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An Exploration of the Commercial Use of Drones in Agribusiness, Infrastructure and Mining

WELCOME

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Session 1 - Drones 101 – Adding Value to Agribusiness and Other Enterprises

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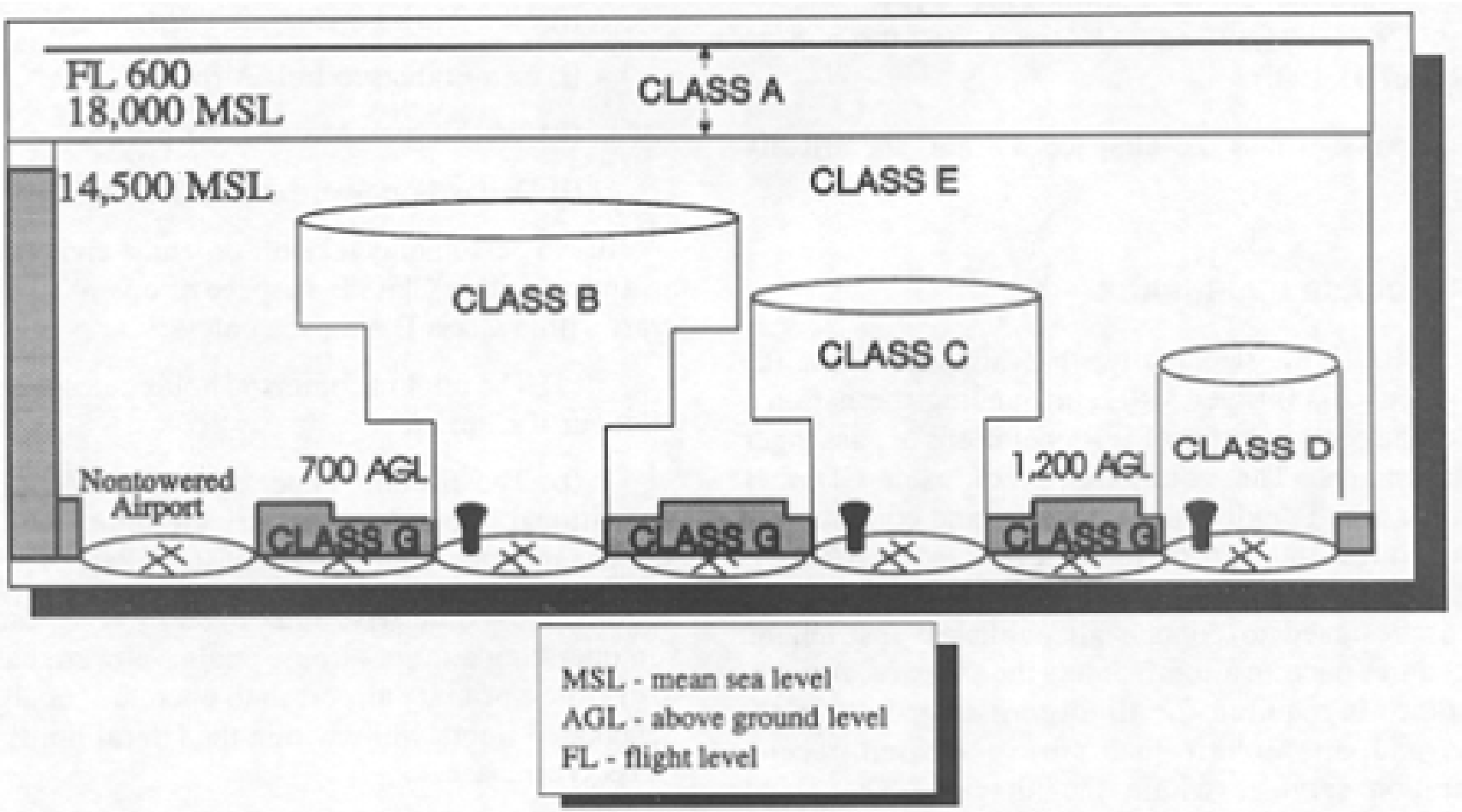
National Airspace System (NAS)

- Any aircraft operations
- in the national airspace require
- a certified and registered aircraft,
- a licensed pilot,
- and operational approval
- NAS Regulated by Classes—Even at Low Altitudes

- **Legal Authorities for the NAS**
  - **Air Commerce Act of 1926**
  - ***United States v. Causby*, 328 U.S. 256 (1946)**
  - **49 USC § 40103**

National Airspace System



Hobby Aircraft

No Tail Numbers for Hobby Aircraft

- *Taylor v. Huerta*, No. 15-1495 (D.C. Cir. May 19, 2017)
  - Invalidated tail numbers for hobbyist drones
  - 2012 FAA Modernization and Reform Act states FAA "may not promulgate any rule or regulation regarding a model aircraft"
  - FAA considering options
  - Tension between recreational use and commercial use not addressed

Section 333 Waiver Process
FAA Modernization & Reform Act

- Identify a Pilot
- Submit an Application
- Wait
- Apply for a Registration Number
- Fly

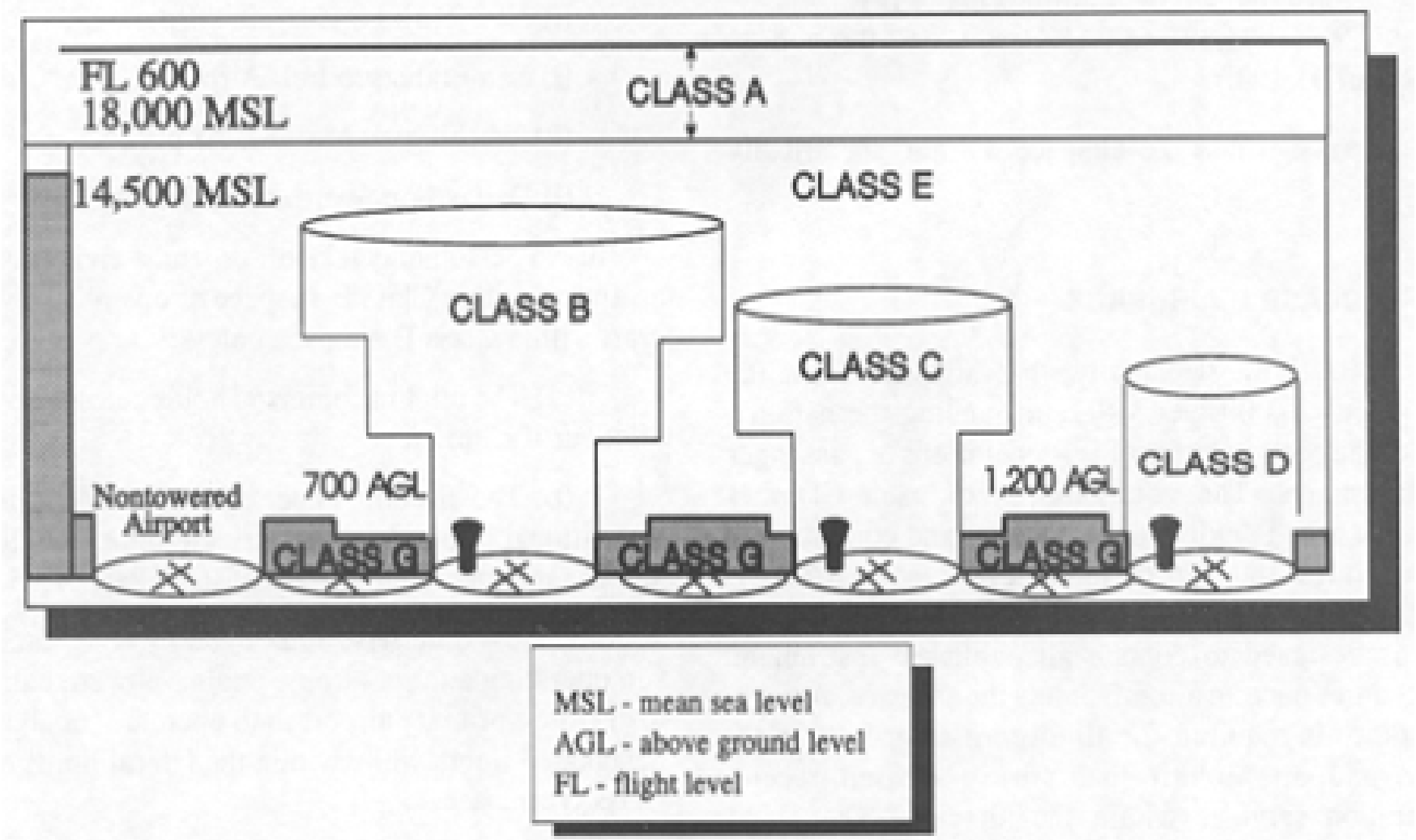
FAA Enforcement—SkyPan International

Cecil the Lion- $55,000 Fine

Part 107 Regulations
General Operational Limitations

- **Less Than 55 Pounds**
- **Visual Line of Sight**
- **Daylight Operations**
- **Height 400’ Speed 87 Knots**

Part 107 Regulations
Where Flights Are Allowed




The Metropolitan Airports Commission
PROHIBITS DRONE OPERATIONS ON ITS PROPERTIES
unless approved by the
Federal Aviation Administration
and coordinated with the MAC.
MAC
Call 612-726-5111
for more information.

Part 107 Regulations
Remote Pilot in Command

- **Required Qualifications**
- **Part 61 Pilot Certificate Holders**
- **Foreign Certified UAS Pilots**

Part 107 Regulations
Other Considerations

- **Additional Important Operational Limits**
- **Part 107 Waiver Process**
- **Section 333 Exemption Process**

Part 107 Ag Operations

Part 107 Infrastructure Operations

Part 107 Infrastructure Operations

Part 107 Mining Operations

Preemption and State Regulation

- **Federal Preemption**
  - **Restrictions on Operations, Equipment or Training**
  - **Local Land Use**

State Regulation

Common Law Issues

- **Trespass and Nuisance**
- **Invasion of Privacy**
- **Negligence**
- **Strict Liability**
- **Damage to a UAS**


KEEP
CALM
AND
CARRY ON
FLYING

New York CLE Code

We have some NY lawyers participating remotely today. In accordance with NY CLE Rules, the New York Verification Code for this program is _____.

