Unmanned Aerial Systems and Airborne Technologies Programs in DHS S&T

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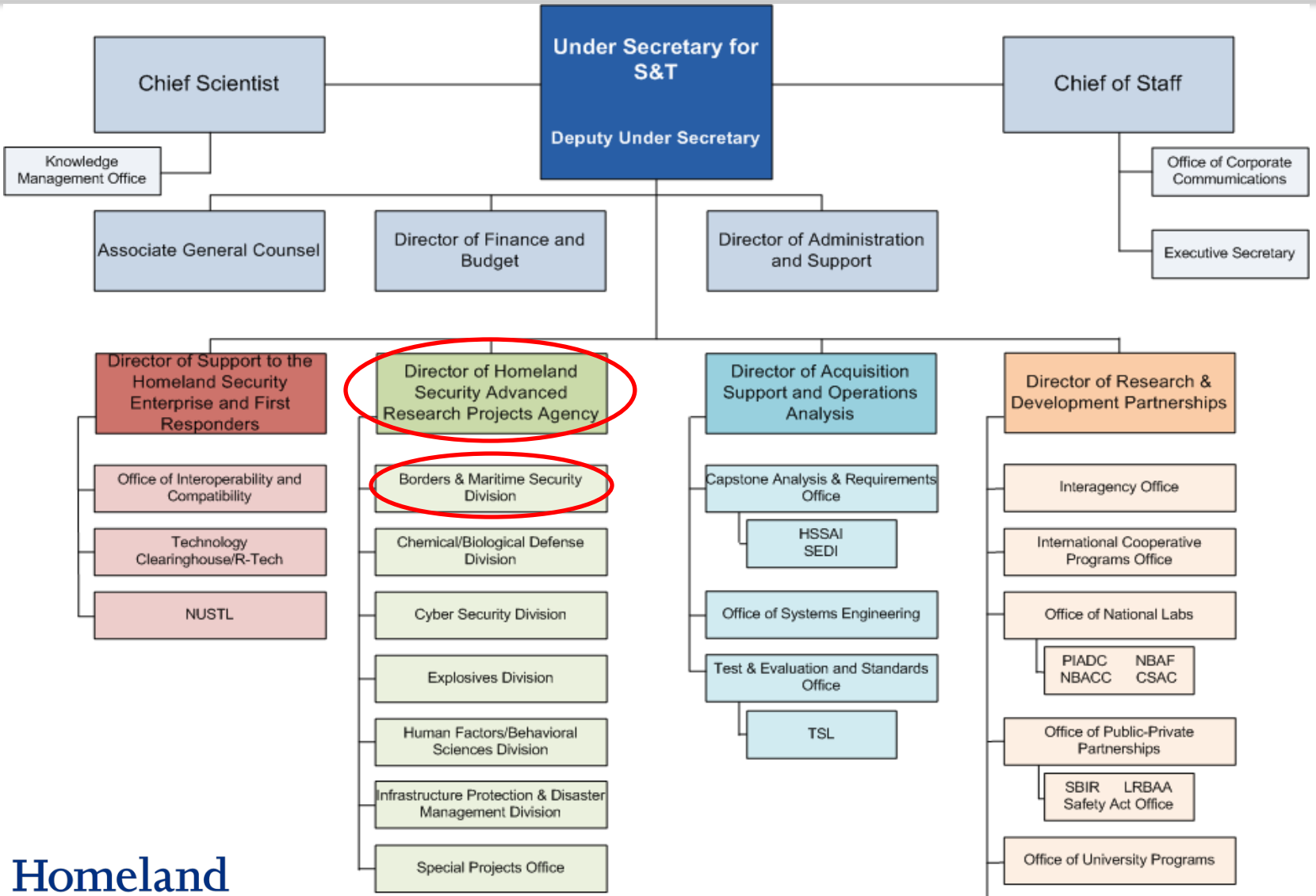
S&T Organization



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Borders and Maritime Security Division

Mission: Develop technical knowledge and capabilities that enhance U.S. border security without impeding the flow of commerce or travel

– AOR: All air, land and maritime borders, including ports-of-entry and inland waterways

