



MHA Nation Drone Project: Planning and Protocol Development

Strengthening Mobility and Revolutionizing Transportation (SMART) Grant
FY22N1P1G3 Implementation Plan

Recipient: MHA Nation: Mandan, Hidatsa, and Sahnish; Three Affiliated Tribes of Fort Berthold Reservation

Fiscal Year of Award: 2022

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Report Submitted By: The Mandan Hidatsa Arikara Nation and their MHA Drone Planning and Protocol Development Partners: University of North Dakota, Nueta Hidatsa Sahnish College, Northern Plains UAS Test Site, Airspace Link, and Thales.

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Part 1: Introduction and Project Overview

Real-World Issues and Challenges:

The real-world issue that the MHA Nation Drones Planning and Protocol Development project is addressing is the adoption of innovative aviation technology (drones or Uncrewed Aircraft Systems) to serve the citizens of the Mandan Hidatsa and Arikara (MHA) Nation /Three Affiliated Tribes of the Fort Berthold Reservation through the commercial delivery of life-saving medication. Efforts began on 15 August 2023, with many partners and stakeholders engaged to ensure project success, including the University of North Dakota (UND) who sub-contracted with NHS (Nueta Hidatsa Sahnish) College, the Northern Plains UAS Test Site, Airspace Link, Valkyrie/Matador (Valkyrie) UAS Logistics, and Thales. The goal is to develop a scalable plan for Uncrewed Aircraft Systems (UASs) to serve historically underserved rural populations to improve their access to medical care, medication, and life-saving equipment through autonomous systems. This effort includes a workforce development program to advance local training in autonomous systems.

The funding is one step towards addressing significant transportation barriers due to the flooding of our Tribal lands by the United States Army Core of Engineers in the 1950s. The Garrison dam was built on the Upper Missouri as part of the Pick-Sloan Plan that created Lake Sakakawea, a reservoir lake that extends across five counties both on and off the reservation. Due to the flooding, a sole one-mile-long bridge connects six segments of MHA Nation creating the unfortunate reality of extensive travel and backtracking to cross the bridge to meet basic needs and to gain access to emergency response and medications at the core health care center, Elbowoods Memorial Health Center located in New Town, ND. New Town was created due to the dam's creation.



Figure 1: Bridge Connecting 6 Segments of MHA Nation

Ground transportation involves driving in rural areas with rugged landscapes and on roads with heavy oil field production traffic. This, combined often with inclement weather conditions, makes travel difficult, especially in the winter months. UASs will allow transportation of medical and commercial goods and resources across Tribal lands without the ground transportation limitation of access to one bridge that crosses the Missouri River.

The MHA Nation, along with its partners, is developing a proof-of-concept in Stage 1 for the transport of medical samples and medicines between the clinics of Twin Buttes and New Town, North Dakota (ND). The introduction of a direct flight option between New Town and Twin Buttes using UAS can save upwards of 3 hours in a ground vehicle making a round-trip between the two clinics. Additionally, this allows an option to provide these critical medical services when transportation may not even be possible by ground vehicle due to the closure of roads and bridges due to accidents, inclement weather, or a lack of transportation capability by a patient. The map below shows the ground transportation route (dark blue) and air transport corridor (light blue) between New Town and Twin Buttes.

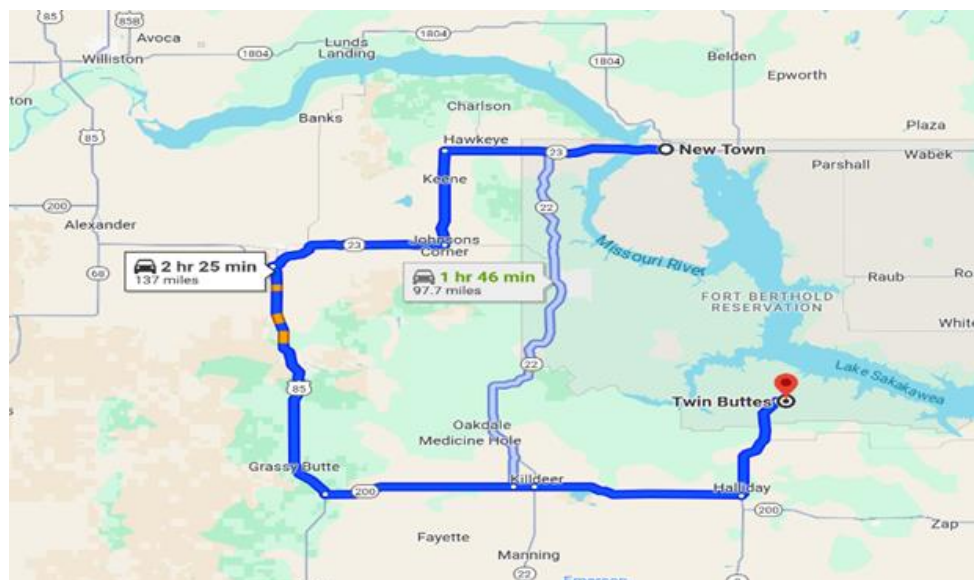


Figure 2: Driving Route Between Clinics

Geographic Area:

The Three Affiliated Tribes of Fort Berthold Reservation, MHA Nation, resides in a large rural area designated as a Historically Disadvantaged Community (HDC). MHA Nation is located along both sides of the Missouri River (Lake Sakakawea) in north-central North Dakota on the Fort Berthold Indian Reservation (map provided below). The land mass includes wide open plains and grasslands that border six ND counties including McLean, McHenry, Mountrail, Dunn, Mercer, and Ward. These mineral-rich Tribal lands encompass 988,000 acres, with 457,837 acres (about half the area of Rhode Island) being owned by Native

Americans as individual allotments or communally by the Tribe. The governing structure is based on geography, with six segments including Four Bears, Mandaree West, New Town North, Parshall Northeast, Twin Buttes South, and White Shield East. Of note, the US Department of Interior in 2022 reaffirmed that the Missouri riverbed within the Fort Berthold Reservation belongs to MHA Nation following extensive disagreements. Historically, the native lands of the Mandan Hidatsa and Arikara people extended from ND across the Missouri River basin through western Montana and Wyoming. A comprehensive history of the geography MHA Nation is provided at <https://www.mhanation.com/history>.

With this challenging geography, creating the opportunity for MHA Nation to provide UAS services within the flight corridor depicted in the image below will dramatically improve commercial access to resources. Using UASs is an opportunity for the citizens of MHA Nation to secure vital supplies, in some cases lifesaving, in a fraction of the time it would take using traditional, roadway-based transportation. The DOT has created an opportunity, via the SMART Grant, that will help to expedite realization of use cases that would have otherwise taken many more years to realize.

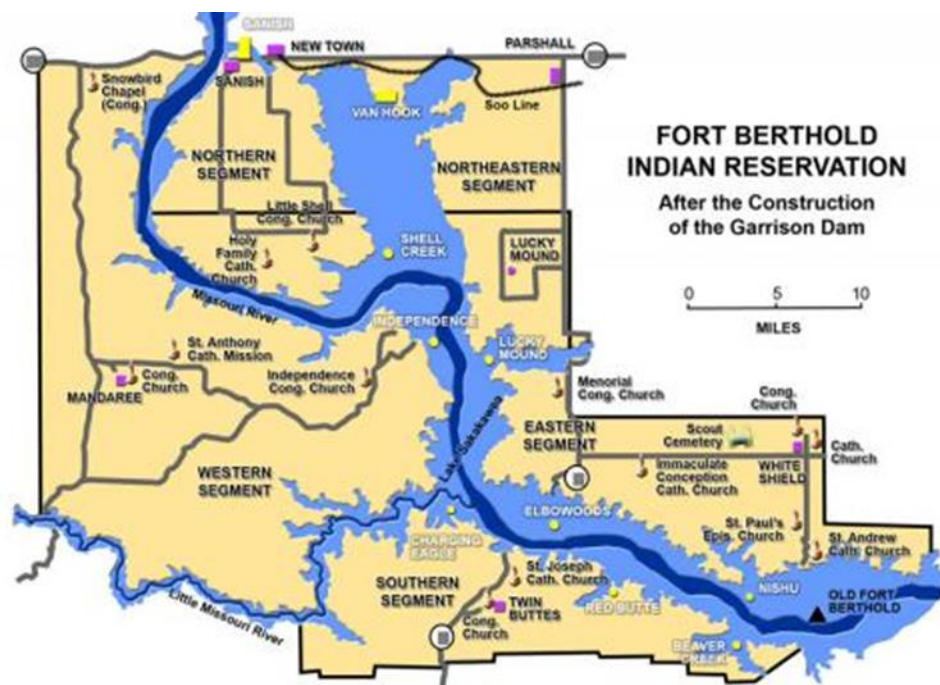


Figure 3: Fort Berthold Indian Reservation

Technology Usage:

MHA Nation is developing a comprehensive plan to create a technical solution to these geographical challenges. This solution aims to enhance the lives of the MHA people by incorporating coordinated automation, sensors, systems integration, delivery/logistics, and innovative aviation technologies. The proposed system will include a UAS platform for advanced aviation, a Ground-Based Radar Network and radio communication system for detection and avoidance, user interface software for Beyond Visual Line of Sight (BVLOS)

operations, and packaging/payload systems for medical delivery. These elements will support system integration, commerce delivery, logistics, and innovative aviation technology.

In Stage 1, MHA Nation focused on identifying use cases, forming partnerships, and determining the necessary infrastructure to enable BVLOS operations. This Stage is creating a blueprint for a scalable BVLOS system in rural areas, such as North Dakota, using the existing physical and digital infrastructure provided by the VANTIS Network, managed by the Northern Plains UAS Test Site (a Federal Aviation Administration (FAA) approved test site). The technical approach will utilize FAA-approved technology for aircraft detection, tracking, and communication with other UASs to ensure safe operations. The preliminary feasibility analysis will assess the project's potential to establish a safe, efficient, and scalable network within MHA Nation Tribal lands.

In Stage 2, the focus will shift to scaling up technology by installing infrastructure and operating commercial flights, with an emphasis on system integration to maximize the benefits of the initiative. The project team is developing a technical approach for airspace monitoring through sensor integration, enabling data collection on air and ground risks, and establishing patterns to support operational planning and airspace management. If funding is secured for Stage 2, it will involve installing additional ground-based radar systems, securing communication devices to connect Uncrewed Aircraft (UA) to the network, and a mission planning/community portal for flight planning and management. The proposed operational area extends beyond the current Vantis coverage, as illustrated below, with a successful at-scale implementation enabling flights between clinics and directly to homesteads across the reservation.

The Vantis Mission and Network Operations Center (MNOC) in Grand Forks, ND, where UND is located, will oversee missions, ensuring that airspace safety is maintained and that ground operations are not adversely affected. In Stage 1, MHA Nation's Key stakeholders have visited and toured the MNOC to ensure confidence in expanding the ground radar system across MHA Nation. Combined with a UAS operator with proven expertise in medical supply delivery and air carrier certification, this will support scalable and routine BVLOS operations. This initial stage is crucial for MHA Nation to identify effective use cases, operational locations, and necessary support infrastructure, ensuring that ground-based systems are deployed to provide vital, life-sustaining benefits to the community while paving the way for future opportunities.

Goals and Outcomes:

A critical initial goal was to develop a team with expertise in autonomous systems and community engagement that supports government-to-government efforts to accelerate the use of advanced UAS operations on Tribal lands. This consists of an extensive assessment and community process including listening sessions in all Tribal segments, testimony before the MHA Tribal Council to secure Tribal resolutions, and a formal needs assessment

process. An overarching goal was to support Tribal Sovereignty and build a sustainable foundation to integrate advanced UAS operations that are valued by the citizens of MHA Nation.



Figure 4: Testimony During MHA Tribal Council

The technology-driven goal was to establish BVLOS capabilities for UASs to serve citizens of the MHA Nation. The key objectives include proving the economic, environmental, and equitable advantages of BVLOS UAS operations, and utilizing these capabilities to improve access to critical medical supplies in areas with limited surface transportation. Collaborations with UND, and other industry partners in aviation, were essential to explore how UASs can improve health outcomes. Stage 1 goals emphasize identifying use cases, partnerships, and infrastructure necessary for BVLOS operations, developing a scalable and efficient UAS transportation network, and implementing technical approaches for airspace monitoring and management. Again, the critical use case of the Project is the delivery of medical supplies between New Town and Twin Buttes, ND. Using UAS will take 30-35 minutes for

a one-way transport of medications while driving one way between these two segments is ~100 miles (nearly 2 hours). Using UAS will reduce travel time by approximately 75% per round trip. UAS operations are less affected by weather conditions like snow, ice, or mud, which impact ground transportation. Up to two UAS round trips per day are expected for delivering medical supplies and returning samples when the Project is at scale.

Based on current estimates, UAS delivery could save ~1061 hours (approximately 44 days) of travel time annually compared to traditional ground transport. These savings are based on the following:

1. Traditional ground transportation takes 1 hour and 45 minutes under ideal conditions for a 97-mile round trip, totaling about 194 minutes (3.2 hours) per round trip.
2. With two round trips daily over 260 business days, the total annual drive time is 1,664 hours.
3. UAS travel covers approximately 35 miles one way, with a round trip of 70 miles.
4. UAS cruises at 60 mph, with a round-trip flight time of 70 minutes (1.16 hours).
5. With two round trips daily over 260 business days, the total annual flight time is around 603 hours (3 and a half weeks).

6. The annual savings from UAS usage is 1,664 hours (traditional) minus 603.2 hours (UAS), equating to around 1,060 (about 1 and a half months) saved annually (approximately 1 month and 15 days).

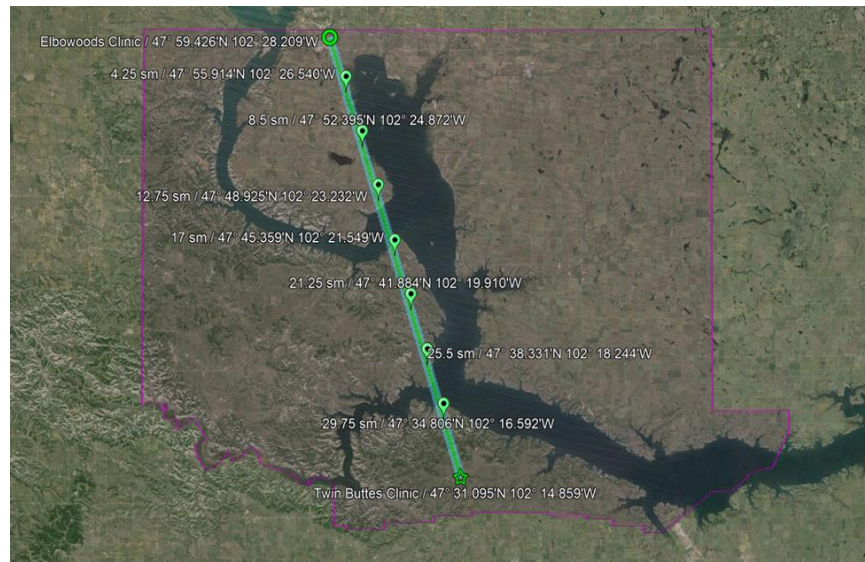


Figure 5: Flight Path for Medical Delivery Use Case

With the vision of use of funding in the Stage 1 SMART Grant to develop a plan for and demonstrate the use of UASs to serve historically underserved populations with better access to medical care and equipment, Table 1 provides a summary of project goals and how these will be realized in this effort.

