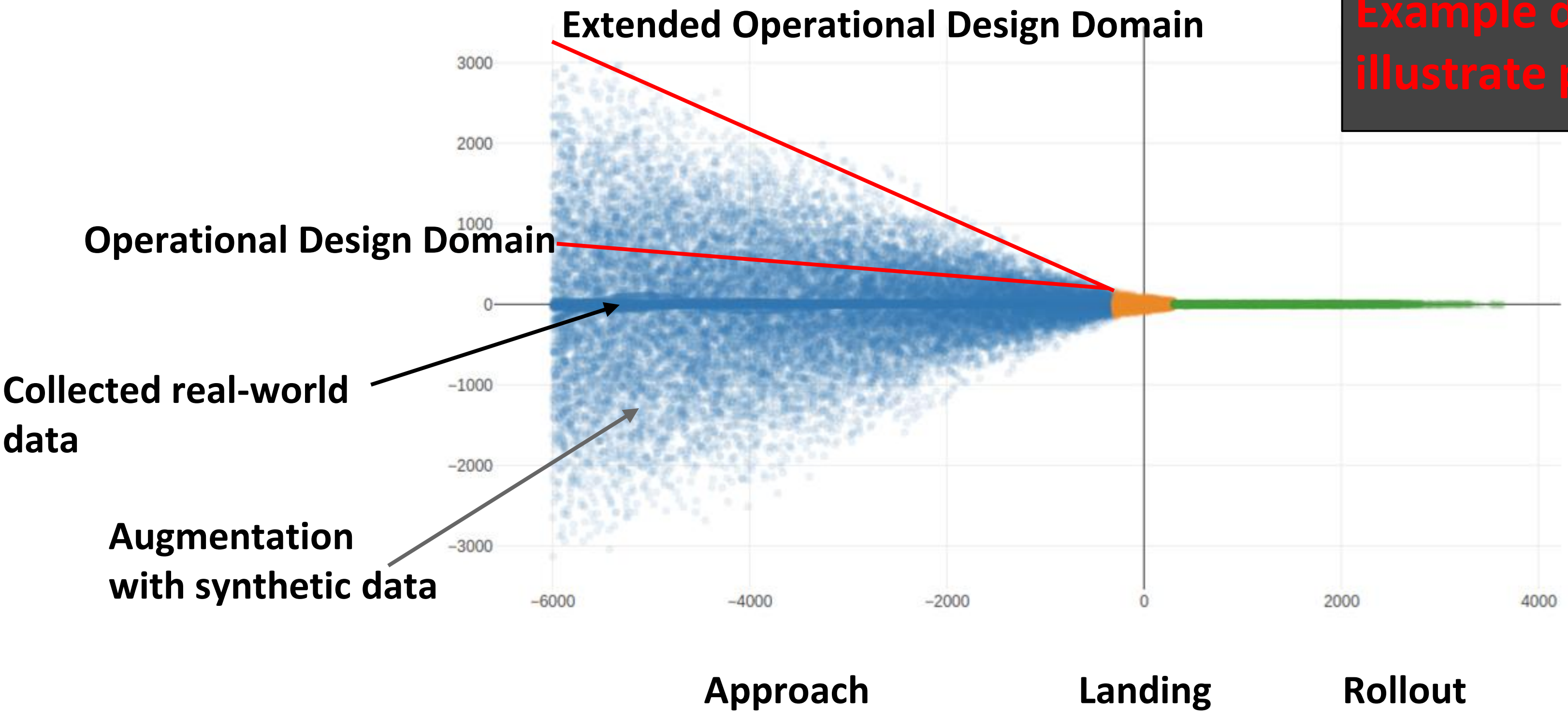
Scaling Up Data Collection





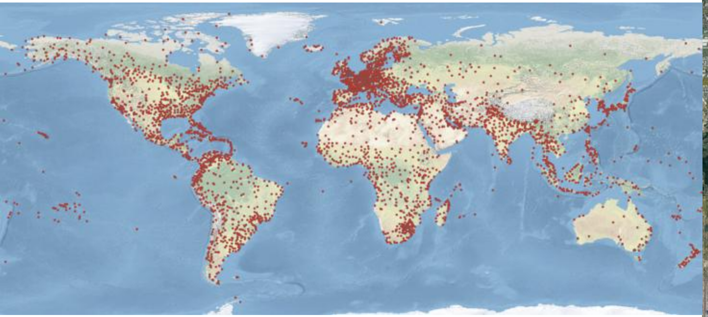
Synthetic Data

Capturing and Generating