NORTH CAROLINA
Department of Transportation

NC UAS Laws Update

Basil Yap, UAS Program Manager

April 19, 2018

Division of Aviation Office

UAS Program Office

- Department of Transportation
  - Division of Aviation
    - Director's Office
      - UAS Program Office
    - Aviation Development
    - Aviation Programming
    - Aviation Services

DIVISION OF AVIATION
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

UAS Program Office Role

Regulatory

Permitting commercial N.C. UAS operators

Education

Safety, opportunity

Research

Technology benefiting state

Flight Services

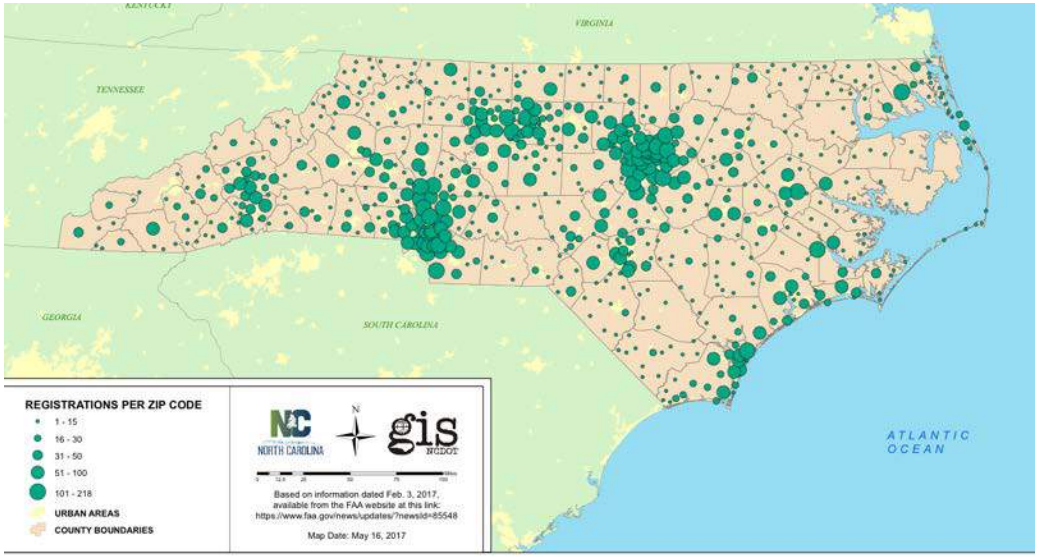
NCDOT, other state agencies, local governments

Government Agency Integration

UAS program development and support

North Carolina Numbers

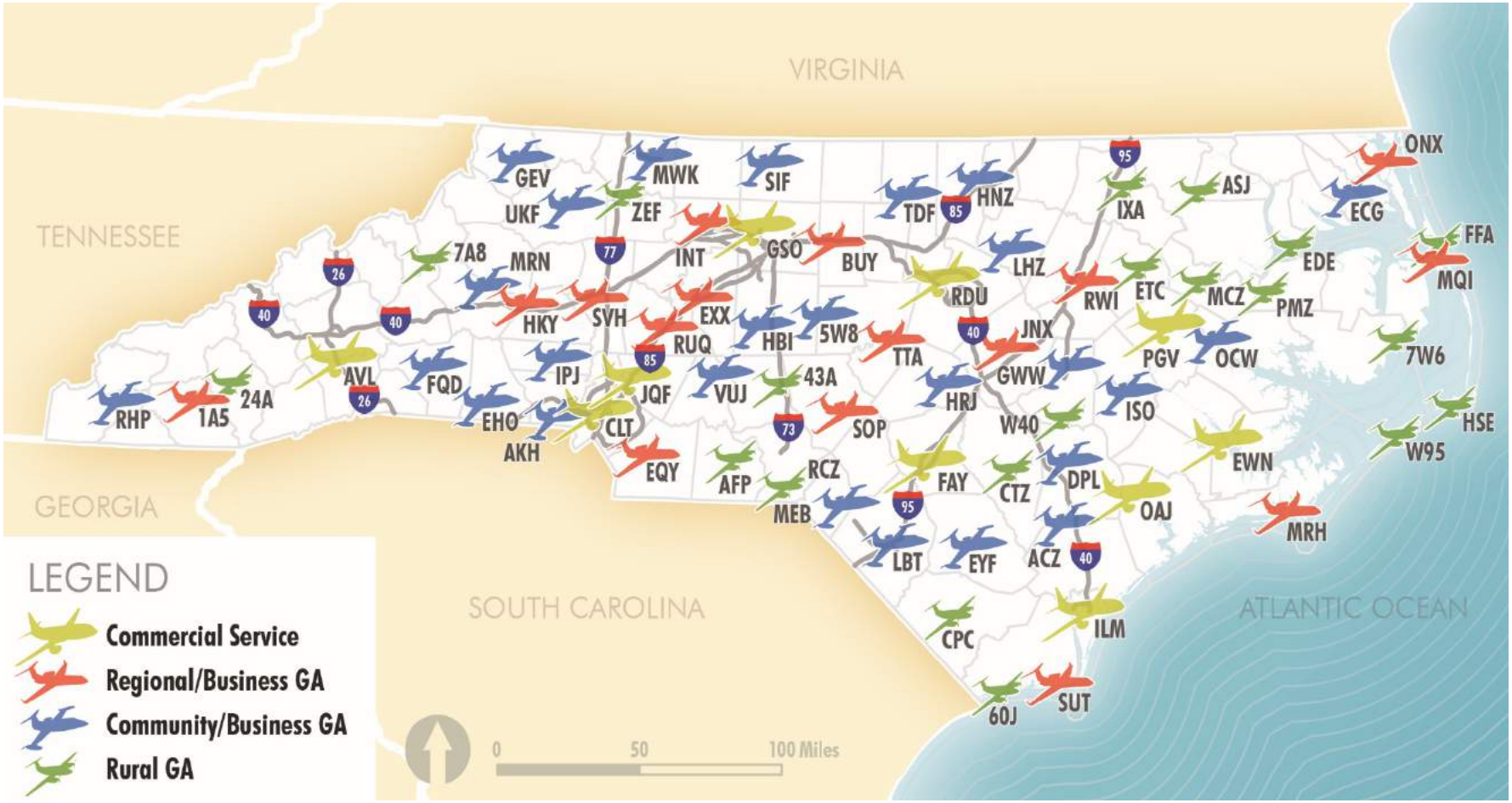
- FAA Registration Data
  - Non-Hobbyist – 3,854*
  - Hobbyist – 24,510*
  - Total – 28,364
  - Manned Aircraft – 6766**
- NC UAS Operator Permits Issued
  - Commercial - 2385
  - Government - 683
  - Total – 3,068



Source:
* https://www.faa.gov/foia/electronic_reading_room/
**http://registry.faa.gov/aircraftinquiry/statecounty_inquiry.aspx

North Carolina's Airport System

72 Publicly Owned Airports in North Carolina



State UAS Regulations

- 2013 – CIO Oversight
- 2014 – House Committee on UAS
- 2014 – Broad UAS Regulation
- 2015 – Funds allocated for the UAS Program
- 2015 – Technical Correction to UAS laws
  - Age and CIO's Role
- 2017 – Restriction of UAS near prisons and edits to existing regulations

State UAS Regulations

- North Carolina General Assembly passed UAS bills into law in 2013, 2014, 2015, 2016, 2017
- Chapter 14 – Criminal Law
  - § 14-7.45 Crimes committed by use of UAS
  - § 14.280.3 Interference with manned aircraft by UAS
  - § 14.401.24 Unlawful possession and use of UAS (Weapon attached)
  - § 14.401.25 Unlawful distribution of images
- Chapter 15A – Criminal Procedure
  - § 15A-300.1 Restrictions on use of UAS
  - § 15A-300.2 Regulation of launch and recovery sites
  - " § 15A-300.3. Use of an unmanned aircraft system near a confinement or correctional facility prohibited.
- Chapter 63 – Aeronautics
  - § 63-95 Training required for operations of UAS (Knowledge Testing)
  - § 63-96 Permit required for commercial operation of UAS
- Chapter 113 – Conservation and Development
  - § 113-295 Unlawful harassment of persons taking wildlife resources

State UAS Regulations

- § 63-95 Training required for operations of UAS (Knowledge Testing)
  - The Division of Aviation will develop and administer a UAS Knowledge Test
  - Applicable to both government and commercial operators who operate in North Carolina
  - The test can be completed online and is the first part of the permitting process
- § 63-96 Permit required for commercial operation of UAS
  - Must be 16 years of age
  - Must provide a drivers license number
  - Must meet the federal requirements for access to the airspace (Remote pilot certificate)
  - Applies to commercial operators only
  - Application for permit is completed online

DOA Website

https://www.ncdot.gov/aviation/uas/

UAS Operator Permits

Federal

- Pass a UAS knowledge test at FAA testing center and TSA background check
- Apply for Remote Pilot Certificate

North Carolina

- Pass NC UAS Knowledge test online
- Apply for commercial or government NC Operator Permit online
- www.ncdot.gov/aviation/uas

NC Permit Awareness

CONGRATULATIONS
you passed your remote pilot test

Remember to get your
NC UAS PERMIT

NORTH CAROLINA LAW
requires all commerical and goverment
UAS operators to obtain a
NC UAS OPERATOR PERMIT

To obtain, please visit:
WWW.NCDOT.GOV/AVIATION/UAS

State UAS Regulations

HB337

- Clarifies model aircraft applicability
- Remove restrictions around special imaging
- Adds emergency management exception
- Brings the NC UAS Permit in line with Federal requirements (age and Identification)
- Signed into law July 21, 2017
- Effective December 1, 2017

HB128

- Establishes § 15A-300.3. Use of an unmanned aircraft system near a confinement or correctional facility prohibited.
- Exceptions for commercial operators
- Signed into law July 25, 2017
- Effective December 1, 2017

UAS Prison Signs

new

New signs prohibiting drone usage

Juvenile Facilities
SKU: 20-9723-61

For Prisons
SKU: 20-9722-61

For All Other
Correctional Facilities
SKU: 20-9721-61

A new General Statute went into effect December 1, 2017 prohibiting Drones around all Correctional Facilities including Jails and Federal Facilities. The statute also requires that signage be posted every 100 yards around the perimeter of each facility.