More specifically, the goals are to enhance the lives of MHA Nation members by expanding access to emergency services, public safety, nutrition, and healthcare through autonomous systems. This involves planning and demonstrating protocols to support government relationships, identifying partners and stakeholder needs, and developing future use cases. Key tasks include determining infrastructure requirements, conducting a cost/benefit analysis for feasibility and sustainability, assessing workforce development needs, and determining additional use case needs once achieving scalability.

This initiative also involves creating and executing a safety case to enable BVLOS operations, securing FAA approval for initial and expanded flights, and closely engaging with stakeholders to identify workforce needs. This includes creating high-quality, inclusive jobs and exploring agreements for a training program, such as a drone camp, in partnership with the Boys and Girls Club of the Three Affiliated Tribes serving all segments. Critical to a successful project is to foster community engagement and education in current and future use cases. (See Attachment A: MHA Nation Drone Project Summary that was distributed widely).

Anticipated outcomes of the funding encompass a detailed description of impacted communities, including baseline data and anticipated benefits; a cost-benefit analysis of

deployment and operations; performance metrics for BVLOS; formation of partnerships for large-scale BVLOS implementation; development of legal, policy, and regulatory frameworks; a site selection plan for communication, navigation, and surveillance infrastructure; and an FAA-approved Safety Case. Achieving these goals, more specifically, will lead to the following key outcomes for the MHA Nation:

1. **Advanced Infrastructure:** Development of a cutting-edge aviation-grade infrastructure network to support sophisticated UAS operations across the MHA Nation.
2. **Enhanced Transportation:** Integration of lower-cost transportation options into the existing network, creating a more resilient and vibrant system with advanced air mobility solutions.
3. **Equitable Access:** Improved access and coverage for historically disadvantaged and underserved communities, ensuring they benefit from BVLOS transportation.
4. **Environmental Benefits:** Reduction in greenhouse gas emissions through fully electric or hybrid UASs, replacing fossil fuel-based vehicles.
5. **Community Engagement:** Increased acceptance of UAS technology within the MHA Nation, fostering economic growth through new workforce opportunities.
6. **Comprehensive Transport Network:** Establishment of UAS and AAM vehicles to facilitate the movement of goods and people, aiming for a statewide or regional transportation network.

The “at-scale” concept defined in the grant submission aims to develop an aviation-grade infrastructure network to support advanced UAS operations within MHA Nation, integrate cost-effective transportation solutions, and ensure equitable access for historically disadvantaged and unserved communities.

A cutting-edge aviation infrastructure will be established to enable advanced UAS operations throughout the region. This infrastructure will be complemented by affordable transportation solutions that enhance the existing network and incorporate advanced air mobility options to improve its resilience. These improvements will ensure that historically disadvantaged and underserved communities gain equitable access to BVLOS transportation.

Furthermore, the transition to fully electric or hybrid UASs will reduce greenhouse gas emissions by replacing fossil fuel-based vehicles. The project will also encourage community engagement and acceptance of UAS technology, while generating economic benefits through new workforce opportunities. Ultimately, the integration of UAS and advanced air mobility vehicles will facilitate the efficient movement of goods and people, contributing to the development of a comprehensive statewide or regional transportation network.

Community Impact:

Using UASs for supply delivery is not a new concept in the U.S. airspace system. However, what is innovative is MHA Nation's approach to developing a repeatable and scalable process. This involves initially flying short distances to demonstrate operational safety and then expanding to provide timely help and access to those who might otherwise lack it. This initiative represents a significant opportunity to collaborate with industry and university partners to bring essential services to the MHA Nation, a historically underserved community in STEM education and technological innovation. Once FAA approvals are obtained, MHA Nation will work with its partners to assess other areas where similar services can be implemented. Key aspects of this effort are:

1. **Community Engagement:** The community has been actively involved through numerous advisory meetings with Tribal leaders and the approval of Tribal Resolutions. MHA Nation and NHS College stakeholders visited UND and the MNOC at Grand Sky in March 2024 to review resources for the project. Additionally, the Boys and Girls Club at MHA Nation co-sponsored 2 "drone camps" in 2023 and 2024 (See Attachments B and E) and will continue this initiative annually to promote learning about aeronautics and drones. NHS College members and Boys and Girls Club participants will also take part in a proof-of-concept flight in September 2024.
2. **Stage 1 Focus:** The initial Stage will identify use cases, operational locations, and support infrastructure to ensure that UAS deployment meets the needs of MHA Nation. While Stage 1 will primarily evaluate medical supply delivery and conduct proof-of-concept flights, the infrastructure developed will support various future uses and operational concepts with many needs identified in the assessment process.
3. **Stage 1 Workforce Development:** The initial Stage will involve creating a plan to expand workforce capacity in aeronautics among MHA Tribal members. This will be achieved through partnerships with the University of North Dakota (UND) and NHS College. The focus will be on providing education, training, and funding to involve the current and future student population.
4. **Stage 1 Proof-of-Concept:** The initial Stage includes testing a real-world route using the selected UAS platform to deliver medical supplies between New Town and Twin Buttes, ND. Project partners will conduct a live flight demonstration in the fall of 2024 to show that the UAS can complete the route safely. This proof-of-concept will involve multiple flight crews and visual observers. A radar system will collect data to inform future operations, with the expectation that large-scale operations will use Remote Pilots in Control (RPIC) and electronic observers (EO) via Vantis or similar systems, reducing the number of required personnel. The prototype UAS used will carry simulated medical payloads. In contrast, Stage 2 will involve flights with actual critical medical resources, using a single flight team and EO with essential infrastructure (e.g., radars, radios, landing zones, and charging stations)

5. **Stage 2 Expansion:** The Second Stage will scale up by increasing the number of UASs for different uses, expanding the BVLOS waiver area to cover more of MHA Nation, utilizing Vantis to enable routine operations, and developing training programs for operating and maintaining UAS platforms. Ongoing evaluation of needs and innovation opportunities will drive continuous improvements and support sustainability.

Project Activity to Date:

At the start of the project, The Three Affiliated Tribes (TAT) of the Fort Berthold Reservation secured a contract with the University of North Dakota (UND). UND then established agreements with the Northern Plains UAS Test Site (NPUASTS), NHS College, and Airspace Link, in partnership with Thales. Valkyrie/Matador was later selected as the vendor for the proof-of-concept flight after an initial use case analysis was conducted and chosen based on MHA Nation needs. Four workgroups were established in the first month of funding. They include an assessment/use case committee, workforce development committee, economic impact and analysis committee, and implementation committee. The implementation committee, for example, meets weekly and applied their expertise to engage many potential industry partners for the proof-of-concept vendor. A vendor selection grid was used to choose Valkyrie/Matador UAS Solutions, noted for its BVLOS experience, including a successful BVLOS corridor in West Texas for medical supply transportation.

Early in the project, the assessment team organized and conducted seven hybrid listening sessions (both in-person and online) to gather input from residents across the six segments of MHA Nation on medical delivery via UASs and other potential use cases. The overarching leadership team, including key Tribal stakeholders, secured several Tribal Resolutions that were passed to ensure that research, proof-of-concept planning, and execution were conducted with both Tribal approval and respect for cultural sensitivities. Additionally, the team attended Tribal Council and Tribal Council Sub-committee meetings to keep stakeholders informed and receive feedback and direction from the MHA Tribes. Direct and focused correspondence with Segment Tribal Chairs focusing on New Town and Twin Buttes leaders also occurred.

Also, the team has developed a preliminary economic impact model to assess the potential effects of UAS implementation, including the creation of new businesses and changes in delivery and supply chains. The MHA Drone grant team will continue to assess the sustainability of current and future use cases that will improve the overall quality of life for MHA Tribal members through the effective use of data being gathered.

Former and ongoing efforts include the preparation and execution of data management and evaluation reports, securing a Tribal resolution for the study, and obtaining protocol approval from UND's Institutional Review Board (IRB). UND and NHS College will provide this information to NPUASTS, which, along with industry partners, will develop Concept of

Operations (CONOPs), Safety Risk Management Documentation (SRMD), and regulatory pathways. The NPUASTS is currently verifying various data sources, such as GIS (Geographic Information System) maps and historical weather data, to plan suitable flight routes and emergency contingencies, that account for efficiency, safety, and cultural considerations. The team has worked with key Tribal stakeholders to ensure data sovereignty in storage and access.

Partner Engagement Activities:

Partner activities include:

1. **UND:** Conducting needs assessments, economic modeling, cost/benefit analysis, workforce development, and regulatory impact evaluations.
2. **NPUASTS/Airspace Link/Thales/Valkyrie:** Developing flight narratives, CONOPs, risk analyses, SRMD, and regulatory pathways. The combined partners are responsible for data collection and distribution and evaluating flight test success.
3. **NHS College:** Providing project guidance and collaborating with UND on needs assessments and workforce development. The NHS college continues to help plan and will evaluate Stage 1 flight test demonstrations and implementation.
4. **MHA Nation:** Continues to oversee project management and evaluation, ensuring the overall success of Stage 1 test flights and implementation.

Milestones:

The following milestones have been identified and are provided with their status italicized:

1. Delineation of resource requirements (coverage area etc.) working collaboratively with the Tribal Council and their representatives (January 1, 2024 – July 31, 2024: *Completed during site visit during the week of July 16th.*
2. Identification of infrastructure locations (launch and recovery), Vantis infrastructure) (January 1, 2024 – July 31, 2024): This is ongoing. For the use case, the coverage area has been determined as a 2-mile-wide corridor of a direct line between Twin Buttes and New Town clinics. *The launch and recovery locations were identified during the July 2024 Drone Camp after three days of conducting the site survey. The Vantis infrastructure is still being discussed and explored.*
3. Economic Cost/Benefit/Economic Feasibility Analysis (January 1, 2024 – January 31, 2025): *Section 3 will provide the latest information. We will continue to determine price points.*
4. Implementation Plan Draft including Concept of Operations, Safety Risk Management Document (September 1, 2024): *Implementation Plan completed August 15, 2024.*

5. Concept of Operations *is being completed by Valkyrie in preparation of the proof-of-concept flight and will be completed by August 30, 2024. The SRMD is being finalized.*
6. Workforce Development Plan including aeronautics articulation agreements, drone camps, and implementation of training programs (August 15, 2023 – December 31, 2024): *An articulation agreement between UND and NHS College is nearing completion, aiming to enhance workforce capacity at NHS College. Collaboration with MHA Nation Public Schools has been established to create workforce development pathways, including the provision of a drone cage to the high school and Boys and Girls Club of the Three Affiliated Tribes, courtesy of UND.*
7. Establishing government-to-government relationships (August 15, 2023 – February 15, 2025): *This occurred through numerous engagements across stakeholder groups including establishing an MHA Drone Advisory Board (See Attachment C: Advisory Board Agenda) that involves key leaders, Tribal Elders, Tribal GIS specialists, emergency responders, and workforce development and economic development leaders. Advisory board sessions were held in-person and online, including a meeting on 17 July 2024 at NHS College that included input from 35 key stakeholders. Additionally, listening sessions were hosted at all six segments, and in Bismarck, ND, where many MHA Citizens live, to secure perceptions about drone use from the citizenry. That report was shared with the Tribal Council and Elbowoods Memorial Health Center leaders to guide policy and planning. Three tribal resolutions were secured including a resolution to release a video message about the project compiled by UND, approval to conduct a formal assessment of needs, and approval to fly BVLOS using the corridor outlined above between New Town and Twin Buttes.*

Two successful Drone Camps were offered by NHS College and UND and industry partners. The first on October 19, 2023, at the Earth Lodge Village in New Town, with five stations for the youth from the Boys and Girls of TAT to learn how to fly drones safely and with precision. The second Drone Camp was also hosted at the Earth Lodge Village on July 18, 2024. It was sponsored in partnership with Nature Camp and the Boys and Girls Club of TAT. Hosts were the NHS College, UND, the NPUASTS, and Airspace Link. The camp's model, based on feedback from previous youth participants, incorporated activities of flying drones to replicate current commercial UAS operations. The July 18, 2024, event included the demonstration of use of radar for detect and avoid.
8. Proof-of-concept flight UAS Live Demonstration Flight (September 16-20, 2024): *The FAA waiver was approved, and a proof-of-concept flight is scheduled for the week of September 16th, 2024. Test flights will be conducted earlier in the week, with the primary proof-of-concept flight flown on 18 September 2024. A backup flight is scheduled for the 19th if weather conditions or maintenance do not permit a flight on the 18th.*

9. Evaluation of Lessons Learned and Future Use Cases (Sept 20, 2024 – Jan 31, 2025): *The team continues to meet regularly to develop future use cases with a focus on transportation needs. The Listening Session (see Attachment D for the report) report provides extensive use case requests.*
10. Final Report Submission (Feb 15, 2025): *The team will collect all information and complete the final report due on 15 February 2025.*
11. Stage 2 Submission (TBD): The team is excited to apply for Stage 2 funding. It was decided to forego the first window of submission until after the Project has conducted the proof-of-concept flight and can analyze data and provide support results to strengthen our submission and to ensure scalability.

Project Attention:

MHA Nation has provided and supported significant media requests regarding the opportunities and accomplishments of the MHA Drone Project in partnership with Tribal and state-wide media outlets including print, radio, and television media. Below is a chronological list of sample media about the project covered throughout ND.

1. UND provided a Press Release entitled *Federal grant to support medicine deliveries by drone* on March 22, 2023.
2. The Forum of Fargo/Moorhead published a piece entitled *Lake Sakakawea hinders medicine access at Fort Berthold. How drones could offer a fix* on May 27, 2023.
3. The Bismarck Tribune story entitled *MHA testing drone delivery of medicine with the help of a 2-million-dollar federal grant* on June 4, 2023.
4. An introductory video was produced by UND in New Town, ND entitled *MHA and UND Drone Research* at the 2023 Culture and Nature Camp describing the project. The release of this video was approved by the Executive Committee of the Tribal Council in the Sept 2023 Executive Committee. This was shown at an event entitled *Wake Up to UND* by UND President Andy Armacost on September 27, 2023.
<https://www.youtube.com/watch?v=lou8WZp6HU>
5. KFYR TV provided television and online media at the first drone camps entitled *Drone Program in New Town aims to improve the delivery of essentials to rural areas* released on October 20, 2023.
6. Presentation at AUVSI (Association for Uncrewed Vehicle Systems International) Exponential 2024 in San Diego entitled *Transforming Healthcare Access: MHA Nation's Drone Delivery Initiative* on April 23, 2024.
7. MHA Tribal Nation published the Resolution of the Governing Body of the Three Affiliated Tribes of the Fort Berthold Indian Reservation entitled *MHA Drone: Planning and Protocol Development Use Case*, May 7, 2024.
8. Nueta Hidatsa Sahnish College provided a live Facebook feed entitled *MHA DOT DRONE Demonstration – of Use Cases of Search and Find and another of Deliver*

9. KFYR TV produced another story entitled *Drones Enhance Medical Service for Tribal Nations in the Midwest* on July 18, 2024. This was produced at that 2024 drone camp in New Town, ND.
10. KX News produced a piece entitled *UND staff teaches kids the benefits of drones with SMART Grant* on July 18, 2024.
11. UND provided at UND Today story entitled *From the clinic to the doorstep: Grant aims to deliver medical supplies by drone* on July 30, 2024.