Statistical Data Distributions



Example data to illustrate principle

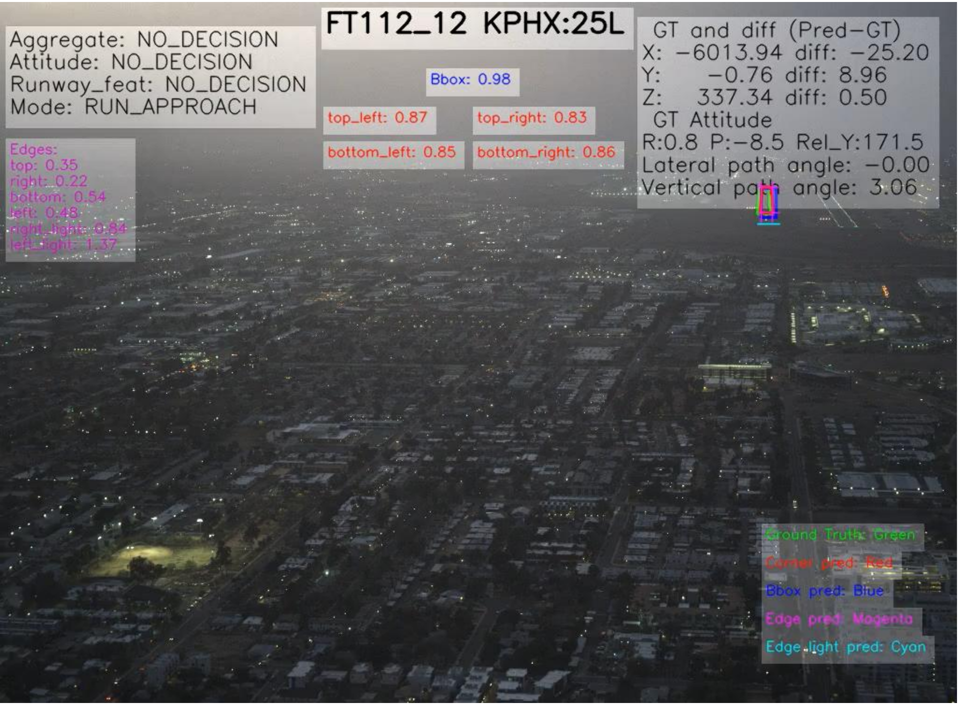
Capturing and Generating Global Data Distributions

