ENABLING UAS OPERATIONS THROUGH SUPPORT OF A UAS NETWORK INFRASTRUCTURE

NORTH DAKOTA UAS INDUSTRY DAY

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Current Challenge

BVLOS Flight Capability ➔ Economic Development
Required Capabilities

- Detect and Avoid
- Command and Control
- Airspace & Traffic Management

Integrated Capability Required for BVLOS
Solution through Partnership

- Cooperative Airspace Techniques & Visualization (CATV)
- Harris UAS BVLOS Network Infrastructure (HUBNet)
CATV Concept

- FAA Radar
- Primary Radar
- ADS-B Coverage Floor
- Augmented Coverage Area
- Broadband 3G/4G, or SATCOM
- ADS-B Out
- Local Surveillance Sensors
- Surveillance Relay Station
- UAS-Vue
- SBS System
- Symphony Infrastructure
- ADS-B
- ADS-R
- TIS-B
- FIS-B

RangeVue
- Avoidance Algorithm and Warning System

Risk and Safety Assessment
CATV: Enhanced Surveillance

- Harris ADS-B Xtend™ expanded surveillance coverage
- Utilized 6 NDAWN sites
  - Langdon, Cando, Harvey, Streeter, Bowman, & Crosby
  - Great collaboration with NDSU
- Analyzed FAA Radar Data for use with UAS
  - Finley ARSR-4 Enroute Radar
  - Fargo ASR-11 Terminal Radar
CATV Flight Tests

• Manned and Unmanned Aircraft Encounters
  • 38 Encounters

• Surveillance Data Feeding DAA Algorithms
  • RTCA and SARP Well-Clear Definitions

• Examined how flight crew uses RangeVue and DAA Algorithms to effectively maneuver UAS
HUBNet Concept

Build on CATV to bring together:

- Detect & Avoid services
- Command and Control services
- Airspace & traffic management
HUBNet Objectives

• Develop networked infrastructure to support BVLOS UAS operations

• Further identify End Users and Technology Partners
  • Initial End Users (utility, transportation, agriculture, and emergency services)
  • Potential technology partners (radio, radar, towers)

• Analysis of Infrastructure that is Scalable and NAS-wide
  • Partner with entities owning current infrastructure
  • Coordinate FAA approvals with input to regulations and standards process

Utilize Partner’s Infrastructure

- Grand Forks
- Fargo

BNSF Railway infrastructure
Xcel Energy and other power infrastructure
ND Department of Emergency Services radio network towers
ND Agricultural Weather Network
Hillsboro Municipal airport
BVLOS Pilot Project Network Overview

Surveillance + DAA + C2 + Payload + Voice

- ISM Band 5800 MHz
- Aeronautical Frequency, Spectrum UAT 978 or 1030/1090 MHz
- Ku Band 16.21-16.50 GHz
- L Band 900 – 1164 MHz
- ISM Band 2.4/5 GHz
- LTE 1700 – 2100 MHz
- VHF 118-137 MHz

CNPC Radio Options to be evaluated and demonstrated during Pilot Program

North Dakota Intranet
Why North Dakota?

Leading FAA designated test site for commercial UAS testing
- Vision, executive leadership, experts, investments
- Actively pursuing BVLOS UAS applications

Strong State of North Dakota support for UAS research and economic development

Geography enables the testing of a wide variety of UAS applications
- Remote and safe area
- All key customer industries present
- Four seasons, day-and-night conditions

Existing communications infrastructure that can be leveraged
Flight Operations w/ NP UAS TS

• Fly UAS Use Cases within Network Infrastructure to determine viability of the infrastructure to support such applications

• Expected Use Cases
  • Transmission Line Inspection
  • Railway Inspection
  • Roadway Inspection
  • Precision Agriculture
  • Public Safety/Emergency Services
  • Expanded flight operations
    • E.g., higher density controlled airspace under a variety of flight rules and meteorological conditions
Questions?