Major Deviations to the Original Proposal:

MHA Nation has been laser-focused from the start of the proposal that the health and welfare of their Tribal members is the number one priority. There have only been two deviations that warrant discussion.

1. The procurement process was a challenge that both MHA Nation and project partners met head-on and remained proactive in accomplishing. However, due to unforeseeable delays in the initial timeline, the project team agreed to seek an outside vendor to fly the use-case to maximize success. Valkyrie joined the team as a highly experienced flight operation with an impressive resume of flying BVLOS and working with Tribal communities.
2. With the great coordination that was afforded to the team with the Federal Aviation Federation (FAA) from the Department of Transportation (DOT), obtaining a BVLOS waiver was a very efficient process. With the waiver already being approved, the timeline before the scheduled proof-of-concept flight now allows the team to plan and execute multiple flights of the medical delivery use-case.
3. The project team was able to to secure enough resources to do a live flight demo of a search and rescue mission and transportation of goods (dog biscuit) during the drone camp. The DeTech radar was utilized on the UND radar truck during this demonstration, providing a great education to the tribe.

Part 2: Proof-of-Concept or Prototype Evaluation Findings

Proof-of-Concept Performance:

The project team is expecting its first proof-of-concept flight to occur the week of September 16, 2024, with live flights expected on September 18, 2024, and a backup day on September 19. As such, the project team does not have data to report on the actual performance of the flights. Below is a list of performance metrics and data the team will collect during the live flight tests.

1. Pre-flight:

- Gather local weather stations and airport Metar/TAF information during the entire flight (Winds, Temps, Pressure, Precipitation, Etc.)
- Record the mission route and contingency points. Evaluate the efficiency and effectiveness of the launch location
- Document procedure to verify landing location is clear of personnel and foreign objects and debris for effectiveness
- Site survey information collected (obstructions, areas of population, restricted airspace)
- Track and document all waivers, verify/include all FAA requirements for safety mitigation and quality check for efficiency and level of safety
- Quality check ground control station checklist to evaluate efficiency and functionality
- Annotate all aircraft checks on the ground documenting aircraft functions (temps, weight, fuel load, voltages)
- Annotate all aircraft payload/camera performance measures (within parameters, functionality, deviations, weight and balance, and center of gravity)
- Capture payload security measures and annotate on flights if anything is modified/improved. If using Visual Observers, annotate location on route (time in place/radio procedures/type of PPE)
- Capture communication network and verify communication plan for effectiveness and functionality

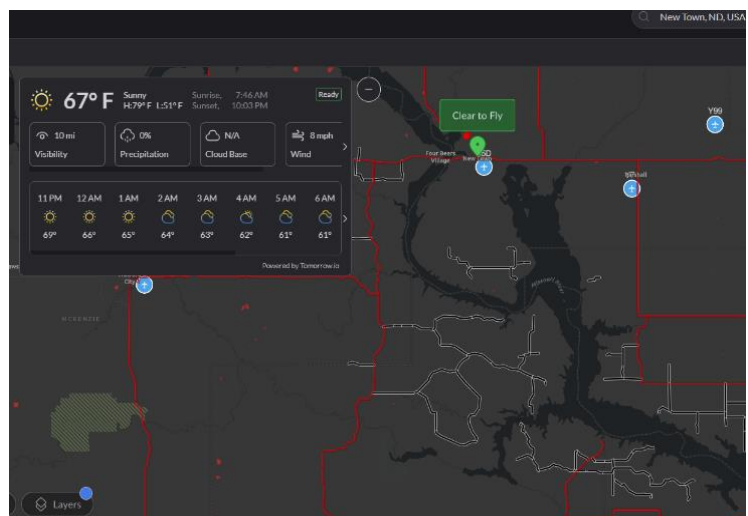


Figure 6: Example of UAS Interface With Aircraft and Pilot

2. Mission:

- Track time taken during ground operations from start to ready to take-off
- Track data on time to upload the route to UAS before Takeoff, note all point's Lat, Long, and altitude being confirmed
- Track data on the Aircraft's emergency lost link altitude, route, and landing location; document any deviation during flight
- Collect data on traffic in the area during the flight
- Annotate all normal functions during flight at what time and any deviations (Aircraft switch to Automatic flight, flying the designated route, good communication to and from aircraft on telemetry and health and welfare of aircraft
- If using Visual Observers, document handoff procedures for aircraft sittings between Visual Observers for effectiveness and note any deviations
- Collect all aircraft payload recordings or data
- Note landing performance and target zone precision. Note any deviations in the landing sequence
- Note time and performance parameters on aircraft power down sequence for efficiency or any deviations
- Note time for turn-around flight if doing an out and back to include all phases of doing the pre-flight for the return leg (loading new mission plan in, changing out the power supply, weather update, communication verification, payload release, and re-securing, etc.)

3. Post-Flight:

- Annotate time of flight (Ground operations, transit, post-flight procedures that go from power off to aircraft and ground operations center secured)
- Analyze the aircraft inspection process for effectiveness and annotate any damage.
- Analyze the procedure for release and delivery of cargo for effectiveness, safety, and chain of command. Document any damage to cargo
- Download and document aircraft logs
- Download and document payload images if taken during flight
- If Visual Observers were utilized, document any significant information including any community engagement during the flight

Additionally, once the proof-of-concept flights have taken place, the project team will use the data gathered to verify additional metrics, including but not limited to:

1. Reduction of overall time for medical deliveries vs traditional transportation
2. Improvement of health care for traditionally underserved populations via additional prescription deliveries and time from discharge to delivery
3. Overall reduction risk/travel time impact associated with transporting medications via air instead of ground

4. Identify the needs of Tribal stakeholders based on current capacity and examine where to expand capacity to address needs. Again, the broad community assessment guided by Tribal Elders and leaders will inform the feasibility and acceptability of technical tasks.
5. Operational limitations, safety, and environmental impact
6. Land, power, network capabilities, and GIS information
7. Workforce benchmarks, skills estimate, and evaluation of curriculum standards
8. Number of workers, skills/training requirements
9. Economic sector changes in employment count and/or composition
10. Regulatory pathways for approval, environmental impacts, and economics for sustainability and safety
11. Critical paths for implementation



Figure 7: UND DeTect Radar Truck

An opportunity has been presented through DeTect Inc., an established radar and sensor company, to conduct a free demonstration during the proof-of-concept flight. DeTect Inc. has worked with UND for nearly a decade on detect and avoid radar systems, to include a collaboration with UND in procuring a mobile radar truck. This truck was on exhibit for Tribal members and media to be briefed on the technology and benefits of increasing UAS flight safety. Data that will be collected includes cumulative latency of third-party service outage time, cumulative latency of third-party service Detect and Avoid (DAA), and communication availability, continuity, and integrity.

Protocol Flight Expectation Results:

As noted in the previous section, the proof-of-concept flights have yet to take place due to the amount of time required to establish project partners/contracts, adjusting to weather

conditions, and required to get regulatory approvals for the medical delivery mission CONOPs/use case. Therefore, the project team does not yet possess the required data to address the performance of real-world flights against the original expectations set forward in the SMART grant proposal and further refined in the evaluation plan. This information will be provided in the final report. To reiterate, it is planned that the project team will conduct up to six, 36 nautical mile flights between the medical clinics of New Town and Twin Buttes, ND.

However, during the drone camp, the team provided a demonstration flight that simulated the delivery of a dog biscuit and a search and rescue operation.



Figure 8: UAS Delivery Demo During Drone Camp

This was conducted by taking off from the campgrounds at the Earth Lodge Village and flying within line of sight at an altitude of less than 50 feet to a peninsula under 200 yards away with a vertical takeoff and lift (VTOL) aircraft that weighed less than 50 lbs. The flight simulated landing at the peninsula and taking back off to deliver a dog treat to the original take-off location. After this flight, another flight was conducted simulating the search of a young child (using a manikin from UND School of Medicine) who fell off a boat wearing a life vest. The aircraft flew over the water and up and down the shoreline until successfully locating the manikin. The team simulated calling authorities with the location of the missing child and remained as overwatch until help arrived. This flight was done to exercise the following aspects of the prototype flight in September 2024:

1. Exercise the communication network within the Tribe by informing MHA Nation of the event taking place, live streaming the event on Facebook, and educating the population on how this is a demonstration of a larger at-scale flight in September

2. Exercising the transfer of data from the collection of the demo flight to the Tribal Nation following the guidance in the data management plan
3. Exercising the coordination of media from all those entities involved in the prototype flight, including MHA Nation, UND, and NHS College
4. Educating citizens of the MHA Nation on the purpose and use of a ground detect and avoid system through the UND radar truck that used DETECH radars.

Improvement in Goals Identified by DOT:

To better provide US DOT guidance on how the team anticipates using UASs for medical deliveries to improve the well-being of citizens of MHA Nation, the team will endeavor to answer each of these areas individually. Again, the proof-of-concept flights and associated flight data collection efforts will occur in mid-September of 2024, but several expected outcomes can be discussed today.

1. **Safety and Reliability:** Improve the safety of systems for pedestrians, bicyclists, and the broader traveling public. Improve emergency response.
 - The project will allow a UAS to travel a direct route in the air, keeping the roadways less congested and allowing for drivers to have an alternate option to obtain critical medications or medical services during times of dangerous driving conditions.
 - The project goal is to plan for implementation of an aviation-grade infrastructure network to allow for advanced UAS operations. This is important for MHA Nation as it will allow more streamlined regulatory approvals and flight safety by having a performance-based, FAA accepted, ground-based infrastructure system. It is expected that this system will provide airspace situational awareness, can help facilitate Command & Control (C2) needs for advanced UAS platforms, and can provide higher overall levels of safety for flight crews and the local communities they serve.
2. **Resiliency:** Increase the reliability and resiliency of the transportation system, including cybersecurity and resiliency to climate change effects.
 - It is the goal of the project to provide other, lower-cost, transportation layers across a rural and relatively underdeveloped existing transportation network. Advanced UAS solutions can remove many of the existing infrastructure and delivery challenges and transportation safety concerns by providing a multi-option approach across multiple transportation use cases, thereby increasing the resiliency of the Tribal transportation network.
3. **Equity and Access:** Connect or expand access for underserved or disadvantaged populations. Improve access to jobs, education, and essential services.
 - Stage 1 of the project aims to increase the access and availability of medical goods, services, and medications by utilizing advanced UAS operations flying beyond visual line of sight (BVLOS) to cover historically disadvantaged and underserved communities. Utilizing advanced UAS in this capacity will ultimately bring an increased level of equity to residents of MHA Nation living in

rural and remote communities and will ultimately impact the current transportation modality within the Fort Berthold Reservation. It also is a step in the Federal government addressing the disadvantages created by flooding Tribal lands through proactive measures.

4. **Climate:** Reduce congestion and/or air pollution, including greenhouse gases. Improve energy efficiency.
 - Implementation of advanced UASs will help offset greenhouse gas (GHG) emissions associated with traditional modes of transportation. As many UAS platforms are electric (and occasionally hybrid gas/electric systems), it is expected that once ubiquitous in use, the region will see a decrease in emissions from fossil fuel-based vehicles and to provide charging through greener avenues of power production.
5. **Partnerships:** Contribute to economic competitiveness and incentivize private sector investments or partnerships, including technical and financial commitments, on the proposed solution. Demonstrate committed leadership and capacity from the applicant, partners, and community.
 - As noted in the original project goals, community engagement with local organizations was the genesis of this project and has continued to be a critical component in the planning, development, and deployment of this project. Through the Stage 1 SMART grant efforts, the MHA Nation and their project partners have interacted with many different stakeholders including Tribal citizens, both Tribal leaders and Tribal Elders, and personnel from a myriad of Tribal offices including law enforcement, transportation, Game and Fish, Legal Department, Emergency Operations, fire management, and the MHA Nation medical community. The relationships built thus far through a series of drone camps, in-person visits to Tribal communities by grant partners engagement of Tribal leadership and working with our Indigenous project team members personnel with the Tribal Employment Right Office (TERO) and Tribal Historic Preservation Office, have been a great success. The guidance provided by the grant lead of MHA Nation guided these efforts. The team hosted a tour of the MNOC Center for Tribal Leaders in Grand Forks in the winter months of March.
6. **Integration:** Improve integration of systems and promote connectivity of infrastructure, connected vehicles, pedestrians, bicyclists, and the broader traveling public.
 - This phase of the project, in addition to concentrating on medical delivery with advanced UAS, has also been collecting and evaluating other use cases for use in high-level development of additional Concept of Operations (CONOPs) for use in expansion of current and traditional transportation networks within the Fort Berthold Reservation. These use cases, in addition to the work the state of North Dakota is pursuing in the UAS ecosphere, is laying the groundwork for an aviation grade, performance based, statewide transportation network.

7. **Workforce Development:** Promote a skilled and inclusive workforce through training and education programs and activities.
- This metric is key to MHA Nation as they continually aim to retain their youth and enable them to build the skills required to compete within highly technological industries such as the power, medical, and aviation industries. To this end, MHA Nation, via the NHS Tribal College, has been working with the University of North Dakota, specifically the John D. Odegard School of Aerospace Sciences, to establish and approve a curriculum that will allow students to obtain CFR 14 Part 107 pilots licensing, which is the first step to being able to fly for commercial purposes within the United States National Airspace System (NAS).
 - Additionally, more fertile avenues for workforce development should exist once an at-scale system is in place. Avenues for development of additional transportation use cases are relatively straightforward, including the ability to deliver medications via UASs to multiple communities within the Fort Berthold Reservation. Other possibilities include an “emergency response force” for public safety or an overall UAS office overseeing official UAS usage for the MHA Nation.

Part 3: Anticipated Costs and Benefits of At-Scale Implementation

There are many different variables to consider when examining the costs and benefits of innovation in a local economy to address transportation barriers. Several features to determine the need for a concept of scale are unique to MHA Nation. The following is a cost-benefit analysis of an early-stage successful introduction on these Tribal lands.

Anticipated At-Scale Impacts:

At-scale is a crucial measurement aspect for the project and is being identified. The difficulty relates to the population base and land mass. The Fort Berthold Indian Reservation is comprised of more than 1,500 square miles (about the area of Rhode Island) with lands that border six North Dakota counties. The population breakdown in this area, according to the 5-year American Community Survey (U.S. Census Bureau. (2024)) is:

Table 1 Fort Berthold Indian Reservation County Census 2024

County	Total Population	Native American
Dunn	4054	495
McKenzie	13762	1505
McLean	9788	747
Mercer	8405	339
Mountrail	9717	3033
Ward	69686	1245
Total	115412	7364

The Native American population density based on this data is no more than 4.71 people per square mile compared to a density for the overall United States of 88.42 persons per square mile. The diffusion of the population across the land area is a key element in describing the scale of the local economy and part of the justification for the project. The scale for this project is not just people served but the distance traveled to serve the citizens of MHA Nation.

