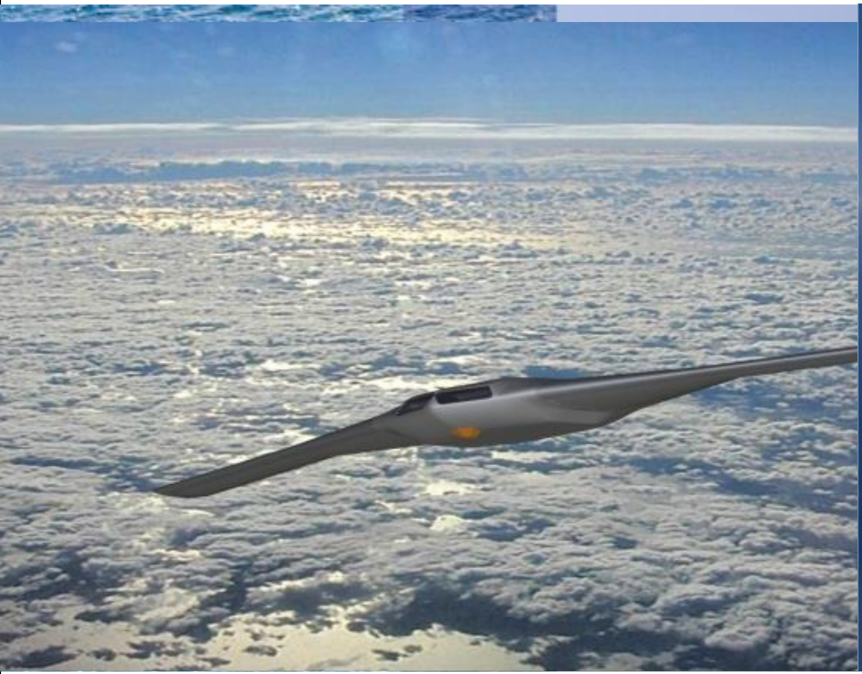
Challenges to Innovate in Complex Systems-Aviation