Overview of Unmanned Aircraft Systems (UAS) in Agriculture, Mining and Infrastructure

Parts of the UAS System

David White

Professional Experience

- Juniper Unmanned – COO & Director of Business Development
- Ariel Technologies Inc. – Director Technical Solutions
- Alacer Gold Corp. – M & A support team - Dataroom Developer
- HS International – Mining - Sr Technical Recruiter

UAS Consulting

- Solution Design and integration
- Program Design – decision quality data
- Workflow development and integration
- Development R&D testing and training facilities

Education

B.S. Mining Engineering, Colorado School of Mines

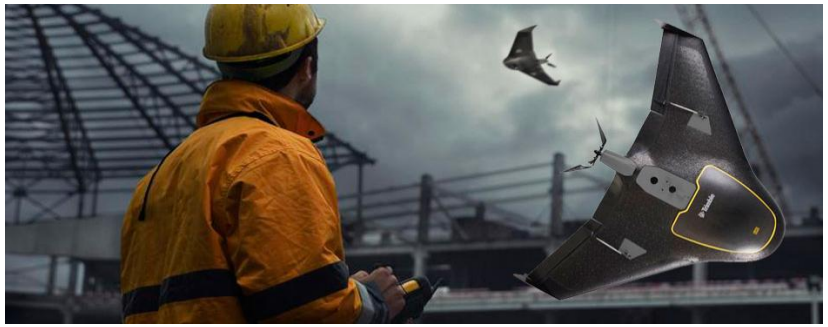
Talk Overview

Topics:

- **What is an Unmanned Aircraft System (UAS)?**
- **Types of aircraft**
- **Sensors and the data they provide**
- **UAS in Agriculture, Mining and Infrastructure**
- **Summary with a caution**

Unmanned Aircraft Systems (UAS)

- *"What **word** should I use… Drone/UAV/UAS?"*
- *"What can a UAS do?"* Almost anything
  - Aircraft types are varied… so, it depends…
- *"What is the best UAS?"* Again, it depends…
  - Not every UAS is well suited for all applications



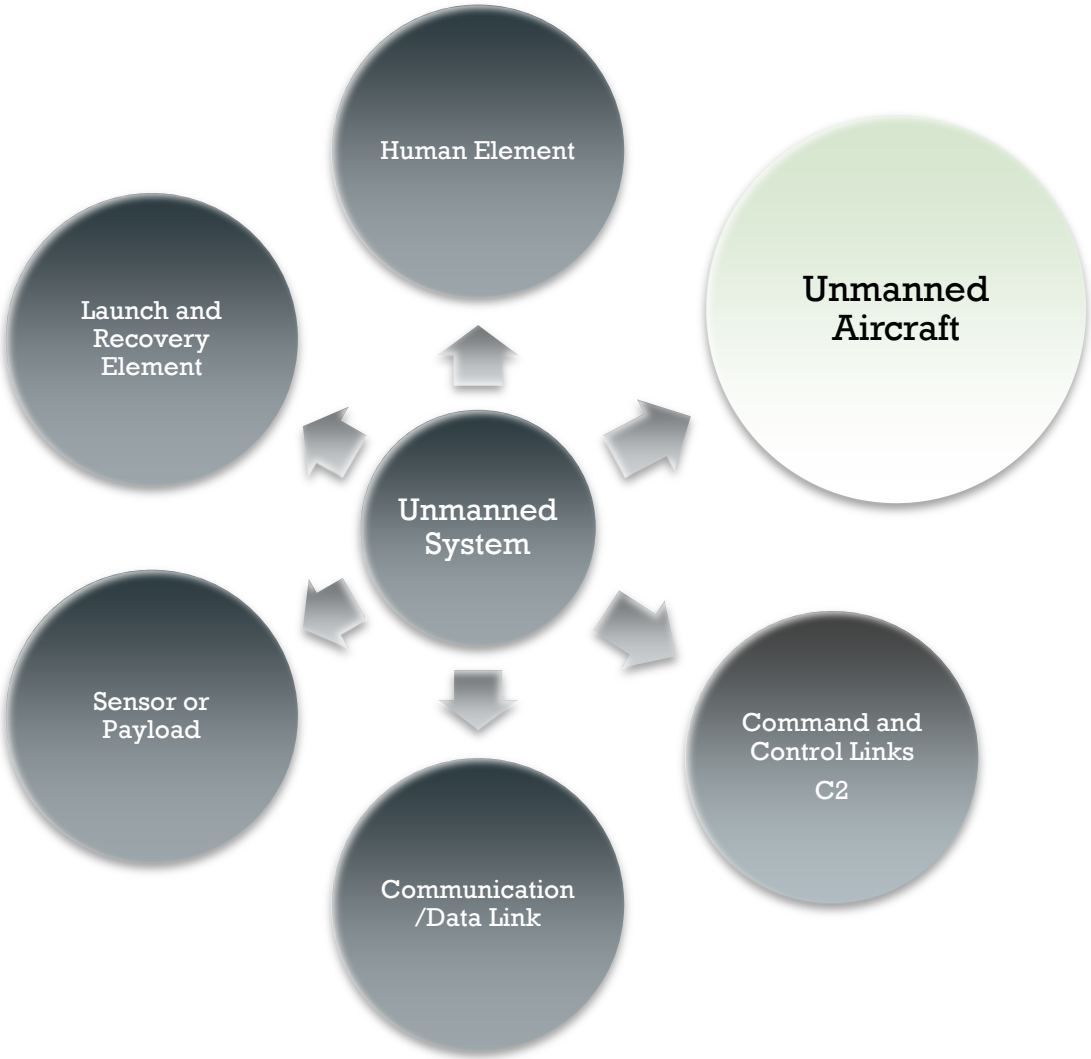
Source: Trimble.com

Unmanned Aircraft Systems (UAS)

- What makes up an Unmanned Aircraft System - UAS?
- Multiple discrete elements
- Each elements performs a specific and unique function
- The elements work together to create a system

Source: http://www.mavinci.de/en

Elements of a UAS



Unmanned Aircraft

- Three basic types of UAV platforms
  - **Fixed-wing Aircraft**
  - **Transitioning Aircraft**
  - **Vertical Takeoff and Landing (VTOL) Aircraft**
    - Multi-rotor Copters
    - Single rotor - Helicopters
    - Ducted Fan Aircraft

(Source: 3DR.com)

Unmanned Aircraft Types

- **Fixed-wing sUAVs:**
  - Delta wing - Trimble - UX-5

    (Source: Trimble .com)

  - Delair Tech - DT 26

    (Source: Delair-tech.com)

  - PrecisionHawk – Lancaster

    (Source: PrecissionHawk.com)

Unmanned Aircraft Types

- **Transitioning UAV's**
  - ALTi – Transition
    - VTOL take-off and landing – Electric
    - Fixed wing flight – Fueled

Unmanned Aircraft Types

- **Multi-Rotor VTOL UAV's**

- **Multi-rotor – Copters**
  - Quadcopter
    - DJI - Phantom 4 Pro

  - Hexicopter
    - DJI Matrice 600 Pro

Source: DJI.com

Unmanned Aircraft Types

- **Single-rotor VTOL UAV's**
- **Single rotor – Helicopters**
  - Pulse Aerospace – Vapor 55

Source: Pulse Aerospace - www.pulseaero.com

Unmanned Aircraft Types

- **Ducted Fan VTOL UAVs**
  - **Honeywell RQ-16A T-Hawk**

(Source: Honeywell RQ-16A T-Hawk)

- **Reference Technologies – Hummingbird 24" ducted fan, 6 external rotors**

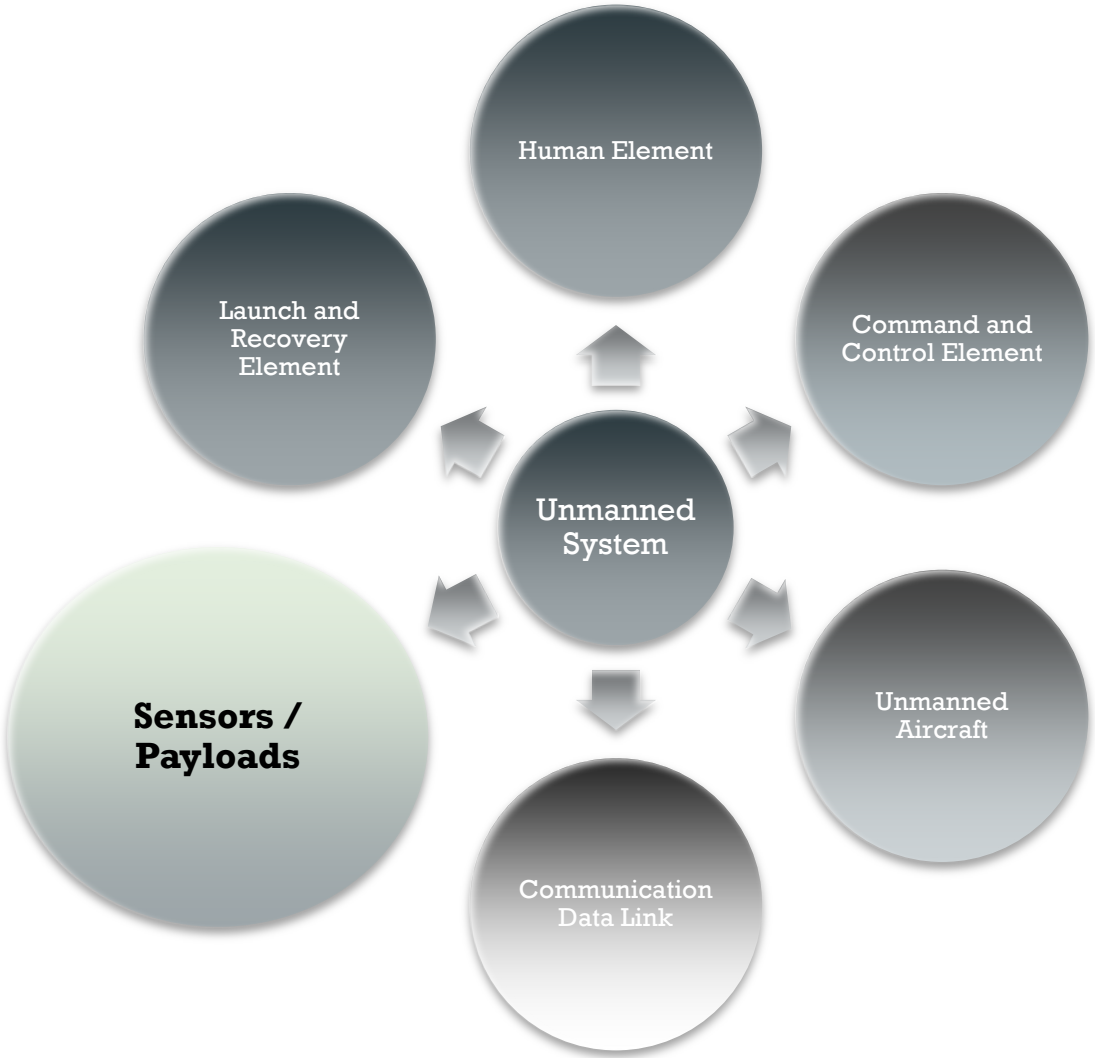
(Source: Referencetek.com)

UAS Capabilities

- Weight (GTW)
- Physical size
- Power Source
- Range
- Endurance
- Wind Tolerance
- Operational Flight Ceiling
- Cruise Speed
- C2 Range
- Sensor types
- Sensor capacity
- Data link range

1,000's UAV Models Available

Elements of a UAS



UAS Sensors

UAS *Mission* - Sensor types

- UAVs may be equipped with a variety of sensors
- Different types of sensors perform different tasks and deliver different types of data
- UAV's may be fitted with a single or multiple sensors
- Mission sensors *ultimately* determine the flight path, flight speed and operational altitude (AGL) of the UAV