$14.80 each

ORDER NOW

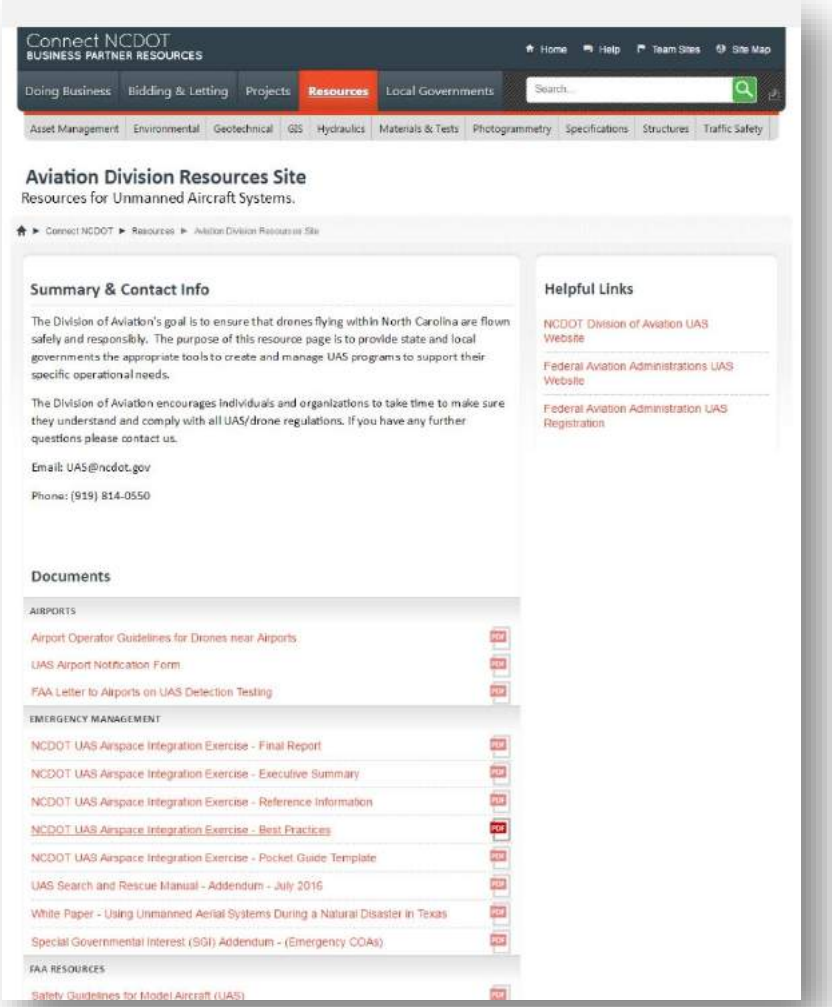
NC UAS Operator Checklist

- ✓ FAA Authorization – Must obtain:
  - Remote Pilot Certificate (under Part 107)
  - Or Certificate of Authorization/Waiver (COA)
- ✓ FAA UAS Registration
  - All UAS/Drones above .55lbs
- ✓ NC Knowledge Test
  - Take and pass the test on the NCDOT Division of Aviation website
- ✓ NC Government Operator Permit
  - Once you have passed your NC UAS Knowledge Test, you may obtain a permit
  - Need to have an airman certificate to complete the process
  - No fee charged at this time
- ✓ Insurance (best practice)

NCDOT UAS Resource Page

Publicly available online:

- List of NC General Statutes
- Best Practices
- UAS Research Reports
- UAS Related Links
- FAA Resources
- Law Enforcement Resources
- Emergency Management Resources
- Airport Operator Resources
- https://connect.ncdot.gov/resources/Pages/Aviation-Division-Resources.aspx