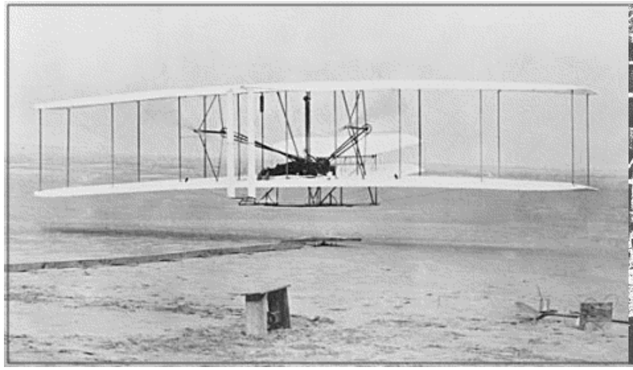


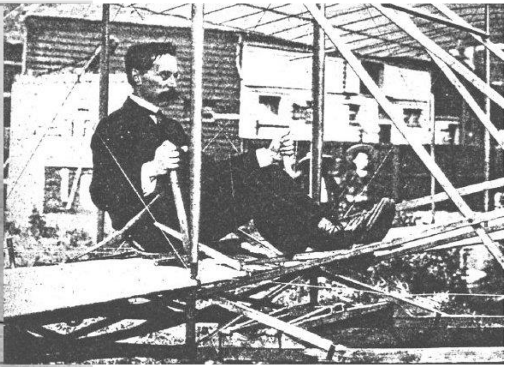
Gunnar Holmberg

13 November 2015

Innovation in Aviation

- 1903, Wright bros





- 1936- , DC-3

- Ca 1990:
  - Boeing 777
  - Airbus 330/340

Unmanned Aviation

UAV

Uninhabited Airborne Vehicle

UAS

Uninhabited Airborne System

RPAS

Remotely Piloted Air System

The operator is responsible, but not on board

Technology Sources-
leaps in miniaturization, reliability and affordability

Computing

Automation

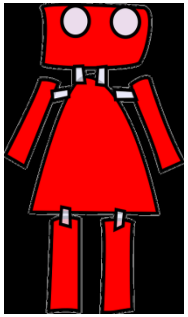
Communication

Controls

Sensor
Informatics

Batteries

Artificial
intelligence



Navigation

S/W

Unmanned Aviation

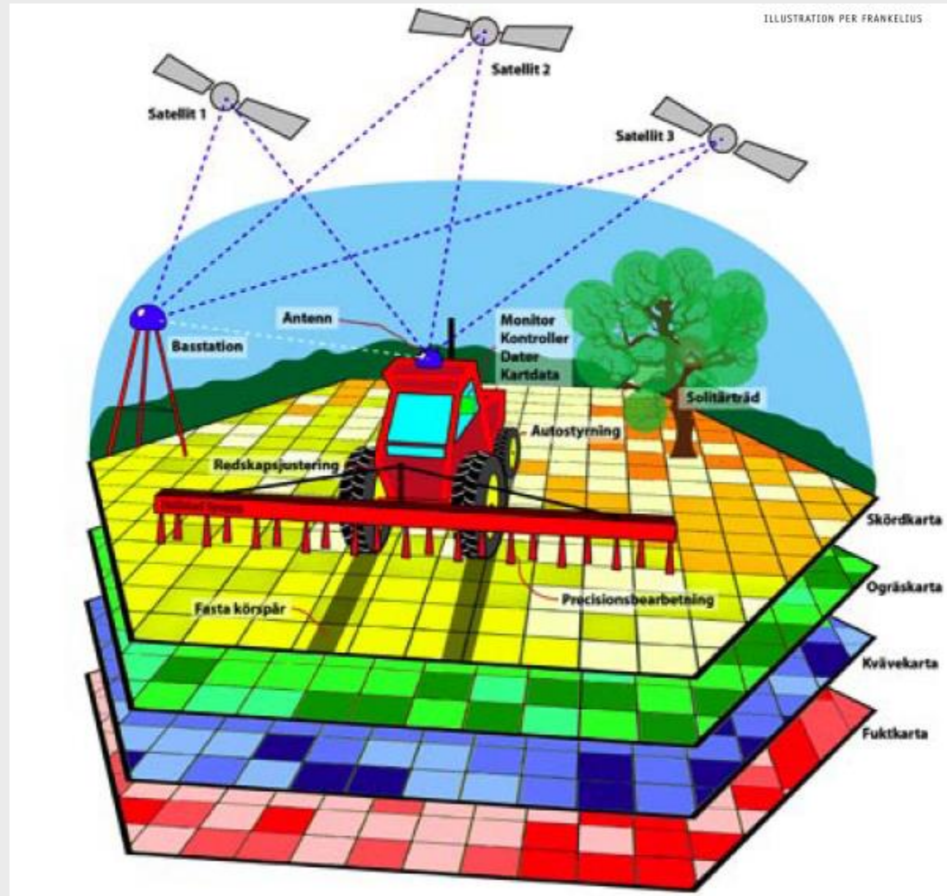
- Small RPAS
  - Mainly driven by mobile and laptop technologies
  - Operate outside normal airspace
  - Easily available
- Large RPAS
  - Aviation technology
  - Operate in normal airspace
  - Controlled and strictly limited availability

