

The logo is a large, light gray circular seal. It features a globe in the center with a yellow and orange arc above it. The text 'UNMANNED AIRCRAFT RESEARCH' is written along the top inner edge, and 'UNIVERSITY OF NORTH DAKOTA' is written along the bottom inner edge. The words 'MANNED' and 'RESEARCH' are partially obscured by the globe and the arc.

University of North Dakota Manned and Unmanned Aircraft Research Activities

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ICCAGRA Meeting – Stresa, Italy

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Overview

- Manned Airborne Research
 - – Citation II
- UAS Systems
 - Airspace Issues
 - Regulations
 - Payload Development
 - Risk Mitigation
 - Education



Overview

- Participating Academic Units
 - John D. Odegard School of Aerospace Sciences
 - Aviation, Atmospheric Sciences, Computer Sciences
 - School of Engineering and Mines
 - Electrical Engineering, Mechanical Engineering
 - College of Arts and Sciences
 - Psychology, Instructional Design and Technology
 - College of Nursing

University of North Dakota Citation II Research Aircraft

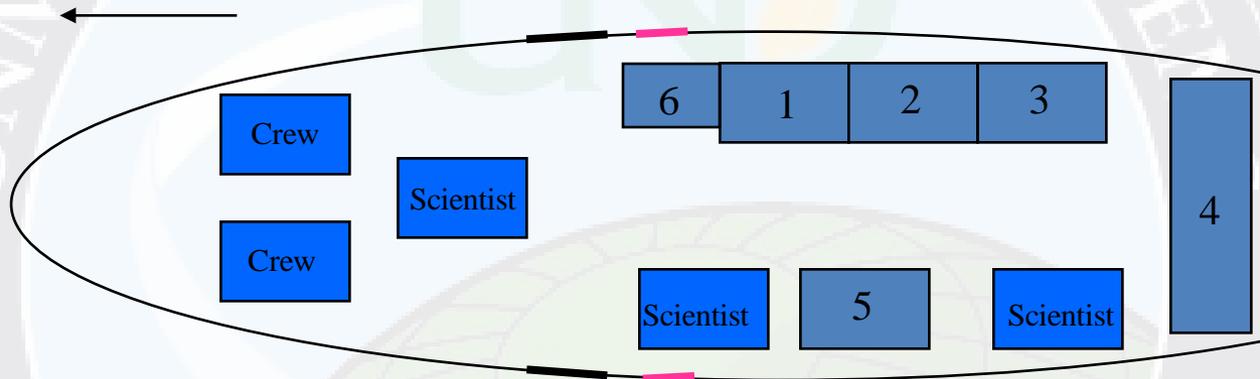


Citation II Capabilities

Ceiling	13.1 km (43,000')
Endurance	3-5 hrs
Weight: Empty/Max Ramp	3888/6682 kg
Speed: Cruise/Sampling	170/120 m s ⁻¹
Time to Climb: 25,000'/35,000/	13/24 min



UND Citation Cabin Plan



Instrument Rack



Seat



Window Insert



Door



Research Capability

- Cloud Microphysics
- Aerosol
- State Parameters and Winds (Inertial)
- Electric Field
- Dropsonde
- SEA Data System
- 4.3 KW Research Power

Summary of Measurement Capabilities

State Parameters

Temperature	Rosemount Total Temperature
Dew Point Temperature	Edgetech Cooled Mirror
Pressure	Rosemount
Water vapor mixing ratio	Maycomm TDL Hygrometer

Cloud Microphysics

Cloud Droplet Spectrum	DMT CDP
Cloud Particles	SPEC 2D or DMT CIP
Cloud Particles	PMS Optical Array 2D-C
Liquid Water Content	PMS King
Supercooled LWC	Rosemount Icing Rate Meter
Particle Images	SPEC CPI
Particle Images	SPEC HVPS

Aerosols and Chemistry

O ₃	Scinrix Chemiluminescent
NO _x	Scinrix Chemiluminescent
Particle Spectrometer	PMS Passive Cavity Spectrometer
CN Counter	TSI Alcohol Condensing

3-D Winds and Turbulence

Gust boom, Inertial Navigation System, Integrated GPS

UND Citation Operations

- Operated under FAA Part 91 Airworthiness Certificate, Restricted Category
- Progressive maintenance schedule per manufacturer
- Modifications done in house (contract DER) or at commercial facilities

UND Citation Funding Model

- Operated as a UND Cost Center
 - fully self-supported
 - Fixed costs = Insurance, Crew salaries, recurrency, misc.
 - Variable costs = Fuel, engine reserve, maintenance
- Costs pro-rated to length of deployment