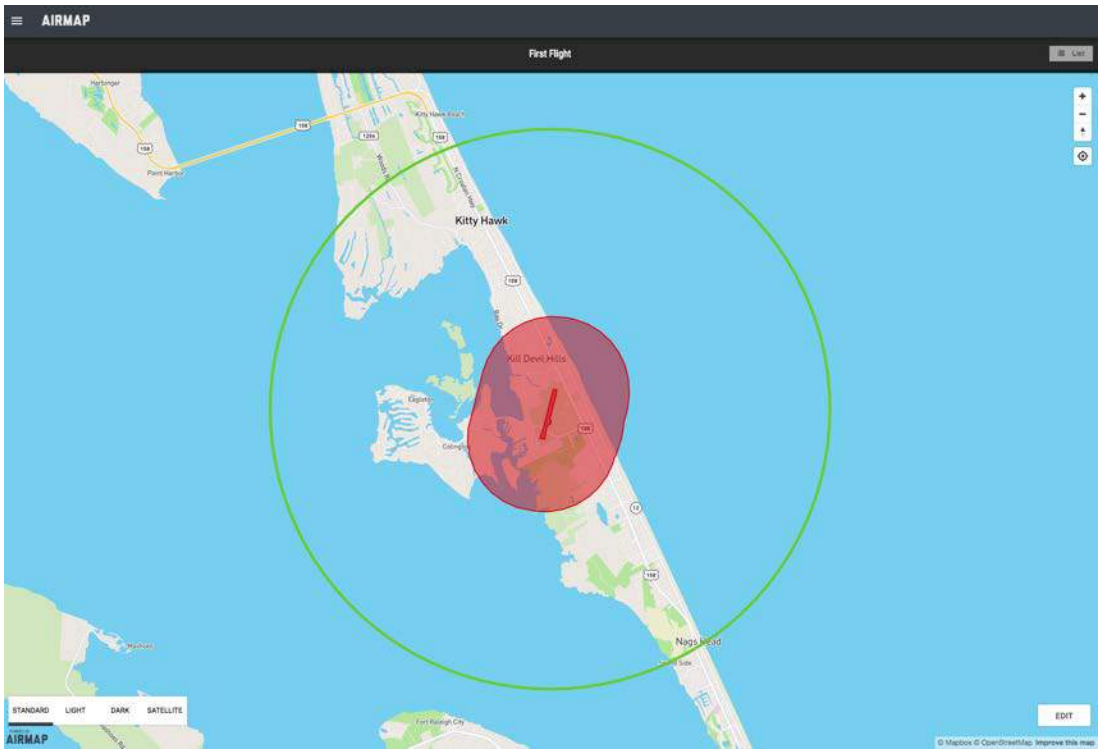


Outer Banks Airports

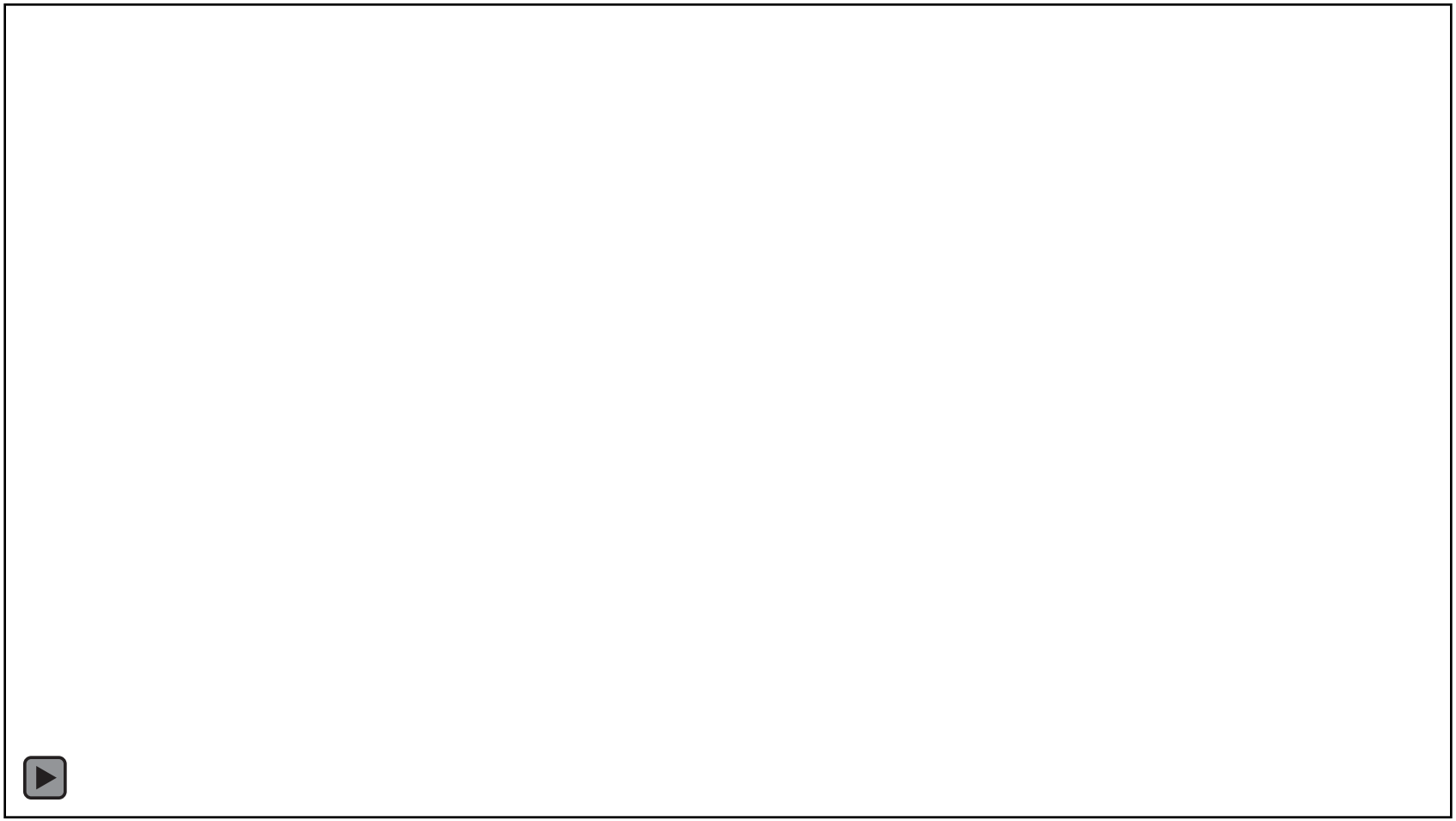
- First Flight Airport
- Billy Mitchell Airport
- Ocracoke Airport

- NCDOT currently utilizing AirMap D-NAS

- AirMap Link



Drones Near Airports



Questions

www.ncdot.gov/aviation/uas

Basil Yap

UAS Program Manager

(919) 814-0572

bkyap@ncdot.gov

DIVISION OF AVIATION
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

Unmanned Aircraft Systems (UAS) for Public Safety

Presented to: NCDOT UAS workshop
NC UAS Working group

Presented by: John Meehan,
UAS Integration Office

Date: 19-20 April 2018

FAA Mission

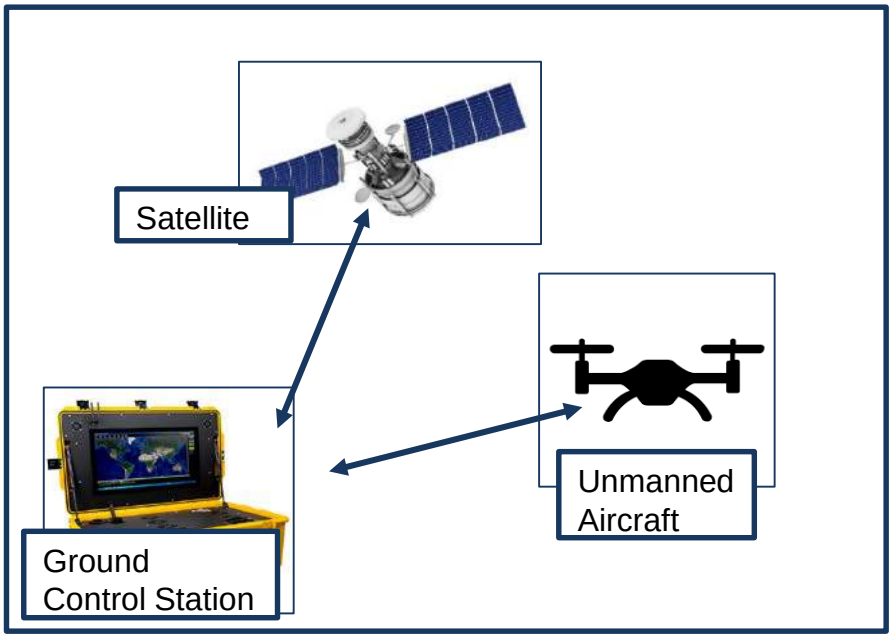
The FAA's continuing mission is to provide the safest, most efficient aerospace system in the world.

What is a UAS?

- Unmanned aircraft system (UAS)
- Drones
- Unmanned aerial vehicle (UAV)
- Remotely piloted aircraft system (RPAS)
- Radio-controlled model aircraft

A UAS is a *system:*

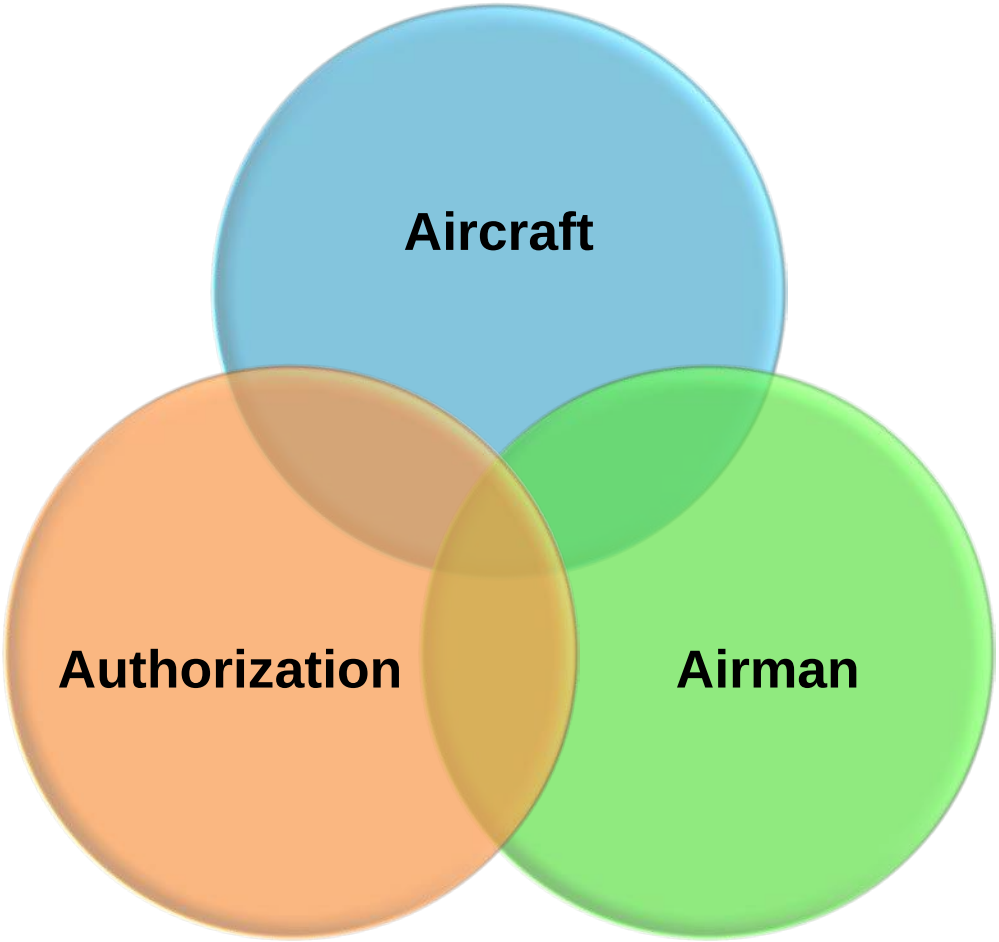
- Unmanned Aircraft
- Ground Control Station
- Command & Control Link(s)



What is the FAA's Authority?

