



ELWIRA

Flying robot platform for control, guidance and mission experiments

Andreas Klöckner, DLR-RM



Outline

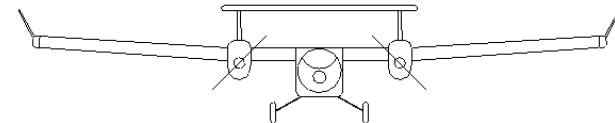
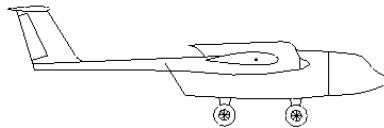
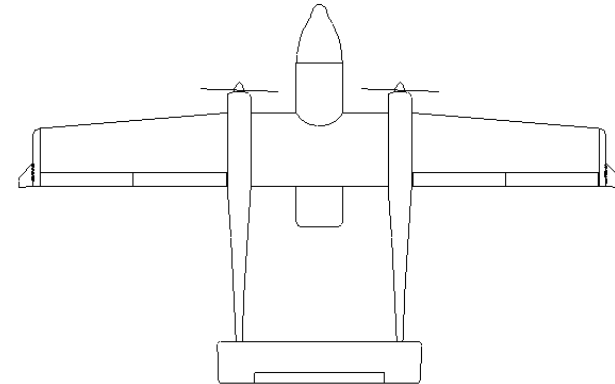
- ELWIRA configuration
 - Airframe
 - Autopilot
 - Operation
- Recent improvements
 - Autoland features
- Mission profiles
 - Sensor platform
 - Control and navigation
 - Mission experiments
- Outlook
 - Future missions
 - Future aircraft



Configuration: Airframe

Electric Low Weight Intelligent Radio-controlled Aircraft

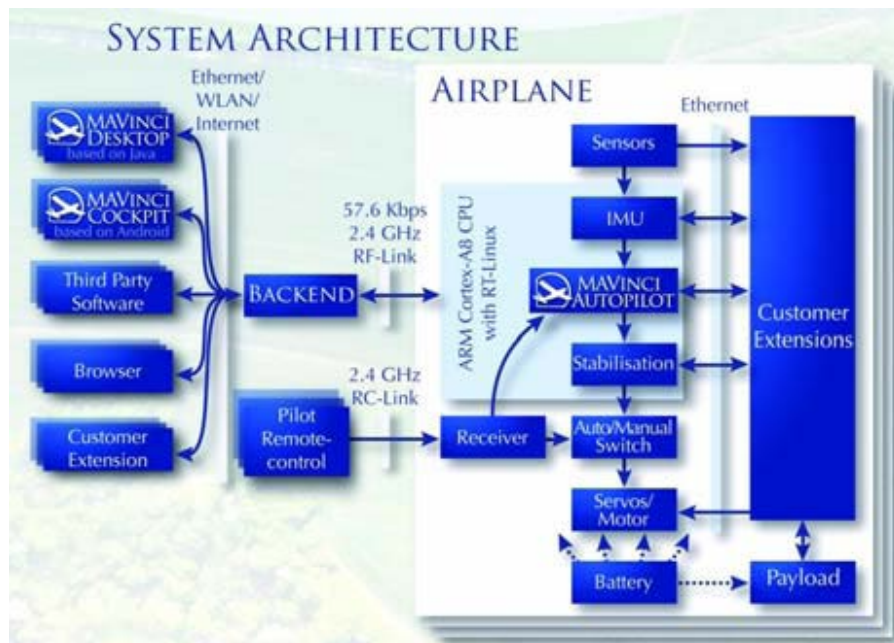
- Wing span: 4.3 m
- Flight time: 30 min
- Empty weight: 22 kg
- Payload: 15 kg
- Electric engines: 2 x 2 kW



