



UAS Use to Inspect Rail System

FAA Focus Area Pathfinder
Program





Quanah Spencer, Tribal Liaison Pacific Northwest Division
Quanah.Spencer@bnsf.com

BNSF is a Leading U.S. Railroad

- A Berkshire Hathaway company
- 32,500 route miles in 28 states and three Canadian provinces
- 48,000 employees
- Approximately 8,000 locomotives
- 13,000 bridges and 89 tunnels
- Moves one-fourth of the nation's rail freight
- Operates over 1,600 freight trains per day
- Serves over 40 ports
- Leads rail industry in technological innovation
- Unlike other forms of transportation, BNSF trains operate on an infrastructure financed almost entirely by the railroad



BNSF's Safety Vision



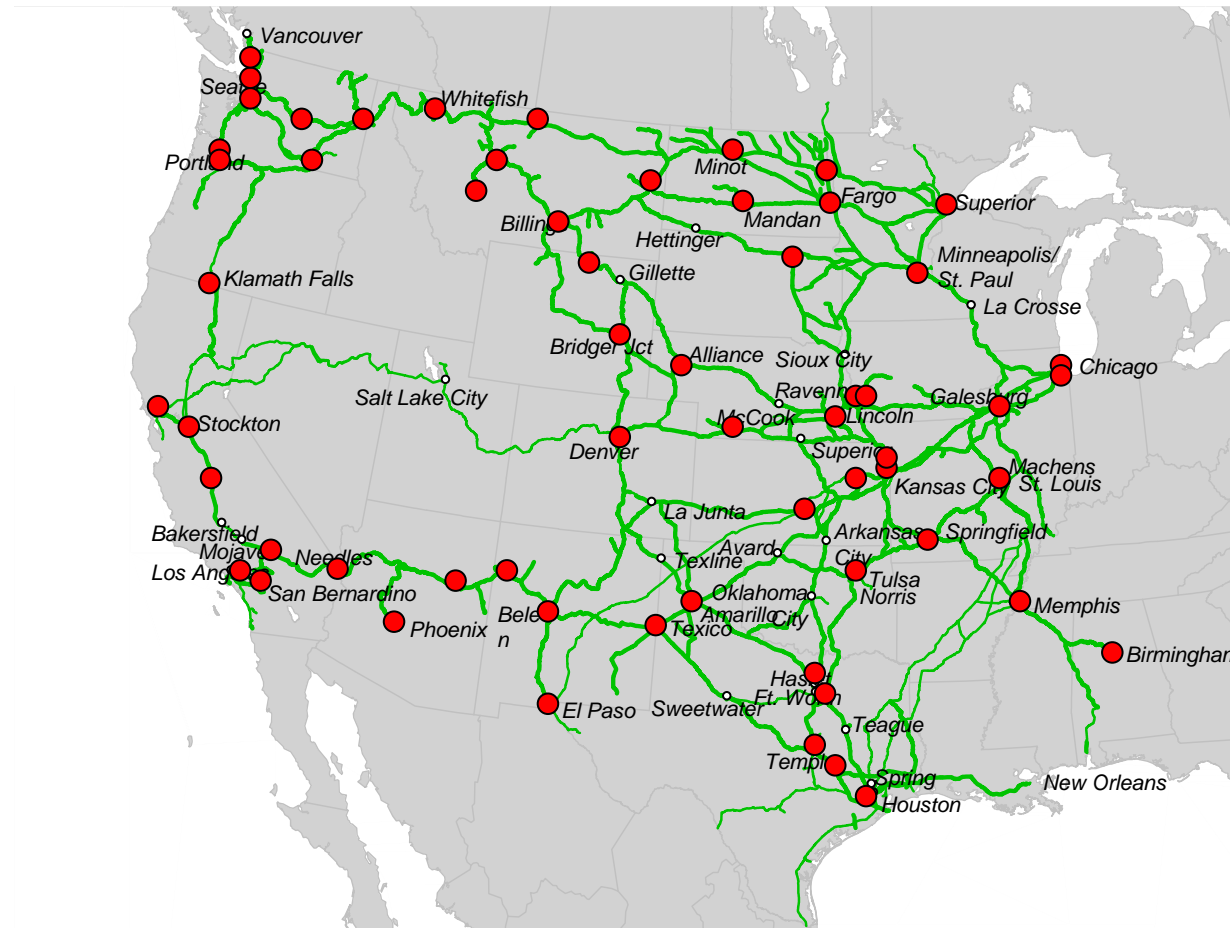
- BNSF believes that every accident and injury is preventable
- BNSF's safety vision is focused on preventing accidents in the first place
- BNSF partners with employees to create a culture that reinforces safety as the highest priority
- BNSF's risk reduction program is designed to enable all commodities to be handled safely and arrive damage and incident-free

Prevention: Equipment Detection Technology

- More than 2,000 trackside detectors
- Hot Box Detector (HBD)
- Wheel Load Impact Detector (WILD)
- Trackside Acoustical Detector (TADS)
- Sonic Cracked Wheel/Axle Detector (CWAD)
- Machine Vision Systems
- Magnetic Particle Inspection
- Warm Bearing Detection System (WBDS)
- Hot Wheel Detectors (HWD)
- Truck Performance Detectors (TPD)