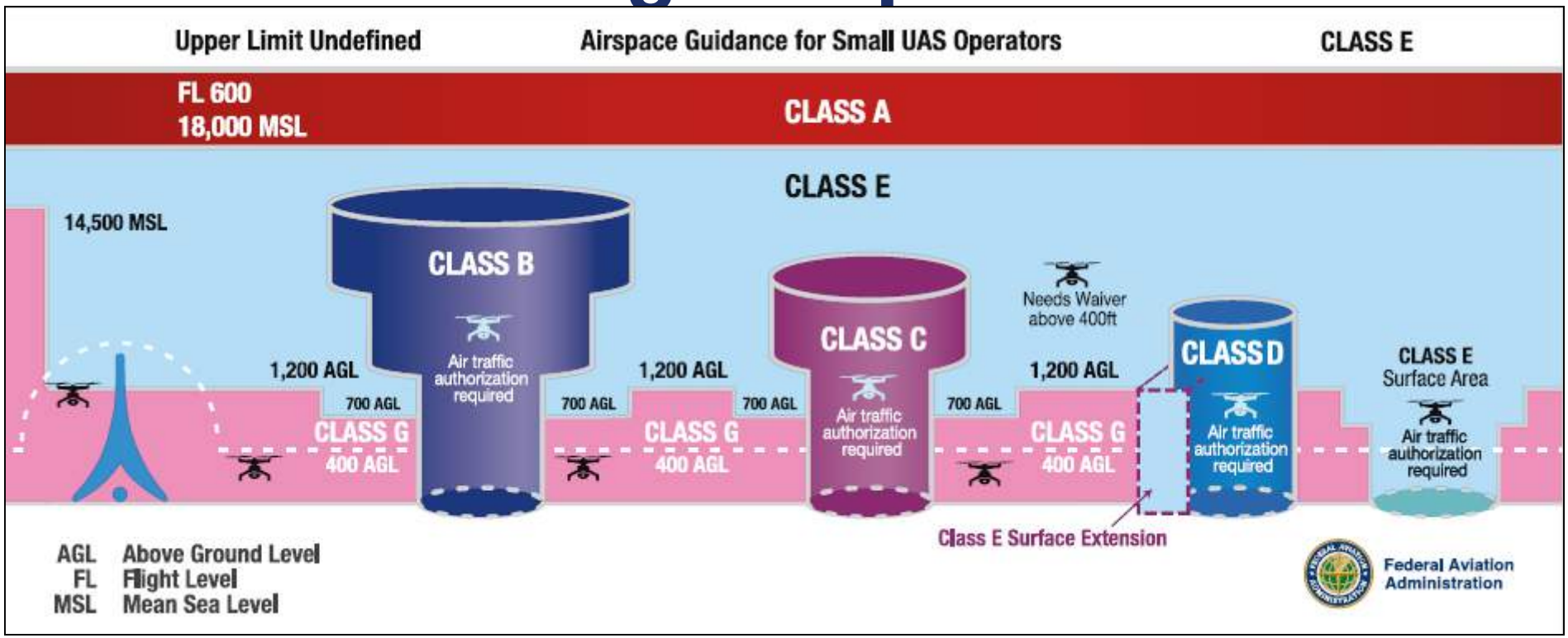
- **U.S. airspace is public space**
  - 49 U.S.C. §40103(a)(1)
- **UAS are aircraft subject to regulation**
  - 49 U.S.C. §40102(a)(6); 14 CFR 1.1; PL 112-95 §331, §336
  - An aircraft is any device used, or intended to be used, for flight
- **UAS flown outdoors must comply with FAA regulations**

The Three A's of Flying an Aircraft



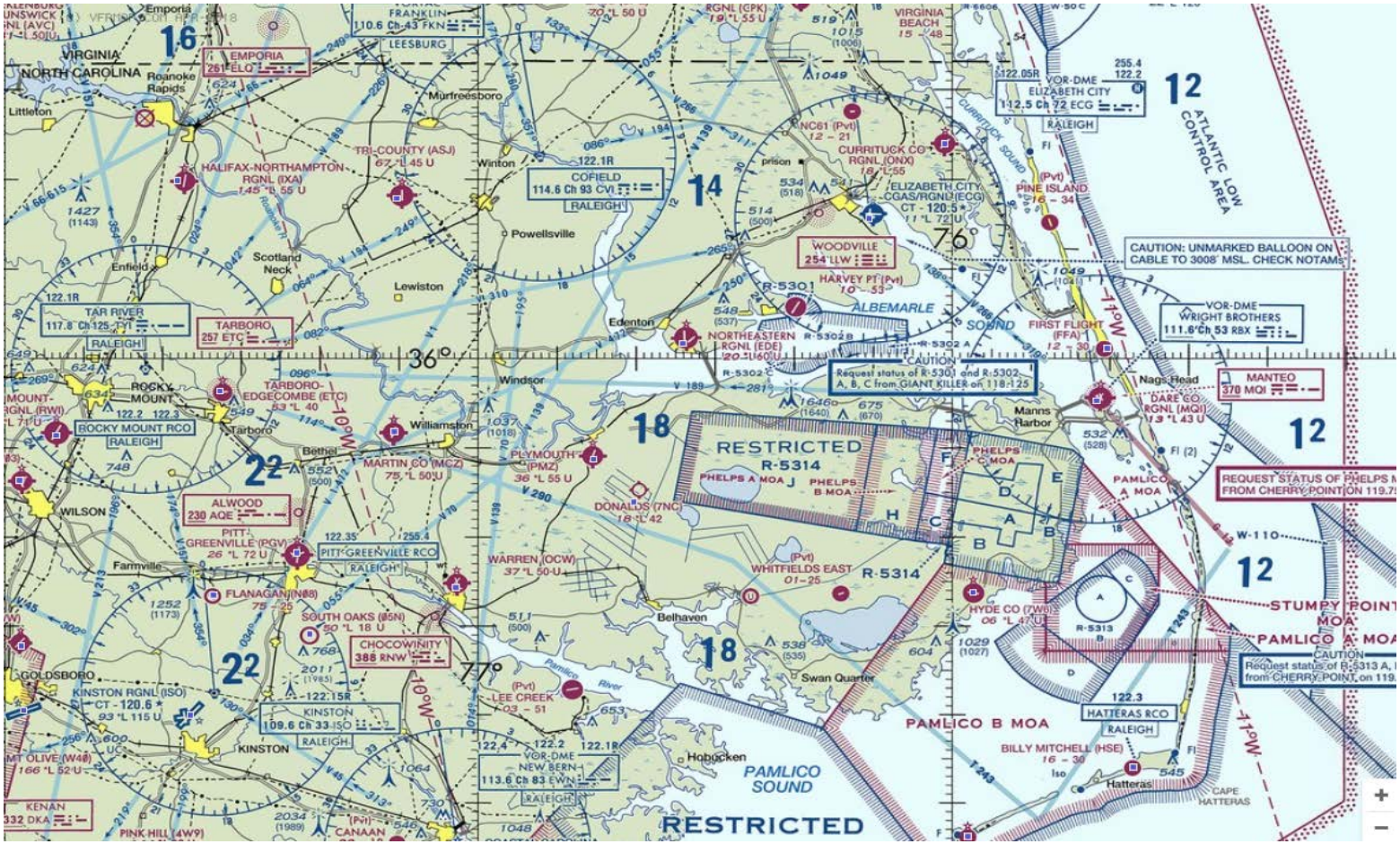
- **Fundamental requirements to fly an aircraft in the NAS**
- **Form the basis for understanding today's aviation rules**

Understanding Airspace



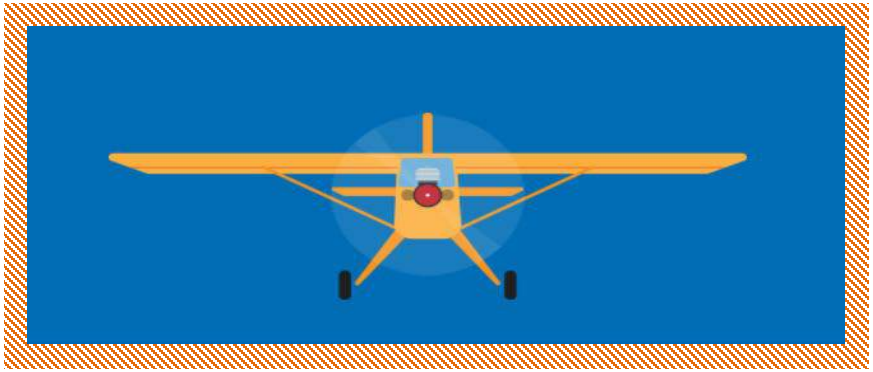
- **Operations in Class G and Class E non-surface do not require ATC authorization; Blanket COA grants access in Class G**
- **Operations in Class B, C, D & Class E surface areas require ATC authorization, either through the FAA DroneZone for Part 107 or a Standard/Jurisdictional COA**

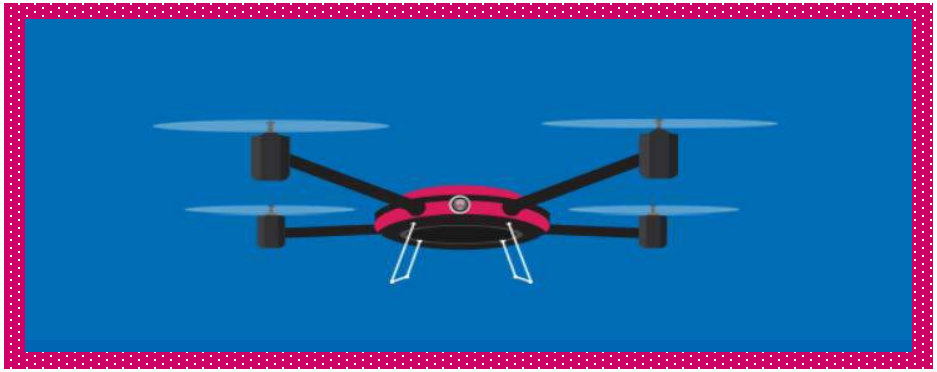
Airspace – VFR Sectional



Online UAS Registration

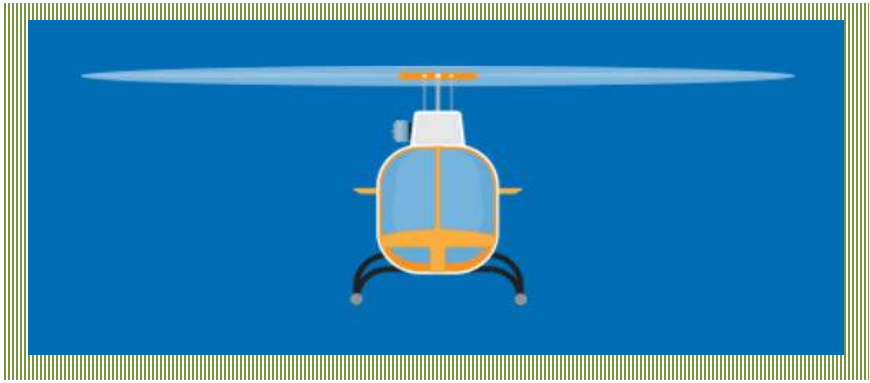
Applies to all small UAS over 0.55 and weighing less than 55 lbs. flown outside