The use case tested for this effort is medical delivery: delivery of prescriptions. There are three field clinic facilities for prescription fills requiring individuals to travel to one of three locations, with one-way times from New Town, ND where Elbowoods Memorial Health Center is located, between 39 minutes and 100 minutes (about 1.5 hours). Patients would have a minimum wait time for medicines as listed above, though delivery would likely wait for complete shipments and would include multiple stops. Another option would be to travel to New Town for the prescription fill, but this could be as much as a three-hour round trip for the patient. Delivery of individual prescriptions to patients also involves similar time and fuel expense. Key areas of impact include time savings, fuel savings, improvements in taking medications properly, and ultimately improved population health outcomes as disparities are addressed.

Qualitative Descriptions of Anticipated Impacts:

1. **Safety and Reliability:** A better and more responsive delivery system for medications, both standard and emergency, reduces miles traveled by patients and lowers both the cost (time, fuel, etc.) and numbers of vehicles on roads. This would decrease accidents and risks to pedestrians, bicyclists, and motorists.
2. **Resiliency:** Significant weather-driven risks exist for travel on roads in the area. In addition, roads currently experience maintenance due to commercial traffic from construction and other oil-related activities. The possibility of reduced usage should prolong the lifespan of infrastructure. Autonomous delivery of medicine, last mile and before, also holds the potential to make the Tribal medical system more resilient in the face of weather events that might make roads out of communities unpassable while streets in the communities remain usable. Weather data from weatherwx.com, which averages the data from the last 10 years, shows from December to February average temperatures range from a high of 23 degrees to a low of 6 degrees, perfect conditions for ice, snow, and blizzard conditions. The average amount of sunlight in these months ranges from 3-4 hours only. Weather conditions can make driving difficult, if not dangerous, forcing residents to potentially make decisions between acquiring necessary medications and risking injury on the road, or going untreated.
3. **Equity and Access:** The significant rural and diffuse population makes access to basic items such as medicine, an essential service, an important source of inequity in access. Improved delivery networks for medicine should increase population health with more people receiving and then taking their medicines, which will also improve economic outcomes.
4. **Climate:** At scale, total miles traveled by the population will decrease, and greenhouse gas emissions will decline with delivery using UASs. Blood tests and access to medicine will create more equity and less travel as described earlier in this report. The expected at-scale case will include around 1000 hours (about 1 and a half months) less driving than a situation with multiple daily deliveries between New Town and Twin Buttes, or the case of patients making trips between locations. For a refill picked up locally after the use of drone flights for delivery, there would be 200 fewer miles driven, round trip. At 25 mpg (about 11 cents per mile) average there would be 8 gallons saved and 152 pounds of CO₂ not emitted into the air. The prescription data provided later shows the possibility of significant reductions when at-scale.
5. **Partnerships:** The introduction of autonomous systems in this aspect of regular life will increase the search for other applications, many of which the team learned in the various listening sessions held by the assessment/use case committee. This creates the opportunity for autonomous systems companies to partner with other companies to adjust the nature of service provision.

6. **Integration:** Different MHA groups are making use of drones and other autonomous systems, but these are principally very specific parts of government duties. The use in a more general, commercial, and public-facing role would promote and possibly pressure government and industry to integrate capacities to effect better service provision. We would expect to observe meetings and discussions around this at the Tribal Council level, in inter-agency discussions, and economic development meetings.
7. **Workforce Development:** The workforce capacity for autonomous delivery for MHA Nation is minimal. To support this, a variety of positions, including monitoring of the delivery method, maintenance of delivery equipment, and support of last-mile delivery, will be needed. It is expected that enrollments in skills/training programs increase as these economic innovations advance. Prediction of emergency medical delivery, one of the possible use cases, is difficult. Emergency medicine delivery/intervention occurs with unpredictable frequency and, therefore, estimation of the total number of events is complicated at scale. That, however, was a need identified and can be addressed in future funding opportunities.

Anticipated At-Scale Costs:

Two daily round trips are anticipated. This number of flights should be supported by the current level of prescription drug usage and the anticipated demand increase with easier access due to drone delivery. The round-trip distance is around 70 miles and would take approximately 70 minutes of travel time.

In any year the total cost of the operation at scale (TC) is equal to the leasing cost (L) plus the cost per hour of operations (W) multiplied by the number of hours (H),

$$TC_t = L_t + H_t \times W_t.$$

The assumption is that MHA Nation will lease two UASs at an estimated cost of \$190,000. Two UASs allow for maintenance, routine and otherwise, and enable continuous operations. The other component of cost is more difficult to ascertain and is an estimate of the hourly cost of operation. This would include a maintenance component and any wages and/or salaries paid. Due to the smaller size of UAS needed for the delivery we estimate hourly costs at \$200 per hour. Depreciation is not included due to the assumed leasing arrangement.

An initial estimate of the cost range at scale for the program for year 1 (603.2 hours) is \$305,640. There may be significant other fixed costs with the adoption of drone delivery that, once incurred, encourage high-volume usage. Those are not included here.

Cost-Benefit Analysis:

The annual cost of the at-scale program is estimated at \$305,640.00. Some of the potential benefits are more difficult to calculate as they are likely more diffuse in terms of persons impacted or economic breadth, or just more difficult to quantify in dollar terms.

Overall benefits to capture include:

1. Improved population health from improved access to medicines and more prescriptions being filled,
2. New jobs in the drone delivery industry,
3. Time savings to individuals in traditional delivery roles and customers not needing to travel as frequently for medicines,
4. Further economic/business development because of the introduction of UAS delivery

The proof-of-concept includes delivery that is roughly 100 minutes (about 1.5 hours) of driving time one way for more than 3 hours of driving time round trip. At 260 business days per year with two round trips in a day, the total time driving would be over 1560 hours (about 2 months) in a year. The actual travel times would likely be longer as there are other field clinic locations that would likely be serviced along the way. However, it should be noted that transportation across this maximum distance, under the favorable assumption of twice-daily direct and immediate return trips, almost completely accounts for one standard workday for one worker.

A firm providing drone services with an employment level of 5 workers would generate over \$904,265 in economic output in the region, which is comprised of labor earnings of nearly \$680,000 and indirect and induced effects the hiring of at least one more worker in the local economic area due to the spending and changes created by the original drone company. Some learning-by-doing is anticipated, potentially resulting in other uses for drones (such as test sample deliveries) that would alter the cost structure soon after the implementation of the medicine delivery program. With the current cost estimates, the region would see economic gains of almost \$600,000. Therefore, economic benefits are expected to exceed costs.

After use cases have been normalized, drone purchases are expected to follow a cost-effective approach with a 3–5-year lifespan for drones. Anticipated additional uses, such as blood delivery for analysis, are also expected to reduce annual costs by a sizeable amount. Other benefits are more difficult to quantify in dollar terms. Lower burdens to attain medicines likely increase the percentage of residents taking medicines as directed and allow them more time for work or leisure. This metric can be tracked through surveys and refill behavior, with longer-term tracking of population health taking place after this planning stage. Work behavior and labor-leisure choices will be important to determine the additional economic benefits accruing to the region.

Baseline Data of Historical Performance:

1. Pharmaceutical Data: Data regarding prescription fills was provided by Elbowoods Memorial Health Center Administrator, Jared Eagle to MHA Nation and provides a sense of the scale of the prescription drug market for MHA Nation in 2023.

Table 2 Prescription Distribution for MHA Nation Clinics 2023

Location	New Fills	Refills	Annual Total
Mandaree	4,905	6,068	10,973
Twin Buttes	4,075	4,420	8,495
White Shield	5,533	5,536	11,069
Total	14,513	16,024	30,537

2. Discussions with Elbowoods indicated that some residents will not seek care or fill medicines because of travel issues. These data represent actual fills and should be viewed as baseline numbers and a floor.
3. Travel Time Savings: Travel times for traditional ground transportation require 1 hour and 45 minutes under ideal driving conditions for 97 miles one way. Direction services put the round-trip time at about 194 minutes (about 3 hours) driving time (3.2 hours) as outlined in the first section of the report with maps provided.

Part 4: Challenges & Lessons Learned

Project Challenges in Stage 1:

Like any innovative efforts, challenges and opportunities exist. The partnership between the UND and MHA Nation was critical and is essential to this project's success. The PI at UND had many existing relationships, and former UND students employed at MHA Nation, who all supported her efforts and provided goodwill due to her established credibility. The PI for NHS College also had many existing networks of alumni from the Tribal College willing to support this effort based on their long-standing relationships. Two key project staff reside on these Tribal Lands and provided a critical context for feedback and future engagement. In the future, more project staff should be residents of the Tribal community. A lesson learned is the importance of building on positive relationships that exist. Additionally, a challenge was getting information to Tribal members in a systematic way about the need to protect information in an established firewall. Below are the issues addressed with many valuable lessons learned.

1. **Legal, Policy, and Regulatory Requirements Challenges:** An initial challenge was the need for more public education regarding the capacity of use of drones, in the context of FAA regulations. The project team, including Tribal stakeholder and UND and their industry partners, have worked to educate stakeholders on current FAA policies, largely related to Part 107 commercial operations, as the FAA currently administers the National Airspace System (NAS). The team hosted bi-weekly meetings with the FAA assigned to assist the project to secure feedback and additional education with Tribal and UND stakeholders present. This was an effective way to address this challenge.

Drone users who were part of the MHA Drone Advisory Committee often stated, “it is like the “Wild West” in the use of drones. This problem was also underscored to the Tribal Council by those who appeared before the Council on behalf of the project. Both Tribal and grant partners were engaged in public education to mitigate concerns in meetings and in listening sessions.

The silver lining in this regard has been the interest and engagement of many entities (Leadership, Departmental, and Educational) in further understanding existing federal regulations and their impact on operations under Tribal jurisdiction. The UND project partners have been engaging with Tribal stakeholders throughout the Stage 1 effort to help identify areas where coordination is most needed. Many of these conversations have revolved around privacy concerns and situational awareness of the airspace, as well as sovereignty of any flight operations utilizing Tribal territory for launch and recovery areas for operations. The project team assembled educational materials to include a review of concepts and terms to all interested in operating UASs so that these operations can be performed in a safe manner and in compliance with existing federal law. The Tribes also provided to

UND and their industry partners the current FAA language from the *American Indian and Alaska Native Tribal Consultation Policy and Procedure* to UND team members. A challenge encountered by the project team was navigating the regulatory framework that would be most advantageous and of greatest benefit to the Tribe in the long term. For the live flights to demonstrate the proof-of-concept use case, a Part 107 Waiver was requested and has been issued by the FAA. The waiver request is limited in scope and overall number of flights based on the timeframe of the original grant. For future use-cases and scalability, a more long-term solution, in coordination and collaboration with the FAA should be established. While the Tribe can apply and obtain a Part 135, this process is often long and costly and it might be best to engage outside stakeholders and partners with current capacity initially and to educate the future workforce to support internal capacity. The MHA Nation moves to at-scale implementation going forward which should be a goal with several vendors expressing an interest in partnerships with the Tribes. Lessons learned are when working with rural populations, Tribal or otherwise, many have not robustly employed UASs. Therefore, building a robust infrastructure to use drones must be coordinated with a capacity to understand legal frameworks and policies/procedures. Also, a lesson learned is that before engaging in a regulatory strategy, it is necessary to understand the needs/desires of the Tribal community concerning transportation use cases. Support for the most viable, least burdensome, and most cost-effective regulatory strategy to move forward should be the aim. It is only effective when an understating of the community's long-term workforce development goals is included in the implementation strategy. Establishing a Tribal UAS Policy will create the necessary building blocks and define the framework needed to support UAS operations throughout the Tribal Nation. Additionally, creating a 'UAS home page' on the Tribal website would assist in encouraging community engagement and feedback. It could provide links to the UAS Policy, and existing federal regulations, as well as a map and link to the common UAS platform where all community members could learn how to fly safely together.

2. **Procurement and Budget Challenge:** The MHA project team worked diligently to understand the required infrastructure needs and use case needs of the community. The focus was to support medical deliveries more efficiently with advanced UASs operations than with traditional modes of transportation. However, the infrastructure to allow for safe, reliable, repeatable BVLOS flights for medical and potentially other transportation use cases is expensive and usually requires long lead times for purchase and installation. Even smaller equipment, such as ADS-B receivers, require an investment and effort to provide the proper amount of power and network connectivity. Given these challenges, a clear plan in the initial stages of development is critical to ensure the anticipated outcomes are successful. Contracting and procurement, as with all grants, was time-consuming

and delayed efforts. The delays occurred as the winter months of 2024 arrived when travel by partners to MHA Nation was more difficult.

Noteworthy is that the subcontractors often required multiple layers of approval creating additional delays. Lessons learned from these challenges include identifying a more specific plan during the proposal phase for any smaller, support infrastructure. Additionally, regarding the budgetary realignments, moving forward the partnership architecture should be reconsidered to having a single layer of multiple subcontractors underneath the prime contractor, instead of having multiple layers of subcontractors underneath the prime. The Northern Plains UAS Test Site oversees the work of Thales and Airspace Link creating more of a hierarchy than was necessary. Making this change in project partnership architecture should allow all parties to move more expediently and efficiently in the future.

The University of North Dakota budget and pre and post-awards offices were effective in working collaboratively with the Grants and Planning Office at MHA Nation. Without that working relationship and the support of the Tribal Chair of MHA Nation and UND's Vice President of Research and Economic Development, this would have been far more difficult. Critical to this engagement is the need for a full-

time program coordinator at MHA Nation.

However, a barrier was engagement by Senior Personnel who were part of the industry partnerships. While there are many benefits of including the expertise and decision-making abilities of senior leaders, they may not be the best point of contact on grant projects, given the demands of their time. They also have limited time to travel to the Tribal Nation to engage face-to-face, which is critical in working with Tribal Nations to build trust. A lesson learned is the importance of assigning personnel who can prioritize the project.

3. Partnership Challenges: A critical understanding of how to secure Tribal

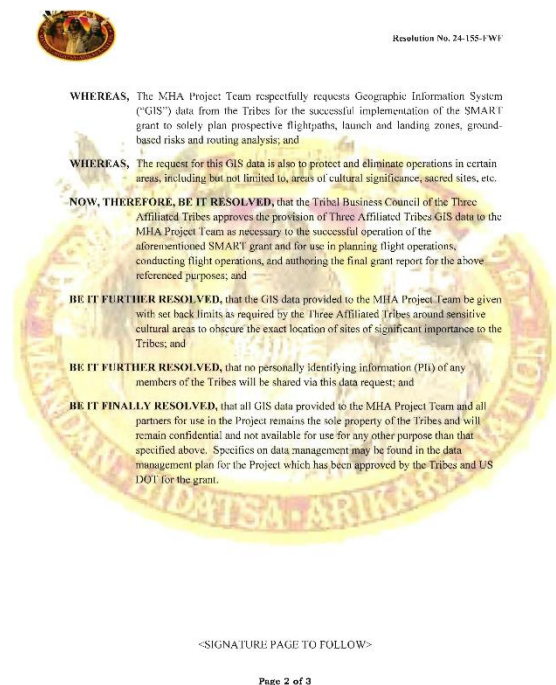


Figure 9: Tribal Resolution for GIS Exchange PG. 1

Resolutions, understanding which requests require what level of approval, and working with stakeholders and MHA members to determine the correct points of contact and decision-makers. As demonstrated in the attached approved Tribal Resolution.