UAS Sensors

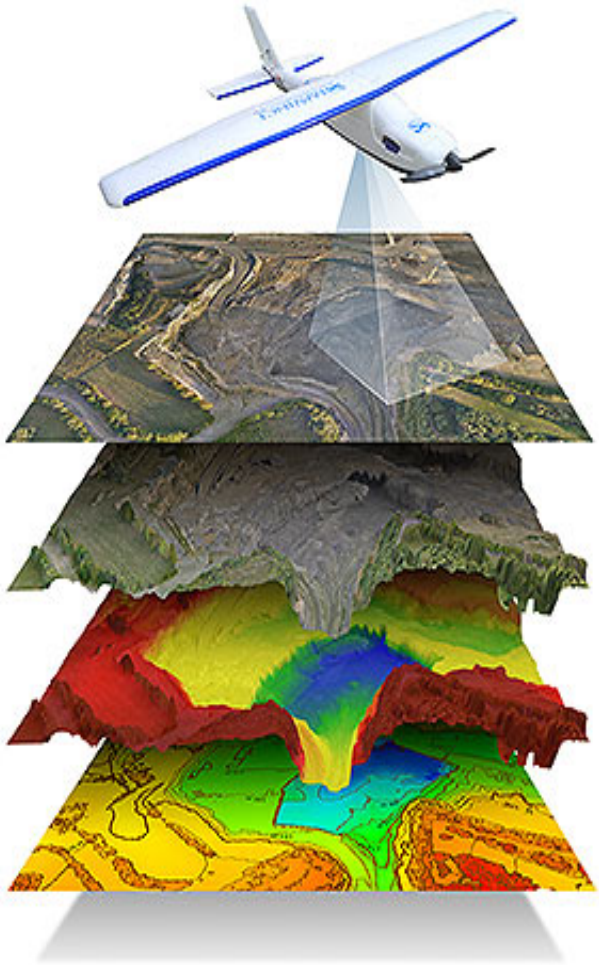
High Resolution Digital Camera

Provides multiple functions…

Photogrammetry = the science of making measurements from photographs

- Multiple highly overlapping images
- Images are post-processed with other flight data resulting in and single large image called a ***photomosaic***
- In addition post-processing produces a ***dense points cloud***
- Points are connected with a mesh generating a 3-D surface or *digital surface model* or DSM

UAS Sensors



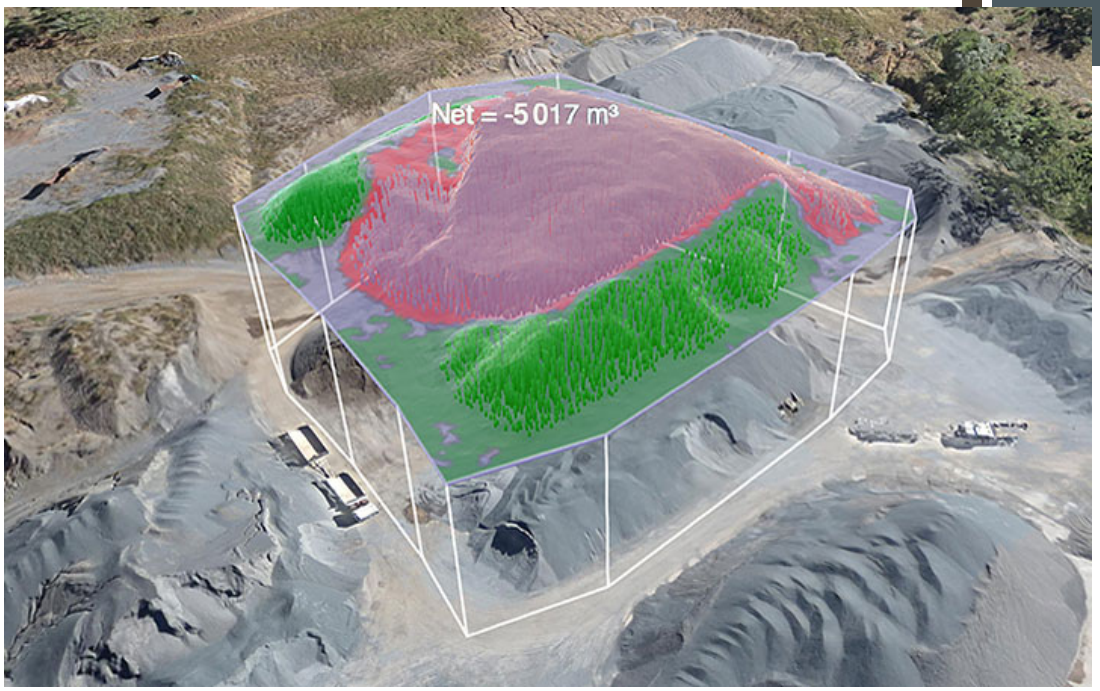
- UAS photogrammetry –
  - Delivers spacial accuracies of 2-5 cm in the x,y, and z dimensions
  - Can fly and process in a day or two, what used to take weeks, and with accuracies that were previously unthinkable.
- At left - progression from images, to colorized point cloud, to DSM to topographic map.

Source: TopCon Positioning Systems (http://www.topconpositioning.com/products/aerial-mapping/sirius-pro)

UAS Sensors

Photogrammetric Stockpile volumes

- Able to calculate the volume of irregular surfaces with +/- 1% accuracies
- Fly as frequently as needed for change detection
- Green - area of added material
- Red - area of removed material



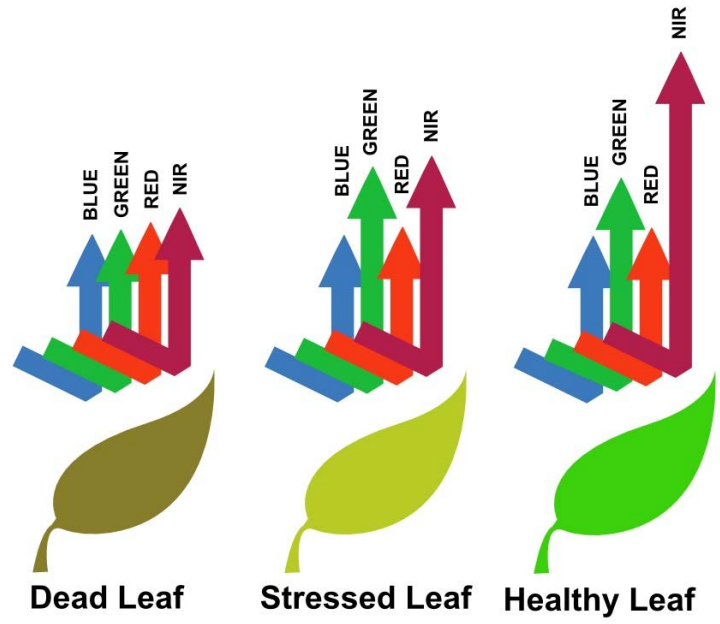
Source: Propeller Aero
(www.propelleraero.com/mining-quarrying/)

UAS Sensors

Multispectral Imagery

- **NDVI** - the **normalized difference vegetation index**
- NDVI - measure of the reflectance of a plant in multiple wave lengths
- Is a good measure of *plant health and plant stress*

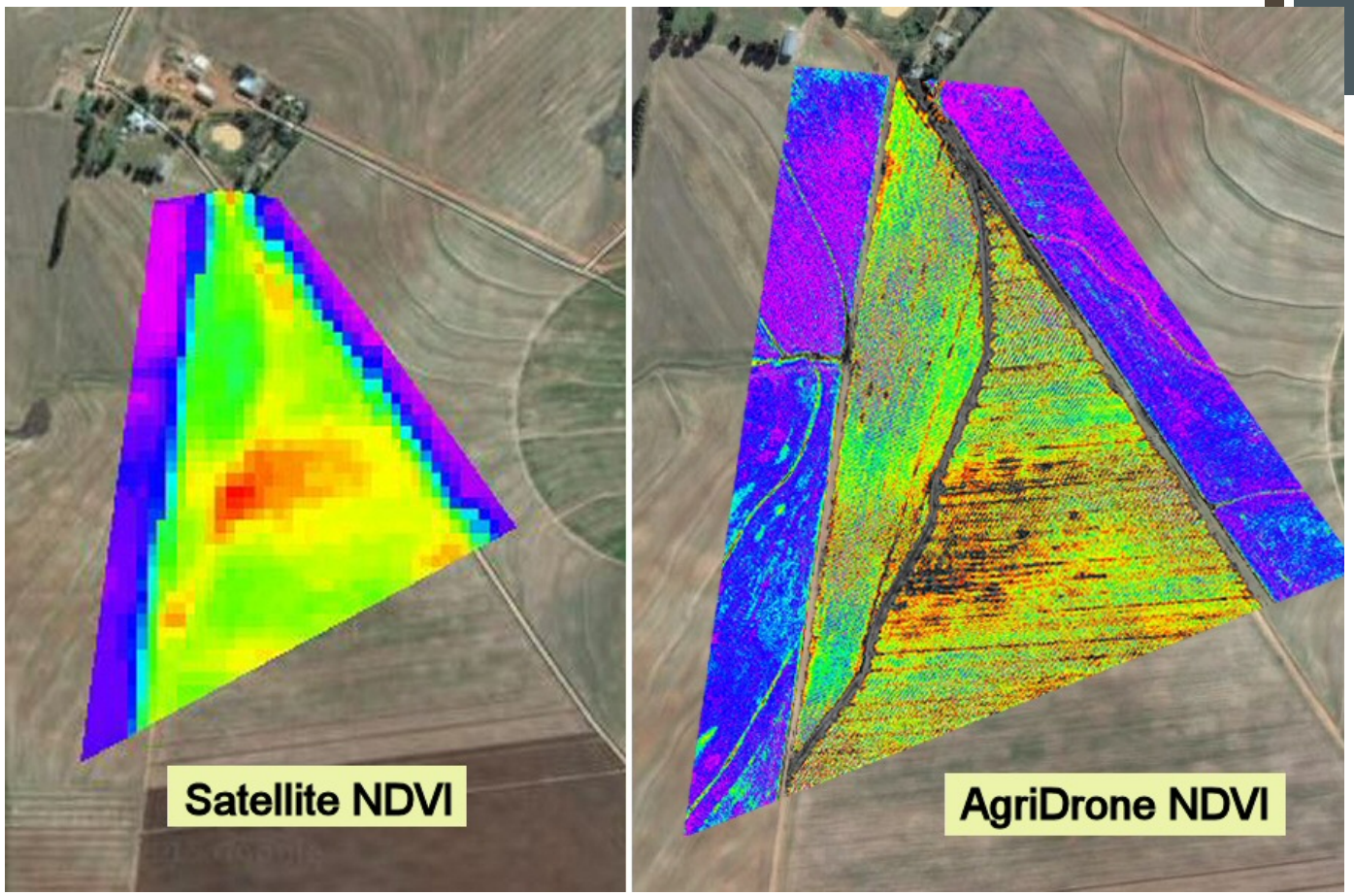
(Source: MicaSense.com)



(Source: Agribotix.com)

UAS Sensors

NDVI Imagery



Source: http://agridrone.co/

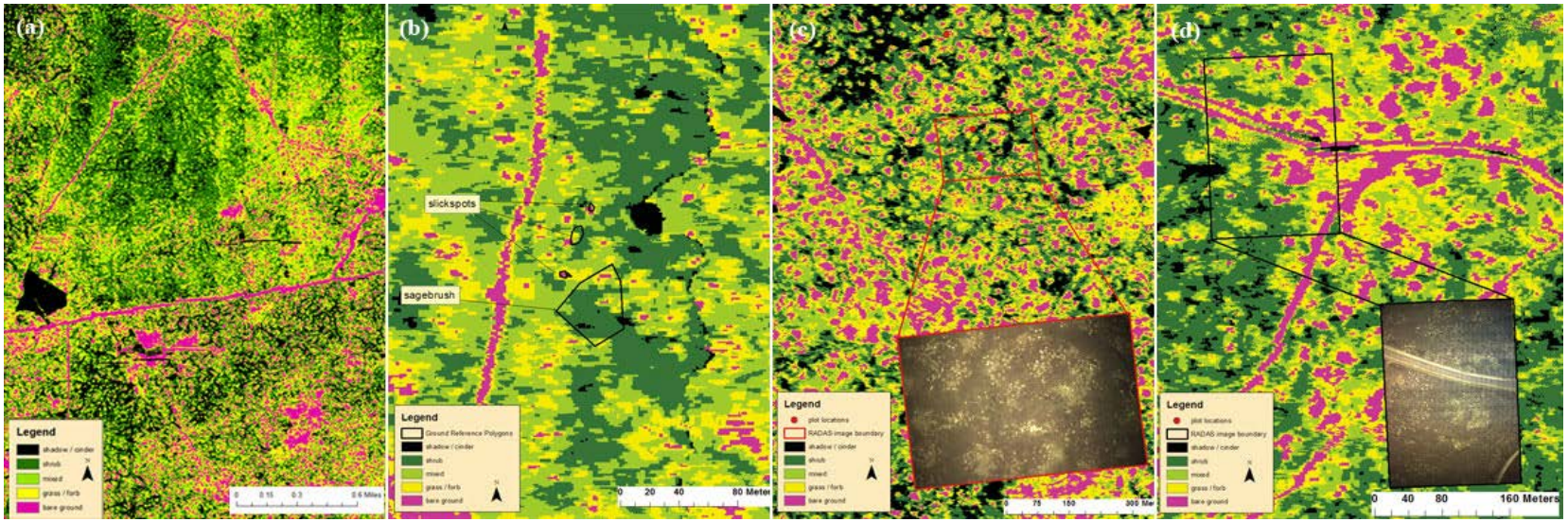
UAS Sensors

Hyperspectral Imagery (HSI)

Light reflected from objects is dispersed into its spectra and then the intensities of certain precise spectral bands are measured.