Challenges

– Operational environments are difficult and varied
– Stakeholders have diverse needs and motivations
– Deployed technologies must be affordable, robust, reliable, and low maintenance

Key Partners/Customers

– Customs and Border Protection (CBP)
– United States Coast Guard (USCG)
– Immigration and Customs Enforcement (ICE)
– Transportation Security Administration (TSA)

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UAS Programs

Scalable Common Operating Picture Experiment (SCOPE)

UAS in National Airspace System

Airborne Sensors

First Responder Community – Small UAS

UAS Programs

- Scalable Common Operating Picture Experiment (SCOPE)

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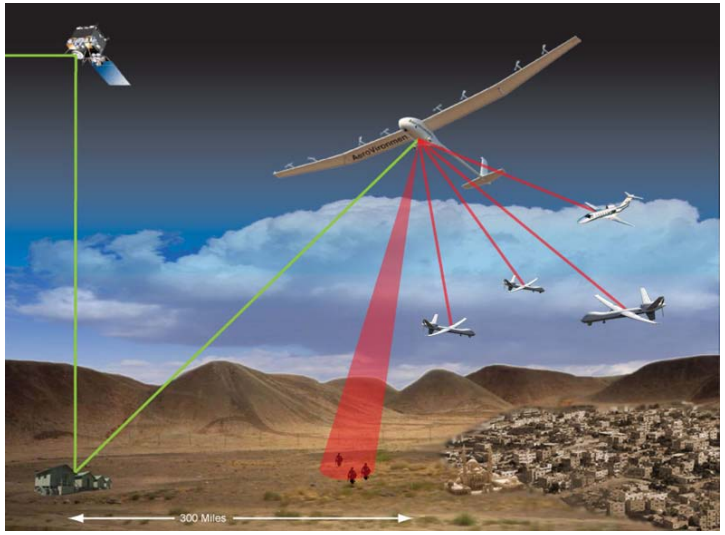
Scalable Common Operating Picture Experiment
(SCOPE)

VISION: Dominant border and maritime domain awareness via continuous over-the-horizon surveillance

- 7-day orbits at 50,000 ft with 2-hr revisit rate
- Reaper cueing, beyond-line-of-sight relay for video & comms
- Full motion video
- Comm. relay
- Multi-function contingency platform
  - Special security events; disaster response; research; other



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Modeling & Simulation

Problem

- DHS needs greater Unmanned Aircraft Systems (UAS) access to the National Airspace System (NAS)
  - FAA today provides NAS access for DHS's Reapers covering large CONUS border domains, with restrictions, based on case-by-case requests
  - The long-term goal is file-and-fly access

Challenges

- UAS today cannot detect and avoid other aircraft autonomously
- For greater access to the NAS, FAA requires a UAS midair collision probability < 10^{-9} incidents/ flight-hour maintained over a year
- This incident probability cannot be demonstrated by actual flying
- FAA safety case requires use of modeling and simulation as well as UAS Collision Avoidance Systems

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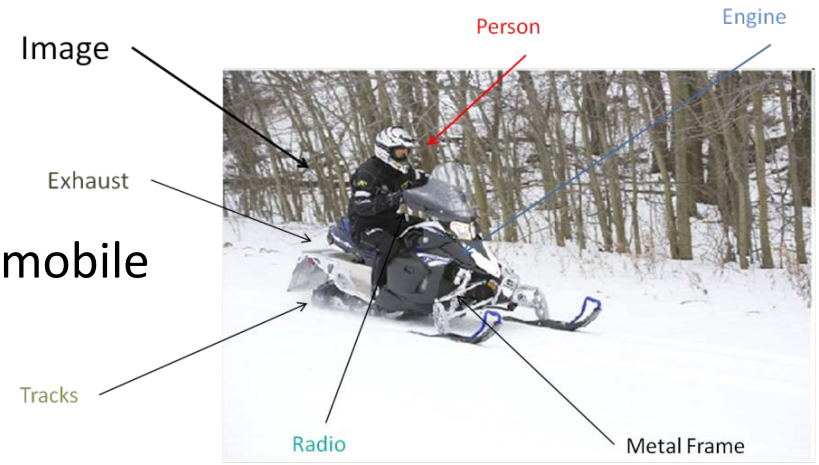
Sample Scenarios and Observables