Configuration: Autopilot

Control and guidance architecture

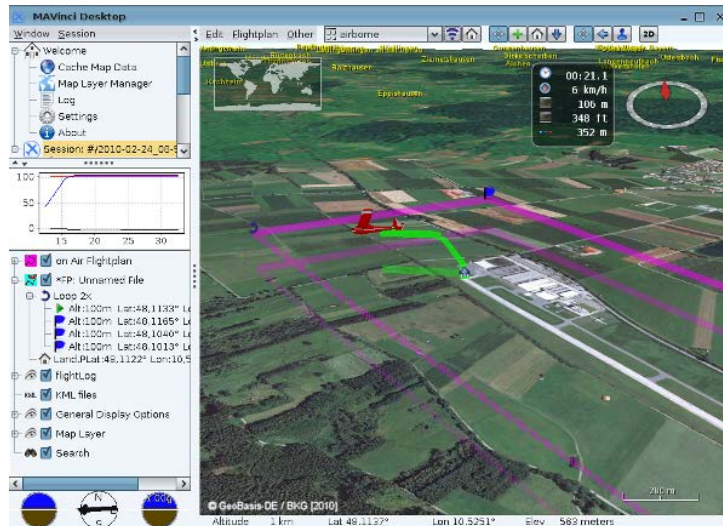
- Multiple control stations and UAVs, single radio link
- Automatic switches for safety pilot
- Extensions on separate board computer



Configuration: Operation

Flight experiments

- Waypoints in 3D world view
- Display of aircraft in 3D world
- Several mission profiles possible



Recent improvements: Autostart / Autoland

- Implementation as altitude hold with too few power
- Also possible with considerable amount of side wind



Autostart



Autoland

Mission profiles: Orthofotos and 3D world models

- Orthophotos can be taken from UAVs to cover a large area
- SGM Algorithm transforms aerial pictures into 3D maps



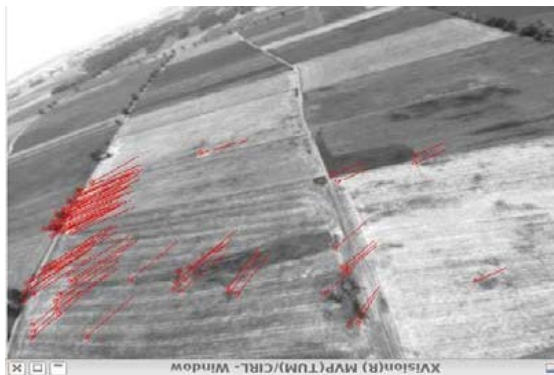
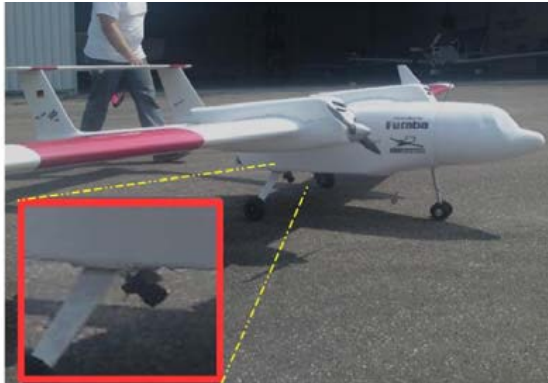
Orthophoto of erosion canyon
by MAVinci