The intensity values are unique and characteristic and create a unique ***Spectral Signature.***

The Spectral Signature – is like a unique ***"fingerprint"***



(Source: https://bcal.boisestate.edu/blog/hyperspectral-uav-sensing-for-dryland-vegetation-monitoring/)

UAS Sensors

EO/IR Imagery

EO/ IR - Live video streaming

Observation of a dynamic environments

Common sensors for UAS systems

- Search and Rescue
- Fire fighting
- Emergency Response
- Security
- Situational awareness

Source: SPi infrafed
http://www.x20.org/shop/industrial-infrared-cameras/m1-d-micro-ptz-infrared-camera/

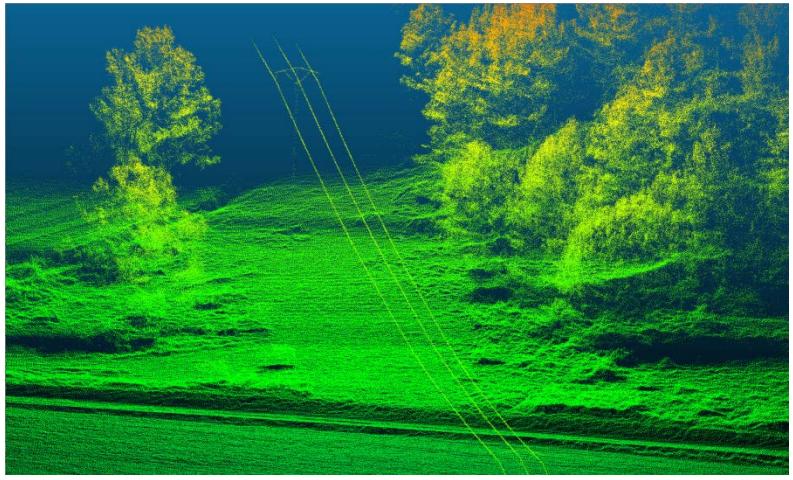
UAS Sensors

LiDAR point clouds

- **LIDAR -- *Light Detection and Ranging*,** is a remote sensing method that uses light in the form of a pulsed laser to measure ranges (variable distances) from the sensor to the Earth.

- The laser pulses generate precise, and highly spatially accurate three-dimensional point clouds of the shapes of objects being scanned.

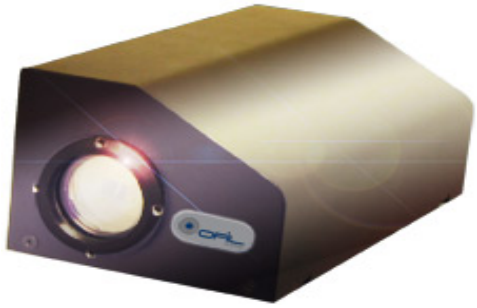
YellowScan Surveyor LiDAR
Source: YellowScan.com



UAS Sensors

Corona Camera Imagery

- ***Corona Cameras*** are able to detect arcing on high-voltage equipment prior to system breakdown and failure
- UAS inspect high-voltage power lines, substations and power installations efficiently and quickly
- UAS removes people from close proximity to live high-voltage equipment, increasing inspection speed and crew safety



Ofil Systems ROMpact 300i
3.3lb, L 9.88"x W4.96"x H3.03"
Source:
http://www.ofilsystems.com/products/rompact.html

UAS System Integration

Putting it together - System Integration

- Aircraft, Sensors and other elements – all work together and form the UAS
- Not all sensors are suitable for all platforms
  - Weight & Size
  - Power consumption
  - Vibration sensitivity
  - Data gathering duration
  - Flight velocity
  - Operational distance
- Key: design with the end goal in mind…
- The unique operational environment
- The Type and Quality of data needed to make decisions

UAS Benefits in Agriculture, Mining and Infrastructure

General Benefits

a) Safety
b) Minimize operational disruption
c) Temporal frequency
d) Flexibility – variety of data types
e) Responsiveness – changing conditions
f) Perspective and Innovation
g) Analytics - create actionable results

Major impact - productivity, cost and efficiency

UAS Applications in Agriculture

- **Real-time crop monitoring & scouting**
- **Crop progress and health**
- Soil/moisture monitoring
- Security/intruded reports
- Damage assessment - storms
- **Field mapping – drainage**
- Soil profile analysis
- Nutrient & Irrigation Mgmt.
- Environmental monitoring
- **Warning & Alerts: Pest, weed, drowned outs, bacterial fungal infections, spoilage**
- Automated planting
- Spraying: pesticides, fertilizers & water
- Critical growth phase Temporal frequency
- **Livestock tracking**

UAS Applications in Mining

- **Security – perimeter**
- Exploration – geological
- Geophysical
- **Mine planning – S,M, L**
- Mapping & Surveying
- **Automated Navigation**
- **Stockpile volumetrics inventory/reconciliation**
- Haul-road optimization
- Delivery – parts, tools…
- Pre-blast "all clear"
- Undetonated explosives
- Blast fragmentation analysis
- **Tailing dam monitoring**
- **Leach pad - design, mgmt.**
- Baseline studies
- Environmental reporting
- Remediation compliance
- Heritage site mapping
- **Slope stability**

UAS Applications in Infrastructure

- Site planning
- **Inventory management**
- Project management
- Mapping & surveying
- As-built documentation
- Asset auditing & management
- **Monitoring and Inspection: pipeline, transmission line, tower, turbine, flare stack…**
- **Fugitive emission detection**
- Easement monitoring
- Security
- **Vegetation encroachment monitoring mapping**
- Infrastructure assessment
- **Emergency assessment and management**
- Railway safety inspection
- Wind Turbine Inspection
- Bulk materials auditing

UAS in Agriculture, Mining and Infrastructure

- Conclusions
  - UAS are significantly impacting each of the industry sectors
  - UAS technology is evolving rapidly
  - The use of UAS will only increase in the future
- CAUTION: Acquiring quality data in challenging operational environments is harder than UAS marketing hype leads you to believe
  - Professional services – allow you to determine UAS cost/benefit

UAS in Agriculture, Mining and Infrastructure

- After all, you never want to be… "that Person"
  - "*In the South Bay, police are looking for a drone pilot who they say caused a large power outage that plunged 1,600 customers into darkness for hours.*"

(7 News, San Francisco, CA, June 9th, 2017)

(Courtesy of the Mount View Police Department)

UAS in Agriculture, Mining and Infrastructure

- Thank you

- Questions

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This program will resume at 10:00 a.m. MT

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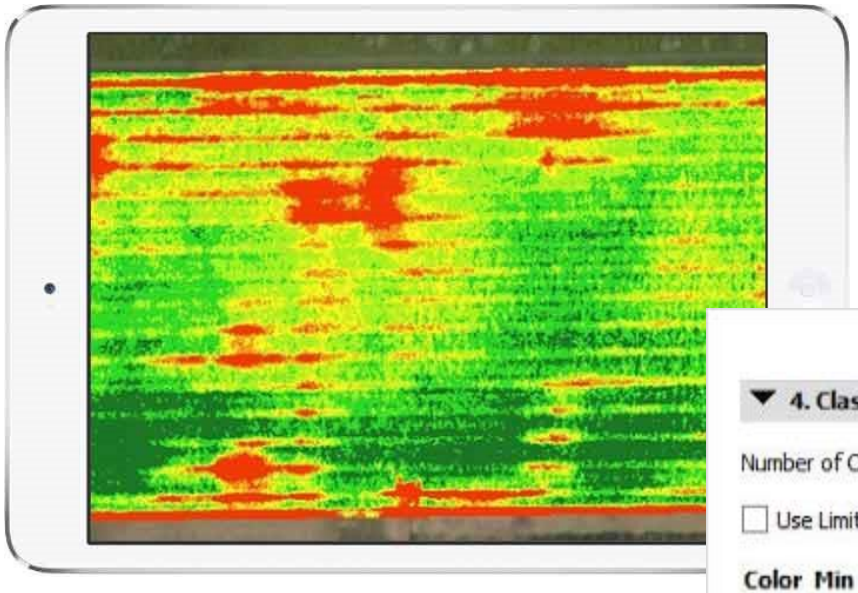
Session 2 - Privacy and Intellectual Property Issues in Precision Agriculture, Infrastructure, and Mining

Jamie Nafziger, Partner
Dorsey & Whitney LLP
Minneapolis, MN

What is Precision Agriculture?

- **Use of technology to collect and process real-time, site-specific data and inform farming decisions**
- **Seed choices**
- **Pesticides and fertilizer application**
- **Smart farms: connecting weather predictions to irrigation systems**
- **Complex ecosystem where software providers, hardware providers, farm equipment providers, and agronomists all working with growers**

From Drone to Tractor



4. Classes

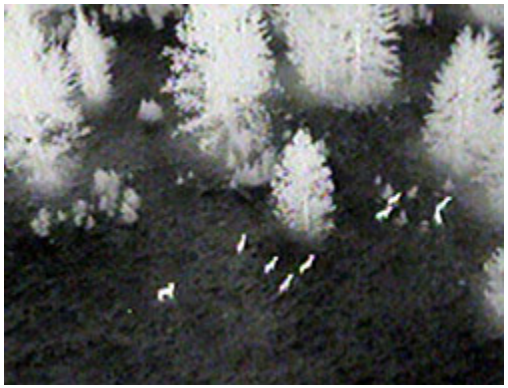
Number of Classes 5 Equal Area Help

Use Limits: Min 0.00 Max 0.00

Color	Min	Max	Area [m²]	%	Rate	Description
	0.67	0.87	15484.62	19.61	0.00	Do not apply
	0.62	0.67	15905.00	20.15	30.00	Spray moderately
	0.54	0.62	15880.12	20.12	40.00	Apply lots
	0.42	0.54	15845.25	20.07	50.00	Apply most
	0.06	0.42	15829.00	20.05	0.00	Do not apply

From Drone to Tracking a Herd

- **Smart ear tags on animals**
- **Thermal imaging**



Types of Farm Data

Grower's/landowner's knowledge of land and conditions

Historical records of field, seed, inputs, etc. and performance

Information from sensors – drones

Grower's/landowner's personal information

Different legal protections/issues for each type

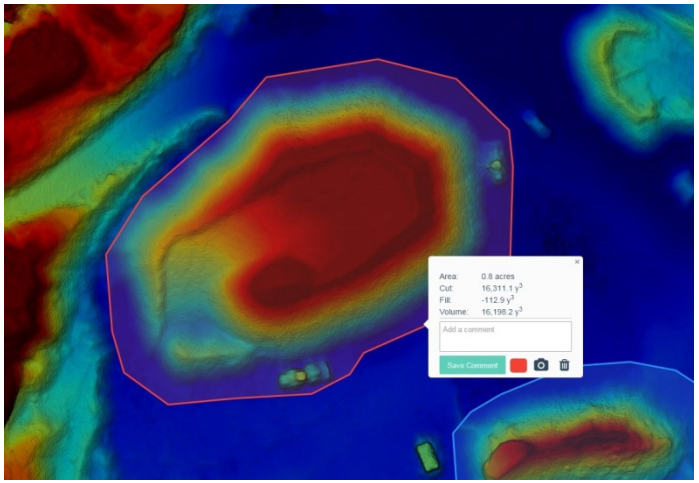
Using Drones For Infrastructure

- **Maintenance inspections (distribution lines, wind turbines, solar)**
- **Storm damage assessments**
- **Surveying construction**
- **Security**

Using Drones for Infrastructure

Using Drones in Mining

- Planning
- Water flow mapping
- Measuring volume of stockpiles and extraction pits
- Safety checks before blasting
- Construction quality control
- Exploration
- Environmental management
- Incident evidence collection
- Security



Key Legal Issues

- **Intellectual Property**
- **Privacy**
- **Licensing**
- **Regulations**
- **State and Federal Drone-Specific Laws**

Fundamental: Is Sharing Drone-Collected Data Freely Problem or Opportunity?

