2015 ROW FATALITY & TRESPASS PREVENTION WORKSHOP

Use of Unmanned Aerial Vehicles in Trespass Abatement

Presented by
Rich Gent
President/CEO Hot Rail, LLC
State Director Nevada Operation Lifesaver

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Background and Experience

- 37 years in Naval Intelligence
  (Intelligence Collection Management)
- 18 years in rail safety program:
  Operation Lifesaver (State Director)
- Owner of rail security firm: Hot Rail, LLC
- NV POST Instructor (basic)
- NV Terrorism Liaison Officer
- Washoe County Sheriff's Office Volunteer

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Background and Experience

Steve Endacott and Flight Test Concierges (FTC)

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- 20 years FA-18 Pilot, squadron commander
- 20 years UAV test consultant to DoD
- 20 years City Emergency Manager

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Objectives

- What do we want you to walk away with from this presentation

- **UAS' can currently provide trespass Situational Awareness (SA)**
- **Capabilities, Limitations and integration of UAS Trespass SA**
- **The military has done this. Don't reinvent the wheel**
- **Start now to develop UAS trespass CONOPS/technical requirements**

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Bottom-Line Up Front

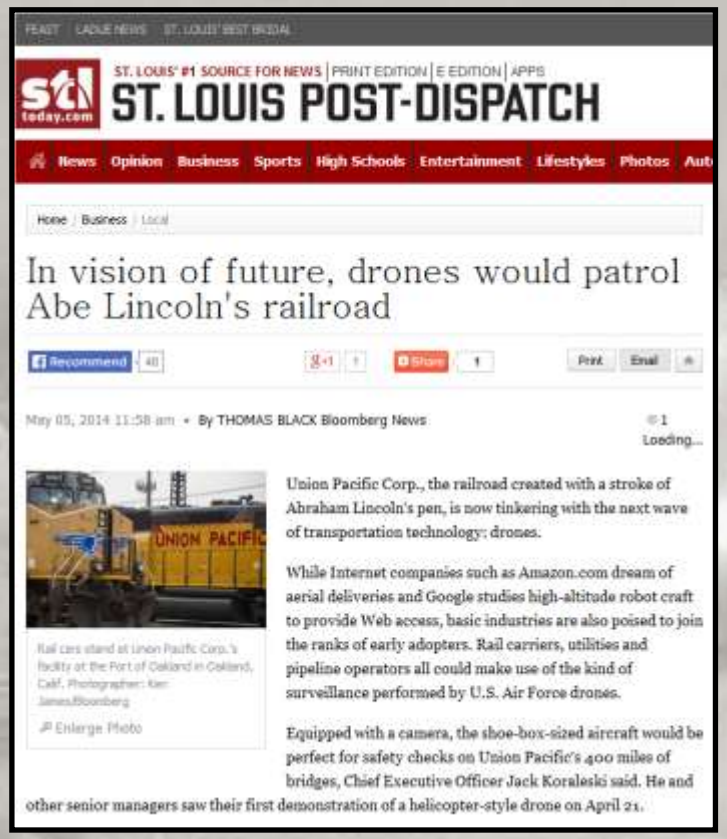
- Can an Unmanned Aerial System-
  - Provide a warning to a train crew of a object or person on the track
    - During Day or Night
    - In all weather conditions
    - Out to 3 miles in front or the train

- ***YES, and the capability exists today***
- But, is the train crew the right choice?

UAS's (drones) are Coming

Will Rail be Ready?

Well, actually they're here



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In vision of future, drones would patrol Abe Lincoln's railroad

May 05, 2014 11:58 am • By THOMAS BLACK Bloomberg News

Union Pacific Corp., the railroad created with a stroke of Abraham Lincoln's pen, is now tinkering with the next wave of transportation technology: drones.

While Internet companies such as Amazon.com dream of aerial deliveries and Google studies high-altitude robot craft to provide Web access, basic industries are also poised to join the ranks of early adopters. Rail carriers, utilities and pipeline operators all could make use of the kind of surveillance performed by U.S. Air Force drones.

Equipped with a camera, the shoe-box-sized aircraft would be perfect for safety checks on Union Pacific's 400 miles of bridges, Chief Executive Officer Jack Koraleski said. He and other senior managers saw their first demonstration of a helicopter-style drone on April 21.

"BNSF drones will patrol the track"

"BNSF has approval to patrol track, property with drones"

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First, a little nomenclature control:

- Unmanned Aerial Vehicle (UAV):
  - A UAV, also known as a drone, is an aircraft without a human pilot on board. Its flight is controlled either autonomously by computers or under the remote control of a pilot in the Ground Control Station (GCS)
- Unmanned Aerial System (UAS):
  - The entire system that supports UAV operations, including the GCS, the pilot, data links, sensors, etc.