Additionally, another challenge the project team has encountered is familiarizing their primary stakeholders and leadership with North Dakota State and US DOT requirements, policies, and procedures. In all it has been an excellent learning opportunity for the project team partners and should facilitate easier coordination going forward. A commitment is required from all external stakeholders to educate

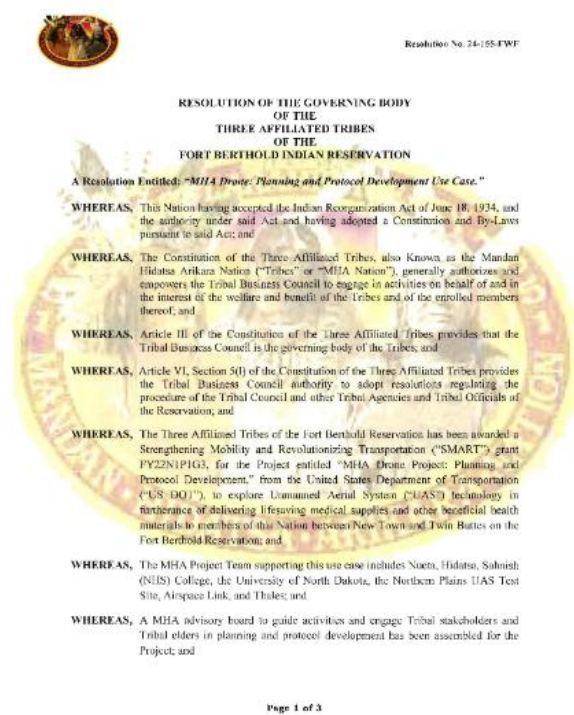


Figure 10: Tribal Resolution for GIS Exchange PG. 2

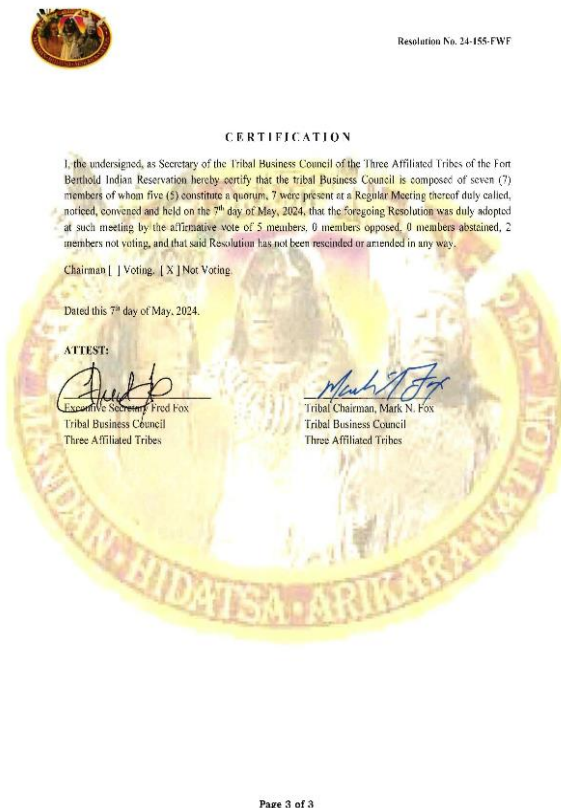


Figure 11: Tribal Resolution For GIS Exchange PG. 3

themselves about the history, geography, and culture of the Tribal Nations they are serving. For example, the assessment committee members all participated and became certified in conducting research on Tribal lands in a culturally adapted research ethics training program to increase awareness of conducting research among Indigenous members. For partners on the project who live several miles from New Town the challenges of frequent inclement weather were an issue. Use of ground transportation at MHA Nation was treacherous during efforts to engage face-to-face in January. The closest airport with commercial flights is 71 miles away and local Lodging is often not available requiring additional travel during visits. The plan for engagement must occur during the spring/summer/fall months and include advanced planning. A platform that allows

capacity for external stakeholders to more seamlessly would be helpful. The TEAMS network was cumbersome for external stakeholders.

Success was noted through support of the MHA Nation Tribal Council. In May 2024, project staff presented to the Health & Human Resource Sub-Committee (part of the Tribal governance process) and received approval to continue Assessment work to understand community impact and public acceptance. Further, the team received Institutional Review Board approval from the University of North Dakota in July 2024 including a reliance agreement with NHS College to continue more targeted qualitative work to address Tribal needs, especially to provide more specificity around the medical use case. Overall, the widespread interest and growing capacity for drone use at MHA Nation may also lead to complimentary funding opportunities and trust is being established.

4. **Technology Suitability/Integration with Incumbent System Challenges:** To support the Tribe's future vision and UAS objectives, a UAS command center structure that uses interoperable technology with other established networks is desired. Currently, the Tribe has one in place that the GIS Department has been using AirHub Portal. While the Valkyrie operator was able to obtain a BVLOS waiver for the proof-of-concept flight using AirHub, to obtain scalable approvals on various use cases going forward, the Tribe should invest in a UAS sensor and communication network that can integrate into their other existing networks. The Stage 1 SMART grant planning has yet to identify any challenges regarding integration with a ground-based detect and avoid radar, such as Vantis. This is because a system does not currently exist in the rural areas of the Fort Berthold Reservation, though the implementation team is looking to recommend infrastructure placement.

In terms of suitability, the challenge currently under review is exactly how much infrastructure is required to mitigate safety at a cost-effective level to provide airspace situational awareness using ground-based detect and avoid capabilities. There are no current lessons learned to report as the study is still underway.

5. **Data Governance Challenges:** Data sharing efforts were supported with the Tribal College working collaboratively with the Tribal Nation in data storage and key technology experts at UND and NHS College were assigned to ensure access and support. All efforts have been deployed to ensure privacy and protection of its sovereign Tribal data. The Stage 1 SMART grant has, however, needed access to a large amount of Tribal GIS data for purposes of ground risk analysis and flight route planning. The sentiment of the Tribe, when the data were requested, is that there was a potential for culturally sensitive and location-specific Tribal data to be shared inappropriately, as proven through their experience throughout history. This requires efforts to continue to establish trust among the MHA Nation partners.

A lesson learned here is that, in addition to a data management plan to be defined at an earlier date—perhaps as an initial milestone, would be to incorporate some additional legal framework such as a mutually agreed upon internal Memorandum



Figure 12: Culturally Sensitive Land

of Agreement/ Understanding (MOA/MOU) to help further assuage Tribal concerns. The Tribe ultimately is the most authoritative source for data within the reservation area. These data layers should be available to the project team, so that we can run analysis and gain valuable insights that will inform our future recommendations and findings to the Tribe. Without this access, reliance is on state and other publicly available data that may be out of date or incomplete, thus having a negative impact on analysis and findings and threatening the value the Tribe will receive from partnering with industry experts.

6. Workforce Capacity (e.g., impacts on jobs) Challenges: The greatest challenge in advancing the existing plan for workforce capacity will be securing approval from the North Dakota Board of Higher Education to offer the nine-credit certification offerings designed around the needs of students at

NHS College. We anticipate approval in the fall of 2024 for a start date of winter 2025. While a pathway has been created through the drone camps this must continue to ensure students' interest and willingness to secure the certificate. Additionally, the goal will be to continue to support enthusiasm around the use of Drones and more public education about workforce needs.

- 7. Internal Project Coordination Challenges:** Given the distance between the partners it has been challenging to get the appropriate stakeholders and decision-makers together. In July 2023, the project team traveled out to New Town, ND, and was able to meet with several members of the medical community, which has driven significant project advancement.



Figure 13: MHA Drone Project Team

Before that engagement, the PI on the project at UND traveled to the various segments of MNA Nation to engage stakeholders.

The project team also faced challenges in identifying which MHA Nation departments were the correct partners to have on the Stage 1 grant. For example, within MHA Nation, the premier department for UAS operations is the MHA GIS/Water Resources Department. Unfortunately, this department was not specifically written into the proposal and, as such, support to the project team from this critical partner has been limited due to the high demand for the department's UAS capabilities as well as seasonal operational demands in North Dakota. In future Stage 2 funding, their engagement will be critical to the project's future success.

8. **Community Impact Challenges:** No impact challenges were identified in the larger community. This was due to the focused effort on the part of the grant team and Tribal leaders. With due diligence being given to what a full-scale implementation of the use case would entail, no challenges to the community have been brought to light. Through this project, the community has demonstrated a broad interest, excitement, and capacity for the use of drones at MHA Nation.

9. **Public Acceptance Challenges:** UASs technologies are new and adaptive so they can be regarded by the public with skepticism. However, the team did not experience high degrees of skepticism but instead experienced support and enthusiasm. Many members had read the positive media and knew about the project's aims. Noteworthy, however, were fears about hidden agendas and cultural insensitivities by outside partners.

Community members, Tribal Council Members, and Tribal Chair were invited to the STEM-focused drone camps (see attached agenda and flyer). The partnerships with the Boys and Girls Club of TAT and the local schools, the six listening sessions (five in person and one remote), conducted in the style of a World Café, with local Tribal citizens. (see attached listening session report). The project team has also gone before the Tribal Council, with project team Principal Investigators testifying directly to the Council while in session. The community at large has been very engaged and supportive, including over 115 members watching the live streaming event on Facebook during the demonstration at the drone camp on September 18th.

10. **Cybersecurity Challenges:** MHA Nation has yet to address the challenges for cybersecurity as it has not yet had the need for storing data or securing networks. In a future Stage 2 grant, there are several cybersecurity concerns to consider. Addressing these early can help establish a strong security posture as the company grows. Here are some key concerns (ChatGPT, personal communication, August 11, 2024)

- **Future Data Protection:** Even if you're not storing data now, you should plan for future data storage. Implementing strong data protection policies and practices early will make it easier to scale securely.

- **Cloud Security:** If you're using cloud services, understanding their security measures and how they handle data is crucial. Ensure that any cloud provider you choose complies with relevant regulations and offers robust security features.
- **Access Controls:** Establish who will have access to sensitive information in the future. Implementing role-based access control (RBAC) and least privilege principles can help prevent unauthorized access.
- **Endpoint Security:** Ensure that all devices used by employees are secured, including antivirus software, firewalls, and secure configurations. This helps prevent unauthorized access and malware infections.
- **Network Security:** Even without storing data, your company's network needs to be secure. Implement firewalls, intrusion detection systems (IDS), and secure Wi-Fi proof-of concepts to protect against potential breaches.
- **Employee Training:** Educate employees about cybersecurity best practices, such as recognizing phishing attempts, using strong passwords, and following proper data handling procedures.
- **Vendor Security:** If you work with third-party vendors or contractors, ensure they follow good security practices. Their security can impact your company's overall security posture.
- **Incident Response Plan:** Develop a plan for how to respond to a security incident. This plan should include steps for identifying, containing, and mitigating any potential threats or breaches.
- **Legal and Compliance Issues:** Understand any legal or regulatory requirements that may apply to your company in the future. Being aware of these requirements early on can help you build a compliant and secure infrastructure.
- **Data Privacy:** Even if you're not storing data now, consider privacy implications for when you do. Understanding data privacy laws and how they affect your business will help you handle personal data appropriately.

By proactively addressing these concerns, MHA Nation can forge a strong foundation for cybersecurity that will support UAS operations as it grows and begins to handle more sensitive information.

Part 5: Deployment Readiness

The MHA Nation is dedicated to ensuring the successful implementation of advanced technologies within their community. This section outlines the key requirements, obstacles, and strategies necessary for scaling the project, focusing on legal, policy, procurement, partnerships, and technological integration.

Requirements for Successful Implementation:

1. **Legal, Policy, and Regulatory Requirements:** The following will focus on the primary obstacles and opportunities experienced during Stage 1.

At scale success for legal and policy development requires that MHA, via its Tribal Council and governance structures, work with project partners to help draft UAS policies for Tribal members that help to facilitate safe, repeatable operations for the citizens of MHA Nation and departments that utilize UAS technology. These policies include privacy, appropriate use of Tribal lands for Launch and Recovery Areas (LRA), and clear definitions of where UAS activities will not be permitted, i.e. near culturally sensitive areas. Codifying these and other policies into MHA's legal framework will set the Tribe up to be successful in its pursuit of advanced BVLOS UAS operations for medical delivery and will also facilitate success among a host of other Concept of Operations. In furtherance of this goal, the project team will continue to identify any gaps to furnish to MHA Nation leadership after this Stage 1 effort to lay out the identified shortfalls in current Tribal UAS policy and recommended next steps to consider.

Successful implementation concerning the regulatory pathway is more complex. Institutionally, MHA Nation is considering several options on how to proceed with obtaining the regulatory permissions required for sustainable BVLOS delivery operations. The Tribe is considering internally seeking the proper certifications for medical delivery (Part 91, Part 135, among others), or rather to see industry partners who have experience in these types of delivery operations and hold the requisite certifications already.

One avenue the team has been exploring is expanding the Vantis system identified in the Stage 1 proposal as a performance standard-based ground detect-and-avoid (DAA) system on Tribal lands. Vantis is a partnership with the State of North Dakota, the Northern Plains UAS Test Site, and Thales. The Vantis team is currently working closely with the FAA as a charter member of its Near-Term Approval Process (NTAP) program for certification of third-party service providers (i.e.) to obtain expedited BVLOS certifications. Potentially expanding the existing Vantis system to provide coverage and a suite of potential services the Tribe could help with the safety and reliability aspects of UAS operations.

In summary, while the legal and policy work is necessary for the Tribe locally, the area of highest risk and critical path is the regulatory pathways to allow for the flight

operations. While the FAA has been processing these requests more quickly in the past few months, the process can be arduous and time-consuming. Therefore, to mitigate this issue, ongoing conversations with MHA leadership and advisors are being held with the project team so that MHA stakeholders are educated on challenges and opportunities of the pathway they select.

2. **Procurement and Budget:** If a ground radar detect and avoid system is selected as the correct recommendation for MHA Nation going forward, then the infrastructure portion of the system will be of primary concern. Of course, efficient management of funds and resources is critical for the project's success and will be at the forefront of the planning process. Risks in this area include the timely procurement of long lead-time items (usually high-value technological components such as radars) but also working the state-to-state relationships to get the requisite approvals to begin construction.

As further investigation continues into the required surveillance coverage, maps using ground radar are still being generated for the medical delivery for MHA Tribal consideration. Smaller infrastructure, such as radios for Command and Control (C2) and Automatic Dependent Surveillance Broadcast (ADS-B) receivers may also be installed depending on the C2 solution of the selected UAS platform and the regulatory pathway chosen.

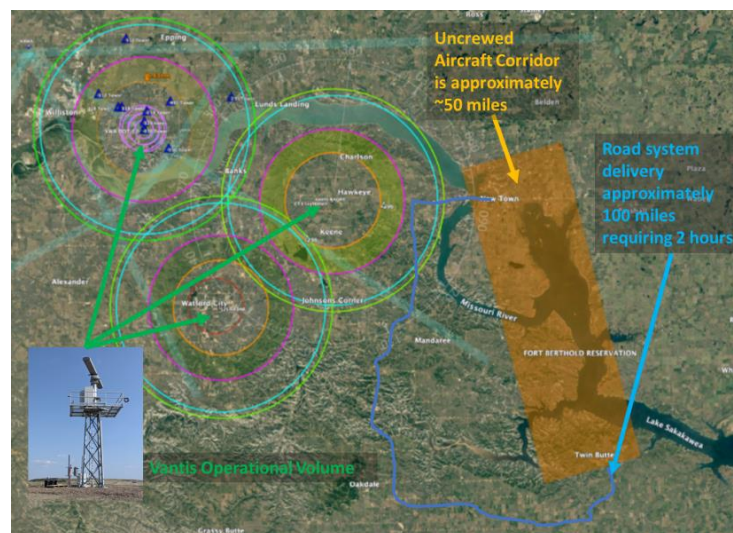


Figure 14: VANTIS Radar Network

As depicted in Figure 14, the final scale implementation could consist of a series of ground-based radar sites that would provide airspace surveillance and awareness to UAS pilots on the ground. To evaluate this solution, the project team will need to continue to perform site surveys with the partner's field engineering teams to determine what will be needed in terms of civil engineering (i.e. site prep), power, network, and physical site security requirements. MHA Nation will work with local

partners to establish budgetary estimates and high-level schedules for infrastructure installation.

