



History of UAS

Prof. Venki Muthukumar, Ph.D.

What is UAV & UAS?



- An unmanned aerial vehicle (UAV), commonly known as a drone, is an aircraft without a human pilot on board.
- Its flight is controlled either autonomously by computers in the vehicle, or under the remote control of a pilot on the ground or in another vehicle.
- The term unmanned aircraft system (UAS) emphasizes the importance of other elements beyond an aircraft itself.

Other names for UAS



- Names that may be used to describe a flying object or machine without a pilot on board aerial torpedo,
- radio controlled vehicle
- remotely piloted vehicle (RPV)
- remote controlled vehicle
- autonomous controlled vehicle
- pilotless vehicle
- unmanned aerial vehicle (UAV)
- unmanned aircraft system (UAS)
- drone

UAV/UAS Production History



- Started with the Kettering Bug (1918)
- Except for the German V-1, not much activity until after WWII
- Radioplane and Others in the late 40's
- Today – Government and Non-Government

Types



Fixed Wing

VTOL (Vertical Take-off and Landing)

Hybrid

Aerostat

Sizes



- Large
- Medium
- Small
- Micro

Kettering Bug with Sperry-Curtis Gyroscope



- 1918 (In Dayton)



Sperry-Curtis Aerial Torpedo



- Developed also in 1918 by Lawrence Sperry for the Navy
- Lawrence Sperry was the developer of the autopilot
- Work started initially as
 - underwater torpedoes
 - first guided missile
 - program in this country
- Launched on March 6 1916 for 1000 ft
- Never put into production



'Queen' and 'Queen Bee'



- 1931 the British developed the Fairey 'Queen from a Fairey IIIF floatplane
- 1935, a larger target was developed that was produced in much larger quantities: the 'DH.82B Queen Bee'
- This led to the designation of the letter “Q” for unmanned aircraft
- The term “drone” is said to have originated from the Queen name “bee or drone”
- Had wheels or floats depending on launch location
- fly at an altitude of 5,182m at speeds of
- over 160 km/hr and for up to 482 km



German V1



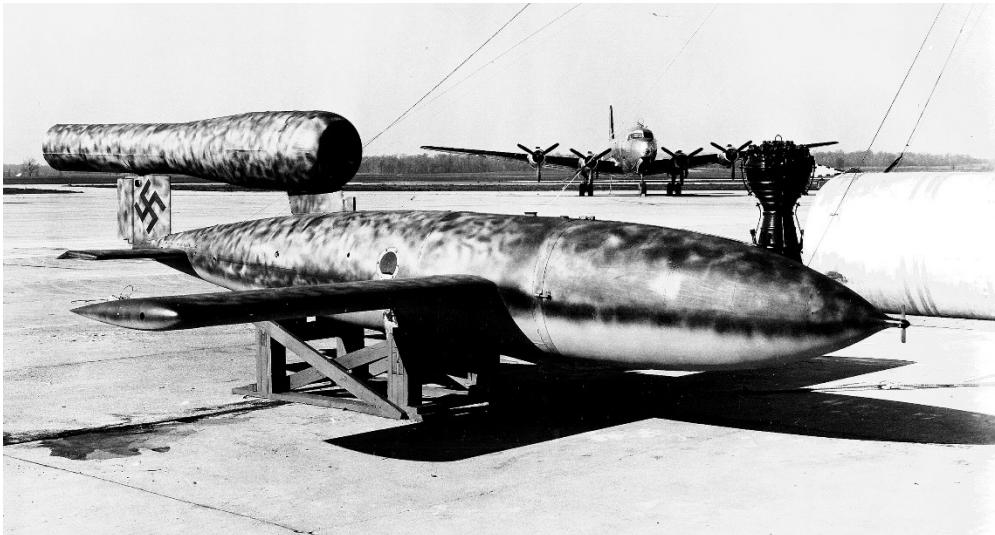
- PulseJet Powered UAV in WW II



WWII German V-1 Buzz Bomb



- Most significant UA of the war
- The first mass-produced cruise missile
- powered by a primitive yet powerful “pulsejet” engine which gave the V1 a loud noise heard 10 mi away (hence the name)
- over 25,000 built
- Could be launched both by air or land
- Used a powerful pneumatic catapult system
- Primarily employed from ground-launch rail systems



Cruse Missiles



- Large Scale Weapons



The Predator



- Modern Day



Challenges of Airspace Integration



- The “fear” factor
- Privacy Concerns
- The “creep factor”
- Civil Liberties
- Safety

Aerospace History



It all started with the Wright Brothers...