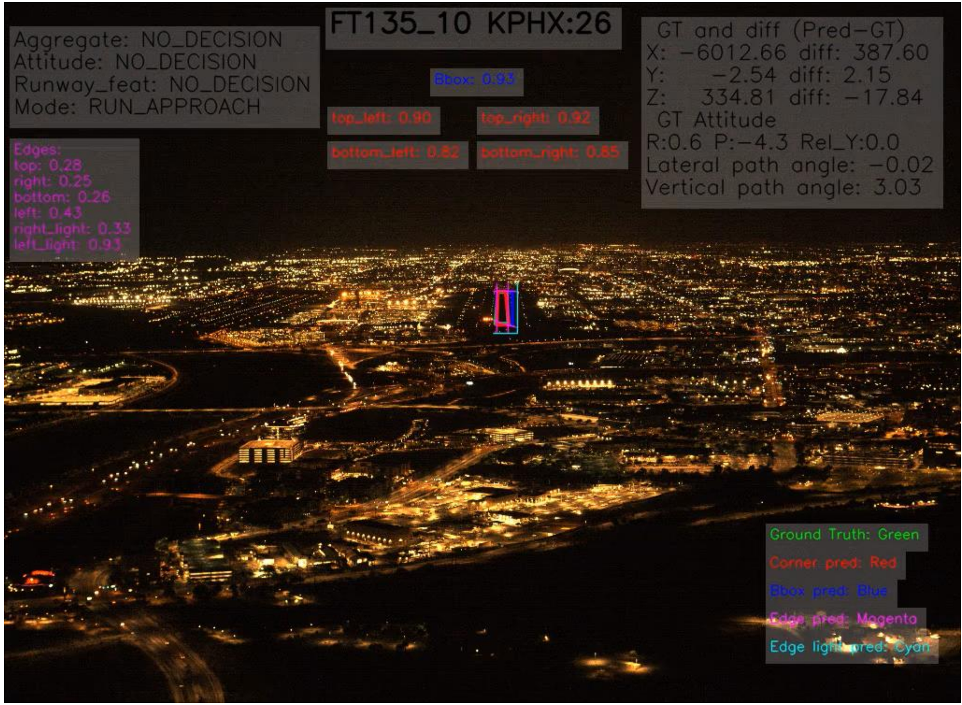


From Data to Flight Functions: Vision Based Landing

Example: Vision Based Landing Guidance at Dusk and Night Time

Example data to illustrate principle

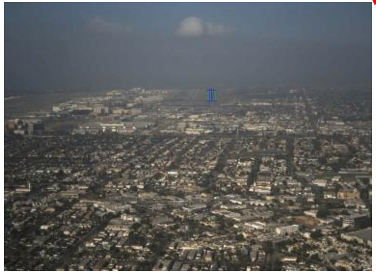


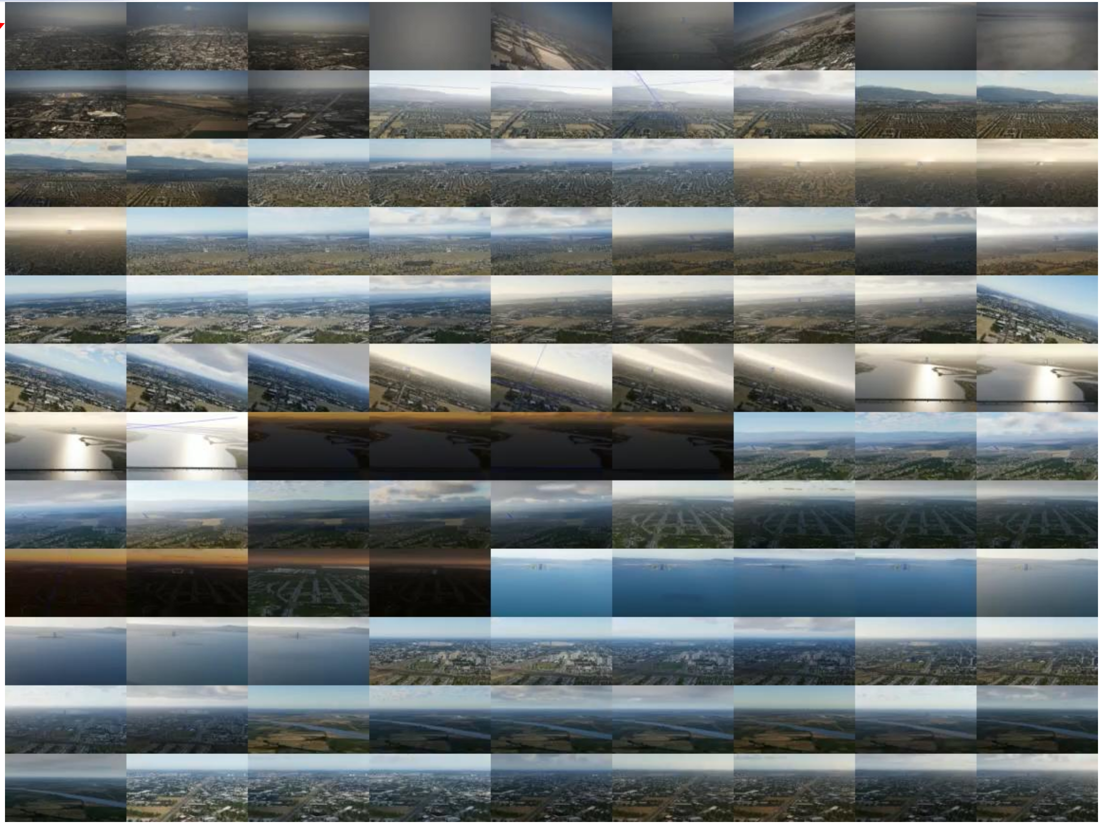


KPHX (Phoenix, Arizona)

