Unmanned aerial systems (UAS) in atmospheric research
ES0802

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Year: 2

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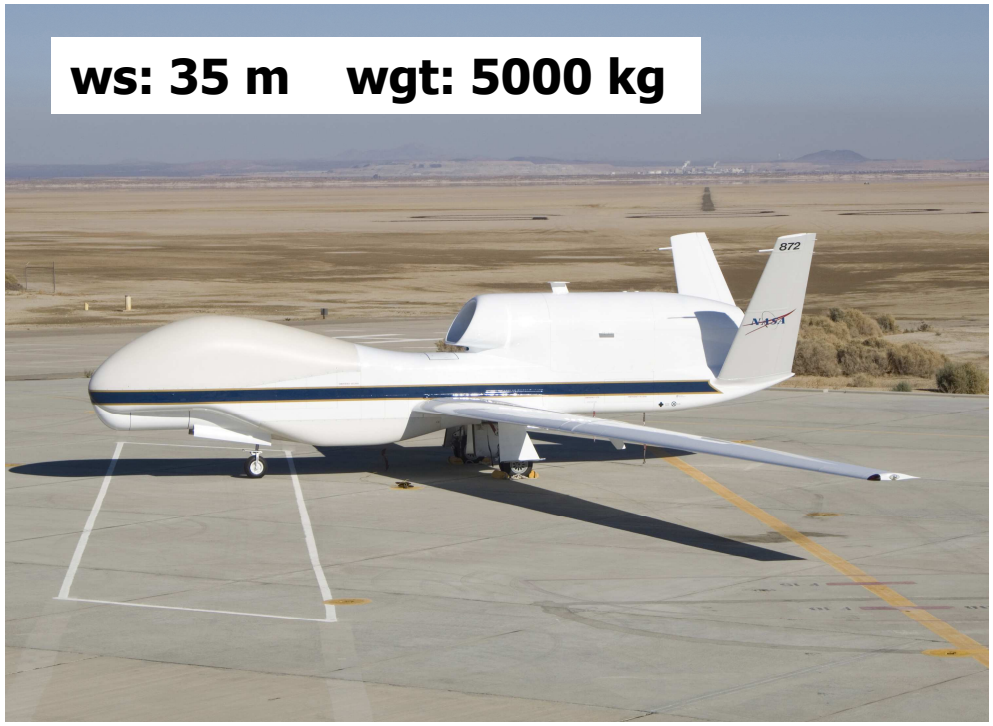
Scientific context and objectives

UAS for atmospheric research

SUMO: Small Unmanned Meteorological Observer (recoverable radiosonde)



Global Hawk intended for long-endurance atmospheric monitoring missions by NASA

Scientific context and objectives

A survey of recent research in meteorology/climatology identifies specific observational requirements for the future:

need for cost-efficient environmental monitoring tools with focus on the atmospheric boundary layer (ABL)

- close the observational gap between routine ground based and satellite measurements
- enable long-term monitoring with respect to climate change issues
- get better access to data in harsh/dangerous/hazardous environments
- to provide 3D meteorological data with high spatial and temporal resolution for the validation of fine-scale of numerical simulations and the test and improvement of the underlying BL parameterization schemes

UAS are the most promising approach, no realistic alternatives available in the near future

Scientific context and objectives

The main objective of the proposed action is the coordination of ongoing and the conception of future research on the development and application of unmanned aerial systems (UAS) to provide a cost-efficient, trans-boundary method for the monitoring of the atmospheric boundary layer and the underlying surface of the Earth.

Scientific context and objectives

- promotion of UAS as new tool to close the identified observational gap between ground based measurements and satellite observations
- compilation of databases of existing UAS and suitable sensors for atmospheric research to avoid unnecessary multiple inquiry and development
- conception and development of prototypes for a fleet of UAS of different size, operation range and complexity with respect to specific observational requirements
- development and test of UAS flight strategies for temporally and spatially highly resolved atmospheric measurements
- compilation of a database on UAS measurements in the atmospheric boundary layer for the validation of corresponding fine-scale numerical simulations
- coordination of legislative initiatives towards the Civil Aviation Authorities on both European and national levels to establish reliable and standardized rules and regulations for scientific UAS operations

Working groups

1. **UA systems**

   (airframes, propulsion, autopilot systems, ground control stations)

2. **UAS sensors for atmospheric research**

   (considering specific limitations with respect to size, weight and power consumption)

3. **High resolution 3D atmospheric measurements by UAS**

   (in particular for especially well suited boundary layer processes; stable BL, entrainment, BL turbulence, pollution issues)

4. **UAS operation**

   (legal aspects of UAS operation for scientific purposes; specific aspects of use in harsh, dangerous or hazardous environments)

Database compilation

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Unmanned Aerial Systems in Atmospheric Research