Disaster Relief

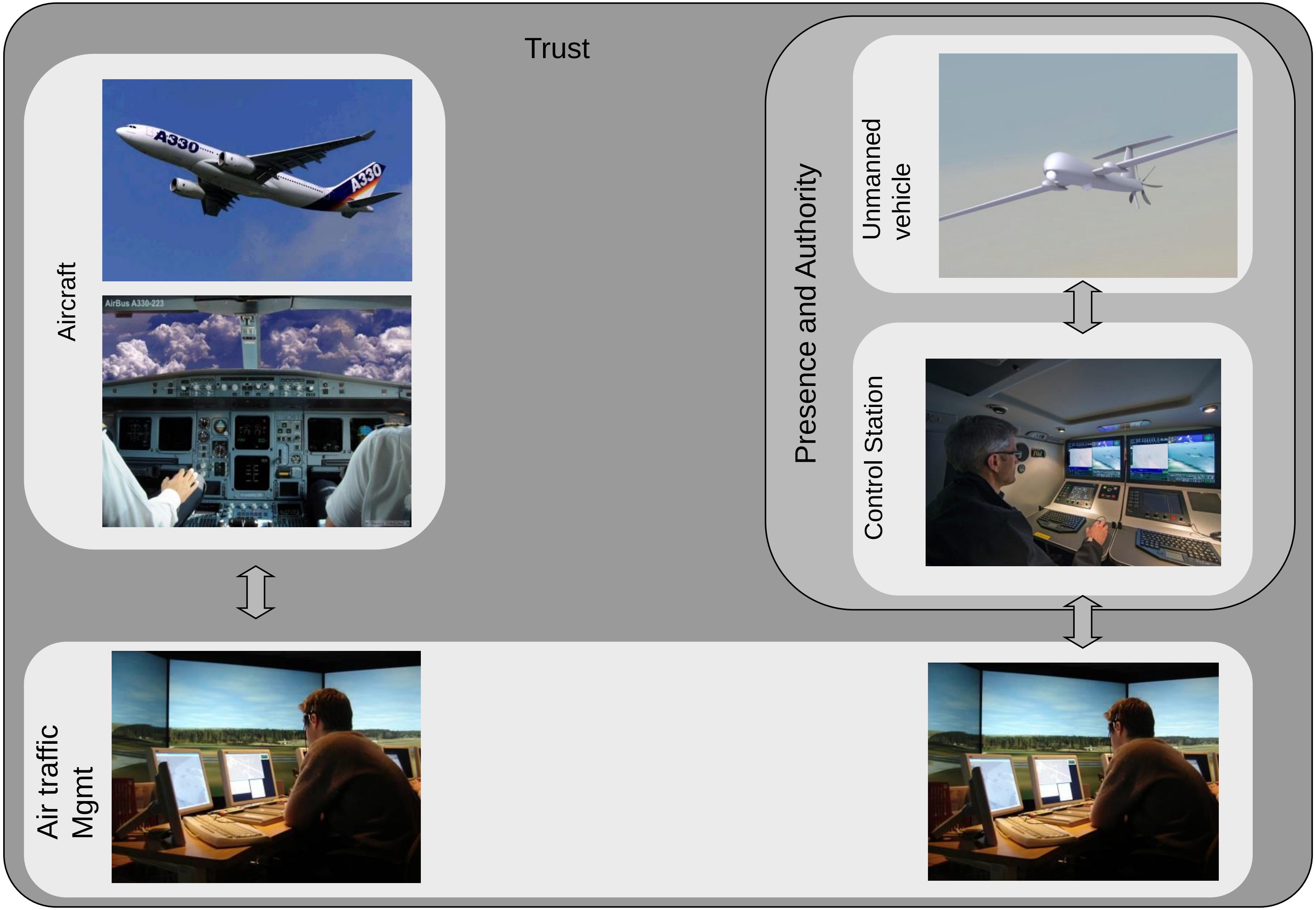
Linköping University research on unmanned intelligent systems cooperating with disaster relief teams able to handle challenging situations. Studied examples include:

- The 2004 south east Asia Tsunami
- The Fukushima nuclear disaster
- Missing people in the Alps