Response: Mobilization of Prepositioned BNSF Hazmat Responders



250 responders at 60 locations

Future Technology Plays a Key Role in Driving Safety Improvements



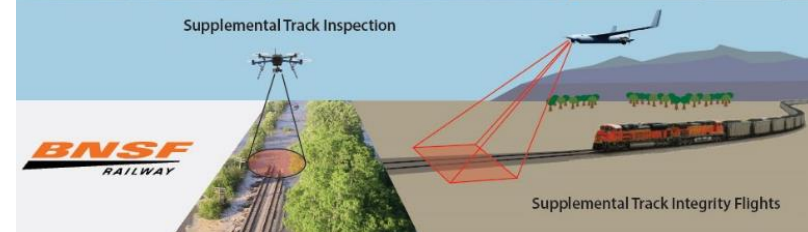
Unmanned Aerial Systems

Supplemental track and structure inspection

- Small multi-rotor aircraft
- Operations governed by FAA Section 333 Exemption
- Will enable service interruption support

Track integrity flights for key train operation

- Larger fixed wing aircraft
- Initially governed by FAA Research Agreement (CRDA)



BNSF Inspection Fleet



Track Inspection Hy-rail Vehicle



Optical Track Inspection Car



Track Geometry Car



STAR Car



UAV (Drone)



Joint Bar Inspection Vehicle



Aurora Tie inspection Vehicle
(concrete and wood ties)

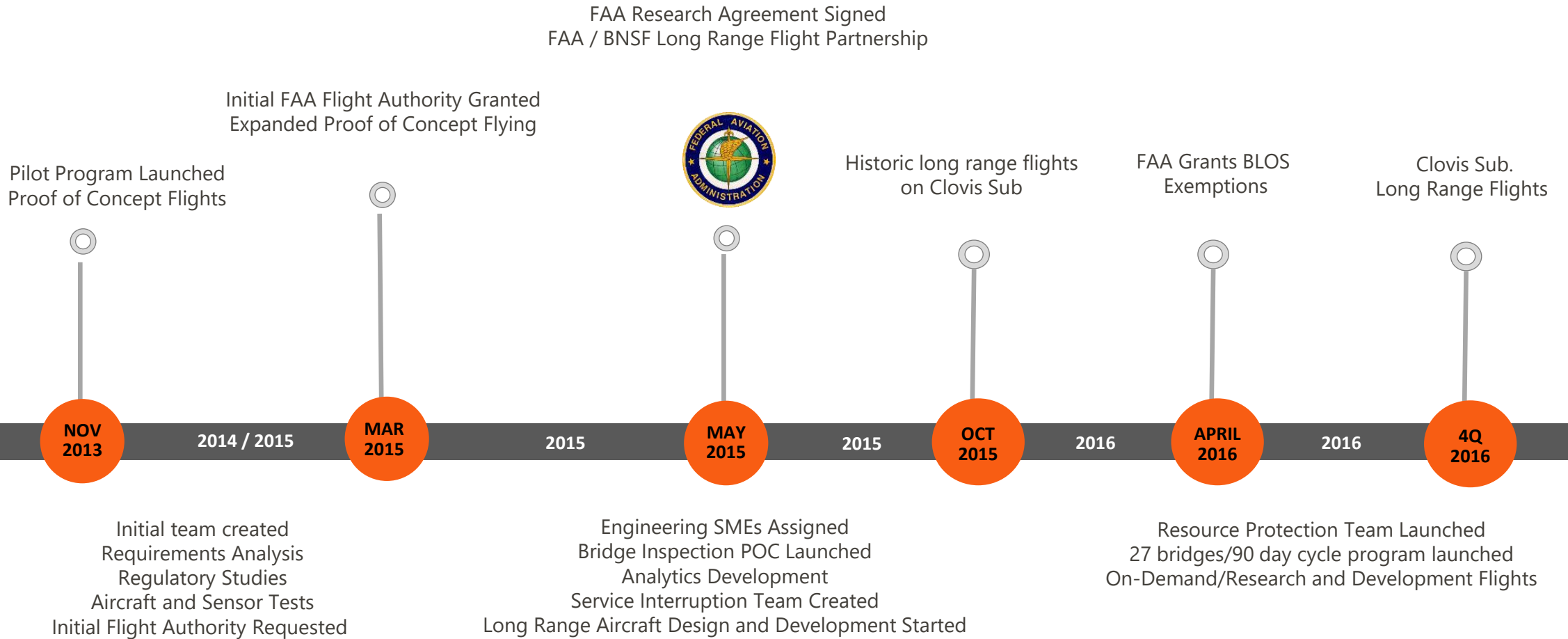


Ultrasonic Hy-Rail Vehicle



Ground Penetrating Radar

BNSF UAV Program Timeline



Engineering: Supplemental Structure Inspections

Business Challenges

- Inspecting bridges without occupancy
- Inspecting areas of bridge structures not easily accessible by traditional methods

UAV Solution

- Capability developed to visually inspect large structures
- Easy access to all areas of bridge structure
- Wide range of product outputs including video, still images, 3D models, and change detection



Engineering: Supplemental Track Integrity

Business Challenge

- Current inspection process requires extensive track occupancy

UAV Solution

- Analytics developed for FRA visual track criteria
 - Track occupancy can be focused on fixing rather than detecting
- Additional products include heat patrols, concentrated load defect detection, tie counts, etc.