- **For some analysis, may only get best value of data if individual data aggregated into larger dataset (big data)**
  - **Research benefits**
  - **Benchmarking**
- **Difficulty and cost of negotiating licenses individually between each grower/ranch operator and each vendor**

Intellectual Property: Legal Standards

- **Is data collected from farms protectable intellectual property?**
- **Trade secret protection**
- **Defend Trade Secrets Act (DTSA) defines trade secret as:**
  - **information, including a formula, pattern, compilation, program, device, method, technique, process, etc.;**
  - **that derives independent economic value, actual or potential, from not being generally known to, and not being readily ascertainable through proper means by, another person who can obtain economic value from its disclosure or use; and**
  - **owner has taken reasonable measures to keep such information secret**
- **Some farm data may qualify; info collected by drones may not**

Other Relevant Legal Standards

- **Real Property**
  - **How far up does ownership extend if you own the land?**
    - **FAA claims right to regulate National Airspace System (NAS) from ground to near space**
    - **Some courts have used arbitrary 500 foot mark**
    - ***Causby* 328 U.S. 256 (1946): land owner owns at least as much space above the ground as he can occupy or use**
    - **Even if you own space, do you have rights in data collected from it?**

Trespass/Nuisance

- **Trespass**
  - **Knowingly entering another person's property without permission**
  - **Damages – not ownership**
- **Nuisance**
  - **Use and enjoyment of land is interfered with substantially and unreasonably through thing or activity**
  - **Damages – not ownership**
- **Looking on from adjacent parcel**
- **Practical reality: UAS can fly at heights where difficult to detect**

Intellectual Property: Practical Solutions

- **Licensing (key for infrastructure and mining uses as well)**
  - **Different categories of data?**
    - **Agreements between growers (or infrastructure or mine owners), software and hardware vendors, service providers, agronomists/consultants**
    - **Agreements between software and hardware providers**
  - **Who can use data?**
  - **What can they do with it?**
- **Ag Data Transparency Evaluator (American Farm Bureau Federation)**
- **Standards/Interoperability**
  - **AgGateway – Standardized Precision Ag Data Exchange (SPADE) and Precision Ag Irrigation Leadership (PAIL)**
  - **Open Ag Data Alliance (OADA)**
  - **Large technology providers: Deere acquisition of Precision Planting (connecting Deere hardware to Climate Corp. software system); Monsanto has platform**
- **Data repositories**

New York CLE Code

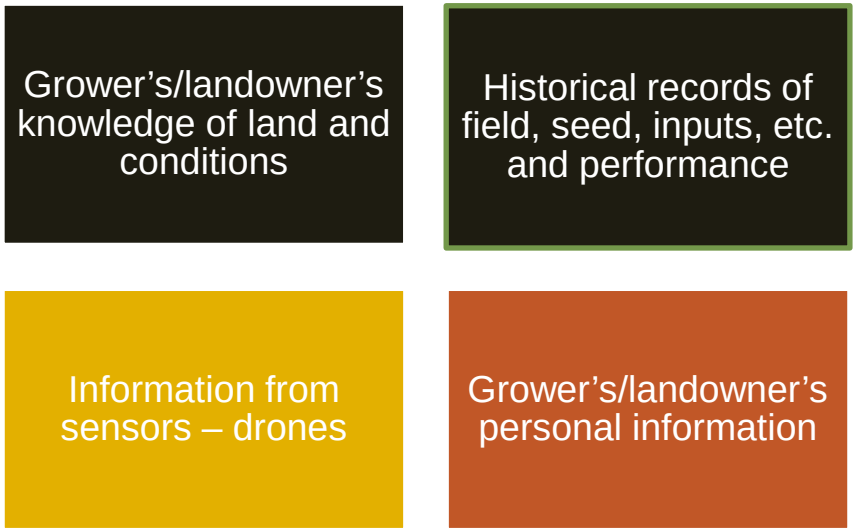
We have some NY lawyers participating remotely today. In accordance with NY CLE Rules, the New York Verification Code for this program is _____.

Privacy: Legal Standards

- **Legal and regulatory framework**
- **Barriers to understanding and compliance**
- **Due diligence required to get information needed for assurances requested by growers, privacy policies, and legal compliance**

Legal Framework: Privacy Overview

- **No federal comprehensive privacy law (instead specific areas: financial, health, etc.)**
- **State laws**
  - **Violations of reasonable expectation of privacy**
- **Federal Trade Commission**
  - **Deceptive or unfair acts**
  - **Individual person and his or her device**
  - **Collecting, using and sharing of personal information**
  - **Privacy policies – notice & consent**



Drone Privacy Law – Not Passed by House

- **Passed by Senate in April 2016 as part of FAA Reauthorization Act**
- **Final bill passed in July 2016 did not contain these provisions**
  - **Commercial drone operators must disclose if collecting personal information about individual, including using facial recognition**
  - **Disclose how using personal information, including use for advertising or marketing**
  - **Disclose when personal information would be destroyed**
- **Final bill did contain**
  - **FAA shall convene industry to develop standards for remotely identifying operators and owners of UAS**
    - **Remote Identification Aviation Rulemaking Committee (March 2017)**

Recent Legislative Attempts

- **Drone Aircraft Privacy &Transparency Act (introduced March 2017)**
  - **FAA would collect**
    - **Data collection statement**
    - **Data minimization statement**
  - **Violations**
    - **FTC**
    - **State Attorneys General**
    - **Private right of action**
    - **$1,000 per violation**
- **Drone Federalism Act (introduced May 2017)**
  - **State, local and tribal government authority may issue restrictions on time, manner and place of drone operations within 200 feet of ground or structure**
- **Trump Administration – National Defense Authorization Act – Gov't may destroy drones that pose threat to safety/security; respect privacy, civil liberties**

Recent Legislative Actions, cont.

- **Example of recent state legislation: Indiana S.B. 299**
  - **Sex offender UAV offense**
  - **Public safety remote aerial interference (using drones to interfere with first responders' operations)**
  - **Remote aerial voyeurism**
  - **Remote aerial harassment**

Recent Litigation

- **EPIC case against FAA regarding lack of privacy regulation**
- ***Boggs v. Merideth* (W.D. Kentucky 2017)**
  - **D shot P's drone down with shotgun**
  - **P alleged trespass to chattels**
  - **P sought declaratory judgment**
    - **Unmanned aircraft is "aircraft" under fed. law**
    - **P was operating drone in navigable airspace rather than on D's property**
    - **P did not violate D's reasonable expectation of privacy**
    - **Prop owner cannot shoot at unmanned aircraft in navigable airspace when operating like P's drone was**
  - **Fed. court dismissed for lack of subject matter jurisdiction**
  - **Q whether drone flying on D's property or in fed. airspace not enough to give juris.**
    - **Anticipatory defense not necessary to trespass to chattels claim**
    - **Dispute between two parties not significant to fed. system**

Recent Litigation, cont.

- ***Huerta v. Haughwout*** **(D. Conn. 2016)**
  - **FAA sought enforcement of subpoenas to defendants**
  - **Defendants allegedly operated drone to fire handgun and flame thrower**
  - **Dicta: court expressed skepticism about whether flying drones on own property subject to FAA regulation**
- ***Blanton v. Deloach*** **(S.D. Ga. 2015)**
  - **P alleged police violated privacy by following him with drone**
  - **Dicta: traditionally, watching or observing person in public place not intrusion upon privacy**
- ***State v. Davis*** **(N.M. 2015)**
  - **Aerial surveillance from helicopter unwarranted search**
  - **Partially turned on helicopter noise; court declined to consider quiet drones since not raised by facts of case**

Fourth Amendment Analogy: Search & Seizure

- ***Dow Chemical v. U.S.*** **(1986): aerial photographer hired by EPA photographed facility from 1,200, 3,000 and 12,000 feet – search constitutional – land open to view and observation does not trigger 4th Amendment protection – open area around facility more like an open field than curtilage of home**
- ***California v. Ciraolo*** **(1986): from small plane 1000 feet over fenced-in backyard, police photographed marijuana plants. Supreme Ct. – no reasonable expectation of privacy in things that can be seen from location where public has right to be**

Fourth Amendment Analogy: Search & Seizure

- ***Florida v. Riley*** **(1989): Police observed marijuana plants from helicopter at 400 feet looking through sides & roof of greenhouse left partially open – search constitutional**
- ***Kyllo v. U.S.*** **(2001): thermal imaging from outside home – search unconstitutional – device not in general public use/details of home previously unknowable**

Personal Information/Device Information: Def'n from FTC Settlement - Brightest Flashlight App (December 2013)

- **"Covered Information" shall mean information from or about an individual consumer, including but not limited to (a) a first and last name; (b) a home or other physical address, including street name and name of city or town; (c) an email address or other online contact information, such as an instant messaging user identifier or a screen name; (d) a telephone number; (e) a Social Security number; (f) a driver's license or other state-issued identification number; (g) a financial institution account number; (h) credit or debit card information; (i) a persistent identifier, such as a customer number held in a "cookie," a static Internet Protocol ("IP") address, a mobile device ID, or processor serial number; (j) precise geolocation data of an individual or mobile device, including but not limited to GPS-based, WiFi-based, or cell-based location information; (k) an authentication credential, such as a username and password; or (l) any other communications or content stored on a consumer's mobile device.**

Personal Information/Device Information: Def'n from California AG Report (Jan 2013)

- **Personally identifiable data are any data linked to a person or persistently linked to a mobile device: data that can identify a person via personal information or a device via a unique identifier. Included are user-entered data, as well as automatically collected data.**
- **Sensitive information is personally identifiable data about which users are likely to be concerned, such as precise geo-location; financial and medical information; passwords; stored information such as contacts, photos, and videos; and children's information.**
- **Types or categories of personally identifiable data include the following: unique device identifier; geo-location (GPS, WiFi, user-entered); mobile phone number; email address; user's name; text messages or email; call logs; contacts/address book; financial and payment information; health and medical information; photos or videos; web browsing history; apps downloaded or used**