3. **Partnerships:** The MHA Nation has established strong partnerships with several key organizations to ensure the success of this initiative. These partners include the UND, NPUASTS, NHS College, Thales, and Airspace Link. UND provides expertise in research, policy analysis, workforce development, and technologies. The NPUASTS leverages the Vantis network to support BVLOS operations and provides expertise in flight test management and regulatory approvals. The NHS College plays a critical role in education and training, helping to prepare the local workforce for new opportunities in UAS technology and operations. Thales can serve as the Systems Integrator, bringing extensive experience from the Vantis project to assist in planning, coordination, and technical implementation of BVLOS operations. Airspace Link provides the current AirHub UAS platform being used by the Tribe, which supports GIS data analysis and maps, air and ground risk analysis, B4UFly and LAANC capabilities for recreational and 107 operations, and much more. For at-scale operations, MHA Nation will need to utilize the relationships it has forged with the university and industry partners to continue to drive its efforts toward advanced UAS operations. Each of the partners can bring support and additional guidance to the effort, and there may be additional partners that will be built.
4. **Data Governance:** Effective data governance is essential for managing the vast amounts of data generated by UAS operations. This includes data collection, storage, security, and usage policies. The MHA Nation's data management plan and Tribal Resolution (GIS) outlines the protocols for handling sensitive data, ensuring privacy and security. Moreover, consistent advisory board meetings enable oversight of data governance. These frameworks are integral to maintaining the integrity and sovereignty of data within the MHA Nation's jurisdiction.

For at-scale implementation, it is recommended that MHA Nation expand on the data governance plan put in place for this effort to include FAA or other reporting requirements and responsibilities. It is also recommended, given the cultural sensitivity of some of the information required for ground risk analyses and other planning activities, that the Tribe consider executing a non-disclosure agreement, memorandum of agreement, or other agreement outlining what data will be shared and with whom to ensure full transparency.

One option for at-scale data governance could be utilizing the Network Operations Center (MNOC) which currently plays a critical role in maintaining cybersecurity standards and monitoring the health and status of physical and cloud infrastructure in real-time.

Ultimately, the data governance policies and procedures will require thoughtful input from Tribal leaders to best protect their desired data. To address these issues, the project team should engage further with MHA Nation leadership and MHA Instructional Technology (IT) to enhance the existing data governance plan.

5. **Workforce Capacity:** The project aims to create well-paying jobs and enhance the local economy. Training and capacity-building programs will prepare the local workforce for new opportunities in UAS technology and operations. Ensuring the local community is equipped with the necessary skills and knowledge is a significant obstacle. Partnering with educational institutions like UND to develop specialized training programs helps mitigate this challenge. The aim is to expand workforce capacity in aeronautics among MHA Tribal members through continued partnership between UND, the NHS College, and the NPUASTS and their partners, including Thales and Airspace Link. This includes education, training, and funding to participate in planning current and future students.
6. **Internal Project Coordination:** Some of the institutional challenges encountered during Stage 1 (see section 4) will need to be mitigated for successful at-scale implementation to occur in Stage 2. Most of these challenges lie in coordination between the different stakeholders within MHA Nation and the outside project partners on the project team. MHA Nation will have to take the lead on coordinating with the appropriate construction and engineering firms to implement the infrastructure, as well as with IT and Cybersecurity professionals both internally and within the state and university.

The main risks here are having non-dedicated personnel for project coordination for Stage 2 which will likely result in long construction times and likely budget overruns. A full-time, dedicated member of MHA Nation who knows how to work with Tribal leadership and within Tribal governance policies and procedures is critical to guiding the team.
7. **Community Impact:** Engaging with the community and ensuring public acceptance is a priority. Outreach programs inform and educate the community about the benefits and safety measures associated with these new technologies. Addressing public concerns and misconceptions is a key obstacle. Implementing communication standards to ensure public engagement to address community concerns and build trust and understanding is key based on effective use of social media like Facebook and Instant Messenger.

Technology Suitability / Integration with Incumbent Systems:

For at-scale implementation, there are relatively few challenges and risks as MHA Nation currently does not have any existing surveillance, C2, or other systems for advanced UAS operations. As such, implementation at scale could allow the Tribes to establish the first layer of technological systems to support their pursuit of UAS to function as innovative aviation for transportation.

Additionally for consideration is an Enterprise Architecture (EA) model for airspace integration, providing a realistic roadmap for airspace management services tailored for the MHA Nation. Key technological integrations and services include (1) enabling remote pilots to control the UAS via a Ground Control Station (GCS), (2) ensuring continuous

awareness of the UAS's position through the MNOC's comprehensive monitoring systems, and (3) providing situational awareness through the MNOC operations room equipped with advanced displays. Integrating new technologies with existing systems and ensuring interoperability are significant obstacles. Thorough testing and validation phases, along with comprehensive training programs for operators, will be conducted to mitigate these challenges.

For MHA Nation, the deployment of a particular service/building block is just as important as the reason *why* that service is needed in the first place and the value the service brings to the user. The following table provides justification for proposed services that should be considered for at-scale implementation.

Table 3 Proposed Services for MHA Nation

Service / Capability	Need Justification
Command and Control Link Management (C2LM)	The means for the remote pilot to control the UAS via a GCS. Can support the integration of any C2 solution the customer desires to use. All Thales requires is the provision of the telemetry.
Remote Identification (ID)	The means for the MNOC/Control Center to be continuously aware of the UAS' position. Three options MHA Nation may exercise to integrate an RID solution are: <ol style="list-style-type: none"> 1. Purchase a tracker 2. Rely on Broadcast-RID; 3. Provide Thales the telemetry from C2LM (we have the API).
Traffic & Surveillance Service (TSS)	The means for an Electronic Observer (EO) and the MNOC/Control Center to be continuously aware of traffic surrounding UAS operations. Surveillance infrastructure comprises Cooperative and Non-cooperative surveillance sensors. Examples of these types of sensors include short and medium-range radar (e.g., Terma, Sparrowhawk, Casia-G) and Automatic Dependent Surveillance – Broadcast (ADS-B) receivers (e.g., Senhive, uAvionix), respectively.

Detect and Avoid (DAA)	<p>The means for the remote pilot and EO to remain well-clear by detecting possible intruder aircraft near the UAS' operational volume, and to perform avoidance maneuvers (if needed) as part of the UAS Operator's Standard Operating Procedure (SOP).</p>
Airspace Management	<p>The means to satisfy all operation management needs during all phases of flight.</p> <p>During Planning: The airspace management service provides the means for the UAS Operator to plan an operation where service is guaranteed. Allows the MNOC to maintain awareness of airspace usage.</p> <p>For Authorization: The airspace management service provides the means for the MNOC/Operation Center to approve / deny operation requests.</p> <p>For Conformance: The airspace management service provides the means for the MNOC/Operation Center to monitor whether or not the pilot is executing the operation as planned.</p> <p>For Strategic Deconfliction / Separation: The airspace management service provides the means for the MNOC/Operation Center to mitigate conflicts.</p>
Service Provision / Support	<p>This set of services allows the MNOC/Operation Center personnel to operate and maintain (O&M) the operational services.</p> <p>The Monitoring and Control Service (MCS) also plays a role in the safe conduct of a mission by distributing the status of specific services in real-time allowing pilots to timely react to service unavailability, for example.</p>

Integration Into the Project and Beneficial Outcomes for MHA Nation:

The integration of advanced airspace management solutions into a ground-based detect and avoid radar network will significantly enhance the project's capabilities. By leveraging the EA model or similar structure, the MHA Nation will benefit from a comprehensive and adaptable framework that supports BVLOS operations. This will ensure safe, efficient, and scalable drone activities. Figure 15 shows the coverage of the operational corridor for the primary (medical) use case and coverage at 150 ft altitude associated with a two-radar deployment. The radar used in the analysis for integration into the current Vantis Network is a Terma Radar that has an

18.6 NM radius of coverage with a 1 NM cone of silence that can be assumed for most altitudes at which drones are flown. In choosing specific radar spots, Lidar data were pulled from the U.S. Geological Survey services as well as the State of North Dakota GIS to create a surface elevation map. From here, Google Earth was used to pick multiple potential sites based on initial factors such as established infrastructure (accessibility to power, ability to get to the location, etc.), relative elevation, as well as relative location to both cities in question and the line that connects the two locations of interest, keeping in mind the cone of silence that would prevent the drones from being detected. Next, the sites were analyzed using the previously created lidar map by placing a virtual 90-foot tower and analyzing its coverage at a 150 ft plane relative to the tower. It is at this height that most drones will not fly below, creating a conservative estimate while staying within FAA regulations. The height of 90 feet for the radar tower is suggested as it gives the greatest area of coverage, overlooking many obstacles that would obscure potential areas with a shorter tower while not requiring the drones to fly at higher altitudes to be detected. Out of the sites analyzed in Stage 1, the two pairs presented help show continuous coverage of the line referred to above. Additionally, these sites provide good coverage of other areas in the MHA Nation, allowing for the expansion of services and the area for the drones to travel in case of an alteration of the flight path to deliver medical supplies along the initially proposed route.

A consideration for MHA Nation when looking at expanding capacity is the existing Vantis system. It has been up and running, ongoing, and has been through several safety panels, resulting in approvals for FAA waivers based on those panels. This continuous validation

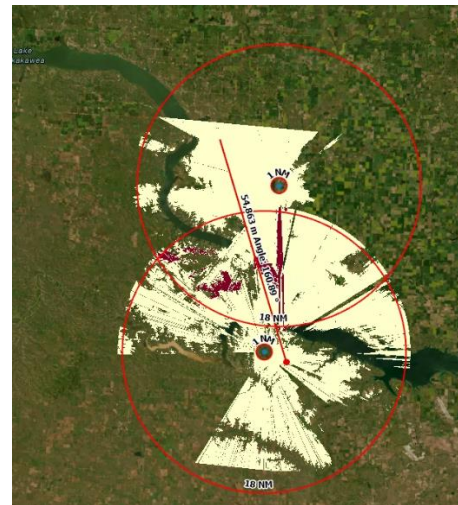


Figure 15: Two-Radar Deployment Coverage

process demonstrates the robustness and readiness of the Vantis network for at-scale implementation.

Public Acceptance Challenges:

UASs technologies are new and adaptive so they can be regarded by the public with skepticism. However, the team did not experience high degrees of skepticism but instead experienced support and enthusiasm. Many members had read the positive media and knew about the project's aims. Noteworthy, however, were fears about hidden agendas and cultural insensitivities by outside partners.

Community members, Tribal Council Members, and Tribal Chair were invited to the STEM-focused drone camps (see attached agenda and flyer). The partnerships with the Boys and Girls Club of TAT and the local schools, the six listening sessions (five in person and one remote), conducted in the style of a World Café, with local Tribal citizens. (see attached listening session report). The project team has also gone before the Tribal Council, with project team Principal Investigators testifying directly to the Council while in session. The community at large has been very engaged and supportive, including over 115 members watching the live streaming event on Facebook during the demonstration at the drone camp on September 18th.

Cybersecurity:

Cybersecurity is critical for safe operations. Any operators must adhere to a very strict set of security protocol. MHA Nation will ensure proper and effective cybersecurity processes that ensure safe and secure BVLOS operations enabling BVLOS operations at-scale.

Project Readiness for At-Scale Implementation:

The MHA Nation, with the support of Thales, UND, NPUASTS, and Airspace Link, is well-prepared for at-scale implementation. Once a sensor provider is selected for detect and avoid, if proven cost-effective for current and future use cases, it will be critical to keep the implementation of that solution on track. A resource to MHA Nation for consideration is the current operational Vantis system has demonstrated progress that includes successful procurement and installation of key technological components, established partnerships with leading institutions and organizations to leverage expertise and resources, and a fully operational MNOC serving as the hub for monitoring and controlling BVLOS operations, ensuring real-time data and situational awareness. Vantis systems operate several miles to the northwest, near Watford City and Williston, ND, with surveillance radar coverage just outside the bounds of Tribal lands. Upon completion of the Stage 1 planning activities and the possible award of Stage 2 funds, the project team could begin construction on the infrastructure sites in a matter of months, with initial procurement of technological systems beginning much quicker than that.

Uncertainties and Risk Mitigations:

Overall potential uncertainties include delays in regulatory approvals, technological integration challenges, and community acceptance issues. To mitigate these risks, the project team will continue to engage with regulatory bodies (FAA) and maintain open communication channels, conduct phased testing and validation of new technologies while providing continuous training and support, and implement comprehensive outreach and education programs to build trust and understanding within the community. Given the safety-critical nature of BVLOS operations and the need for mitigations to enable them, this team has significant experience with mitigating risk.

Maintenance and Operating Requirements for Continued Success:

To understand the maintenance and operating requirements needed for ongoing operations after at-scale implementation, the team would need to adjust for feedback from the medical community. While the project team has data in hand about the number of prescriptions and trips required to service the communities under study, it is anticipated that having advanced UAS operations for medical delivery could greatly increase the availability, and therefore demand, for prescriptions and other medical supplies/services including the transport of blood sample. It is unknown at this time how that demand curve will affect UAS operations and the number of UAS operations ties directly into maintenance and operating costs and requirements. The UAS industry is a young, dynamic, and fast paced sector. Technology is constantly changing and advancing and, as such, the project team is very sensitive to the ability to plan for future technologies. The capacity to update technology and prevent technical debt is supported by ongoing education, scalable infrastructure, collaboration with partners, and proactive risk management. By addressing these areas, and implementing the Airspace Manager function, the MHA Nation can ensure the long-term sustainability and success of its airspace surveillance system thereby leveraging advanced technologies to benefit MHA Nation for years to come.

Part 6: Wrap-Up

Throughout this report, the authors have underscored challenges and how they were addressed. Notable is the transparency of the authors in addressing barriers. However, this is largely a success story.