Agriculture and Forestry

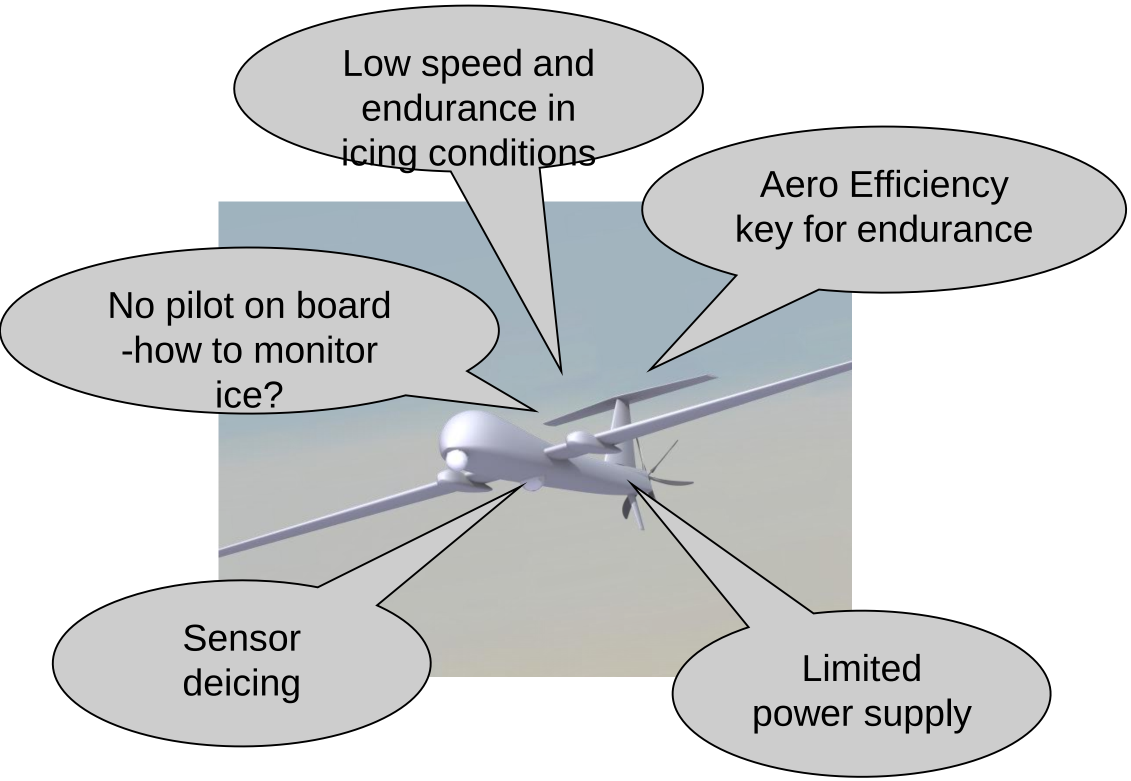


Challenges for unmanned flight in general airspace



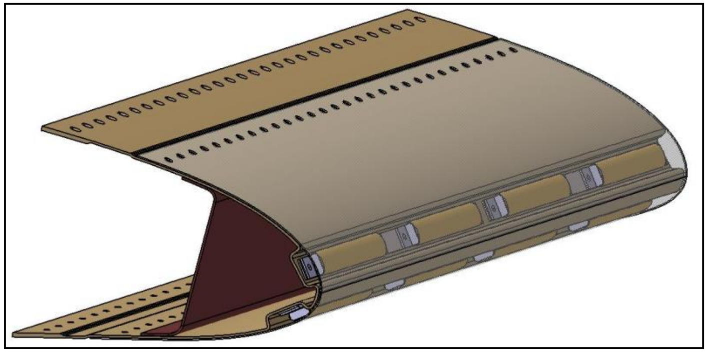
TECNOLOGIES FOR RPAS

ICING CONDITIONS DESIGN CONSIDERATIONS

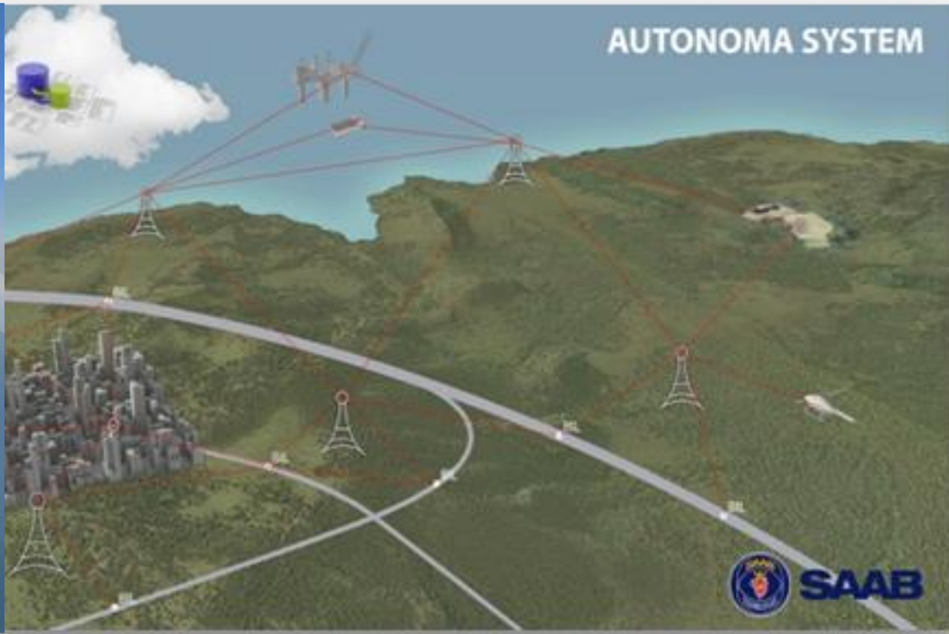


Development and miniaturization of ice sensor

- System design and how to use the ice sensor to achieve low power consumption
- Integration of the ice sensor into the structure



Future aviation is part of a heavily networked environment



Conclusions

- Leaps in technology enables new aviation opportunities
  - Wide range of innovation paces to be integrated- established processes in aviation are challenged
  - Architectures are key to be able to benefit from different innovation speeds
- The pilot/operator no longer needed on board, the flight could be managed elsewhere
  - Human constraints removed, such as size, maneuverability and endurance- small, low flying RPAS is a new niche in aviation
- Many exciting and useful applications
  - Immense set of ideas- we are in the beginning
- The ”Safety Contract”
  - Straight forward for large RPAS, maybe expensive
  - Still to agree needed safety for small RPAS- is the aviation perspective fair?


THE WORLD IS AN **EVER-CHANGING PLACE** AND OUR FIELD IS **DEFENCE AND SECURITY.** WE PUSH BOUNDARIES, SEEKING NEW AND BETTER SOLUTIONS. WE STRIVE TO **ANTICIPATE TOMORROW.**
THE WAY WE MANAGE **ARCHITECTURES** AND **INNOVATIONS** IS A CORNERSTONE IN OUR SUCCESS