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Unmanned Aerial System

- Air Vehicle
- Antenna/Data Link
- Control Station
- Mobile Receivers

The UAV Technical Game Changer

During the last decade, UAS have experienced a explosion in capabilities, regulation reform, procedures development and technology.

- Size
- Sensors
- Data Links
- Endurance
- Automation
- Control Stations
- Product Exploitation
- Testing Opportunities
- Information Distribution

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The Problem

Can a UAS reduce loss/incidents

- Trespassing (criminal/public) on increase
  - Who is trespassing?
  - Where are they trespassing?
  - Where do they go after illegal activity?
  - Planned/inadvertent interference by public

PopularResistance.org

Michael Steinbach
Assistant Director,
Counterterrorism Division
Federal Bureau of Investigation
Statement Before the House
Committee on Homeland Security
Washington, D.C.
February 11, 2015

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Solutions to date

- Education
  - Operation Lifesaver (OL)
  - Rail sponsored
- Engineering
  - Fencing
  - Fixed camera system
- Enforcement
  - Surge Ops
  - S4 campaign

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Talking to Railroaders about UAS's

- "Every time I talk to you I learn something different."
- "It'll cost too much, the railroads will never pay for that."
- "I could use a drone for cable theft."
- "What can I use it for?"
- "An overview of the capabilities would be helpful."
- "I guess I could use it in high traffic areas."

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- Is it time to explore new strategic and technological solutions?
- Are there any Game Changers out there….
- Are there potential partnerships that should be explored?

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DoD Unmanned Aircraft Systems

(As of 1 JULY 2011)

•USA gMAV / USN T-Hawk	•270/135	•ISR/RSTA/EOD	•Small Unit

UAS Procedural Maturity

Military and Industry have already done a lot of the heavy lifting:

- Extensive flight experience, pilot training
- Reliable aircraft and airspace procedures
- UAS Control and Communication Architectures
- Plus…. Employed UAS in similar tasks and missions that the railroad community can leverage.
- **Such as:**

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Missions and Experience that Directly Transfer to Rail Operations

- Convoy Escort
- Route screening
- Perimeter Security
- Damage assessment
- Automated change detection
- Data and communications relay
- Search and recovery operations

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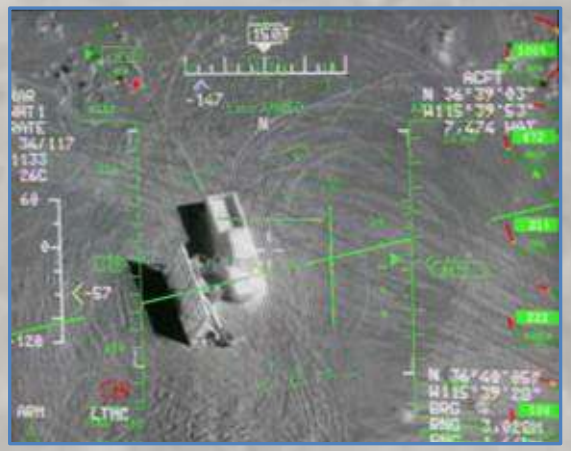
UAS General Capabilities

- Full-color nose camera that the pilot uses primarily to navigate the craft
- Variable aperture camera (similar to a traditional TV camera)
- Variable aperture infrared camera for low-light and night viewing
- Synthetic aperture radar (SAR) for seeing through low visibility
- Other “scientific sensors”



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NAR
WHT
RATE
21/117
1138
10C
50
38
ACFT
N 51' 30' 9.352"
W 0' 0' 54.761"
1,337 HAT
N 51' 30' 10.684"
W 0' 0' 51.522"
BRG 61
RNG 5116m
RNG 2.762 NM
ELV 6224 F

Synthetic Aperture Radar Imagery

Sandia Labs

LEIDOS, Inc

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Other 50 pound head items

- **Hyper and Multi-spectral**
- **Two Color Multi-view**
- **Coherent Change Detection**
- **Light Detection and Ranging (LIDAR)**
- **Time Lapse Viewing**

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UAS Downside

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German Heron Drone Hacked and Crashed by Taliban in Afghanistan

- Who's watching the sensors
- Intelligence Oversight (legal issues)
- Wind
- It's a duck
- Soda Straw
- MIJI

" Ways How To Hide From Drones"
December 23, 2013, by Ken Jorgustin

"How to hide from Predator Drones UAV – Unmanned Aerial Vehicles Survival Guide"
Posted on 03/24/2013 by 2LT Website Administrator — 29 Comments ↓