Munich's Frauentom after
SGM processing

Mission profiles: Sensor platform

➤ e.g. vision based navigation



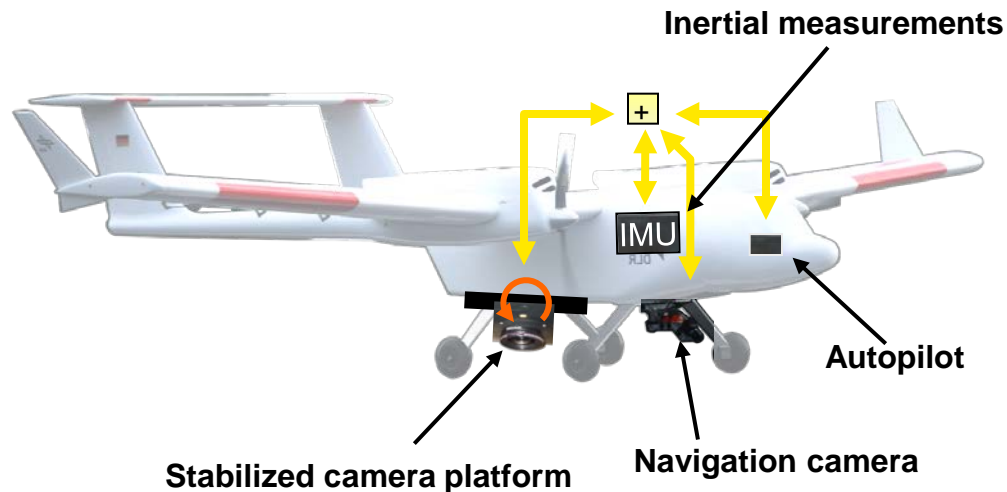
Technische Universität München



Deutsches Zentrum
für Luft- und Raumfahrt e.V.
in der Helmholtz-Gemeinschaft

Mission profiles: Control and navigation

- Fusion of inertial and vision sensors
- Complex interactions between sensors, image processing, flight dynamics and control



Outlook: Future missions

- Rescue missions in the mountains
- Automation in forestry
- High-performance control for bad weather
- Cooperation of different types of UAVs
- ...

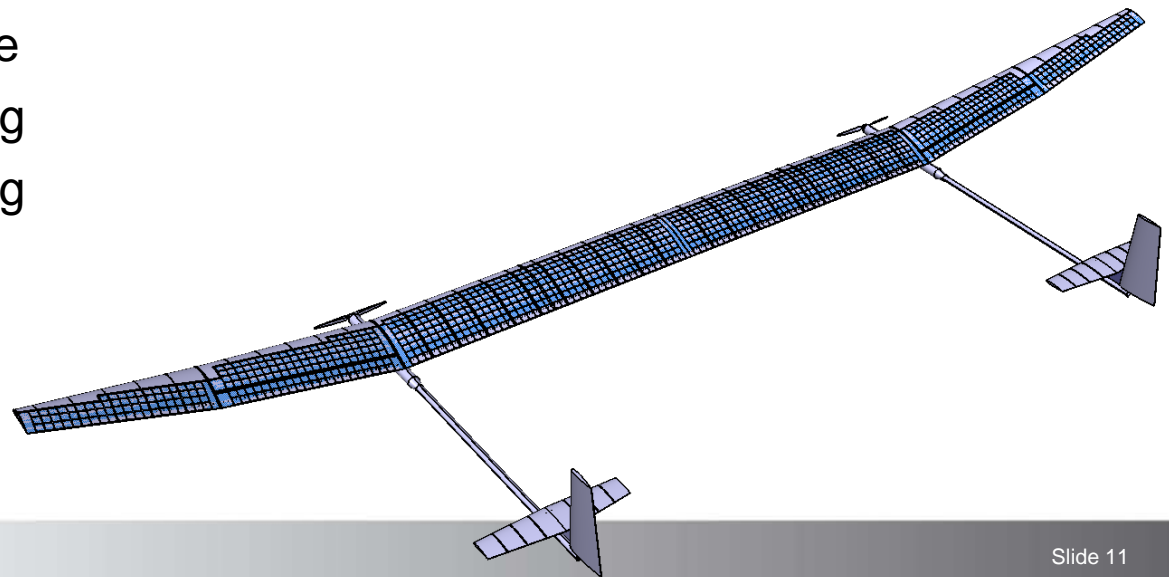


Outlook: Future aircraft

Electric High Altitude Solar Powered Aircraft

- Solar sailplane as alternative or supplement to satellites
- Proof of concept and control of elastic structure
- Projected for mid 2011

- Wing span: 23 m
- Flight time: infinite
- Empty weight: 100 kg
- Payload: 5 kg



Synopsis

- A flexible carrier UAV has been achieved
- Future missions and aircraft are envisaged
- Cooperation of many partners in research and industry



Technische Universität München

Point of contact:

Deutsches Zentrum für Luft- und Raumfahrt e.V.
Institut für Robotik und Mechatronik
D-82234 Oberpfaffenhofen-Weßling

Dipl.-Ing. Andreas Klöckner

➤ Visit us at booth F88!

www.dlr.de/rm

Andreas.Kloeckner@dlr.de