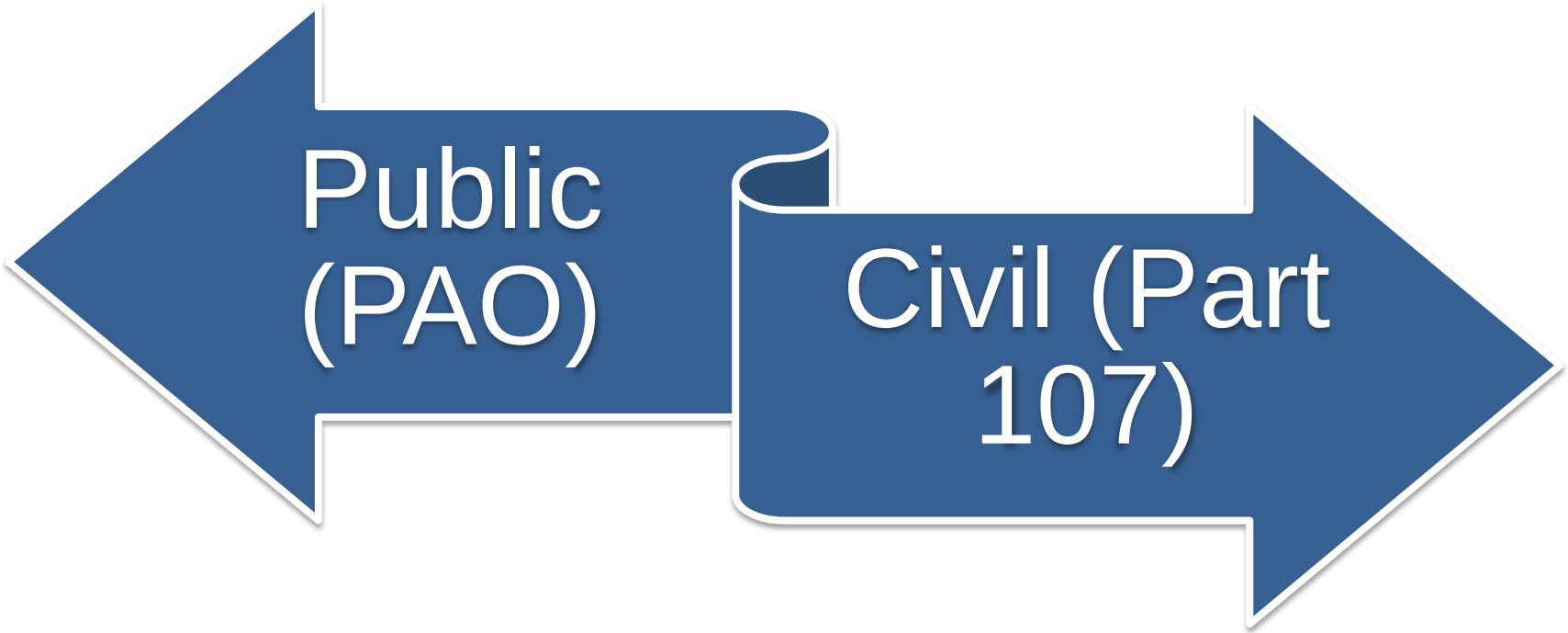
Owner must provide name, address, email

Non-recreational owners (includes Part 107 and public COA) must provide make, model, and serial number (if available) of each sUAS



Register through FAA DroneZone

How Will Your Department Operate?



Assess each mission, plan ahead, and understand the rules

Getting Started

- **Start with the end in mind**
  - Use cases
  - What do you want your UAS to do for you? What can be approved?
- **Learn about the legal frameworks**
  - Public: Title 49 U.S.C. §§ 40102(a)(41) and 40125
  - Civil: Part 107, Section 333, Experimental, Type Certificated
- **Must fully comply with applicable flight rules**
- **Cannot fly under combo Part 107 and PAO COA requirements – mission must be flown under one or the other set of rules**

Getting Started – Part 107 Operations

- **Can fly now under Part 107 but must fully comply**
- **If waivers to regulations are needed, complete the online waiver request (https://faadronezone.faa.gov/#/)**
  - Carefully and thoroughly address the questions in the **Waiver Safety Explanation Guidelines** when you complete the *Waiver Safety Explanation* field
- **Prior written approval is needed to operate in Class B, C, D, and E surface area controlled airspace, requested online or through a LAANC service supplier**

Getting Started – Public Aircraft

- **Review the Statutes & Legal Interpretations**
  - What is a “public aircraft”? 49 USC 40102(a)(41)
  - Does the operation/mission qualify for “public” status? 49 USC 40125
  - FAA PAO Legal Interpretations
- **Obtain Public Declaration Letter (PDL) from City, County, State Attorney**
  - Suggested guidance available
  - Send copy of PDL to FAA by email and snail mail
- **Obtain user ID and password for online COA Application Processing System (CAPS) from FAA**
- **Complete COA application online**

Public Aircraft Operations

Certificate of Authorization (COA)

- **Blanket Area (US Airspace) COA**
  - Operations in Class G, day and night
  - Typically processed in 10 business days

- **Jurisdictional (Area Boundary) COA**
  - Defines a specific operating area. Needs to be coordinated with Flight Standards and Air Traffic
  - Processing time 30 business days or more

- **Special Governmental Interest (Emergency COA)**
  - Requires approved active COA
  - Enables operations outside of approved COA provisions or operations within TFR
  - Processing approval within 60 minutes

Which is Best for Your Department?

- Public Declaration Letter required
- Oversight responsibility shifts to City/County/State
- NOTAM required for each flight
- Air Traffic Separation required in Class B & Class C
- Monthly report required
- Night ops allowed
- Emergency ops over people allowed
- Blanket and/or Jurisdictional COA options

Public Aircraft Operator COA

- Part 107 remote pilot certificate required
- UAS must be under 55 pounds
- Must comply with all of Part 107 or obtain waivers to certain sections for night, ops over human beings, weather, etc.
- Written authorization through the DroneZone or LAANC required to operate in controlled airspace
- Maximum operational flexibility

Part 107

Emergency Public Safety Operations

Already flying under Part 107 or a COA, but need additional operational provisions?

Need to fly in a Temporary Flight Restriction (TFR)?

Need to fly in controlled airspace?

If you checked <u>any</u> of these boxes, call the FAA System Operations Support Center (SOSC) at 202-267-8276

For more info, go here:

https://www.faa.gov/uas/getting_started/emergency_approval/

Temporary Flight Restrictions (TFRs)

- **A TFR defines an area restricted to air travel due to a hazardous condition, a special event, or a general warning for the entire FAA airspace**
- **The text of the TFR contains details about the restriction (and who the POC is in addition to the SOSC)**
- **Types of TFRs**
  - **Section 91.137**, Temporary Flight Restrictions in the Vicinity of Disaster/Hazard Areas
  - **Section 91.138**, Temporary Flight Restrictions in National Disaster Areas in the State of Hawaii
  - **Section 91.139**, Emergency Air Traffic Rules
  - **Section 91.141**, Flight Restrictions in the Proximity of the Presidential and Other Parties
  - **Section 91.143**, Flight Limitation in the Proximity of Space Flight Operations
  - **Section 91.145**, Management of Aircraft Operations in the Vicinity of Aerial Demonstrations and Major Sporting Events
  - **Section 99.7**, Special Security Instructions

Temporary Flight Restrictions (TFRs)

- **A TFR may be requested by various entities, including:**
  - Military commands
  - Federal security/intelligence agencies
  - Regional directors of the Office of Emergency Planning, Civil Defense State Directors
  - Civil authorities directing or coordinating organized relief air operations (e.g., Office of Emergency Planning; law enforcement agencies U.S. Forest Service; state aeronautical agencies)
  - State Governors
  - FAA Flight Standards District Office
  - Aviation event organizers, or sporting event officials

- **FAA Headquarters or the Directors of Terminal or En Route and Oceanic Area Operations (or their designee) having jurisdiction over the area concerned may issue a TFR.**

Handy Tools and References

Help with Operations	• **B4UFly App:** https://www.faa.gov/uas/where_to_fly/b4ufly/ • **Part 107 Waivers:** https://faadronezone.faa.gov/#/ • **NOTAM Entry**: https://www.1800wxbrief.com/Website/uoa
Understanding Regulations	• **AC 00-1.1A:** Public Aircraft Operations • **14 CFR Part 107:** Small Unmanned Aircraft Systems • **AC 107-2:** Small Unmanned Aircraft Systems (sUAS) • **Title 49 U.S.C. §§ 40102(a)(41) and 40125**
General Information	• **FAA UAS Webpage: https://www.faa.gov/uas/**
Emergency Operations	• **Sys Ops Sec: (202) 267-8276, 9-ator-hq-sosc@faa.gov** • https://www.faa.gov/uas/getting_started/emergency_approval/

Questions?