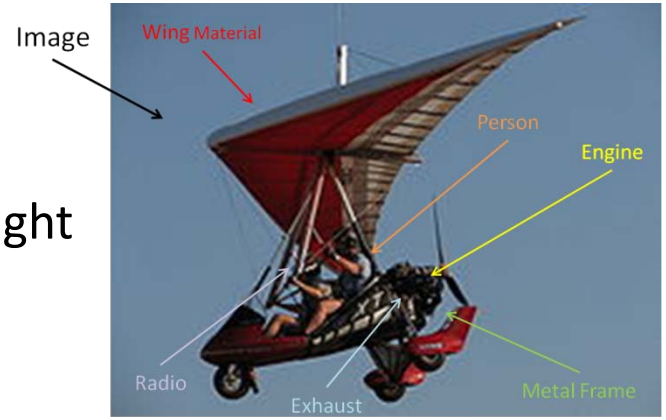
Scenarios:

- Ultralight aircraft dropping payload
- Helicopter crossing US/Canada border
- Boats transporting between borders
- Underground tunnel
- Boat rendezvous
- Pedestrian border crossing
- Vehicles driven on frozen lakes/rivers
- Smuggling via commercial trade
- Crossing via Native American reservations

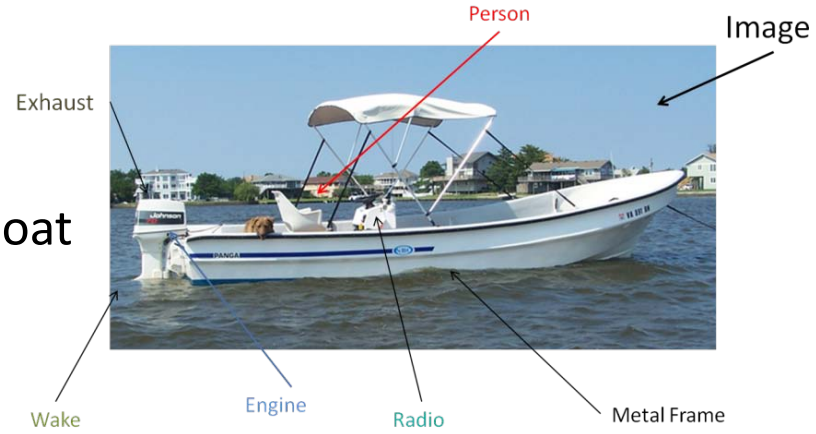
Snowmobile



Ultralight



Boat



