The Challenges of the Elements

• VLOS
  – Extreme weather challenges
    • Cold weather
    • Hot weather
  – Other inclement weather challenges
    • Rain
    • Wind

• BVLOS
  – Extreme weather challenges
    • Cold weather
    • Hot weather
  – Other inclement weather challenges
    • Icing
    • Wind

• Weather sources
Concept of Operations

Supplemental Tunnel and Bridge Inspection

Continuous Overflight of Assets

Supplemental Track Inspection

Supplemental Track Integrity Flights
BNSF UAS Program Timeline

2013-2017

- Pilot Program Launched
- Proof of Concept Flights
- Initial team created
- Requirements Analysis
- Regulatory Studies
- Aircraft and Sensor Tests
- Initial Flight Authority Requested
- FAA Research Agreement Signed
  FAA / BNSF Long Range Flight Partnership
- Historic long range flights on Clovis Subdivision
- Engineering SMEs Assigned
- Bridge Inspection POC Launched
- Analytics Development
- Service Interruption Team Created
- Long Range Aircraft Design and Development Started
- FAA Grants Regulatory (BVLOS) Exemptions
- Expanded Proof of Concept Flying
- Resource Protection Team Launched
- 27 bridges/90 day cycle program launched
- On-Demand/Research and Development Flights
- Part 107 Waivers Granted (Night flights)
- NextGen Aircraft Type Certification
- Expanded Flight Areas

2018

- Long range Infrastructure Expansion
- Long range Operations Expansion
- Long range Operations from Ft Worth
- Long range Future Planning
- Long range DAA Mitigation Testing
- Line of Sight Automated / Repeatable Flights

- Q1 2018
- Q2 2018
- Q3 2018
- Q4 2018
VLOS Extreme Weather Challenges

• Cold Weather
  • Temperatures above 17°F
  • Reduction in battery performance (approx. reduced to 50%)
  • Adhere to manufacturers recommendations

• Hot Weather
  • Temperature below 120°F
  • Reduction in performance of Ground Control Equipment
  • Adhere to manufacturers recommendations
VLOS Inclement Weather Challenges

14 CFR §§ 107.51(c) and (d), Operating limitations for small unmanned aircraft, are waived to allow small Unmanned Aircraft operations in reduced visibility and with reduced distance from clouds.
BVLOS Extreme Weather Challenges

- Cold weather – 0°F
- Hot weather – no published limit as of yet
- Icing / High winds

Proprietary Information – Patent Pending