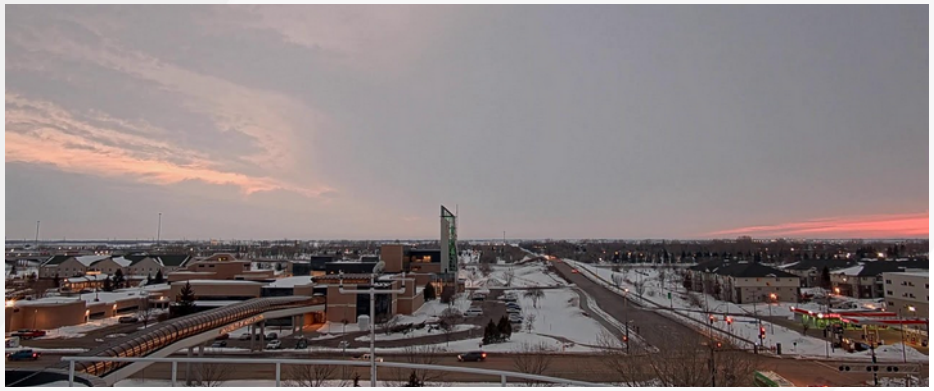
FAST -
Future Aerospace Strategic Thinking

David J. Delene

Aerospace Research Fellow

UNIVERSITY OF NORTH DAKOTA
ATMOSPHERIC SCIENCES



UNIVERSITY OF NORTH DAKOTA
EARTH SYSTEM SCIENCE & POLICY

UNIVERSITY OF NORTH DAKOTA
AVIATION

UNIVERSITY OF NORTH DAKOTA
SPACE STUDIES

UND AEROSPACE
UNIVERSITY OF NORTH DAKOTA

FAST Research Session Presentation Overview

- Future Research
  - Not an existing project.
- Aerospace Research
  - Involves aerospace personnel and facilities.
- Strategic Planning
  - FAST Presentation
  - Discussions
  - White Paper / Proposal
- Thinking about the Whole Project
  - Development of the project.

UND AEROSPACE
UNIVERSITY OF NORTH DAKOTA

FAST Research Session Presentation Format

- One Slide
  - Need/Problem
  - Concept
  - Apparatus
  - Objective
  - Advancement
  - End Users / Sponsor
- 3 Minute Presentation
- 3+ Minutes for Questions and Transition

UND AEROSPACE
UNIVERSITY OF NORTH DAKOTA

FAST Research Session Slide Summary

- Put everything on one slide.
  - Three main sections from left to right is good.
  - Somewhat similar to a conference poster.
  - Include a key concept figure, if possible.
  - Do not need to cover everything in 3 minute overview.
  - Covers material that would be in a White Paper.
- Next slide is a template to use.
  - Modified from NASA technology development slide.

Unmanned Aerial Vehicle (UAV) Based Measurements of Ice Clouds and Environment Related to Rocket Launch Exhaust Plume (UAV-REP)

Need/Problem

Current state of the art are large instruments deployed on costly piloted research aircraft.

There is a need for smaller, integrated systems capable of more remote deployment that can target specific high-altitude locations.

The proposed, multi-instrument sensor payload has the potential to offer new, time critical observations contributing valuable launch data to the new space economy.

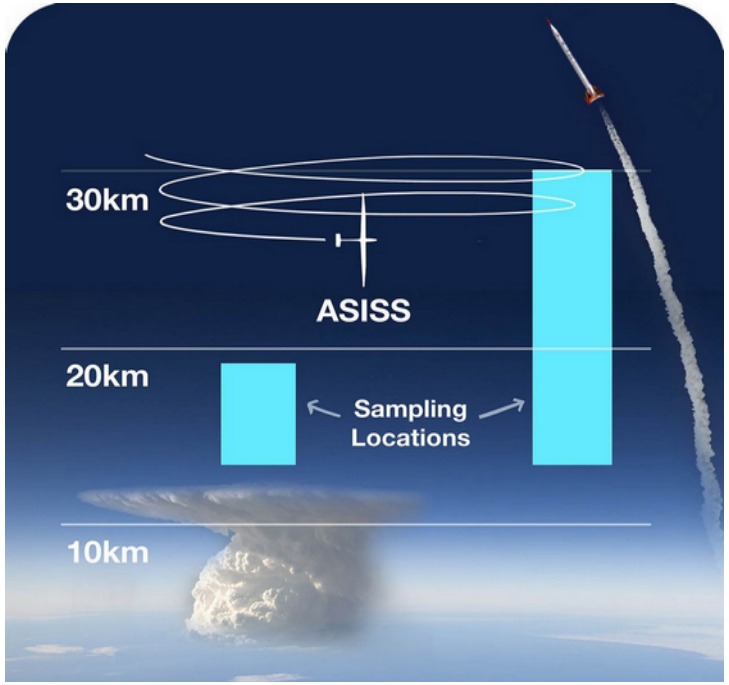
Concept

An Autonomous System for In-situ Stratospheric Sampling (ASISS) is a new, all-in-one instrument suite integrated into a balloon launched platform used to observer atmospheric state parameters, aerosols and ice particles.