- Wilber and Orville

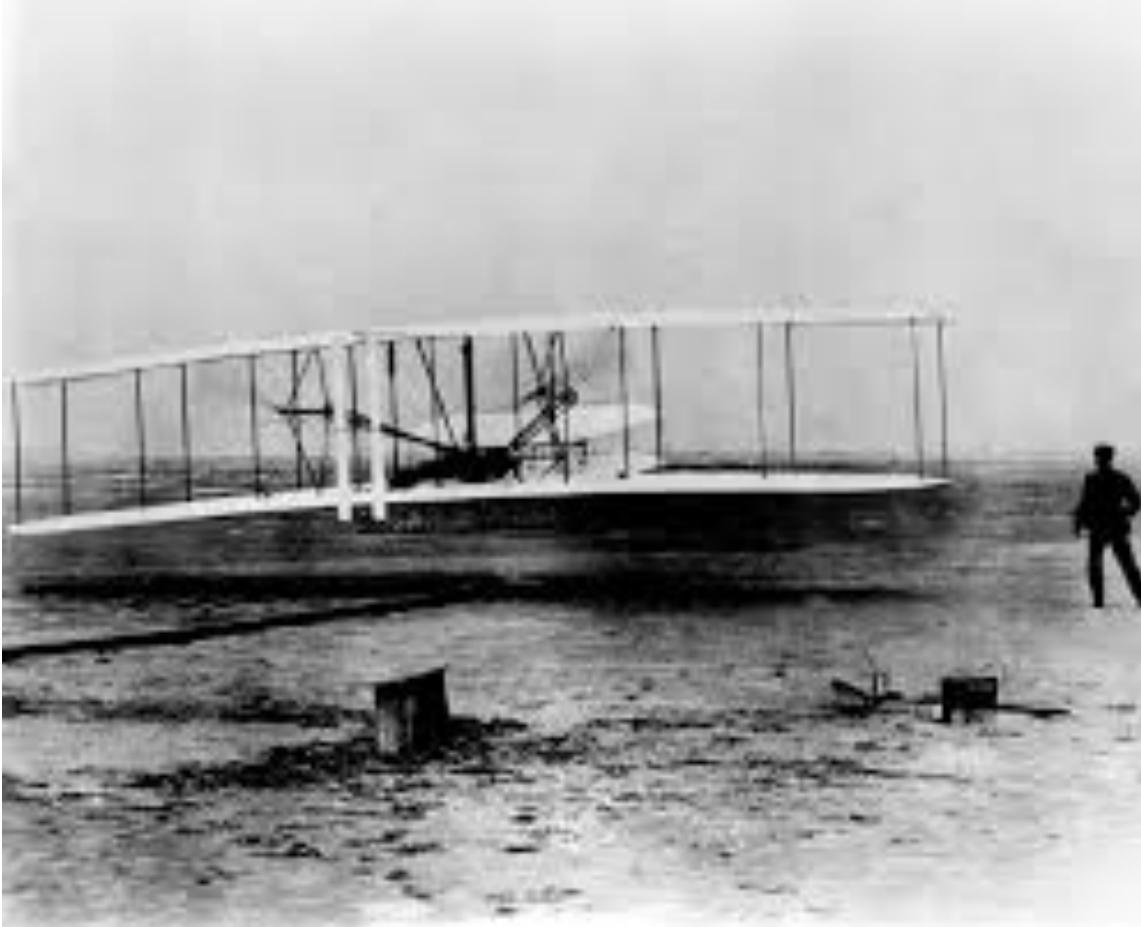


Ohio
Birthplace of Aerospace Science

Wright Flyer



- Kitty hawk 1903



World War I



Signal Corps



The **United States Army Signal Corps (USASC)** is a branch of the [United States Army](#) that creates and manages [communications](#) and [information systems](#) for the [command and control](#) of [combined arms forces](#).

