Departments/Centers Engaged in UAS Activity

- Biological Sciences
- Center for Computationally Assisted Science and Technology
- Geosciences
- Upper Great Plains Transportation Institute
- Visual Arts
- Architecture and Landscape Architecture
- Construction Management and Engineering
- Computer Science
- Electrical and Computer Engineering
- Civil and Environmental Engineering
- Mechanical Engineering
- Research, Education, and Outreach
- Extension Services
- Animal Sciences
- Range Science
- Plant Pathology
- Soil Science
- Plant Sciences
- Agribusiness and Applied Economics
- Agricultural & Biosystems Engineering
- Experiment Station Research Centers
Agricultural UAS Research

MULTI-DISCIPLINARY APPROACH

- Unmanned Vehicles
  - Remote Sensing
  - Data Collection

- Agricultural Domain Expertise

- Data Storage & Processing

- Data Analytics

- Agricultural Economics

- Agricultural Experiment Resources

- Agricultural Outreach

- UAS Flight Ops under Part 107
- Unmanned Ground Vehicles
- In-Field Sensors
- Satellite Imagery

- Agronomists, engineers, soil scientists, plant breeders, plant pathologists, entomologists, environmental scientists, animal scientists, rangeland scientists

- CCAST High Performance Computing

- Computer Science

- Agribusiness and Applied Economics

- Greenhouse Complex, Agricultural Research Extension Centers and Private Landowner Collaborator Fields

- NDSU Extension Service
Agricultural Research Involving UAS At NDSU

- CHS / NDSU Collaboration at Grand Farm:
  Aerial imagery to study dicamba drift impact in soybeans and wheat
- Agronomeye / NDSU Collaboration at Grand Farm:
  Aerial imagery for decision making on water management strategies,
  redevelopment proposals, financial feasibility, etc.
- Nutrient management in crops – prescriptions for in-season fertilizer application
- Crop disease detection
- Crop stand counts (number of plants that emerged)
- Weed detection and identification
- Precision spot spraying by UAS
- Soil health management practices
- Crop breeding – collection of phenotype trait data on field variety plots.
- Irrigation management - optimum amount and timing of irrigation for enhanced
crop yield, quality, and water productivity
- Blackbird deterrent strategies in sunflowers
- Wheat lodging detection / assessment
- Hail damage assessment
- Remote livestock tracking and animal health monitoring
- Hydrology / water management
Autonomous Research at UND

Mark Askelson
Executive Director, RIAS
Autonomous Research at UND

- Autonomy Grand Challenge
  - Research Institute for Autonomous Systems
    - Mission: Create autonomous systems and policies that serve society
  - Structure
    - Platforms
    - Applications
    - Data Supply Chain
    - Cybersecurity
    - Policy
  - Cross-college and departments
  - Voluntary participation
 Autonomous Research at UND

- Strategic Growth Areas
  - National Security
    - DoD
      - Space Force/Command
    - DHS
    - Industry
- Current Efforts Examples
  - AMG
  - DHS
  - ASSURE (FAA)
- Activity (total active this year)
  - RIAS Led: $6M
  - RIAS Affiliated: $5.5M
Autonomous Research at UND

• Example Current Project
  • ASSURE (FAA COE): sUAS (small Unmanned Aircraft system) Detect And Avoid
    • Objective
      • Provide answers to FAA to enable development of rules, regulations and standards for sUAS Detect and Avoid.
    • Team
ASSURE sUAS Detect And Avoid (cont.)

- Modeling to determine requirements to maintain well clear status
  - Well clear is safe separation between aircraft.
- Flight testing
  - Test plan for determining Detect And Avoid system performance.
  - Flight testing
Autonomous Research at UND

• Example Past Project
  • LD-CAP (Limited Deployment-Cooperative Airspace Project)
    • 2011-2017
  • Objectives
    • Evaluate Cooperative Autonomous Sense and Avoid
    • Develop advanced transponders (NDSU & Appareo)
  • Team
Autonomous Research at UND

- LD-CAP (continued)
  - Testing

- Avionics
  - Appareo
Autonomous Research at UND

Cooperative DAA
UND & NDSU
L3Harris
Appareo

Synthesis
Blueprint for Statewide BVLOS Effort
Successes include GFAFB & Xcel BVLOS
GFAFB
Grand Sky

NORTH DAKOTA Statewide UAS BVLOS Network

HUBNeT

Use of Cooperative Data
UND & NDSU
Industry Impact

Critical Partners/Successes include GFAFB & Xcel BVLOS
Autonomous Research at UND

Mark Askelson
Executive Director, RIAS