ENHANCING THE BAKKAN WITH BEYOND VISUAL LINE OF SIGHT (BVLOS) UNMANNED AIRCRAFT SYSTEMS (UAS)

JAMES CIEPLAK
UAS Commercial Solutions, Harris Corporation
Commercial UAS market growth accelerating and ahead of forecast

**Commercial UAS fleet**

<table>
<thead>
<tr>
<th>Year</th>
<th># UAS ('000)</th>
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<tbody>
<tr>
<td>2016</td>
<td>42</td>
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<tr>
<td>2017</td>
<td>111</td>
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<tr>
<td>2018</td>
<td>150</td>
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<tr>
<td>2019</td>
<td>452</td>
</tr>
<tr>
<td>2020</td>
<td>718</td>
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<tr>
<td>2021</td>
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<td>2022</td>
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Growing number of applications

- **Oil & Gas:**
  - Pipeline Inspection
  - Infrastructure Inspection
- **Railroad utilities:**
  - Rail inspection
  - Policing and security
- **Power utilities:**
  - Powerline inspection
  - Vegetation management
- **Public safety:**
  - Accident response
  - Surveillance
- **Package delivery:**
  - Consumer products
  - Food products
- **Precision agriculture:**
  - Crop monitoring
  - Chemical spraying

1 FY2018-38 FAA Aerospace Forecast

150K reported at end April vs. 170K forecast for “High Scenario”
Harris is a trusted partner to the Federal Aviation Administration

30 year partnership

Core competencies in air traffic management communications, weather and surveillance

Supporting 5 of 7 NextGen transformational programs, modernizing the National Airspace System (NAS)

600+ employees supporting NAS programs

Three Harris facilities (Melbourne, FL, Atlanta, GA and Herndon, VA); supporting 5,500 FAA facilities in 50 states plus Puerto Rico, Caribbean, Canada and Mexico

$300M+ of Harris investment
Harris leadership across the UAS industry

**FAA Pathfinder & PSP Programs**

- Extended visual line-of-sight operations in rural areas
- Harris supplying live manned aircraft data from the FAA
- Beyond visual line-of-sight inspections in rural and remote areas
- Harris providing Detect-and-Avoid solution
- Beyond visual line-of-sight inspection of transmission power lines
- Harris providing an integrated BVLOS network

**FAA-designated UAS test sites**

- Harris engaged with all six official FAA test sites

**Electric Utility**

- Detect-and-Avoid solution

**Standards and Regulations**

- UAS Special Committee-228 member with active participation in the development of command and control (C2) Data Link and Detect-and-Avoid (DAA) UAS standards
- Actively developing small UAS DAA and critical surveillance solutions for the FAA’s University consortium Center of Excellence for UAS
- Drone Advisory Committee member advising on how best to integrate UAS in the NAS

**NASA UTM Program**

- Harris is the lead surveillance systems integrator
Harris is collaborating extensively across the State of North Dakota.

**Initiative**

- FAA BVLOS project - inspection of high voltage lines for a power utility
- Harris **contracted with NPUASTS** for operations
  - Detect-And Avoid capability proof-of-concept
  - Command & Control system proof-of-concept
- Long-term partnership agreement **NPUASTS-Harris**
  - Collaborating on NASA demos and research
- FAA BVLOS project at **Grand Forks AFB**
  - Harris surveillance system installed
  - To be operated initially by NPUASTS
- **Harris buying key surveillance product from a Fargo-based avionic supplier**
- **Harris licensed 2 patents** on commercial terms
  - Monetizing existing research and IP

**Results**

- First-in-the-country **BVLOS for power utility**
  - Customer also operates in ND
- **First-in-the-country state-wide ADS-B network and UAS network deployment**
- Successful **demos**
  - Expecting to win research awards
- **First-in-the-country BVLOS UAS in controlled airspace**
  - DoD training flights soon
- **Win-win commercial relationship**
  - Growing business in ND
- **Future Royalty payments** to UND
  - First-to-market UAS surveillance solution
Enabling UAS Operations Beyond Visual Line of Sight (BVLOS)

Fuses multiple surveillance data sets through high accuracy Detect-and-Avoid solution

Provides a mission-critical Command & Control link delivered by an aviation-grade communications network

Transfers sensor data through a highly secure payload data link

Support flight operations integrated with National Airspace System (NAS) and local aviation information
Overview of the concept of a “Bakken BVLOS UAS Network”

Public Private Partnership (PPP) between the State of ND, Northern Plains UAS Test Site, and private industry

Proof-of-Concept demonstration project for UAS Network deployment in the Energy industry (e.g. within the Bakken footprint)

Develop business plans for Bakkan BVLOS UAS deployment

Test and mature a Bakken-specific solution and make it deployment-ready for a wide-scale implementation

Secure FAA authorizations
UAS Network deployment will generate multiple benefits for the O&G industry in North Dakota

A single investment will be generating multiple value streams for multiple energy sector companies

- Infrastructure inspection
- Environmental compliance
- Reduced lost revenue

The same UAS network will support additional non-O&G customers

- Private industry (e.g. agriculture)
- Government (e.g. Public Safety)
- Research & Education

UAS applications

- Leak detection
- Construction
- Pipeline inspection
- Infrastructure inspection
- Right of Way management
- Assets protection (Safety and Security)
Goals for a Bakken UAS BVLOS Program

Develop a **thorough understanding of how UAS can transform the energy industry** to improve safety, costs, customer service, environmental compliance, and drive revenue.

Develop extensive insights about how UAS can **support multiple other industrial and public customers** in North Dakota.

**Evolve UAS technology and validate readiness** to be deployed at scale across the Bakken.

**Goal:** To establish the State of ND as a leader in oil/gas UAS research and operations, while enhancing the oil/gas industry and accelerating growth of the UAS industry in North Dakota.
Next steps

1. Launch a core “UAS Bakken Team”
   - Multiple stakeholders – energy industry, UAS industry, state and local government, etc.
   - Public-Private-Partnership (PPP) – e.g. every stakeholder will contribute

2. Refine a Bakkan “UAS Network” concept
   - Customer operational use cases
   - Preliminary business cases
   - UAS technology and infrastructure solutions
   - Payload sensors and data analysis
   - High-level program plan

3. Apply for a matching grant from the Oil & Gas Research Council
James J. Cieplak
Director Business Development and Strategy
UAS Commercial Solutions, Harris Corporation
+1-571-287-1284  james.cieplak@harris.com  www.harris.com