Guns and Bombs



United States Mail



Passengers



- 1919



World War II

More Guns and Bombs



- B-25



Modern Aircraft



Why Now



The **“fusion”** of new technologies:

- Micro Sensors
- Firmware
- Software
- New Modulation Methods
- GPS
- Out runner Motors
- LiPoly Batteries
- Strong, lightweight materials

Sizes Today



Gas-powered VTOL

- Carries more payload and more payload types than electric VTOL
- Can have additional endurance but usually utilized for the additional payload capability in a hover

Gas-powered Fixed Wing

- Allow for high endurance and multiple payloads
- Generally the most expensive UAV type

Electric VTOL

- Usually the cheapest option
- These platforms will be preferred by recreational users and small business owners

Electric Fixed Wing

- Utilized when mission drives increased endurance but low cost still required
- Examples:
 - Search and rescue
 - Extended surveillance

Large



Medium



Small



Micro



Why all the fuss about UAVs?



Sensor Fusion for UAV Pose Estimation



Applications Today

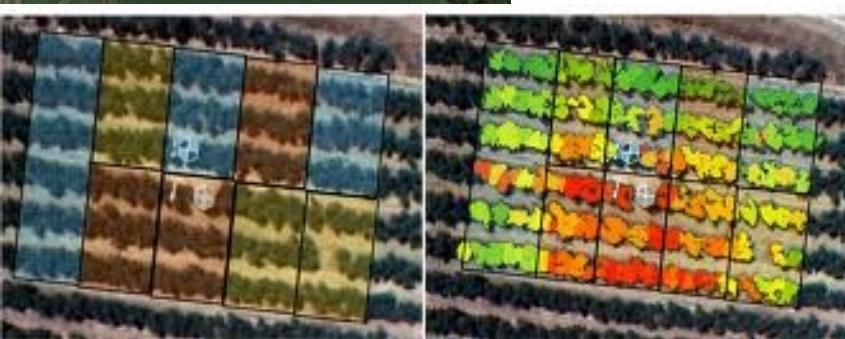


Fish and game monitoring/research	Aerial video/photography	Radiation measuring/atmospheric sampling
Oil pipeline inspection	Traffic/crowd monitoring	Search and rescue
Electrical wire monitoring	Small package delivery	Tunnel detection
Infrastructure inspection	Terrain mapping/surveying	Protection from MANPADS at large airports (Project Chloe)
Searching for natural resources	Construction site survey/monitoring	Charging wireless devices
Wildfire detection/suppression	Environmental monitoring/protection	Airborne wi-fi
Storm/natural disaster damage assessment	Archeology	Communications relays and temporary communications during outages
Man-made disaster damage assessment (i.e., oil spills)	Volcanology	Coastal/beach monitoring
Environmental change detection (floods, ice flows, erosion, etc.)	Atmospheric monitoring and measuring	Mineral detection
Flood potential monitoring	Hurricane monitoring/prediction	Avalanche monitoring/rescue
Meteorological study	Environmental rule compliance	Mining applications