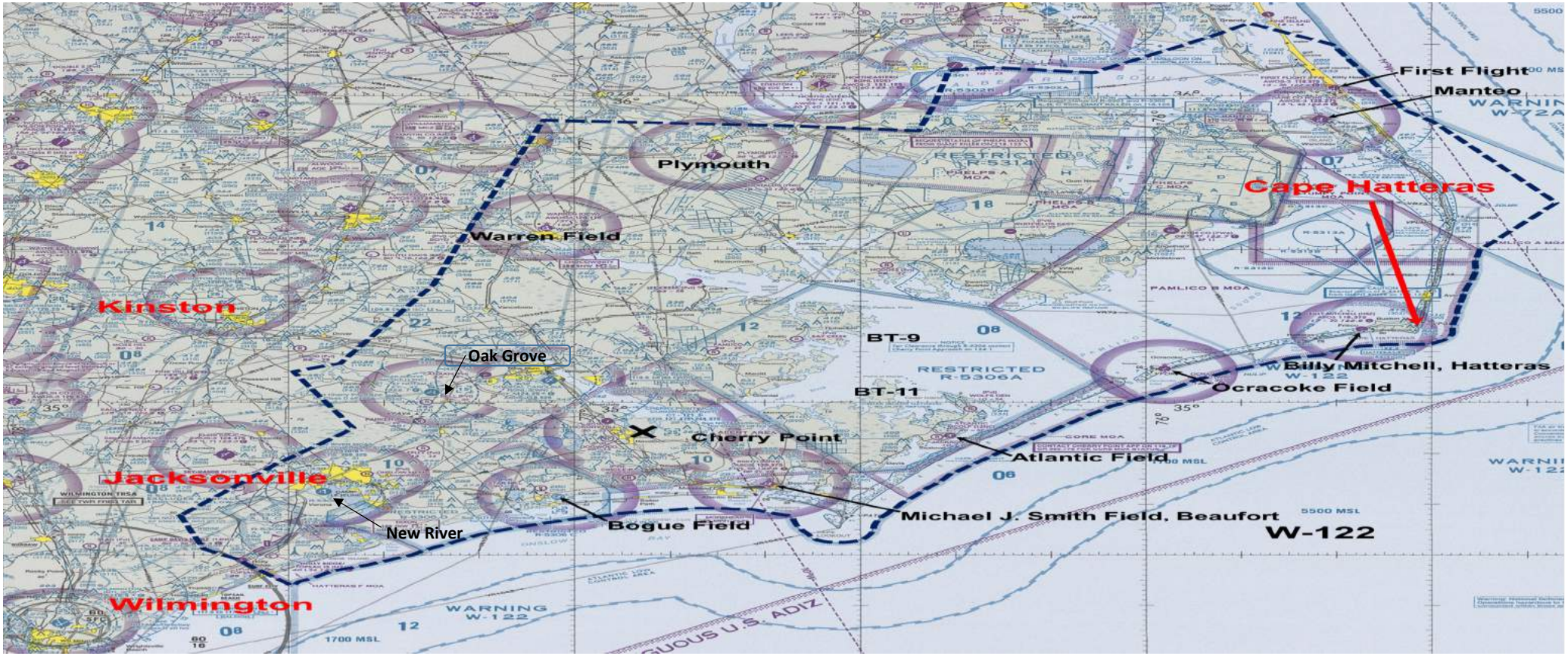
- For questions about operations contact the Help Desk:

  UAShelp@faa.gov or 844-FLYMYUA

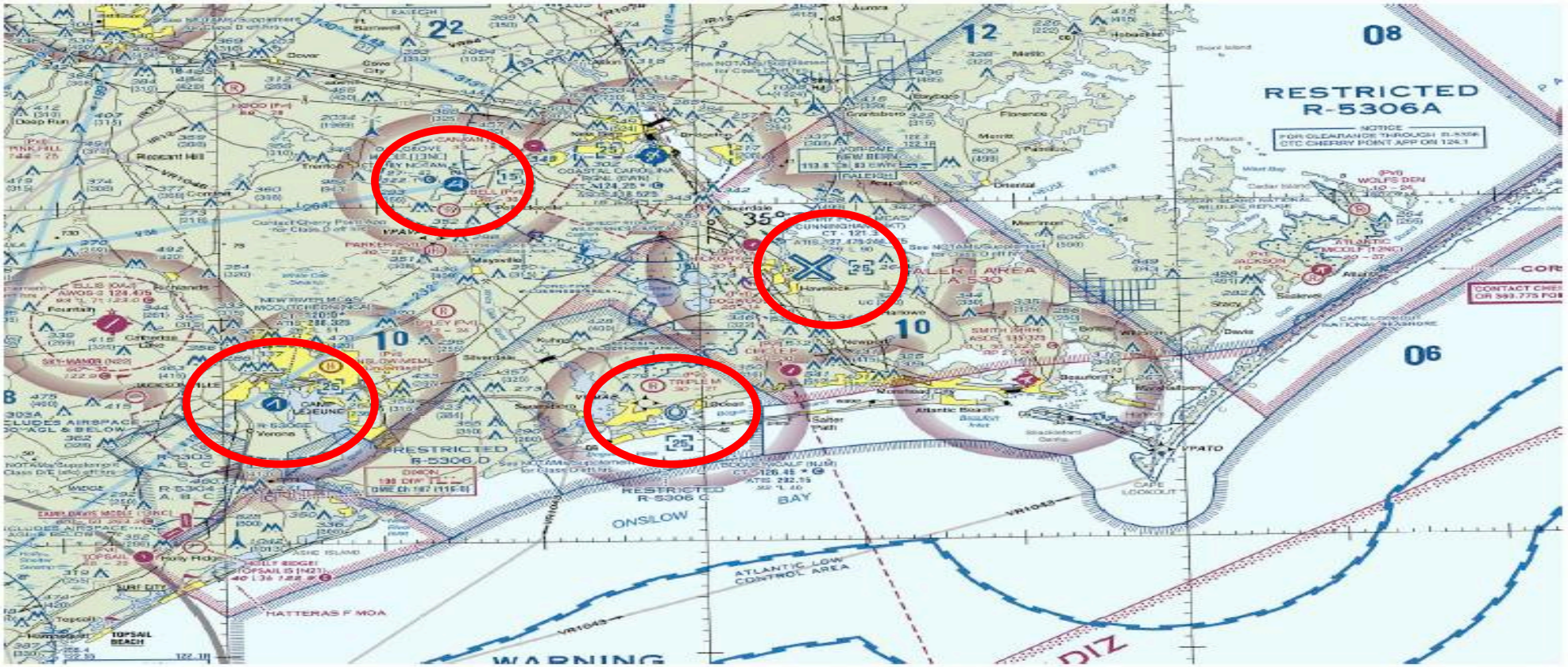
- For questions about enforcements contact LEAP:

  LEAP@faa.gov

Marine Corps Airspace Footprint in Eastern North Carolina



Marine Corps Class Delta Surface Areas



Points of Contact for 14 CFR part 101 Operators

- **MCAS Cherry Point**
  - Phone Number - (252) 466-4146
- **MCOLF Bogue Field**
  - Phone Number - (252) 466-4146
- **MCOLF Oak Grove**
  - Phone Number - (252) 466-4146
- **MCAS New River**
  - Phone Number - (910) 449-6580 or (910) 449-6800

FEMA Region IV UAS Strategy

NCDOT Drone Workshop April 19, 2018

USAR and DSAT teams arrive in Key West, Irma

Yvonne Smith/FEMA

FEMA Region IV UAS

Yvonne Smith/FEMA

USAR Teams, Irma

Yvonne Smith/FEMA

DSAT teams in Key West, Irma

Yvonne Smith/FEMA

Pre-scripted Power and Road Safety UAS Missions

FEMA

All Disasters Are Local.

FEMA Photo/Jocelyn Augustino - Lumberton, NC October 10, 2016 Flooding

FEMA Photo/Ruth Kennedy - Holt, AL., August 29, 2011 Tornado

The number of emergency agencies using drones is growing.

"The number of police, sheriff, fire and emergency agencies with drones doubled in 2016, with nearly 350 departments having them as of last year, according to a study released this past spring by the Center for the Study of the Drone at Bard College in New York. Almost half were in places with fewer than 50,000 people, the study found."