The system is currently at Technology Readiness Level (TRL) of 5 having previously flown through boundary layer fog and cloud systems.

Apparatus/Facility

The hybrid, balloon launched, stratospheric glider and custom, in-situ weather and hydrometeor instrument suite has a combined weight of 18.5lbs, a wing-span of 12.8 ft and a fuselage length of 10 ft. Platform has battery power for the payload, avionics and telemetry, and a parachute equipped, with GPS capabilities.



Objective

Three-week field project at Cape Canaveral during peak thunderstorm weather with a 3-person crew from the proposer organization and a 3-person crew from the flight provider.

1.) Conduct ice, aerosol, and extinction sampling above, and through, thunderstorms to characterize environment.

2.) Conduct local and long distant rocket exhaust sampling, pre- and post-launch.

Advancement

The ability to quickly sample, retrieve and repeat both pre- and post-launch in a stratospheric, operational environment will move to this new, combined sensor suite to TRL 8.

End Users

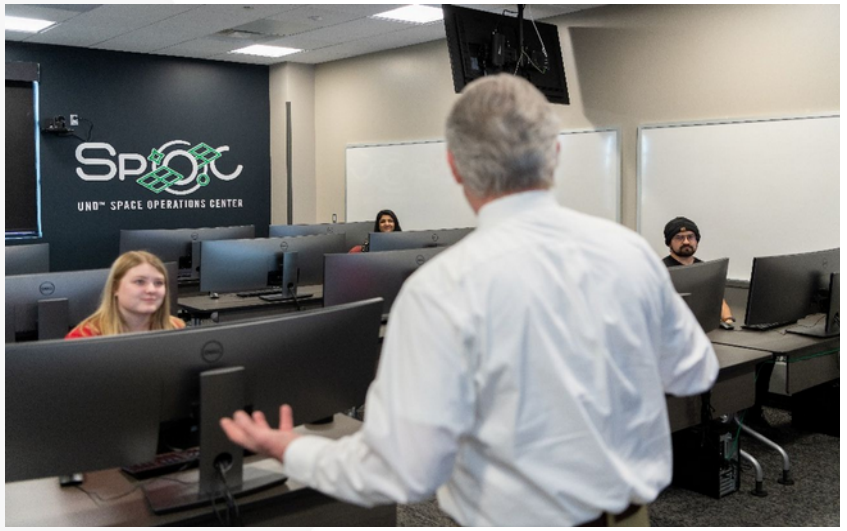
Researchers need quick and repeatable, high-altitude sampling to study cloud processes, climate change and rocket launch induced environmental changes, which include NASA's airborne science program, NOAA's Extreme Weather Office and launch providers.

Applicability: Autonomous, Low Cost, High Altitude, In-situ Meteorological Measurements

11/13/2024

FAST Research Session Attendee Participation

- Ask Questions following the Presentation
- Research Topic Discussions Follow-on
  - 1 pm Robin Hall Atrium
- Submit Research/Proposal Questions
  - Email, or Talk, to David Delene
- Informal Project Idea Discussion
  - Weds., 12-1 pm, Robin Hall Atrium
- Present at Future FAST Sessions
  - **February 12, 2025 at 12-1 pm**
  - September 2025 and November 2025



UND AEROSPACE
UNIVERSITY OF NORTH DAKOTA

September 11, 2024 FAST Presentation List

Marwa Majdi, Improved Nowcasting of Cloud Ceiling for Uncrewed Aircraft System (UAS) Operations using Surface Camera Images and Satellite Data

- White Paper under review at the FAA. Expect response by November 22nd (60 days).

Marcos Fernandes Tous, Effects of Ablation Processes in Hypersonic Reentry Vehicles over the Stratosphere

- Search for NASA proposal call where project could fit.

Sreejith Vidhyadharan Nair, Designing and Developing a Distributed, Low-cost Acoustic Counter-UAS System

- Search for place to submit proposal.

Daile Zhang, Aerial-Borne Electric Field Mills and Soundings for Studying Warm Clouds, Fogs, and Dust

- Obtained a 2024 UND Early Career Scholars Program Award (1/1/2025-12/31/2025)
- In-progress NSF (EAR/IF) White Paper (STTR Backup)
- In-progress NASA INSPYRE Letter of Intent (Due 12/6/2024)

Sean Hammond, Reimagining Victory Gardens: Small-scale Automation for Modern Backyards

- Proposal submitted to UND Connect, not funded. Waiting on reviews.

November 13, 2024 FAST Presentation List

Jacob (Jake) Carstens, Atmospheric Sciences

- UND Weather Update: Building a Student-Integrated Leader at the Intersection of Meteorology, Education, and Social Science

Nancy Jones, Space Studies

- Encouraging Research in Amateur Radio

Jeffrey VanLooy, ESSP

- LiDAR for Analysis of Rock Glacier Mass Balance and Water Quantity Calculations

Keith Crisman, Space Studies

- Casualty Autonomous Emergency Transport [CATT]