Precision Agriculture



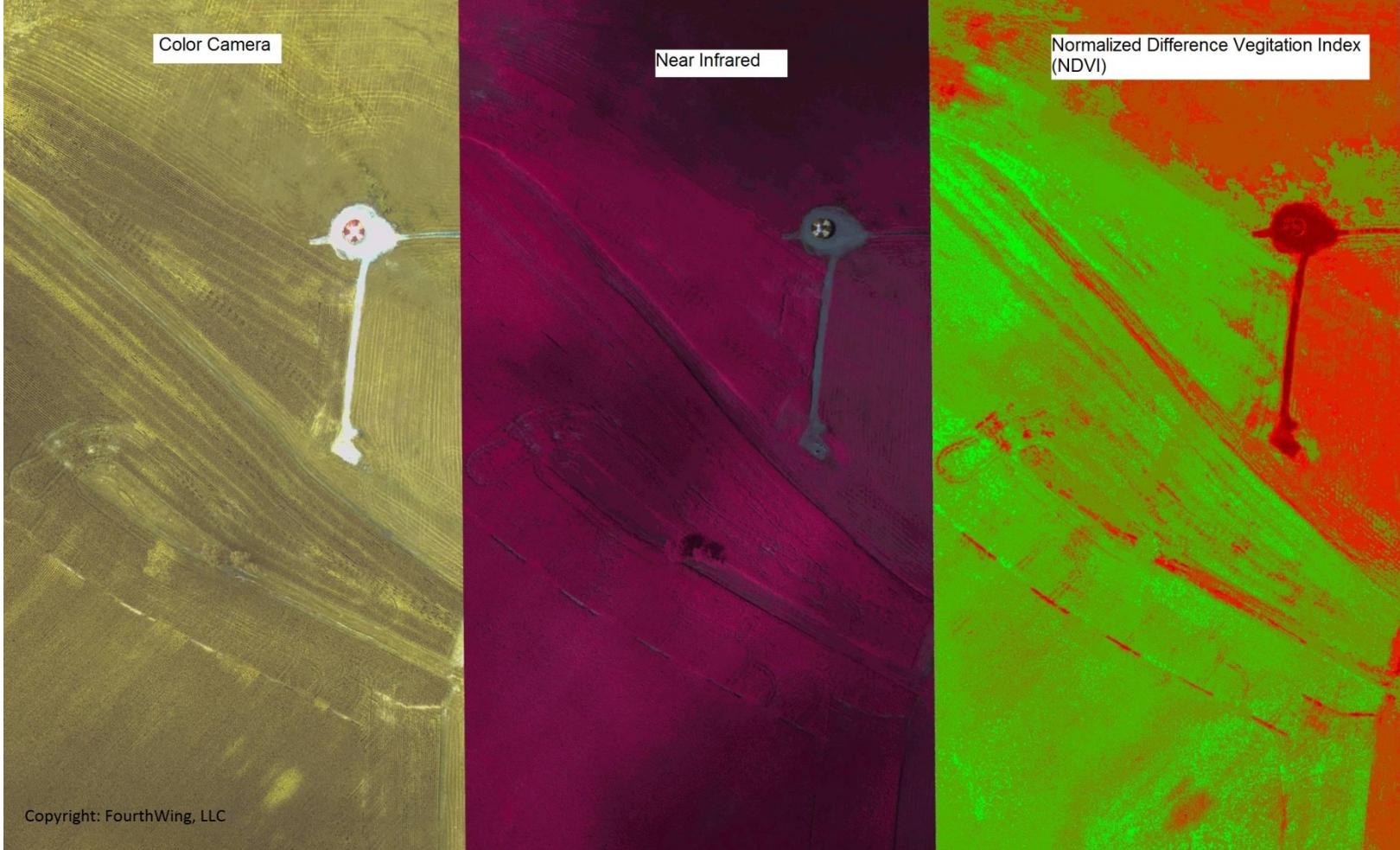
UAV Workshop



Precision Agriculture



UAV Workshop



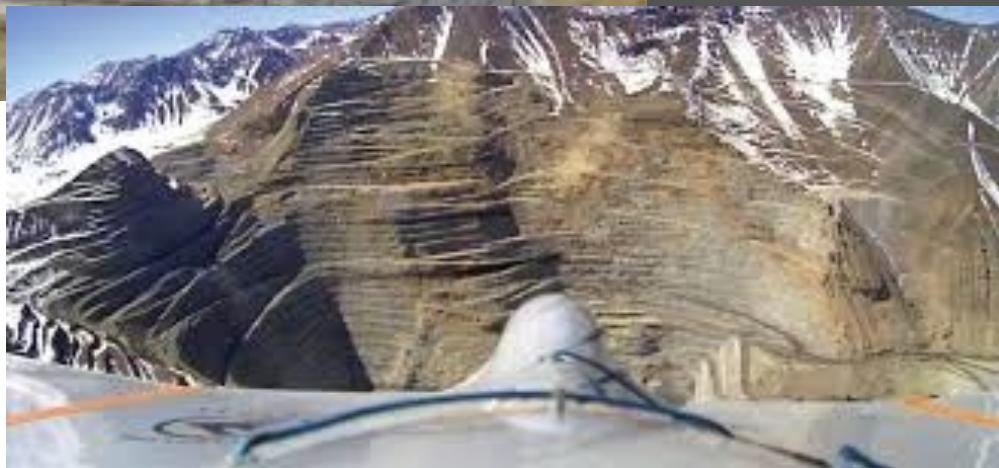
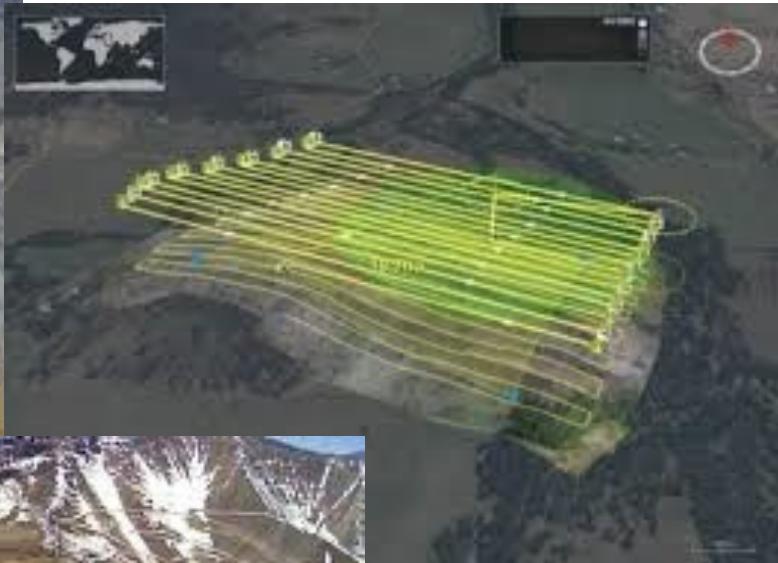
Agriculture Applications



- Irrigation
- Crop Moisture
- Soil Moisture
- Fertilizer Concentration
- Mold
- Bug Infestation
- Chlorophyll Concentration
- Feed Lot Inspection
- Peak Harvest