Farm, Infrastructure, and Mining Data

- **Examples: elements of farm data that could be considered personal information**
  - **Grower and owner contact information**
  - **Geolocation of person or device**
  - **Image or video of person**
  - **Device identifiers**
  - **Credit card info**
  - **Financial information**

- **Examples: elements of infrastructure or mining data that could be considered personal information**
  - **Geolocation of person or device**
  - **Image or video of person**

Barriers to Understanding and Compliance

- **Privacy policy**
- **Barriers to understanding/ minimizing personal information collection**
  - **Out-of-date/inconsistent definitions of “personal information” make due diligence difficult**
  - **Inadequate disclosures by third parties**
  - **Lack of understanding by developers**

Privacy: Due Diligence on Third Parties

- **Software providers/hardware providers**
- **Database/repository providers**
- **Analytics providers**
- **App platforms**
- **Connections between apps**
- **Cookies and other trackers**

In the face of uncertainty…

- **Change law / new law**
- **Self-regulation**
- **Agreements**
  - **Who can access and use data?**
  - **What can they do with it?**
- **Disputes**

Change Law / New Law

- **Amend trade secret law to include farm data? Proposed by witness in House Committee on Agriculture hearing October 28, 2015 http://agriculture.house.gov/uploadedfiles/10.28.15_ferrell_testimony.pdf**
- **Over 45 states have considered or enacted drone legislation**
- **Concepts in Some Proposed/Enacted State Laws**
  - **Identification of drone owner or operator on device**
  - **Registration with state**
  - **Prohibit municipalities from regulating drones**
  - **Tenants need written permission from landowner to use UAS on property**
  - **Louisiana – farm data collected through UAS belongs to legal owner of property where collected (La. R.S. 3:41-47)**
  - **Texas – misdemeanor to capture, disclose, display, distribute "image" of individual or privately owned real property (narrow exceptions); Ch. 423 of Government Code**
  - **Utah – misdemeanor to chase, disturb, harm livestock through UAS use**
  - **No use over critical infrastructure facilities**

Self-Regulation

- **American Farm Bureau Federation**
  - **Privacy and Security Principles for Farm Data (November 13, 2014; updated May 5, 2015)**
- **Open Ag Data Alliance (OADA) http://openag.io/about-us/principals-use-cases/**
- **AgGateway data privacy and use white paper http://www.aggateway.org/WorkingGroups/Committees/DataPrivacySecurity.aspx**

NTIA Voluntary Best Practices for UAS Privacy, Transparency, and Accountability

- **National Telecommunications and Information Administration**
- **https://www.ntia.doc.gov/files/ntia/publications/uas_privacy_best_practices_6-21-16.pdf**
- **Released in May 2016; updated June 2016 when new FAA drone regulation released**
- **Five voluntary best practices**

NTIA Voluntary Best Practices for UAS Privacy, Transparency, and Accountability

1. **Inform others of your use of UAS**
   - **Reasonable effort to provide prior notice to individuals of general timeframe and area where UAS will be intentionally collecting data.**
   - **If UAS operator anticipates collection of covered data, operator should provide privacy policy for data.**
     - **Covered data: "information collected by a UAS that identifies a particular person. If data collected by UAS likely will not be linked to an individual's name or other personally identifiable information, or if the data is altered so that a specific person is not recognizable, it is not covered data."**
     - **Privacy policy should be in place no later than time of collection and made publically available.**
       - **Purpose for which UAS will collect covered data**
       - **Kinds of covered data UAS will collect**
       - **Information regarding any data retention/de-identification practices**
       - **Examples of types of entities with whom covered data will be shared**
       - **How to submit privacy and security complaints/concerns**
       - **Information describing practices in responding to law enforcement requests**

NTIA Voluntary Best Practices for UAS Privacy, Transparency, and Accountability

2. Show care when operating UAS or collecting and storing covered data

- **Without compelling need or consent of data subjects, avoid using UAS to intentionally collect covered data where operator knows data subject has reasonable expectation of privacy**
- **Avoid using UAS for purpose of persistent and continuous collection of covered data about individuals**
- **Make reasonable efforts to minimize UAS operations over or within private property without consent of property owner or without appropriate legal authority**
- **Make a reasonable effort to avoid knowingly retaining data longer than reasonably necessary to fulfill specified purposes**
- **Establish a process to receive privacy or security concerns for covered data**

NTIA Voluntary Best Practices for UAS Privacy, Transparency, and Accountability

3. Limit Use and Sharing of Covered Data

- Receive consent if covered data is used for employment eligibility, promotion, or retention; credit eligibility; or health care treatment eligibility
- Avoid using or sharing covered data for purpose not included in privacy policy covering UAS data
- Regarding publicly disclosed covered data, make reasonable effort to obfuscate or de-identify covered data prior to disclosure
- Make reasonable effort to avoid using or sharing covered data for marketing purposes

NTIA Voluntary Best Practices for UAS Privacy, Transparency, and Accountability

4. **Secure Covered Data**
   - **Provide adequate program with administrative, technical, and physical safeguards appropriate to operator's size and complexity**
   - **Model security programs after NIST Cybersecurity Framework**
5. **Monitor and Comply with Evolving Federal, State, and Local UAS laws**

NTIA Voluntary Best Practices for UAS Privacy, Transparency, and Accountability

- **Supported by:**
  - **Amazon, Association for Unmanned Vehicle Systems International (AUVSI), Center for Democracy and Technology, Commercial Drone Alliance, Consumer Technology Association, CTIA, Future of Privacy Forum, Intel, New America's Open Technology Institute, PrecisionHawk, X (Formerly Google [x]), Small UAV Coalition, Online Trust Alliance (OTA), News Media Coalition, Newspaper Association of America (NAA), National Association of Broadcasters (NAB), Radio Television Digital News Association (RTDNA), Digital Content Next (DCN), Software & Information Industry Association (SIIA), NetChoice, U.S. Chamber of Commerce**

Reducing Privacy Risks for Infrastructure and Mining Users of UAS

- **Fly over own land or own right of way**
- **Technological solutions**
  - **https://fpf.org/wp-content/uploads/2016/08/Drones_and_Privacy_by_Design_FPF_Intel_PrecisionHawk.pdf**
- **Provide notice**
- **Create privacy policy**
- **Special care if releasing to public**
- **Persistent and continuous uses may pose highest risk (security monitoring)**

Conclusions

- **Both intellectual property and privacy issues regarding data collected by UAS uncertain**
- **Due diligence required to answer producer questions about their data or required to draft privacy policies challenging in complex technology ecosystem**
- **For tech providers – getting grip on your data flows may become table stakes in precision ag and infrastructure**
- **Participation in standards development and legislative action likely helpful**
- **Focus on user agreements key**
- **Notice, privacy policies and following best practices reduce risk**

Thank You

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DORSEY™
always ahead

This program will resume at 11:00 a.m. MT

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Session 3 – Business Plan Discussion

Robert Hensley, Partner
Dorsey & Whitney LLP
Denver, CO

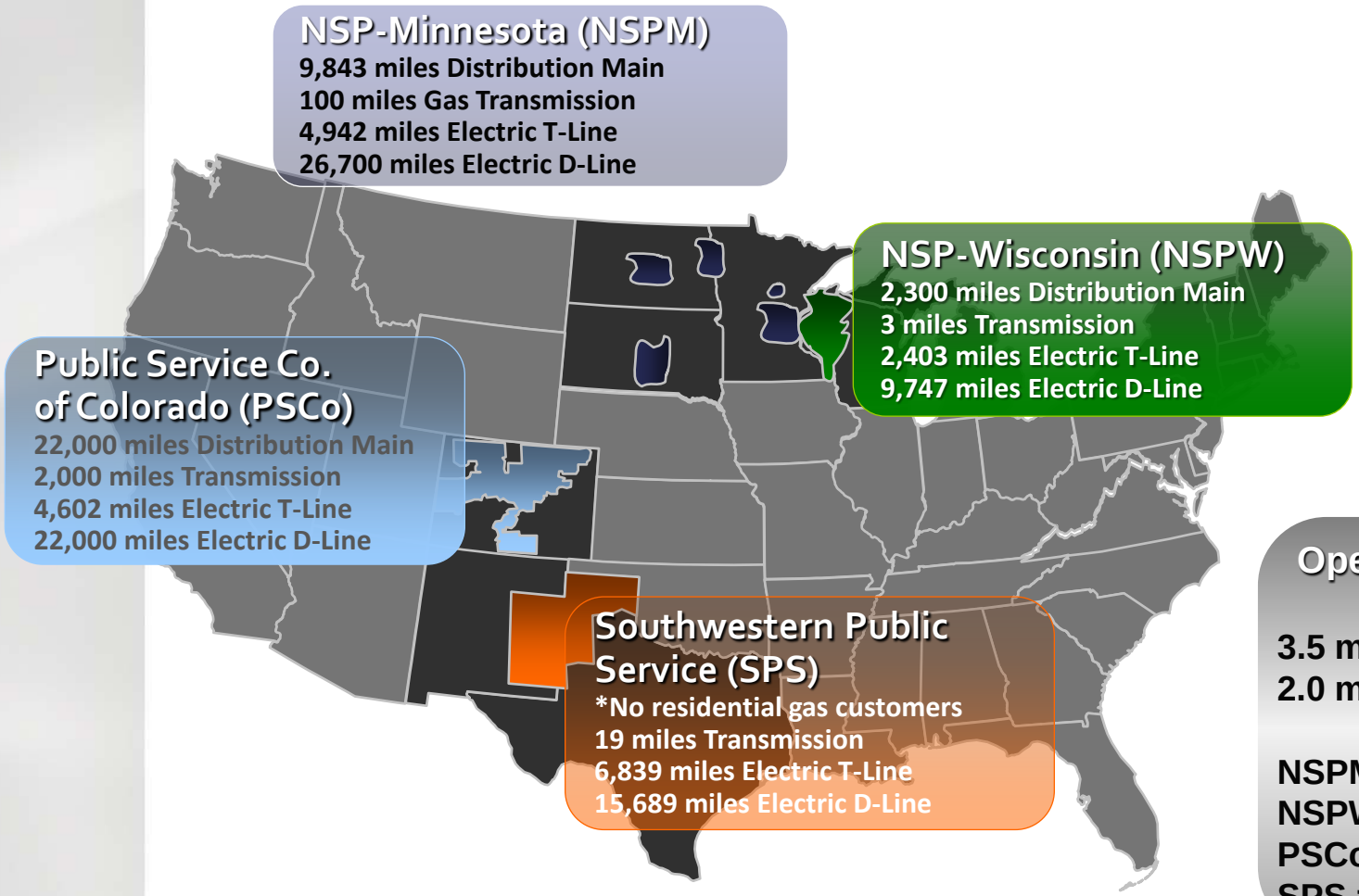
Aaron Lessig
CEO and Chairman
Pulse Aerospace, Inc.