"How To Block IR Infrared Thermal Imaging"
February 24, 2013, by Ken Jorgustin

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UAS Legal Issues

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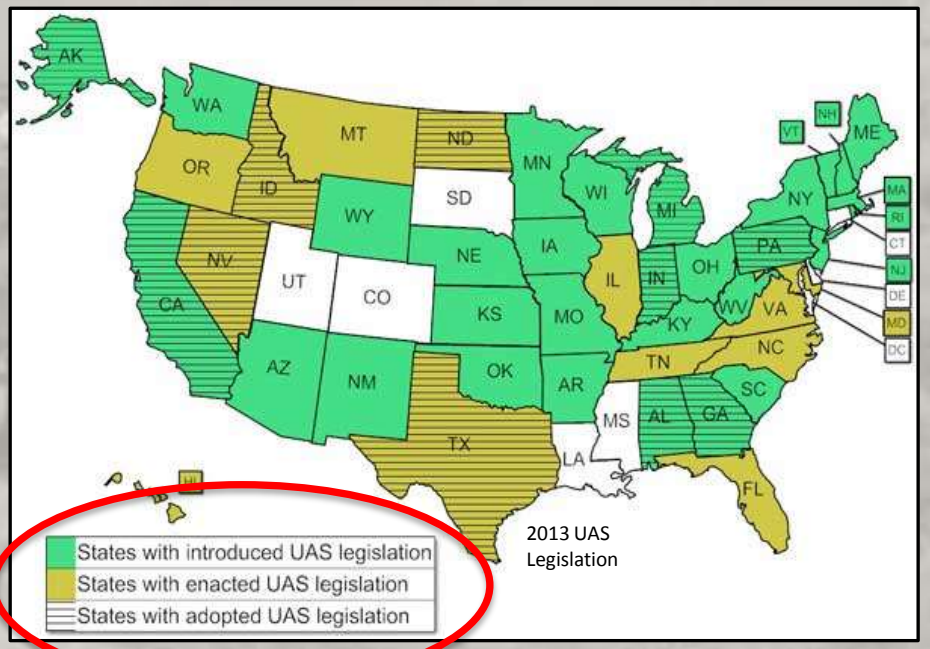
28101. Rail Police Officers
Under regulations prescribed by the Secretary of Transportation, a rail police officer who is employed by a rail carrier and certified or commissioned as a police officer under the laws of a State may enforce the laws of any jurisdiction in which the rail carrier owns property, to the extent of the authority of a police officer certified or commissioned under the laws of that jurisdiction, to protect—
(1) employees, passengers, or patrons of the rail carrier;
(2) property, equipment, and facilities owned, leased, operated, or maintained by the rail carrier;
(3) property moving in interstate or foreign commerce in the possession of the rail carrier; and
(4) personnel, equipment, and material moving by rail that are vital to the national defense.

"Border-patrol drones being borrowed by other agencies more often than previously known"
The Washington Post



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National Regulatory Game Changer

- In the FAA Modernization and Reform Act of 2012, Congress directed the FAA to establish a test site program to integrate UAS into the National Airspace System.
- Six test sites were selected from over 50 applicants.
- These sites are searching for UAV test and test scenarios that will benefit industry and the public at large.

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Current Commercial UAS use in Railroad Operations

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- Germany
- France
- India
- Netherlands
- Israel
- UK
- CBP
- Transit Authority
- BNSF

"German Railway Operator Deploys Drones in War on Graffiti Artists"

SNCF is testing drones to tackle thieves who have been pilfering copper cable from train tracks in France. Photo: Wikimedia commons

French call in drones to fight rail thieves

Published: 23 Oct 2013 14:01 GMT+02:00
Updated: 23 Oct 2013 14:01 GMT+02:00

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Transit Authority UAS

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Discussion on Utilization

- CONOP Considerations:
  - Assigned to a Subdivision?
  - Assigned to a specific train?
  - Assigned to a specific unit/individual?
  - What sensor suite, where does the info go?
  - Individual railroads or nationwide protocols?
  - Communication Paths?
- Will the benefit outweigh the cost
  - Mutual Use Agreement

Costs associated with drone use

- Cost -vs- Benefit
- Infrastructure/Logistics
- Manpower
- Training
- Maintenance

The drones **cost $3.36 an hour** to operate, which compares to $250 to $600 an hour for a manned aircraft, Miller said. The drones cost $30,000 to $50,000 each to buy, about the price of a squad car, he said.
"Bloomberg"

"For Fiscal Year 2010, DHS reported that its Predator B (a variant of DOD's Reaper) costs **approximately $3,234 per flight hour**," the U.S. Government Accountability Office reported in 2011.