Areas proposed solutions met or exceeded at-scale implementation were as follows:

1. Tribal engagement for the project was exemplary as witnessed by the following:
 - High levels of engagement by the citizens of MHA Nation in the project through positive media (including clips) and positive energy about the future use of this technology.
 - Strong and informative testimony before the Tribal Council and Sub-committees about the project with approval secured for requests.
 - Support from an internal 14-member Advisory Board to guide culturally responsive implementation of the project. (See Attachment F)
 - The engagement by critical stakeholders in examining the capacity of UASs/drones to include leaders throughout MHA Nation that protect the safety of our Citizens by providing their expertise and guidance.
 - Publishing a report entitled *Summary of Listening Session: MHA Drone Project* with information gathered from the seven Listening Sessions that were shared and reviewed across our Tribal lands. This content guides community member's awareness regarding the capacity to forward a scalable project,
 - Engagement with local media to keep people updated including the MHA Nation Times newspaper and the KMHA Tribal radio station - 91.3 FM.
 - Engagement by UND and NHS College in developing a future workforce program that is scalable and manageable.
 - Hosting two excellent drone camps and witnessing youth enthusiasm and engagement as the future workforce in this technology. (include media)
 - Support witnessed in countless meetings with Tribal leaders to provide education about the project and UND preparing a comprehensive summary for distribution.
2. Support provided by the DOT SMART grant personnel:
 - The attendance by the Director of US DOT SMART grants, at the in-person advisory board meeting on July 17, 2024, and the second drone camp on July 18, 2024, in New Town, ND. His interviews with many media outlets were appreciated and valued.
 - Able assistance was provided by the SMART grant Program Manager who offered information and feedback on the quarterly reports that focused on our efforts and supported collaboration with other SMART grant recipients.
 - The assistance provided by SMART grant staff at the first meeting in DC and second meeting in Boston with valuable content provided and guidance by DOT

partners on the SMART grant requirements and pitfalls. The opportunity to meet with other DOT SMART grantees working on advancing autonomous technology to support collaboration, instead of competition, was noteworthy.

- The thoughtful engagement by the vendor working with data management on the SMART grants in their willingness to gain a deeper understanding of data sovereignty opportunities.
- Support provided by DOT from the FAA through assignment of a point person to support the project with bi-monthly meetings to touch base and engagement in meeting all legal requirements of aeronautics.
- Acknowledgement on the DOT SMART grant web page of the presentation at AUVSI in San Diego, and Second Drone Camp was appreciated.



3. Valuable partnerships and trust were established:

- The support to MHA Nation in budgeting and finance by the UND in the pre and post award process was exemplary. The Vice-President of Research and Economic Development Office supported all efforts. UND accommodated delays in securing resources. Support was secured from personnel in the Tribal Chair's office to ensure tasks were expedited. Noteworthy was the capacity for frequent conversations with the PI at UND and the Director of Planning and Grants at MHA Nation to solve problems.
- The prompt follow-through on requests by UND to engage the MHA Tribal Council with their commitment to working the project into their agendas.

- The strong communications across stakeholders at frequent meetings including all team meetings, sub-committee meetings, advisory board meetings etc. Several meetings were held each week to move this effort forward.
- Providing an opportunity through access to a UND mobile radar truck for Tribal members to see the capacity of radar to increase the capacity for flight safety.
- The Tribe acknowledges the frequent trips by UND faculty and staff on the project to support initial and continued engagement.
- Many media outlets provided information about this project across the state, and all were positive and underscored hope for improved transportation access to secure medications in this rural Tribal area.

Changes to the Proposal At-Scale:

1. Support for a flatter bureaucracy with one lead key partner serving the MHA Nation.
2. Engage earlier and effectively to advance BVLOS for commercial delivery.
3. Ensure that all partners are fully engaged and move people off the project who do not engage in the early stages to support strong deliverables.
4. While efforts were made to accommodate the rigid firewall in submitting materials to the Tribes by partners, it remains an area for growth.
5. Ensure effective use of technology to improve transportation barriers that can address inequities between indigenous and non-indigenous groups including public education. This can be completed with a greater understanding of needs and fears about the elimination of personal privacy. For example, several Tribal Elders express concerns about violations of their privacy at events such as powwows.
6. Given the proximity of MHA Nation to the Minot Air Force base, examine lessons learned in this partnership that have been effective in defense/Tribal engagement as replicable in the future.

Advice to provide to others undertaking a Tribal project of this nature:

1. Understand all nuances and expectations in procurement including Federal, State, and Tribal requirements.
2. Engage communities in a culturally responsive manner and ensure you have “boots on the ground” and a thoughtful temperament among all partners who reside outside the community working on the project. It is only successful if you have “community buy-in and establish relationship”.
3. Present technology changes in transportation in a manner that benefits the community and addresses risk/benefits.
4. Begin efforts immediately upon securing the award to achieve your deliverables as the timeframe for Stage 1 SMART grants is short.
5. When working government-to-government with a Sovereign Nation as the lead, it is critical to establish trust among all partners and the Tribe. Many outside

entities have promised solutions that are not realized in the Federal grant awards where there are partnerships that result in needless ill-will and frustration. This creates legitimate concerns that are historical.

6. Establish a requirement that all partners participate in education about Tribal Sovereignty, history, and culture of the Tribal region.
7. Engage vendors committed to improvement with a world view to use their resources for the greater good.
8. Ensure workforce development is long-term and there is a commitment.
9. Make sure to set up a regular rhythm with a weekly check-in to ensure remote partners are engaged and informed weekly.
10. Ensure you have program management software that all can access and use.
11. Advance both internal and external collaborations that move the project forward. Many moving parts exist that require good communication and leaving “egos at the door”.
12. Consider incorporating an educational initiative to get local leaders and operators aligned with one another allowing the communities to drive policy and legal requirements as best befits their needs

While the project is not complete, we will move forward next month to implement our protocol flight to fly BVLOS with an FAA approved waiver between New Town and Twin Buttes. We are confident the final report will provide information that is significant in what will be a successful flight. The MHA project team looks forward to providing these updates.

Conclusion:

The project has been effective in supporting workforce development, understanding the community's needs, providing a strong economic basis for advancing the project into the future, and includes all components for the proof-of-concept flights including approval by the FAA for a scalable BVLOS flight. The infrastructure of technology to support BVLOS exists in the Tribal community of MHA Nation if connected in the future to the VANTIS network and can be adapted and supported with meaningful engagement and follow-through. This can only be accomplished, however, through a commitment to a shared common good to address transportation barriers and engagement in technology for good. Hopes have been raised about this capacity to address transportation barriers by this project, so follow-through is critical.

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2. U.S. Census Bureau. (2024). *2018-2012 American Community Survey 5-year*. Retrieved from: data.census.gov 20 July 2024.



ATTACHMENT A



MHA Drone Project Summary

Project Overview: The goal of the MHA Nation Drone Project: Planning and Protocol Development is to develop infrastructure to support government-to-government relationships to improve access to basic needs using autonomous systems (drones) on the Tribal lands of the Three Affiliated Tribes (TAT) of the Mandan Hidatsa and Arikara (MHA) Nation. This effort will include building a sustainable foundation to integrate the use of UAS, which is repeatable and scalable. Specifically, the project will demonstrate the use of UASs/drones to ensure better access to medical care and equipment and potentially other use cases. The priority use case is the application of drones to deliver medical supplies between Twin Buttes, ND, and New Town, ND across the Missouri River in northwestern North Dakota.

Project Timeline: August 15, 2023, to February 15, 2025.

Funding: Stage One SMART grant funding is provided to Three Affiliated Tribes by the United States Department of Transportation (DOT) in the amount of \$1,966,345.00 for the 18-month period. A total of 392 proposals were submitted with 59 funded (15% acceptance rate). Three Affiliated Tribes is the only Tribal Nation to secure an award and the only recipient in a broad geographic area of the mid-west. Stage One funders are the only group eligible for Stage 2 funding in the amount of \$15 million dollars for 36 months of activity on their project. The grant team has notified DOT that they plan to apply for Stage 2 Funding.

Partners: The entities supporting this project include the Nueta Hidatsa Sahnish College, GIS Water Resources at Three Affiliated Tribes, the University of North Dakota, the Northern Plains UAS Test Site, Thales, and Airspace Link. The primary mission is to develop a safe, efficient, and scalable network within MHA Nation to deliver products and services using drones on Tribal lands.

Specific Project Aims: The Three Affiliated Tribes of MHA Nation will work with their university and industry partners to (1) finalize a community assessment of needs to support decisions regarding future use cases, (2) determine the economic viability of using drones to improve the quality of life on these Tribal lands, (3) expand workforce capacity and development in collaboration with the NHS College and Boys and Girls Club of the Three Affiliated Tribes, (4) expand government to government relationships, (5) plan for integration of Beyond Visual Line of Sight (BVLOS) operations and implementation of drone use on Tribal lands through application of the Vantis Network, and (6) evaluate the effectiveness of planning and protocol development activities in the request for Stage 2 funding.

Team Structure: The MHA Drone Project has sub-groups who have assigned and are working collaboratively with Three Affiliated Tribes to achieve the aims of the project, including an assessment/use case group working in tandem with an economic viability group at the University of North Dakota. The workforce development committee is guided by NHS College in collaboration with the University of North Dakota College of Aero-Space Sciences, and a Beyond Visual Line of Sight Group/Implementation group in partnerships with the Northern Plains UAS Test-Site, Thales, and Airspace Link.



ATTACHMENT B



MHA Nation Drone Camp

Schedule of Events | Boys and Girls Club of TAT



Thursday, July 18, 2024 | Earth Lodge Village | New Town, ND

9:45 - 10:00 AM | Registration @ Earth Lodge Village

10:05 - 10:10 AM | Introductions of Drone Camp Staff @ Earth Lodge Village

10:10 - 10:25 AM | Safety Discussion | *Amanda Brandt, Senior Research Scientist*

10:30 - 11:55 AM | Rotate Through Three Stations

- **Station 1: Airworthiness Flight Training**

Air Traffic Control demands drone pilots to fly at assigned altitudes and on charted flight routes to maintain safety separation from other traffic and ground obstacles. Aviator candidates will practice flying through an obstacle course to hone their pilot skills essential to become the next great maverick of the sky!

Lead Instructor: Tanner Yackley, University of North Dakota Aerospace

- **Station 2: Livestock Herding**

Drones are providing new and exciting opportunities through innovation across many diverse career fields. Aviator candidates will simulate herding livestock (ping-pong balls) using a drone's downwash to direct them into desired locations.

Lead Instructor: Leslie Martin, University of North Dakota Aerospace

- **Station 3: Precision Delivery**

Aviator candidates will practice "On Time-On Target" operations crucial for the distribution of critical supplies in humanitarian and military operations. During this station, essential team building and communication skills will be practiced as mission controllers talk pilots onto a target and granting them clearance to land to hit targeted times.

Lead Instructor: Amanda Brandt, University of North Dakota Research Institute for Autonomous Systems (RIAS)

12:00 PM | Complimentary Lunch at the MHA Interpretive Center

12:25 PM | Flight Demonstration

12:50 PM | Graduation

1:00 PM | Return to Earth Lodge Village to Board Bus

This project is supported by the United States Department of Transportation SMART Grant Number: SMARTFY22N1P1G38



ATTACHMENT C

MHA Drone Project Advisory Board and Community Leader Meeting Agenda

Wednesday, July 17th, 2024 | 2:00 P.M.
Nueta Hidatsa Sahnish College | New Town, ND
Hosted by MHA Drone Project Personnel
Facilitation: Kerry Hartman and Thomasine Heitkamp

Registration: Name Tags, Gift Bags

Prayer

Welcome: MHA Nation Tribal Council Members: Invited
Stanley Caldwell: US DOT SMART Grant Director
Sheila Many Ribs: MHA Director of Planning and Grants (MHA Nation Project Lead)
Scott Snyder: VP for Research & Economic Development, UND

Introduction of Advisory Board, Community Members, Grant Personnel

MHA Drone Project Overview: Thomasine Heitkamp (UND PI) Review Material in Folder

Year 2 Drone Culture Camp Overview: MHA Drone Project Team: Thomasine Heitkamp/ Kerry Hartman; Amanda Brandt; Prairie Rose Seminole

Discussion of Use Cases with Tribal Input: Thomas Nash, Emergency Planning Specialist; Marle Baker, Fire Management; Lee Voight, GIS Water Resources, and Jared Eagle, Director of Health Administration/Elbowoods Memorial Health Center; Dawn White, Special Agent, MHA Nation Public Safety Division of Drug Enforcement

Demonstration and Protocol Use Case Overview and Input: Vendor is Valkyrie facilitated by the Research Institute for Autonomous Systems (RIAS), Air Space Link, and Northern Plains UAS Test Site (NPUASTS). Discussion led by Landon Johnson, NPUASTS, and Mark Askelson, Director of RIAS.

Input on Economic Analysis: Presentation by David Flynn, MHA Drone Project Economist

Assessment Update: Sheila Hanson and Rylee Dahlen

Next Steps: Thomasine Heitkamp, Mark Askelson, Amanda Brandt, Kerry Hartman, and Sheila Many Ribs

Wrap-Up and Prepare for Dinner at 4:30: Traditional Meal Hosted by NHS College

This project is supported by the United States Department of Transportation SMART Grant Number: SMARTFY22N1P1G38



ATTACHMENT D

MHA Drone Project: Planning and Protocol Development Report

**Summary of Listening Sessions on January 22, 23, and 24, 2024
Mandan, Hidatsa and Arikara Nation**



This project is supported by the United States Department of Transportation SMART Grant Number:
SMARTFY22N1P1G38





MHA Drone Project

MHA Drone Project: Planning and Protocol Development Listening Session Report

Submitted Final Report by Thomasine Heitkamp (UND - Principal Investor) and Sheila Hanson (UND Needs Assessment Coordinator) in coordination with Prairie Rose Seminole (NHS College - Program Manager), Rylee Dahlen (UND Graduate Student, Indigenous Public Health), and Landon Johnson (Northern Plains UAS Test Site - Program Manager).

Background:

The MHA Drone Project: Planning and Protocol Development - Department of Transportation (DOT) funded project in collaboration with the Nueta Hidatsa Sahnish (NHS) College, the University of North Dakota (UND), Three Affiliated Tribes (TAT), GIS Water Resources Department, and the Northern Plains UAS Test Site hosted seven listening Sessions. A Session, which was open to the public, was offered in each segment of MHA Nation to determine the need for drone use on their Tribal Lands. The goal was to gain a greater understanding of the use of drones to inform the Project's efforts and plans. The sessions were offered from January 22-24, 2024. The sessions were designed to support broad community participation and engagement in determining opportunities, barriers, and needs relative to the use of drones (uncrewed aircraft systems) at MHA Nation with publicity shared broadly through a flyer designed by the Project team. Below are the dates and locations of listening sessions:

- January 22, 2024 | 9:00 AM - 10:30 AM | Sage Coulee | 1321 Elbowoods Lane | Bismarck, ND
- January 22, 2024 | 2:00 PM - 3:30 PM | Twin Buttes Wellness Center | Twin Buttes, ND
- January 23, 2024 | 9:00 AM - 10:30 AM | Diabetes Wellness Center | 1058 College Drive | New Town, ND
- January 23, 2024 | 11:00 AM - 12:00 PM | Nueta Hidatsa Sahnish (NHS) College | 220 8th Ave E | New Town, ND
- January 23, 2024 | 12:00 PM - 1:30 PM | Parshall, ND & Four Bears, ND | Zoom only
- January 24, 2024 | 9:30 AM - 11:00 AM | New Ralph Wells Memorial Community Center | White Shield, ND
- January 24, 2024 | 2:00 PM - 3:30 PM | Water Chief Hall | Mandaree, ND

Implementation:

Five of the sessions were offered in a hybrid (online and in-person) format with project team members in-person and online except for Parshall and Four Bears (online only) and Mandaree (in-person only). Due to the various technology capabilities at the locations, some challenges occurred for participants attending online to hear content. However, dedicated facilitators were on site who kept notes that contributed to the content provided in this report including four DOT project members, with two being citizens of MHA Nation, who facilitated the session and provided content. Nineteen people attended the sessions with up to five MHA Drone Staff and representatives from GIS/Water Resources. The Project Team attendees drove on icy and snowy roads to attend due to poor weather conditions. The written notes gathered were analyzed and summarized into three categories 1) strengths and opportunities, 2) challenges and considerations, and 3) summary of outcome. Email addresses of all who participated were gathered and this report was shared with participants for input prior to distribution.