University of North Dakota Airborne Research Education

- Education Programs
 - B.S., M.S., Ph.D.
- Research
 - Instrument Operation and Calibration
 - Data Processing
 - Data Analysis
 - Mission Planning

Overview

- **UAS related activities**
 - Sponsorship of 28+ Certificates of Authorization or Waiver (COAs)
 - **Alaska Marine Mammal Project (NOAA), Beaufort & Chukchi Seas, Summer 2008**
 - ScanEagle COA
 - Crop remote sensing projects in ND and MN (in progress)
 - **NOAA MOU (in negotiation)**

Overview

- **UAS related activities**

- Member, FAA sUAS Aviation Rulemaking Committee
- Arctic Monitoring and Assessment Program delegate, 2008
- AMAP Report to Arctic Council, October 2008
- Member, RTCA Special Committee-203 (**Minimum Performance Standards for Unmanned Aircraft System and Unmanned Aircraft**)
- Member, ASTM F-38 Committee (Unmanned Aircraft Systems)
- **Member, SAE G-10U Committee (Unmanned Aerospace Systems)**
- AUVSI Advocacy Committee

Overview

- **UAS related activities**
 - **Steering Committee, “Civilian Applications of Unmanned Aircraft Systems (CAUAS)” Conference, Boulder, CO, 2007 & 2009**
 - **UAS Steering Committee Member, Base Realignment Impact Committee, City and County of Grand Forks**
 - **Joint USAF and FAA Task Force for UAS airspace integration at GFAFB**
 - **JIPT/JPDO Team Member**
 - **DoD UAS Center of Excellence, Creech AFB**
 - **USAF and CBP Predator Training Program**
 - **Global Hawk Bed Down Team, GFAFB**

Overview

- **UAS related activities**

- **FAA-funded projects:**

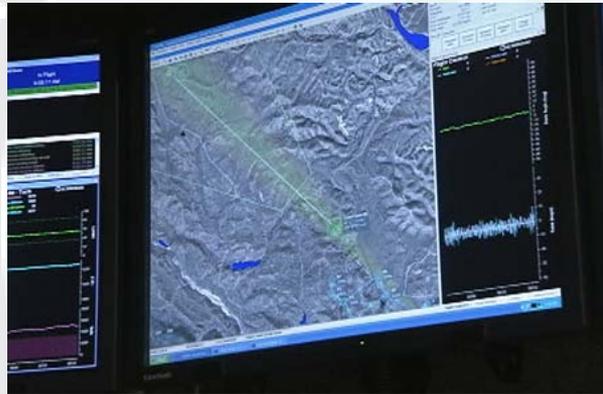
- **Unmanned Aircraft Systems Regulatory Review (published)**
 - **Unmanned Aircraft Systems Detect, Sense, & Avoid Study (published)**
 - **Analysis of 14 CFR Part 61 for Pilot, Flight Instructor and Ground Instructor Certification for Unmanned Aerial Systems (in progress)**
 - **Analysis of 14 CFR Parts 91 & 43 for UAS Applications (in progress)**
 - **Development of UAS Operational Data Concept (in progress)**

Overview

- **Planning stage for pipeline surveillance and monitoring program**
- **National Science Foundation Expert Reviewer, Proposal Title: “MSI: An Unmanned Aircraft Systems (UAS) Facility for Atmospheric Research,” January 2008**
- **3 UAS Centers of Excellence (DoD, ND, FAA)**
- **UAS Commercial Aviation Degree Program, Fall 2009**

University of North Dakota UAS Research & Education

- **Insitu's ScanEagle (in acquisition)**



Private Sector Partners

- Lockheed Martin
 - Access to Sky Spirit UAS
 - UAS technical expertise
 - UAS payload testing
 - Flights at Camp Ripley October 2006 & August 2007
- Raytheon
 - Access to Cobra UAS
 - UAS technical expertise
 - UAS payload testing
 - Flights at Camp Grafton South June 25-27, 2007



Private Sector Partners

AAI Corporation



American Crystal Sugar



Appareo Systems



Cirrus Design



PLANE GENIUS™

Composite Engineering Inc.



Diamond Aircraft



Evergreen



General Atomics



General Dynamics



Ideal Aerosmith



INSITU (Boeing)



Killdeer Mountain Mfg.



Laserlith Corp.



Mayo Clinic



Microsoft Corp.



Micro Systems Tech.



Northrop Grumman



Science Applications Intl. Corp



SEO Precision



Public Sector Partners

Cavalier County Job Development Authority



**Grand Forks Region Economic
Development Corporation**



ND National Guard/State of North Dakota



Red River Valley Research Corridor



Public Sector Partners

- NOAA (MOU pending)



- NASA



- DHS/Customs Border Protection



- Federal Aviation Administration



- Department of Defense/Air Force