Name of System	Carolo T200
Type	Wing
Take-Off Weight	5.6 kg
Payload	
Propulsion Type	electrical
Number of Engines	2
Cruising Speed	72 km/h
Wing span / rotor diameter	2.0 m
Application Area	Meteorological reseach
Photo	
Autopilot	MINC
Manufacturer of autopilot	Mavionics
Sensors	Sensor package for humidity, temperature and wind vector
Known campaigns	British Antarctic Survey,...
Web site	www.mavionics.de
Contact (name)	Marco Buschmann
Contact (email)	info@mavionics.de
Compiled by	Burkhard Wrenger
Date of compilation	05.02.09

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Unmanned Aerial Systems in Atmospheric Research

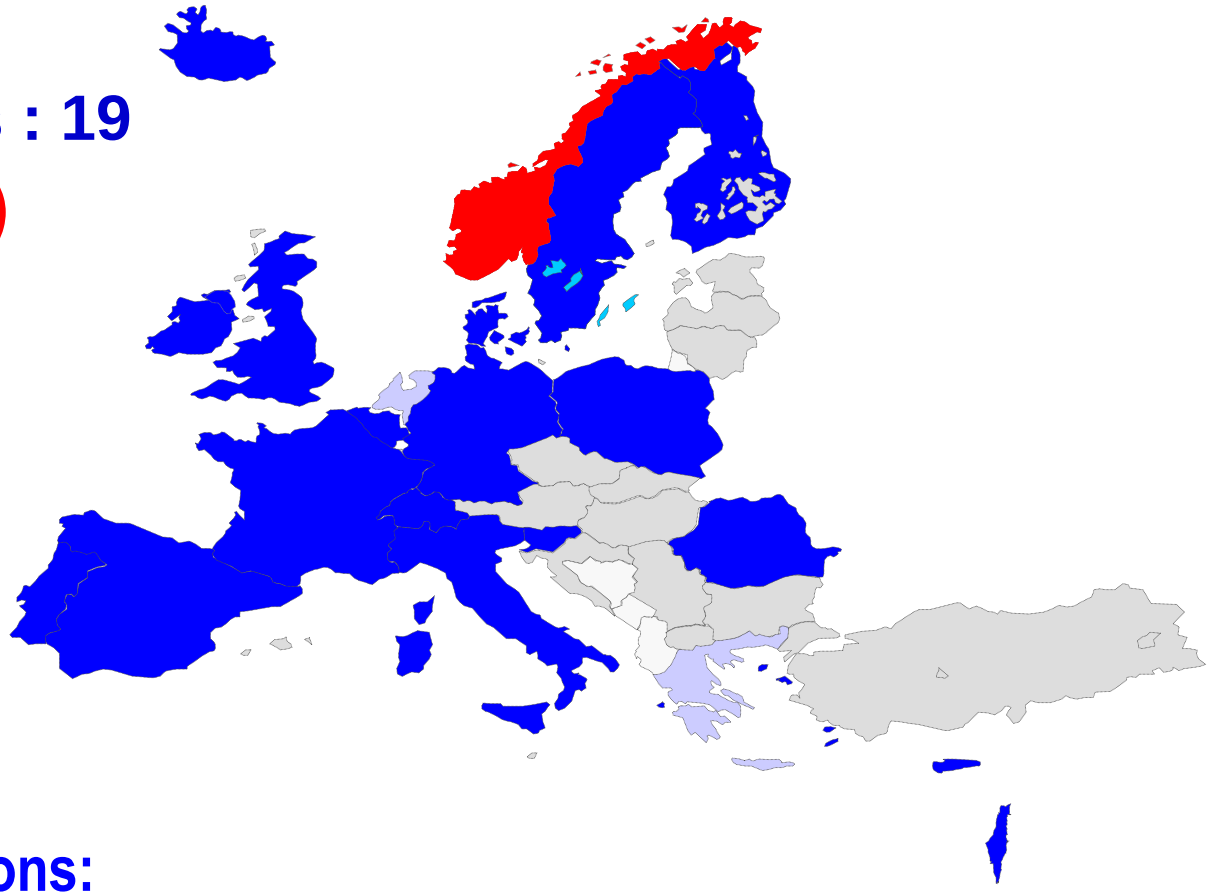
Name of Sensor	SCP1000
Type of Sensor	Absolute pressure
Principle of Operation	
Effective Range (min)	300
Effective Range (min)	1200
Unit of Effective Range	hPa
Resolution	0.015 hPa
Accuracy	1.5 hPa
Manufacturer	VTI Technologies
UAV	Sumo (University of Bergen)
Campaigns	FLOHOF campaign on Iceland
Contact (Name)	
Contact (Email)	
Website	www.vti.fi
Compiled by	Burkhard Wrenger
Date of Compilation	05.02.09
Photo	

Geographical impact

COST Countries : 19

Chair : NO (Norway)

BE, CH, CY, DE, DK, ES, FI, FR, IE, IL, IS, IT, NO, PL, PT, RO, SE, SV, UK



Non-COST institutions:

- NASA
- NOAA