Source: AP Toledo November 3, 2017

"There are 27,216 fire departments listed with the National Fire Department Registry. This is about 91 percent of all U.S. fire departments. Registration for the list is voluntary." – U.S. Fire Administration 2016

"*Law enforcement in the United States is made up of about 18,000 federal, state, county, and local agencies." – U.S. Department of Justice 2016*

Remote Sensing Platform Costs

$$$$$$$

$$$$$

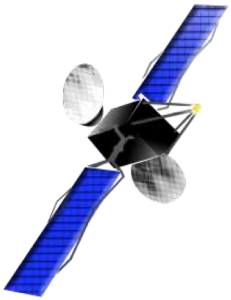
$$$

400 Feet

$

$

Coordinated Remote Sensing Response



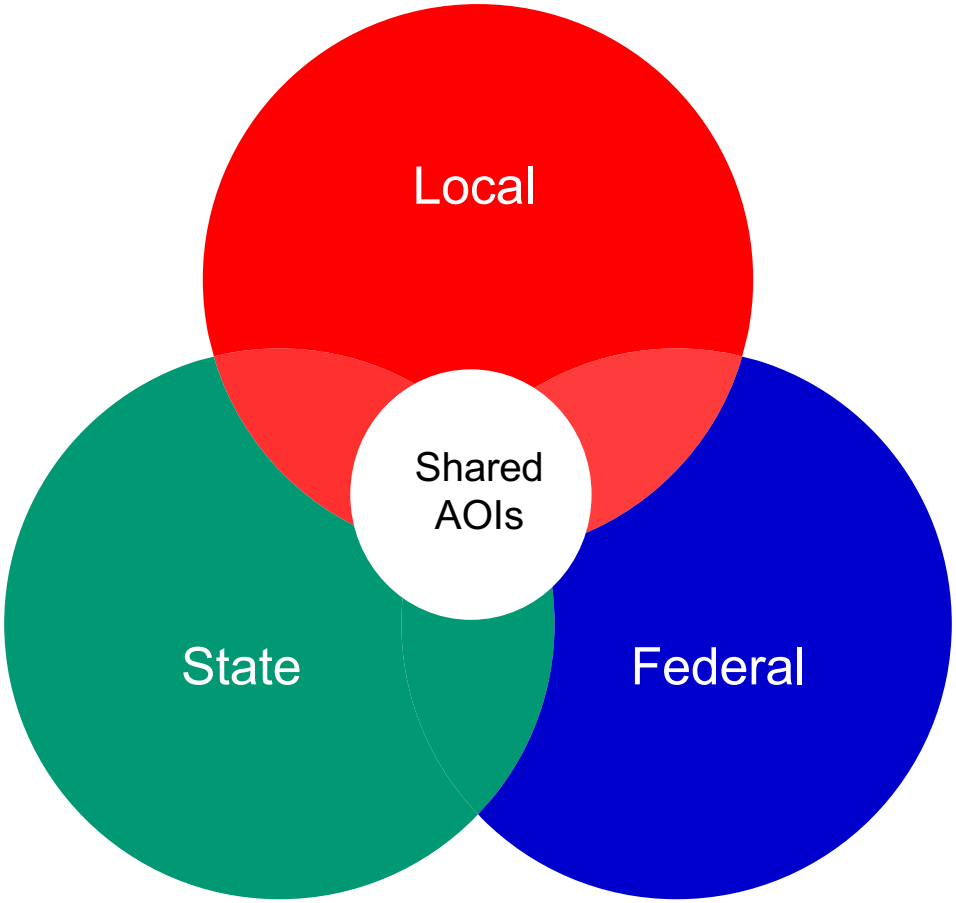
Federal

State

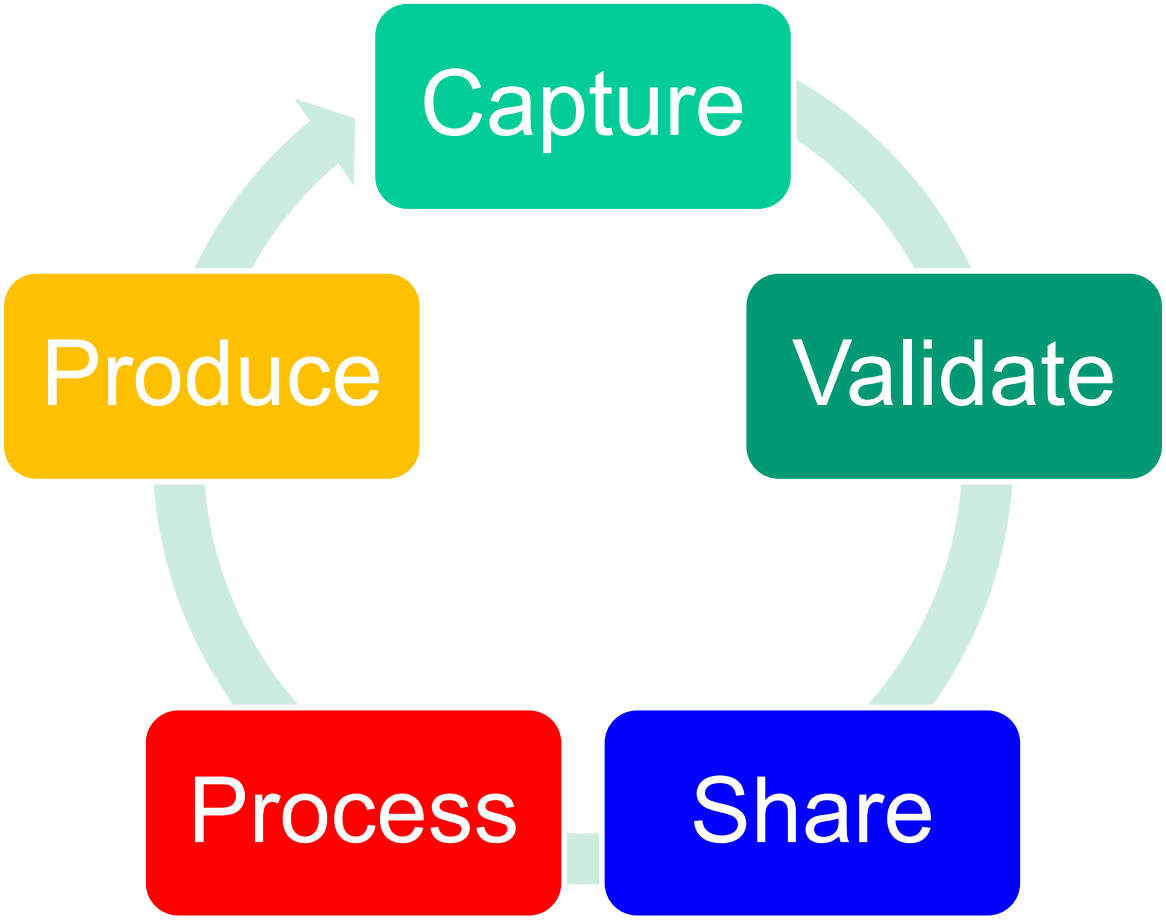
Local

Trusted Agents

Remote Sensing Common Operating Picture



Disaster Imagery Workflow



Regulator (Section 333, 14 CFR Part 107)

FEMA **Authenticator, Coordinator, Reimburser**

FEMA as Authenticator

FEMA **National Integration Center**

Resource Typing Definition for Response and Situational Assessment Efforts

UNMANNED AERIAL SYSTEM TEAM, FEMA-508-v20170717

PILOT-IN-COMMAND–UNMANNED AERIAL SYSTEM, FEMA-509-v20170717

TECHNICAL SPECIALIST–UNMANNED AERIAL SYSTEM, FEMA-509-v20170717

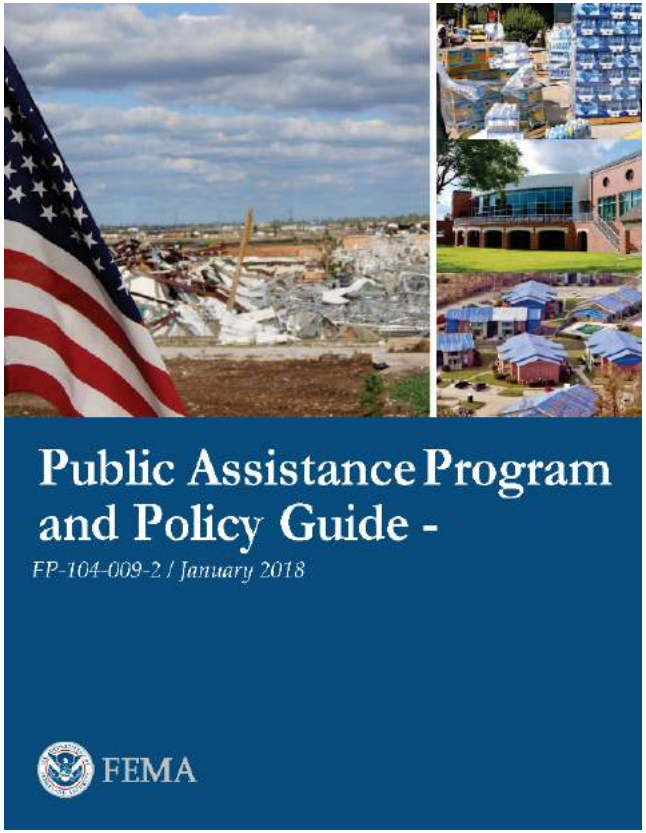
SEPTEMBER 2017

FEMA as Coordinator

FEMA's mission is to support our citizens and first responders to ensure that as a nation we work together to build, sustain and improve our capability to prepare for, protect against, respond to, recover from and mitigate all hazards. May 16, 2017