Mining



Power Line Inspection



Emergency Services



UAV Workshop

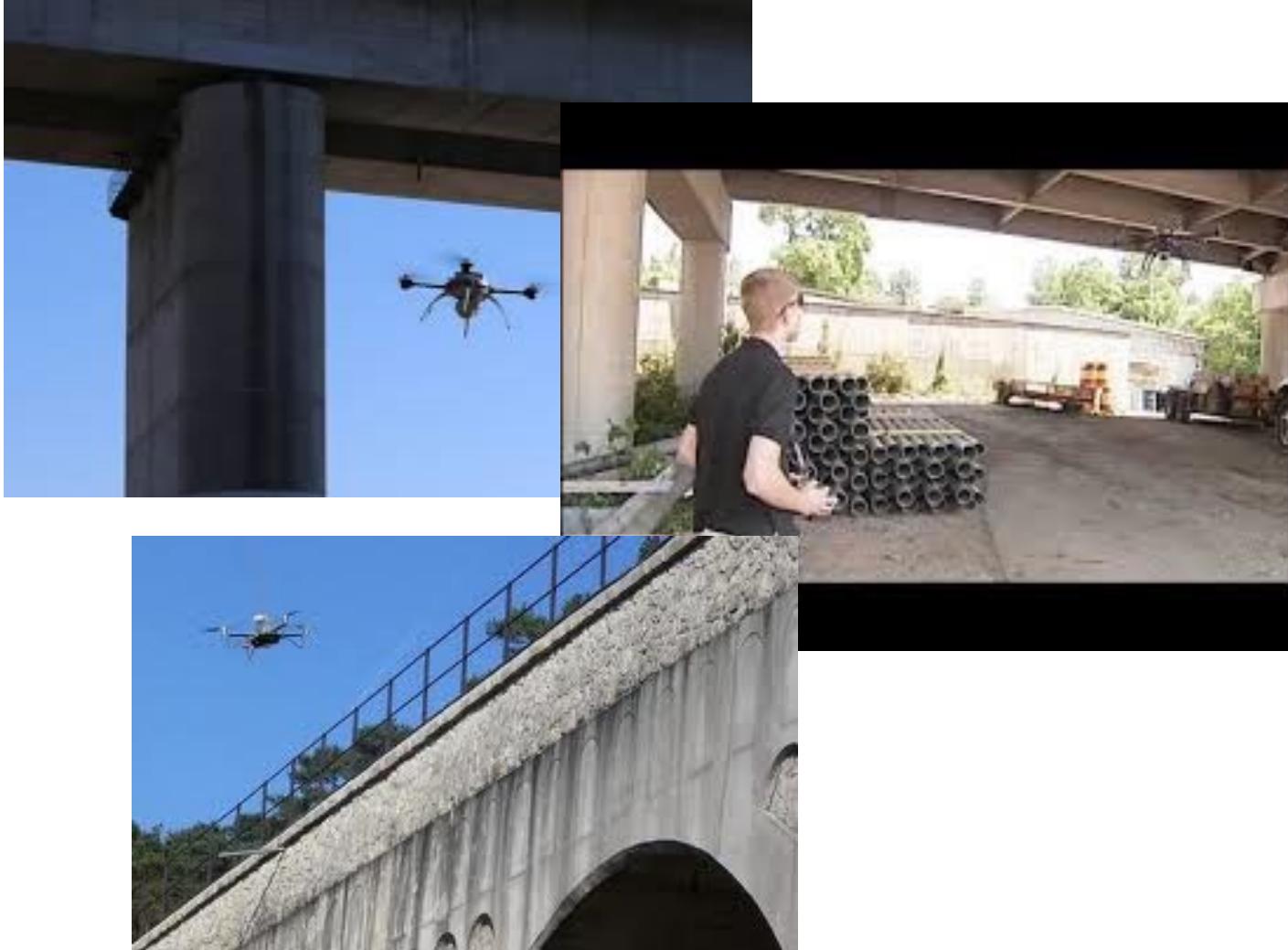
**UAV
CHALLENGE**



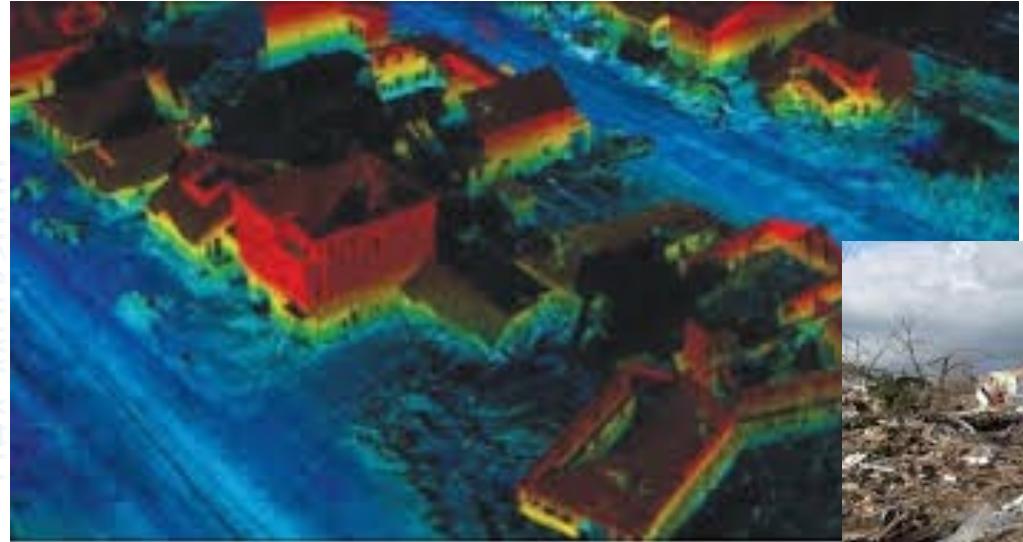
Law enforcement



Bridge Inspection



Disaster Assessment



UAV Workshop