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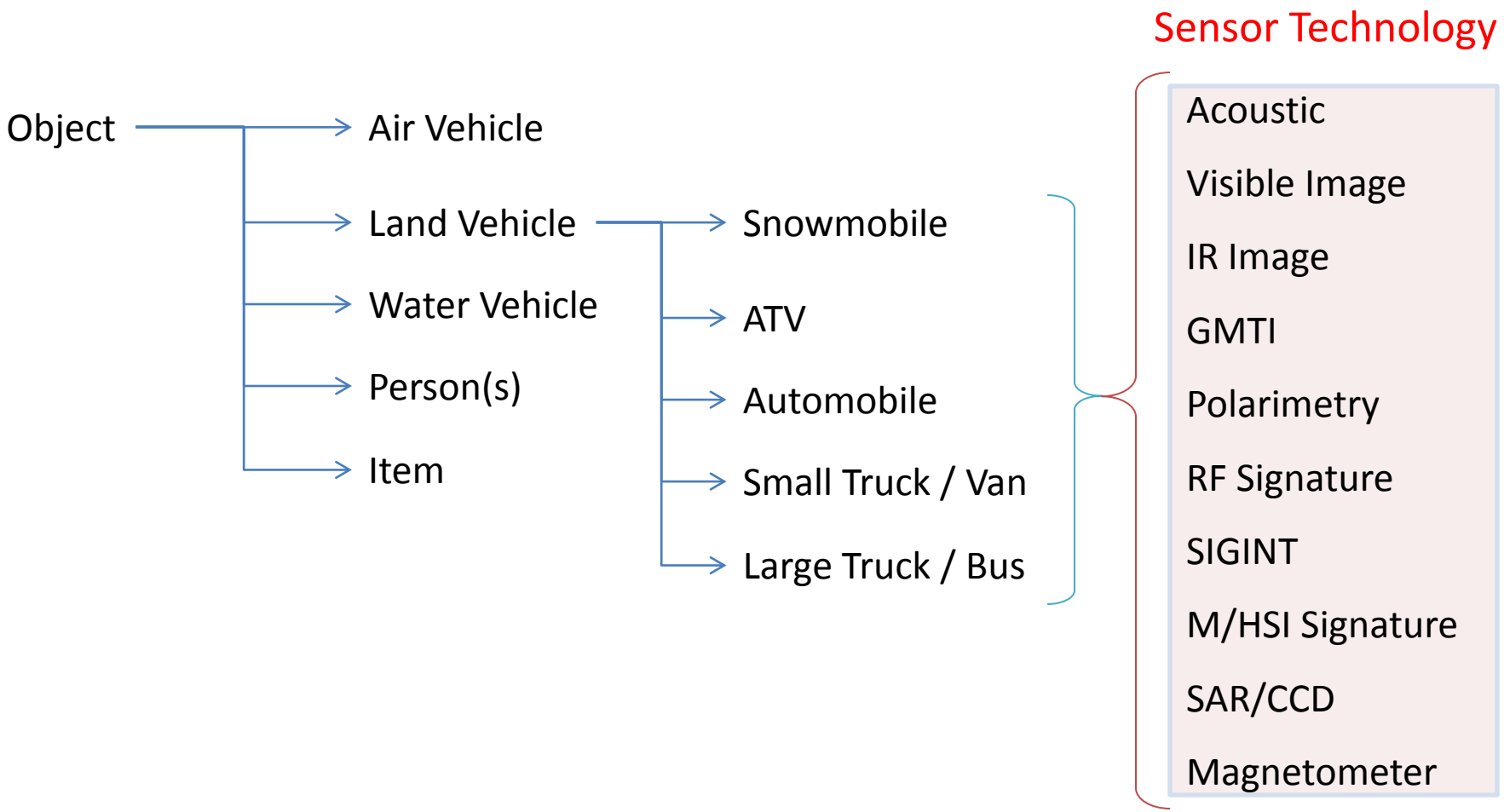
Example of Problem Decomposition: Land Vehicle Summary



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Capability Gap: High-Res but Narrow FOV Sensors

- Only a small area can be imaged at one time
- Targets of Interest (TOIs) or potential TOIs are identified by some other means

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WAS Capability: Large FOV Imaging System