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Hurtles before UAS use

- Certificate of Authorization
- FAA approval
  - Safety of Flight Procedures
  - Spectrum Management
  - Aircraft Certification
  - Pilot Credentials
  - Airspace Design

- But…it's changing

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What's happening now

- Still no comprehensive guidance from FAA
- Some limited COAs granted (Rail, Film, Ag, Mining…)
- Drone manufacturers talking to railroad
- FAA/NASA looking at future UAV integration into National Air Space

RESEARCH OPPORTUNITIES IN AERONAUTICS 2015 NRA APPENDIX B.4 SAFE AUTONOMOUSSYSTEMS OPERATIONS PROJECT

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New Business Models and Processes for Developing UAS Integration Solutions

- Interdisciplinary Professional Teaming of Users: Railroad, Regulators, Aviation, Security, Intelligence, Flight Testing and Training and Communities.
- Leverage FAA UAV Test Site Initiative…..like Nevada that has companies with experts.
- Have the discipline to do it right!!!

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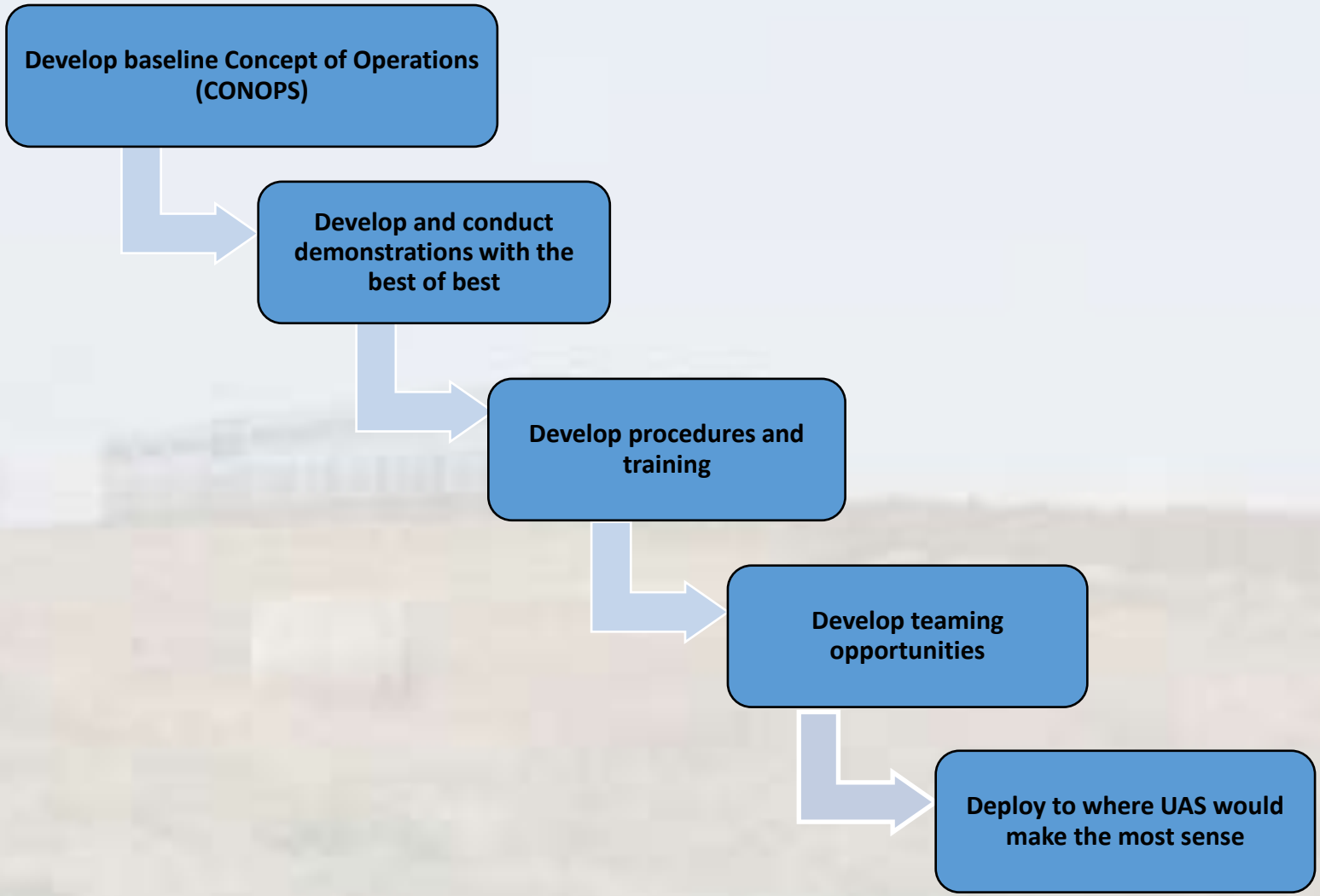
Recommended Next Steps



So now what for this workshop

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- Start CONOPS now and get professional help to:
  - Develop a prioritized requirements list where UAVs may provide solutions sets and associated CONOPS
  - Explore technical options for:
    - Effectiveness
    - Cost efficiency
    - Low impact on operations or personnel

StreamSend

- **Move forward with a plan, don't reinvent the wheel and don't get sold by the first vendor.**

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Questions

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