The background surrounding the current use of drones at TAT was provided by the GIS/Water Resources staff who had representatives at each session in their role as a co-sponsor of the listening sessions. The access to \$1,966,345.00 in funds from the Department of Transportation (DOT) to support this effort in a timeline of August 2023 to February 2025 was also underscored. The role of MHA Nation as prime in securing this funding from the DOT was described. Conversations were organic with numerous topics raised in the groups involving opportunities, challenges, potential next steps, and ideas for consideration, etc. Primary themes that emerged in discussion are categorized from written notes and described in the next page.



1





MHA Drone Project

MHA Drone Project: Planning and Protocol Development Listening Session Report

Overarching Theme that Emerged in Discussions:

The use of drones on these Tribal lands must ensure the protection of the Seven Generations of the future. This includes protecting their energy, water, and natural resources. Acknowledgment of relationships of citizens of MHA Nation was emphasized with one participant stating, "We are all related culturally, socially, or by blood." In terms of the focus of the use case of the Project, it was noted that the use case in the proposal to DOT is the delivery of medications between Twin Buttes and New Town. A statement underscored that when "medication is going to a relative, there will be gratitude and appreciation."

Identified Strengths and Opportunities: 10 Items for Possible Development:

1. Ensuring the use of drones for positive environmental outcomes. For example, drone use for **monitoring pipelines for oil spills** is an opportunity to assist and respond to environmental crises. This will save the time of the people on four-wheel vehicles monitoring the lines. Related to environmental reclamation, drones may be used to **monitor environmental safety**. Further, drones could **monitor road damage, flooding, and construction site progress**. The opportunity to **create three-dimensional topographic maps is easier, safer, and more efficient, as drones can fly over more difficult or dangerous terrains** to ensure environmental safety.

2. Creating a more successful and safe community with drones as a resource. Along with the GIS/Water Resources Department, the TAT Fish & Wildlife Division and the Energy Sector use drones. Still, opportunities exist to **expand drone use to emergency services and law enforcement**. Use for **search and rescue** was a theme. Recognition of various locations on Tribal lands that may benefit from the use of drones for **surveillance among law enforcement** and others exists. For example, drones could be used to **identify encampments on Tribal lands**.

3. Expanding the use of drones to support animal husbandry/agricultural use. UAS/drone use for livestock management was a recurring theme. Participants indicated that it costs \$2.5K+ to replace a lost animal, which has a huge economic impact on ranchers' livelihoods. Searching for cattle, in general, and finding calves during the calving season, especially during/after a blizzard, were raised as expanded opportunities for the use of drones. Further, GIS applications in agriculture are a continued need (soil coverage and aerial view of grasslands). Other agricultural uses include the elimination of noxious weeds.

4. Expanding the workforce at MHA to improve access to pilots - 107 Certified. Currently GIS/Water Resources at TAT contracts with Frontier Precision¹ in Bismarck for training pilots. Discussions are underway about establishing a certification program at NHS College in partnership with the University of North Dakota - John D. Odegard School of Aerospace Sciences. Interest was expressed in providing support to begin the process of training pilots and creating an interest in aeronautics at the Twin Buttes High School, which is under construction and will have space. Further, opportunities exist for dual training of drone pilots working in search and rescue as emergency responders or working in collaboration with pilots. Beyond pilots, there is interest in the potential demand for UAS-connected workers at MHA particularly to ensure sovereignty of the data gathered to be analyzed and summarized by Tribal members.

¹ <https://frontierprecision.com/events/event/1-day-part-107-uas-training-bismarck-nd-25/>





MHA Drone Project

MHA Drone Project: Planning and Protocol Development Listening Session Report

Identified Strengths and Opportunities: 10 Items for Possible Development:

5. Expanding opportunities business-to-business and government-to-government partnerships by establishing a process focused on sovereignty. This includes ensuring data sovereignty as these data drives the effort and guides future decision-making for the Tribe. Given that six counties border MHA Nation, several opportunities exist to partner; however, this also creates challenges. The project creates opportunities for industry and higher education to work collaboratively with MHA Nation. **A need for a Tribal Resolution on the ethics and safety of drone use on Tribal lands** and consideration of a corridor for flight paths was discussed.

6. Building on the current and potential capacity of the GIS/Water Resources Office. A strength is their existing capacity including expertise in GIS and drone pilots and GIS/Water Resources Department data specific to these Tribal lands. Collecting GIS data potentially serves multiple purposes developing efficiencies in the GIS office as they continue to gain momentum in their work. Their drones are equipped with infrared or thermal imaging to analyze heat patterns from the air. The office has also secured external grant dollars. For example, the elimination of the noxious weed program was funded by the US Department of Interior through Indian Health Services with approval from the Tribal Council through resolution number 23-017-FWF to secure and access this funding with efforts beginning in the spring and summer of 2024.

7. Respecting cultural and sacred spaces and Tribal events (e.g., Pow Wows). Protecting cultural spaces and Native Site Information locations and monitoring unidentified drone activity in the area was underscored by many participating in the sessions. Using drones while setting exclusionary areas and boundaries to protect sacred spaces was identified as both necessary and possible. Of note, drones flying recreationally during Pow Wows were expressed as a concern.

8. Addressing food scarcity. Both quantity and quality of food are concerns for MHA Nation. For example, people living in Twin Buttes travel to Beulah (38 miles) to shop for food that is not in a convenience store. On the day of the meeting in Twin Buttes, that road was covered in snow and ice with an hour-long drive one-way. An impactful statement made was that "There should not be a hungry household on tribal lands." MHA Greenhouse² and Buffalo³ Projects, and potential future use cases tied to both of those endeavors, are opportunities. Availability of fresh fruits and vegetables and other healthy food options is a concern with discussions on the role of drones in enabling the delivery of healthy foods. Though pharmacy deliveries were also raised as a possibility, food delivery was also a strong theme.

9. Involving youth and future workforce. There was a strong theme across groups about involving children and grandchildren in drone efforts with implications for a future workforce. Of note was an appreciation for the collaboration of the DOT Project staff and GIS/Water Resources in offering a Drone Camp in New Town at the Earth Lodge Village in October 2023. Many ideas emerged for youth. Outreach to the High Schools located at the various segments was underscored, particularly to support their role in workforce development. It was noted that drone racing is fun and a great way to include kids. Visiting the high schools to conduct educational outreach was suggested. Perhaps accessing the drone cage that UND purchased for MHA as a resource to engage students in the proper use of drones and establish a drone team for high schools. Though UAS is the topic right now, developing autonomous systems in general, both air and ground-based, is possible.

²<https://www.mhanation.com/news/2021/4/19/mha-nation-breaks-ground-on-greenhouse-project>

³<https://echo-maker.com/the-mha-buffalo-project/>





MHA Drone Project

MHA Drone Project: Planning and Protocol Development Listening Session Report

Identified Strengths and Opportunities: 10 Items for Possible Development:

10. Adopting emerging technologies for drone use, numerous possibilities were discussed. This could include the capacity to remain innovative in developing the use of drone-in-a-box technology, enhancement of 3D printing capabilities, increasing payload and battery capacity of drones, and improvements in remote identification. The goal could be the development of a QR code that all could have access to that will ensure safety and support for travel. The future holds promise for increased capacity to use drones.

Identifying Challenges and Considerations:

1. Expanding public education to ensure the public is engaged and has input on this effort. Overall, there is both interest and hesitation about drones that generates conversation and questions which calls for the need for more public education. Expanding community education would facilitate the six segments working together to expand the use of drones. **Building a drone program, setting up a satellite office for flight recording, and offering a Drone 101 course for the public** were discussed for consideration. Most of the adults we spoke with had never flown a drone. Interest exists in finding a way to engage more hands-on opportunities so Tribal Members can experience flying a drone in a safe environment that ensures addressing privacy concerns.

2. Expanding use to enhance public safety is necessary. The potential use of drones to add to public safety was a theme as previously discussed. However, the importance of **privacy in the use of drones was underscored in the public safety comments.** Privacy appeared as a subtheme within other general themes like public safety. There were stories of instances of attempts to “shoot down” drones already happening. Tribal members may be inclined to protect themselves from unknown drones on their property. The question was raised regarding the use of drones to prevent crime. At present, use of drones related to public safety is described as “a reactive tool, not a proactive tool.”

3. Serving remote and rural Tribal areas can be difficult. There are many needs emanating from the rural challenges of the six segments and the six counties create challenges. For example, some rural roads are not all named, they are isolated, and **sometimes there are no 911 addresses.** At times, individuals and families are stranded in due to a blizzard for multiple days which is most problematic for running out of medication and oxygen. Also, access to dialysis during power outages is a concern. The needs of rural Tribal members, due to their isolation, need to be made known to inform policymakers. A road map for rural delivery could help.

4. Adapting for severe weather conditions is needed. Cold temperatures and high winds were often topics of conversation. The extremes of -50 degrees Fahrenheit and 75 mph winds were raised. MHA land does fall in a geographical area with “good” and “excellent” wind as a resource⁴. However, that is challenging for drones, so for implementation, drone specifications need to consider local weather conditions.

5. Ensuring privacy and security is paramount. Security challenges and identifying which units or departments will protect cultural resources in people’s homes and on their lands were discussed. Education regarding the laws around flying over air space and people’s homes or being a nuisance and potential concerns from individual landowners (e.g., water intakes on private lands) about the uses of drones by the tribe as well as by industry is needed. There is a need to be compliant with airspace laws and be respectful of landowners.

⁴<https://windexchange.energy.gov/maps-data/78>





MHA Drone Project

MHA Drone Project: Planning and Protocol Development Listening Session Report

Identifying Challenges and Considerations:

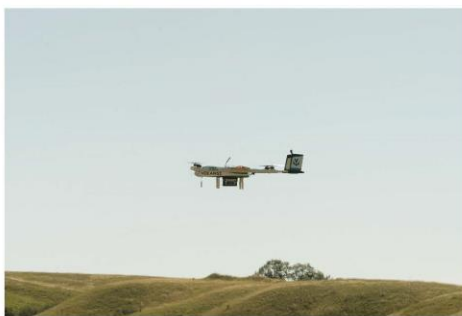
6. Balancing Tribal/Industry relationships and privacy issues vs environmental issues. Using UAS/drone to monitor companies' wells/construction/pipeline/industrial sites raises both privacy issues and environmental issues. Conflicts like oil companies opposing rules and regulations, require the Tribes to ensure enforcement which is costly and cumbersome. The importance of keeping a business-friendly culture but also adhering to rules and resolutions from the Tribe was emphasized. Participants want to protect Tribal lands and keep companies honest while still facilitating a healthy business environment. Discussion occurred regarding balancing business interests with accountability and adherence to laws. Continued discussion about environmental surveillance when dealing with companies with a common theme of environmental protection. A suggestion was provided regarding promoting Mandaree as the "drone hub" due to its ample land and the presence of oil companies. This would expand capacity to ensure that oil companies comply with regulations on dumping and use of waste sites.

7. Ensuring safety by broadly understanding airspace, sovereignty, and policy development. Formulating drone usage laws on these Tribal lands was mentioned as an opportunity. Noting the limited staffing in the GIS team despite heavy drone use. Concerns about this being "the wild west" in the use of drones were expressed. Questions were raised about airspace use and policies.

8. Involving Tribal leadership in the future of drone use. A need exists for Tribal Council involvement and buy-in. There was a suggestion to meet with segment leaders directly. Tribal members want more information regarding the use of drones and this project. There was also a suggestion that project members get involved in more regular community gatherings.

9. Understanding drone knowledge, technology capabilities, and challenges. Participants were curious about the types of drones, sizes, and how they are currently used. Access to large payloads on the drone is a challenge. Wind and weather limitations as previously stated were a potential limitation raised. Noise from drones is both an environmental concern and a potential nuisance. Flight safety is a concern and curiosity around seeing and detecting aircraft in the airspace.

10. Delivering medication is a need. Of note, medication delivery is a priority to pursue in the aims of the DOT fundings from the listening sessions, it was not often raised by community participants as a priority. This theme primarily emerged, however, related to winter weather. Citizens have mentioned the delivery of medications from veterinarians for animals as a possible use case as well.





MHA Drone Project

MHA Drone Project: Planning and Protocol Development Listening Session Report

Summary of Outcome:

The use cases for drones that were identified in the listening sessions include:

- identifying Tribal artifacts,
- protecting Native Site Information,
- conducting environmental surveillance/environmental protection (e.g., monitoring drill pads) and pipelines,
- continuing efforts to monitor construction sites,
- expanding use of emergency services and use among law enforcement,
- continuing all efforts to ensure safe water access,
- delivering bison from the Bison Farm to citizens,
- delivering fruits and vegetables from the Native Green Grow project⁵
- checking fences,
- general animal husbandry (counting cattle),
- measuring soil coverage and grasslands,
- expanding industry and government-to-government relationships.

Building internal capacity and understanding viewed as critical to the DOT-funded project. The listening sessions were not only an opportunity for the Project team to listen and learn, but they were also an opportunity for GIS staff to do outreach and share their current capabilities with the community. Further, it was an opportunity for the project team, GIS/Water Resources Department, and community members to interact about building capacity. An opportunity exists to have a radar system that will allow for Tribal capacity to monitor launch and landing sites within the reservation borders. It is anticipated that the Project will assist in this endeavor. Sophisticated GIS mapping of the reservation is another opportunity that remains. Finally, there is an opportunity for future funding to build infrastructure as the DOT funding has a Stage 2 opportunity for funds. This document can guide future efforts and be organic as future needs arise and the technology of drone use grows.

The DOT has provided liaisons from the Federal Aviation Administration to offer guidance on safety and advice on the use case. The use case identified in the MHA Drone Project is delivering medications between Twin Buttes and New Town. Monthly meetings are occurring with all partners on the Project to ensure collaboration.

⁵<https://www.nativegreengrow.com/>



The team wishes to thank all who participated in these sessions and provided such valuable feedback.



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ATTACHMENT E



MHA Drone Project



**Demonstration of Delivery
of Medicine - Mandan
Hidatsa Arikara Nation
Beginning Use Case - Twin
Buttes Community
Center, July 2022**

**Drone Camp in Collaboration
with TAT Boys & Girls Club
Mandan Hidatsa Arikara
Earth Lodge Village,
October 2023**





MHA Drone Project

MHA Drone Project: Workforce Development



ATTACHMENT F



MHA Drone Camp Advisory Board Members



Marle Baker

Fire Management Officer, TAT

Sheila Many Ribs

Director, Planning and Grants,
MHA Nation

Dr. Twyla Baker

President, Nueta Hidatsa Sahnish
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Marcus Levings

Director, Public Works, MHA Nation

Morgan Berquist

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American Indian Language and
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GIS/Water Resources Director, MHA
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Dewey Hosie

Deputy Director, MHA Nation

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