Massive Statistical Testing of AI Flight Functions

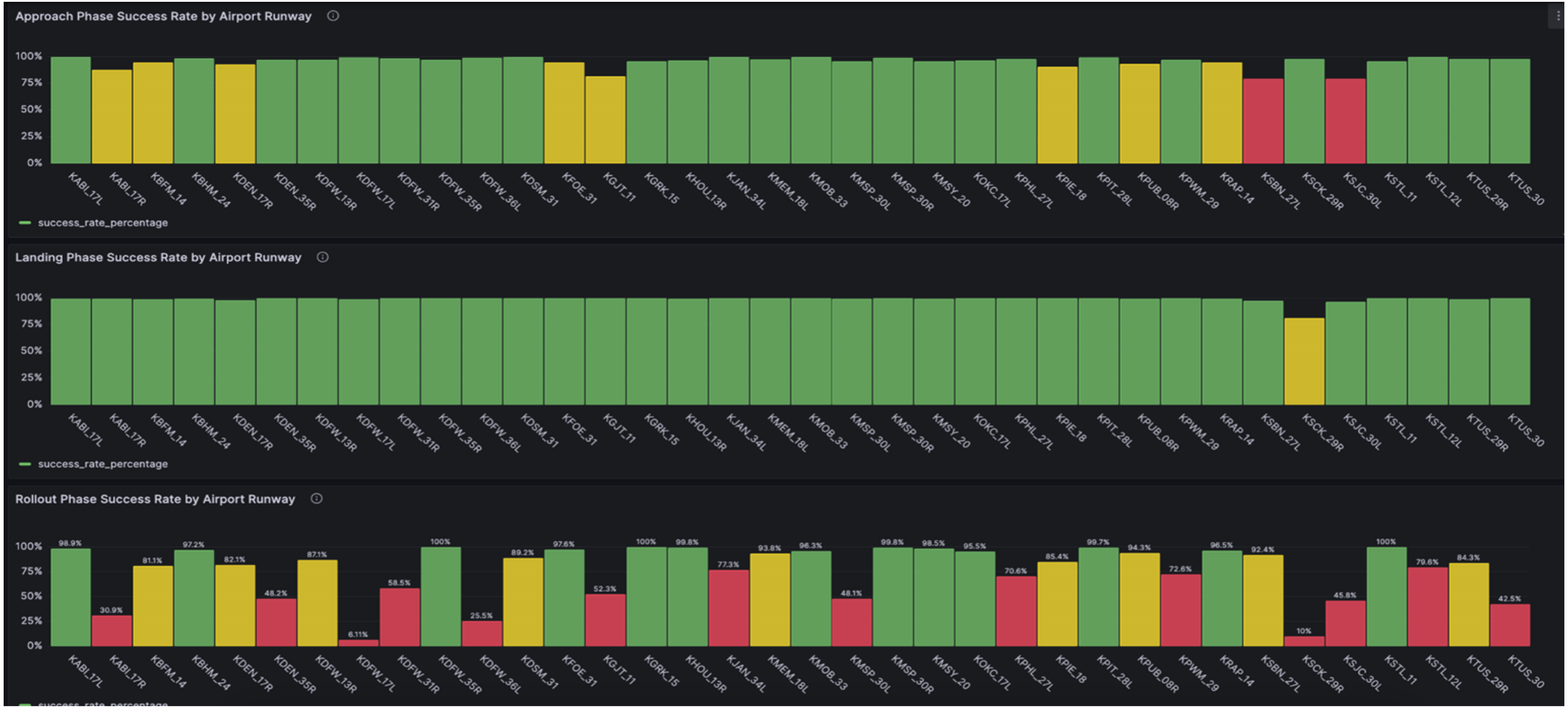
Example data to illustrate principle





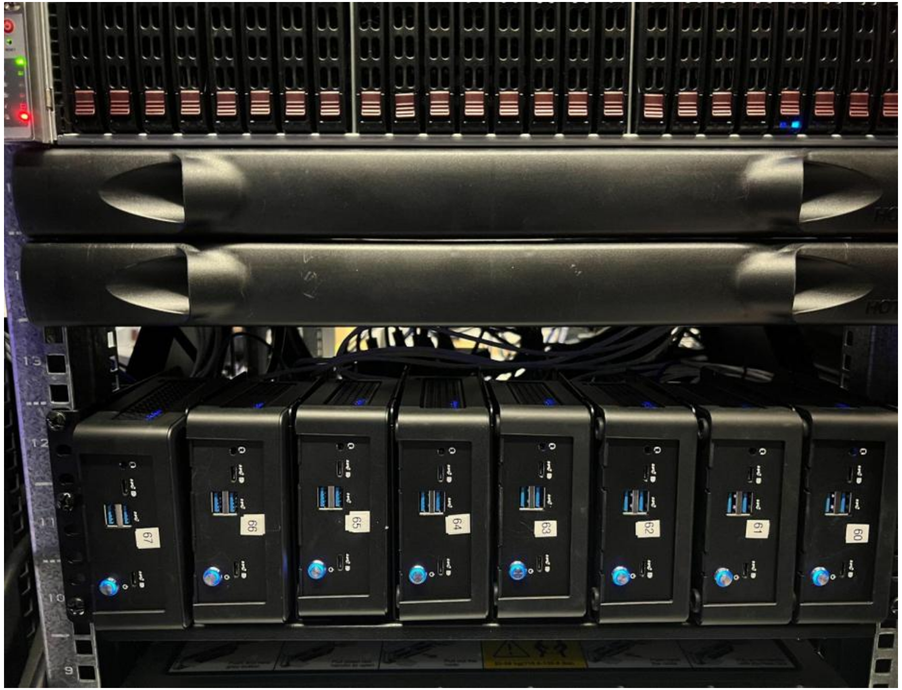
Detailed Statistical Failure Analysis

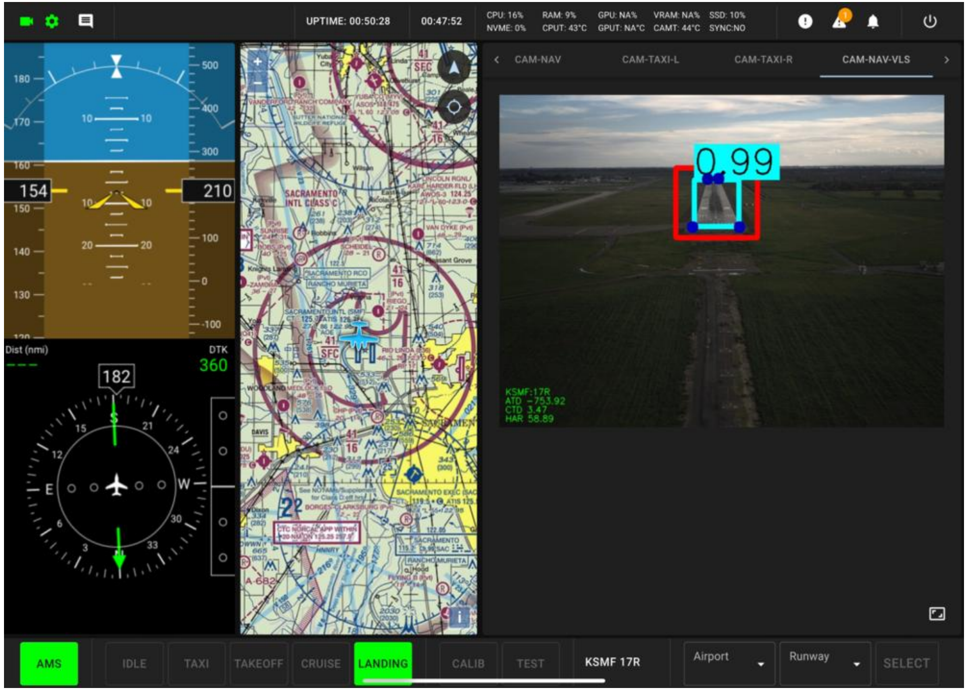
Example data to illustrate principle



Real-Time Testing on Target Embedded Hardware

Example data to illustrate principle



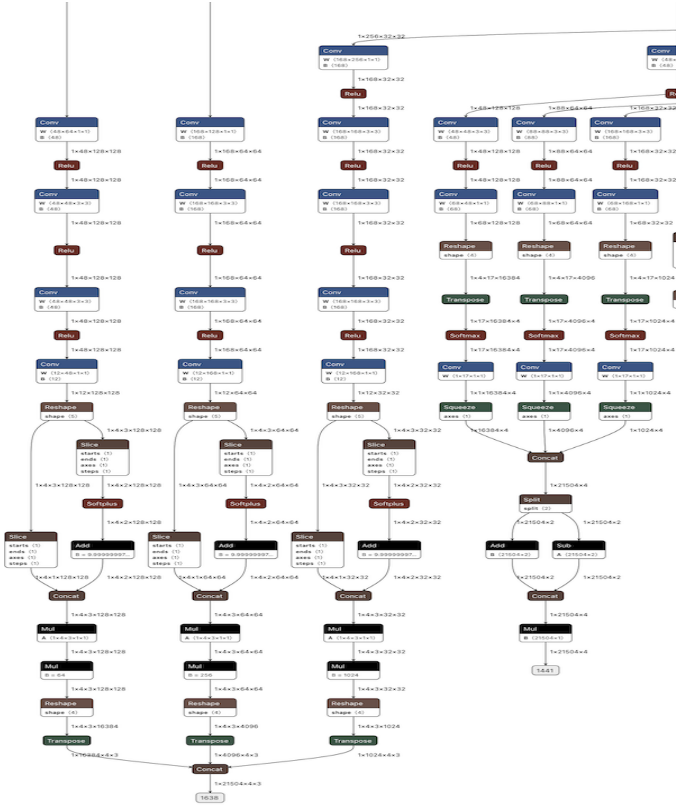


SIL - Embedded Computing Cluster

HIL - Flight Lab

On-Aircraft Embedded AI Computing

- Fit with aircraft ecosystem
- Size, weight, power
- Environmental conditions
- Hardware optimization, quantization, etc.
- Long-term availability
- Certifiability, incl. software components, accelerators, toolchains



Conclusion

➔ Massive increase in air traffic expected in next 15 years

➔ Future aircraft will be based on highly connected and automated digital platforms

➔ AI will be key enabler, such as for situational awareness and human/AI decision making

➔ Development of AI based flight functions follows data driven development framework

➔ Domain specific requirements for performance, safety, and certifiability

Thank you

https://acubed.airbus.com

https://acubed.airbus.com/projects/wayfinder/