Eileen Lockhart
Unmanned Aircraft System (UAS) Program Manager
Xcel Energy

Xcel Energy UAS Program Overview

June 20, 2017

DIVERSE OPERATING AREAS



Operate in 8 States

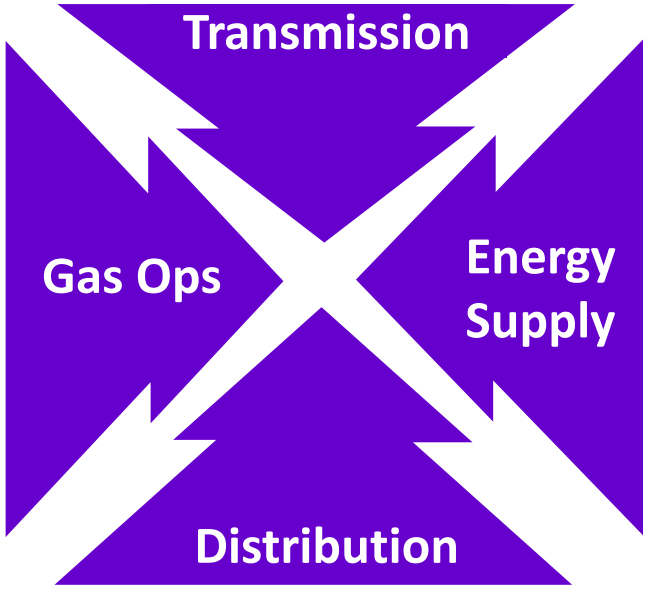
Customers

3.5 million electric
2.0 million natural gas

NSPM = 1.5 million
NSPW = 272,330
PSCo = 1.7 million
SPS = 363,559 (Electric only)

TECHNOLOGY IS CHANGING

- Xcel Energy views UAS technology as transformational and believes it will redefine traditional working methods.
  - Started experimenting with UAV's indoors in 2013
  - Developed a small internal UAS team in 2014
  - Researched sUAS technology capability
  - Developed use cases
  - Shared vision with our internal stakeholders and federal legislators
  - Partnered with several organizations including:
    - EEI, EPRI, INL, IEEE, NPTS & more
  - Received a Section 333 exemption & blanket COA in May 2015



- Summer of 2015
  - Mission planning and mission execution began…

UAS MISSION APPROACH

UAS Program Office

Dedicated resources to manage VLOS and BVLOS operations

Proof of Concept Missions

Execute POC missions and understand feasibility and lessons learned

Visual Line of Sight

Apply learnings and enable employees to use as a tool

Beyond Visual Line of Sight

Partner with outside organizations for beyond the line of sight operations

POC MISSIONS COMPLETED

August 2015 – February 2016

Completed POC missions in 2015-2016

- Data collection of five energized substations
- Transmission line inspections
- Volumetric survey of ash storage facility
- Wind turbine blade inspection
- Transmission high pressure gas pipeline & leak detection
- Distribution gas pipeline bridge inspections

February 3, 2016: Xcel Energy became the first electric utility in the United States to complete an FAA-approved beyond-visual-line-of-site research mission.

– Completed condition assessment of a 69kV over head transmission line (OHTL) using two different UAS (helicopter and fixed wing).

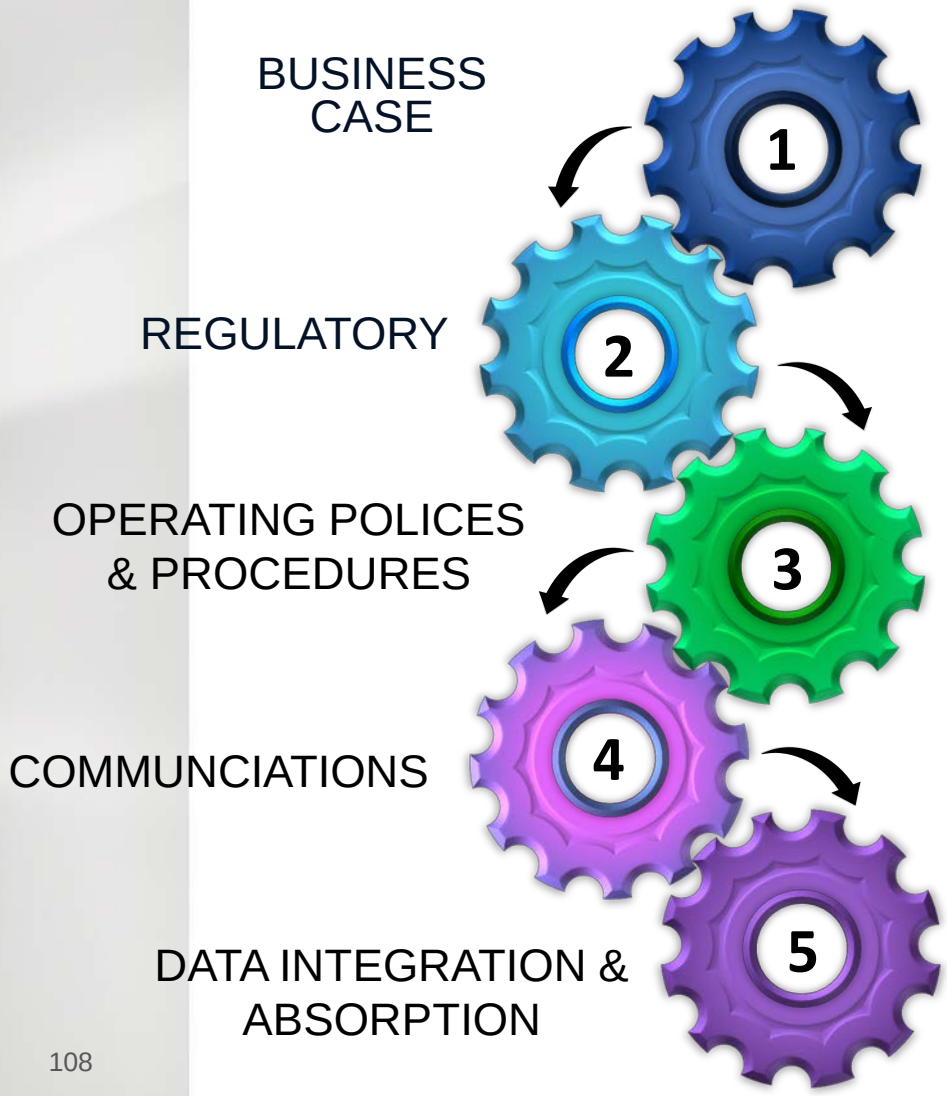
POST STORM ASSESMENT

The UAS Program Office & Team partnered with ND stakeholders and submitted a $1M + joint grant proposal

August 2016-May 2017
Project Objectives

- Assess high / low altitude UAS capabilities to enhance post-event damage and restoration efforts
- Apply UAS capabilities to support reconnaissance/ restoration functions for electric distribution infrastructure
- Develop a UAS Natural Disaster strategy in collaboration with emergency management
- Assess feasibility of utilizing UAS for post-event reconnaissance and restoration activities

PARALLEL STEPS



INTEGRATE MORE MISSIONS

Wind Turbine Inspection
Cooling Pond Soil / Cement Inspection
Aerial Wildlife & Habitat Inspections
Storm Water Waste management
Bird/Bat & Migration Studies
Cross Business Unit Applications
Insurance Claims
Volumetric Surveys
Objective Data Collection
GIS Mapping and facility verification
Security / Protection
Vegetation Management
Sighting and Land-rights
Transmission High Pressure Gas
Tank, Pipe & Storage leaks /Inspections
Energy Supply & Nuclear (indoor & outdoor)
Security for Generation & Nuclear Facilities
Facility/Plant Boiler & Equipment Inspections
Electric Transmission & Distribution
Asset Inspection/ Asset Inventory
Pre/Post construction surveys
Enhanced Security for Remote Substations
Fault Location in Remote Areas
LiDAR analysis for new line construction
Post-Storm / Post-Disaster Assessment
Aerial communications,media,marketing
Live streaming/public safety

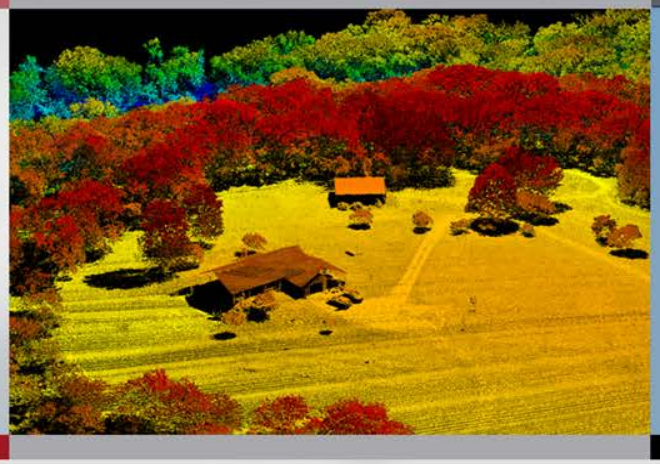
New York CLE Code

We have some NY lawyers participating remotely today. In accordance with NY CLE Rules, the New York Verification Code for this program is _____.

Performance

High-value Data

Precision



Overview Presentation

2017

PULSE AEROSPACE

Pulse Overview

- Provider of leading commercial / military-grade unmanned aerial systems (“UAS” or “drones”) with flight control and optimization technology, branded **HeliSynth**™
- Pulse’s founders have been leaders in the design and automation of UAS for 12+ years
- Pulse’s **HeliSynth**™ technology, coupled with its UAS design expertise, results in a UAS platform with unparalleled precision flight, endurance and payload capacity
- Pulse’s **HeliSynth**™ architecture enables advanced UAS capabilities and high-value enterprise solutions including data networking, precise data collection, onboard processing, machine learning and dynamic retasking – all tied to the Flight Control System
- **HeliSynth**™ software architecture enables modular, home-grown and third party enterprise solution development integrated with advanced UAS automation
- Company is based in Lawrence, KS; with roots in the world-class University of Kansas Aerospace Engineering program

Massive Addressable Markets			
	Size	**Opportunities**	**Annualized Growth Rate**
Commercial (1)	**$127Bn by 2020**	• Mining • Survey • Inspection • Agriculture • Logistics	**100%+**
Military (2)	**$71Bn by 2020**	• Reconnaissance • Lethal support • Casualty assistance • Logistics • Public safety	**100%+**