Example: City-sized area is imaged & recorded at high-res and high frame rate

FOR is many miles across; coverage is many hours in duration

Events of interest happen where and when you're not looking…

…DHS needs real-time ops support and forensic capabilities

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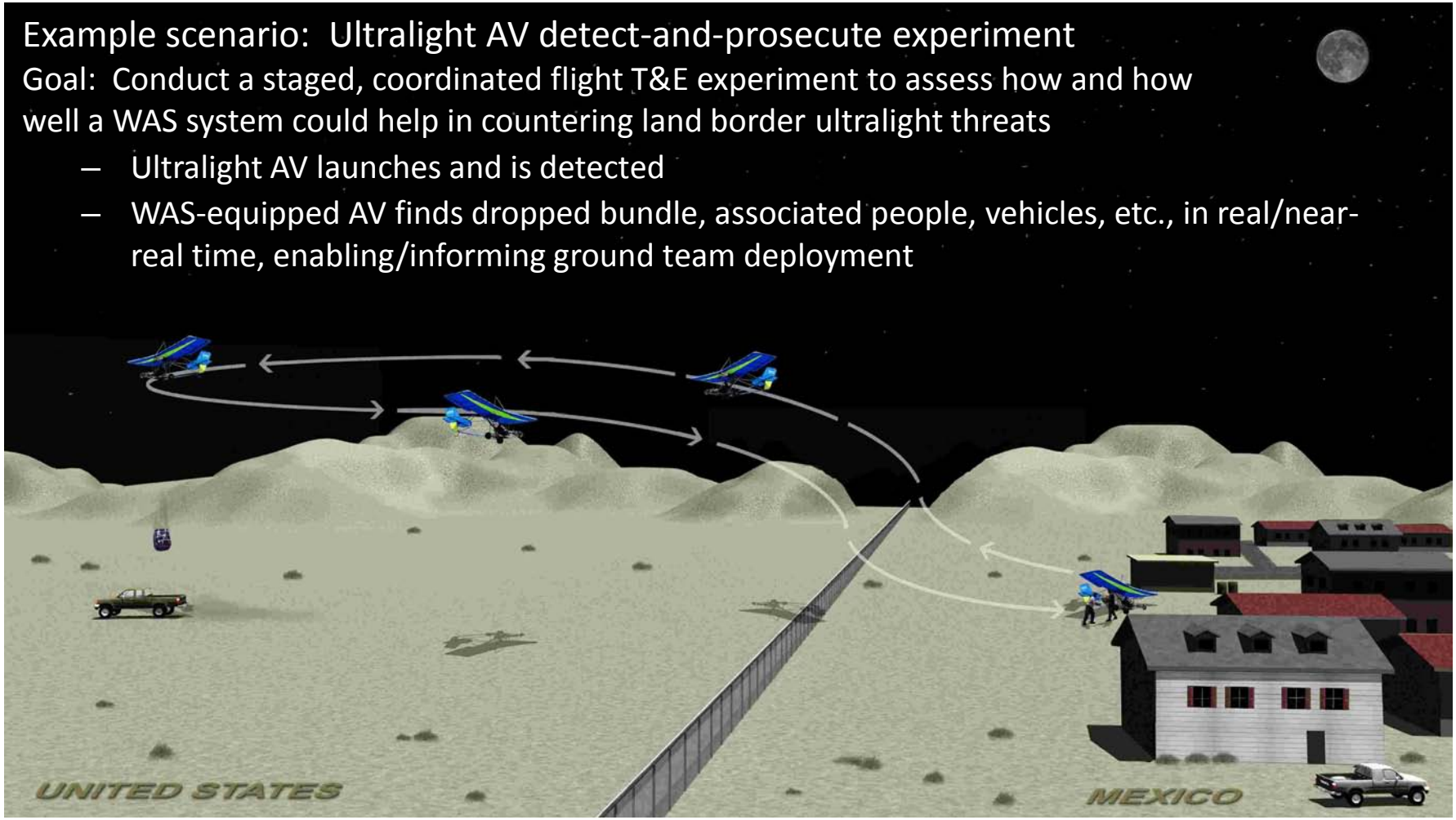
Persistent Airborne WAS – 2011/12

Example scenario: Ultralight AV detect-and-prosecute experiment

Goal: Conduct a staged, coordinated flight T&E experiment to assess how and how well a WAS system could help in countering land border ultralight threats

- Ultralight AV launches and is detected
- WAS-equipped AV finds dropped bundle, associated people, vehicles, etc., in real/near-real time, enabling/informing ground team deployment



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Examples – Other WAS Program Scenarios

1. **Surveillance of near-border urban areas**
   - Tracking, back-tracking vehicles and people
2. **Monitor very large border areas**
   - Unauthorized intrusion
3. **Detect near-border tunnel entrances**
   - Automatically measure flux of people entering and leaving near-border buildings
4. **Disaster relief – notional example:**
   - WAS imagery finds TOIs over large areas and cues high-res. spotter to locate victims & vector rescue teams

Mariposa POE, Nogales, AZ

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First & Emergency Responder UAS T&E

Goals

- Evaluation of small unmanned aircraft system (sUAS) value to first and emergency responders in real operational environments
- Use/validate FAA's draft criteria for flying sUASs
- Build experience and knowledge base for sUAS use in urban areas including disaster response

Initial step (2010-11)

- Scenario types: Law enforcement; fire; hazmat; S&R
- 3 sensor types: EO/IR, chemical, radiological
- Representative sUAS types
- Observers (e.g., FEMA; USSS; CBP; other)

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Mission Needs comments on GHO

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