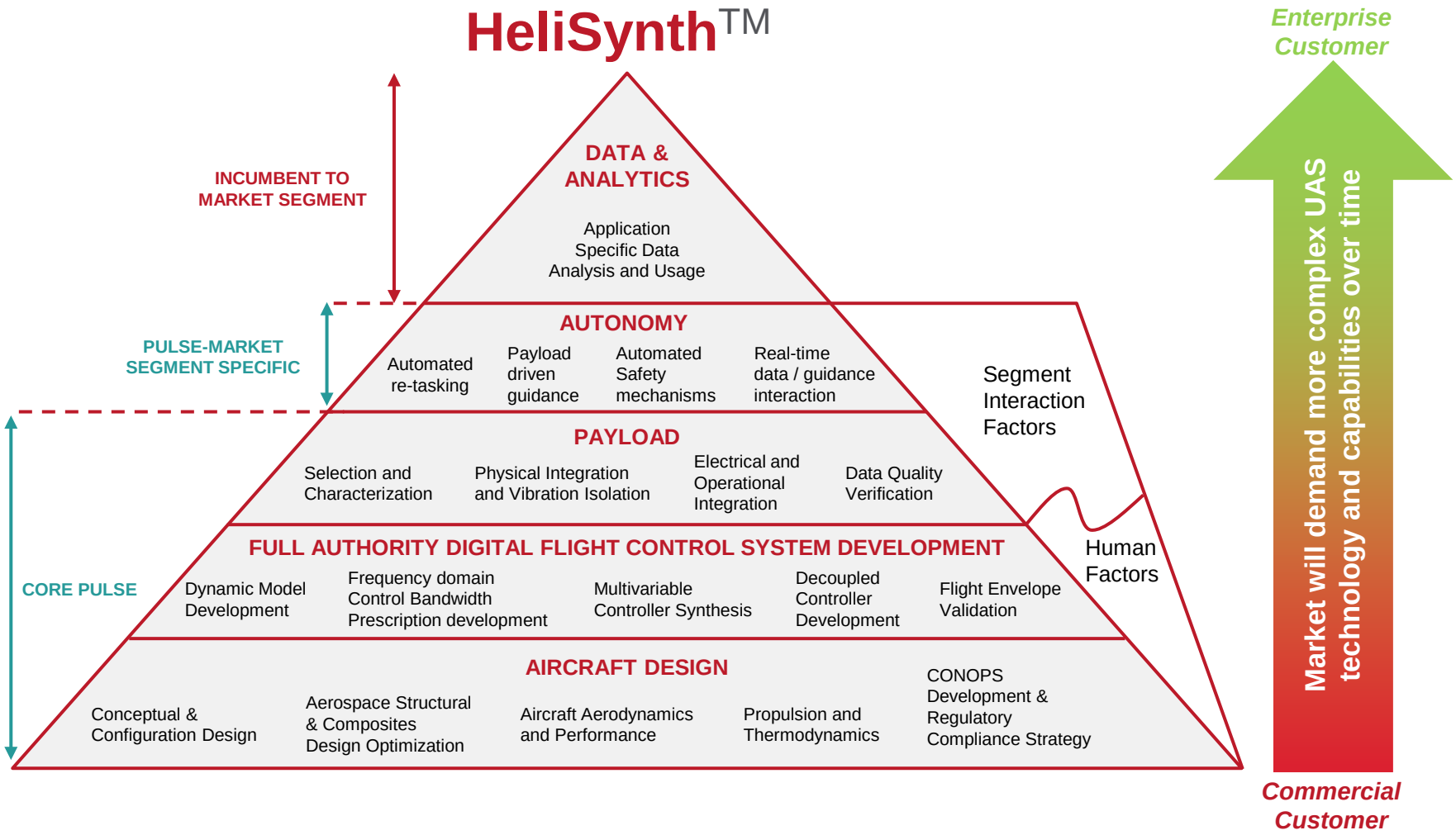
Notes

1. Commercial trends and market size from PwC report dated May 2016. value of drone powered solutions
2. Commercial trends and military global addressable market size from Goldman Sachs report dated March 2016, value of UAS

Projects that have Developed Pulse's Technologies

- Aerospace Engineering Firm – 15 Years Experience in UAS Automation and Development
- Automation and Optimization of Complex UAS Systems - Helicopters
- Department of Defense, Special Forces / SOCOM, Skunkworks, DOE, DOI, BLM, Spawar, Numerous Defense Contractors
- 30+ Research Universities
- UAS Platforms Ranging from 30 – 1,200 Pounds
  - Antarctica
  - Greenland
  - Australian Outback
  - Death Valley
  - Kansas!
- Fixed Wing and Helicopter UAS

HeliSynth™ Technical Building Blocks



Pulse Capability

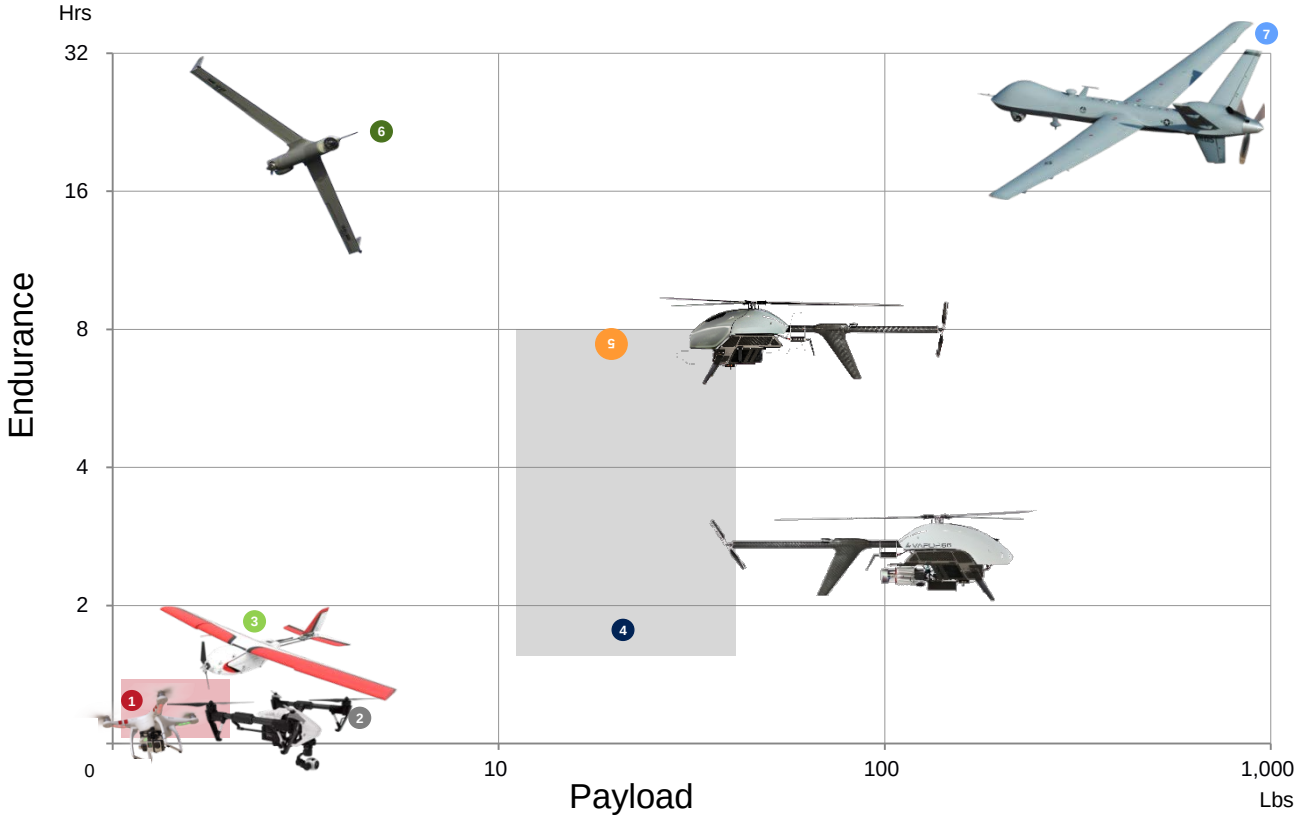
- **HeliSynth**™ technology creates a robust platform carving out a new niche for payload and endurance
  - Pulse platforms are optimized for Commercial/Enterprise uses as well as certain military and government applications
  - Pulse precision flight control capabilities far exceed competitors, particularly fixed wing UAS
  - **HeliSynth**™ technology can be applied to third party airframes

UAS Comparison

	UAS	Price (000)	Configuration	Main Markets
1	DJI Phantom III Professional	~$1	Quadcopter	Consumer
2	DJI Inspire 1	~$5	Quadcopter	Consumer
3	PrecisionHawk Lancaster	~$22	Fixed Wing	Commercial
4	Pulse Vapor 55E	~$95	Helicopter	Commercial/ Enterprise Military/Gov't
5	Pulse Vapor 55G	~$175	Helicopter	Commercial/ Enterprise Military/Gov't
6	ScanEagle	~$800	Fixed Wing	Military/Gov't
7	MQ-9 Reaper	~$64,200	Fixed Wing	Military/Gov't

Capability versus Competition

Normalized for Max. Gross Takeoff Weight (1)



Note

1. Positions are approximate

Recent Highlight Projects - Examples

- SOCOM – Special Missions
- First Commercial UAV Gas Leak Detection
  - Excel Energy
  - Worley Parsons – US and Australia
- First Medical Delivery Beyond Visual Line of Site – State Department, Special Forces, Harvard Medical
- Oil Detection in Waterways and Ocean
  - Major Oil Company
- Mining Management
  - Australia
  - Asia
  - South America
- First Beyond Visual Line of Site Utility Line Inspection in the US
  - Excel Energy
- Tethered LTE Communications
  - AT&T
  - Verizon
- First BVLOS Lidar
  - Multiple Utilities
- DOI UAS Contract
- ARMY and NAVY Airworthiness Certs
- Largest Consumer Electronics Company
- First Commercial UAS “Shark Watch” Patrol in Australia – Little Ripper
- 30+ Payload Configurations Completed – “Hot Swapable” on Vapor

Pulse Vehicle Examples

VAPOR 55

GTOW:	55 lbs
Maximum Endurance, Full Payload;	60 min Electric, 6 to 8 Hours Fuel
Useable Payload Weight:	12 lbs Electric, 15 lbs Fuel
Range:	35 Miles Electric, 200+ Miles Fuel
Primary Missions:	Mining, Utilities, Geospatial, Oil and Gas,
Ground Control:	Logistical Delivery Automatic or Manual Flight

Vapor 55 – Sample of Integrated Payloads

CLASS LEADING PAYLOAD FLEXIBILITY

SONY PRECISION MAPPING PACKAGE

SONY PPK MAPPING PACKAGE

PHASE ONE IXU PRECISION MAPPING PACKAGE

PHASE ONE IXU PPK MAPPING PACKAGE

HEADWALL NANO HYPERSPECTRAL IMAGER

YELLOWSCAN LIDAR

TRILLIUM ORION HD-50

RIEGL VUX-1 UAV LIDAR

PHOENIX AERIAL RANGER LIDAR

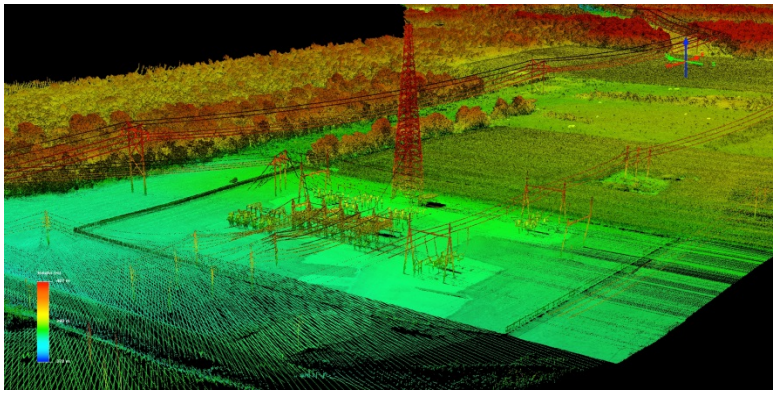
PHOENIX AERIAL AL3-32 LIDAR

MULTI-PAYLOAD OPTIONS

DROP MECHANISM

Recent Highlight Projects – Gas Leak Detection, Shark Watch

Recent Highlight Projects – Utility (lidar, Inspection, Line Pulling, Ash Dam)



Recent Highlight Projects – DOS Roof Top Medical Delivery (12 Pounds, 16 miles BVLOS, Fully Automatic)

Enterprise Solutions Enabled by HeliSynth™

- ✓ **Beyond Visual Line Of Sight (BVLOS)**
- ✓ **Payload Capacity**
- ✓ **Flight Automation**
  Stability, Reliability, Precision
- ✓ **Adaptability**
  Upgradeable, Modular Software, Application Tailoring
- ✓ **IoT & Big Data Integration**

Questions

Thank you for joining us today. If you have any questions, please don't hesitate to contact the speakers below.

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Dorsey & Whitney's Industry Groups

For more information on the Dorsey & Whitney Food, Beverage & Agribusiness Industry Group, the Energy Industry Group and the Mining Industry Group, please visit our website at https://www.dorsey.com/services

Thank you again for joining our drone program today!