FEMA as Reimburser

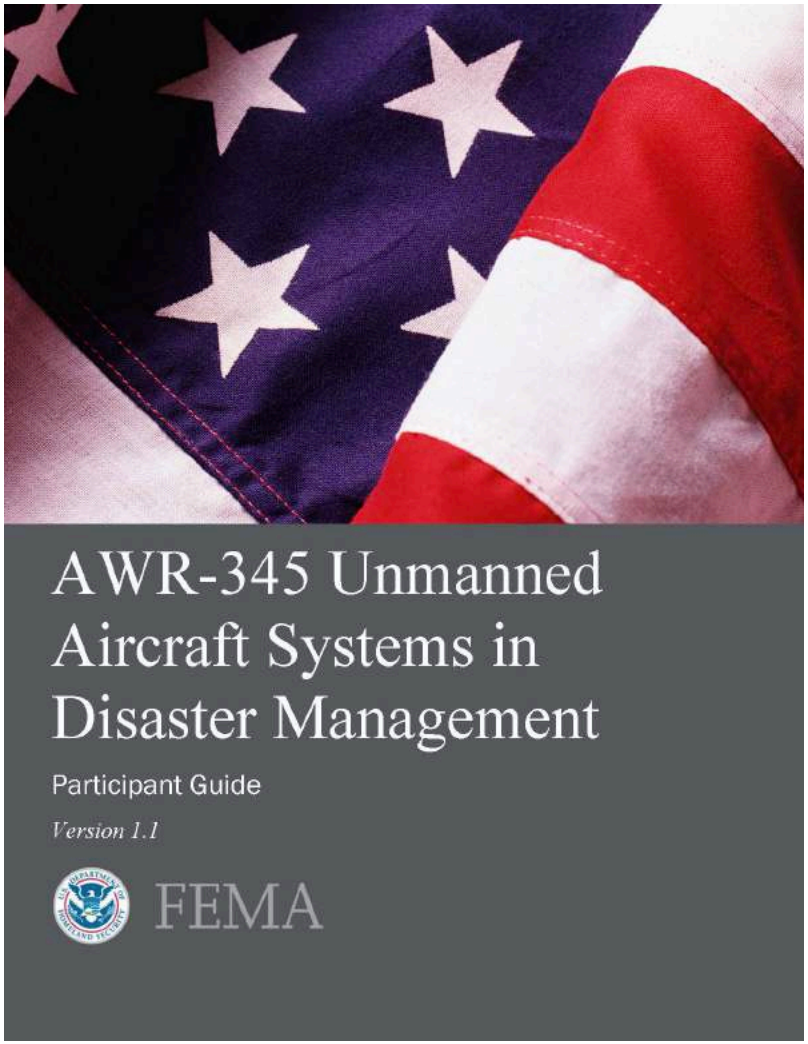
FEMA Office of Response and Recovery



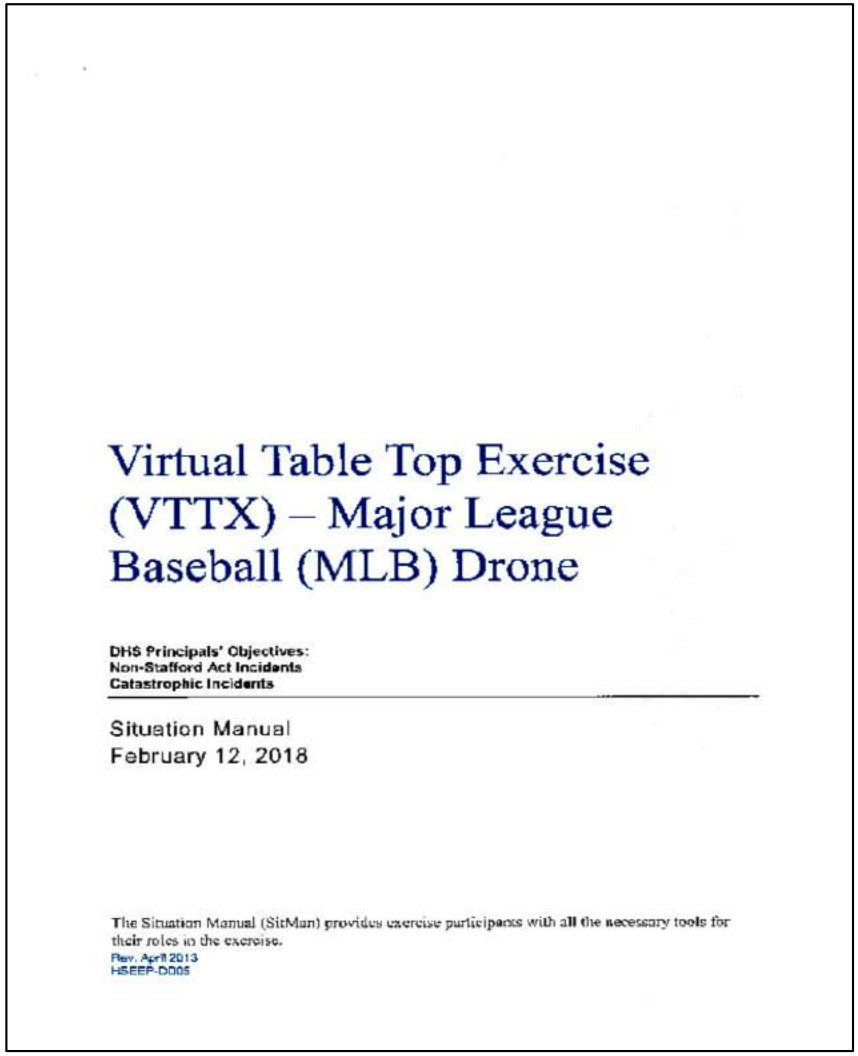
1. Under Category B (Emergency Protective Measures) the Applicant can request reimbursement on behalf of the Subgrantee if drones were used to find areas that were heavily impacted and require immediate attention to prevent a threat to **life and safety**. FEMA will pay the Applicant who should then reimburse the Subgrantee for those costs. (**Response**)

2. The Applicant can pay for justified drone aerial photography using the disaster management cost funds. (**Recovery**)

FEMA UAS Course



FEMA EMI Drone TTX



Virtual Table Top Exercise (VTTX) – Major League Baseball (MLB) Drone

DHS Principals' Objectives:
Non-Stafford Act Incidents
Catastrophic Incidents

Situation Manual
February 12, 2018

The Situation Manual (SitMan) provides exercise participants with all the necessary tools for their roles in the exercise.
Rev. April 2013
HSEEP-D005

UAS Activity During Nate, Irma, and Harvey

The imagery standards developed by the working groups were adopted and used by UAS teams during these events.

The FAA issued more UAS waivers than during any other previous period for emergency response efforts in FEMA Region IV.

A Delaware PDA team with UAS capability was EMAC'd to Florida to do damage assessments.

2018 Region IV UAS Working Group Activities

Alabama – February 27th, GEOHuntsville TTX

North Carolina – April 20th Kickoff

Georgia – 2nd Quarter Kickoff

Mississippi – TBD

Tennessee – TBD

“The integration of UAS into the National Airspace System during emergency response and recovery efforts at the local, state and federal levels will require collaborative efforts involving all levels of government and the private sector. Assembling and exercising during “blue skies” are not only necessary, they are key to the success of that integration and will pay many dividends during the upcoming tornado and hurricane seasons ultimately benefiting the survivors of those disasters.”

FEMA

Questions?

Travis Potter
Proj Mgr\IT Specialist
UAS Coordinator
DHS\FEMA RIV
404.909.1400
travis.potter@fema.dhs.gov

Meet senseFly

The world's #1 producer of mapping drones

Troy Hittle

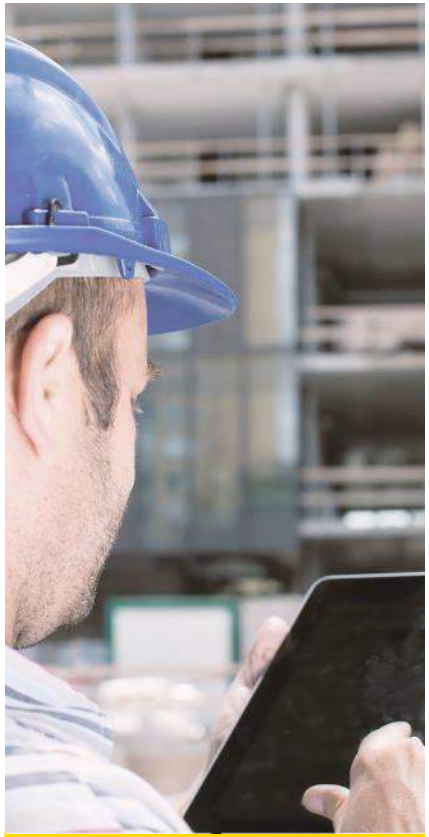
Regional Manager, North America

4.19.2018

senseFly
a Parrot company

At senseFly...

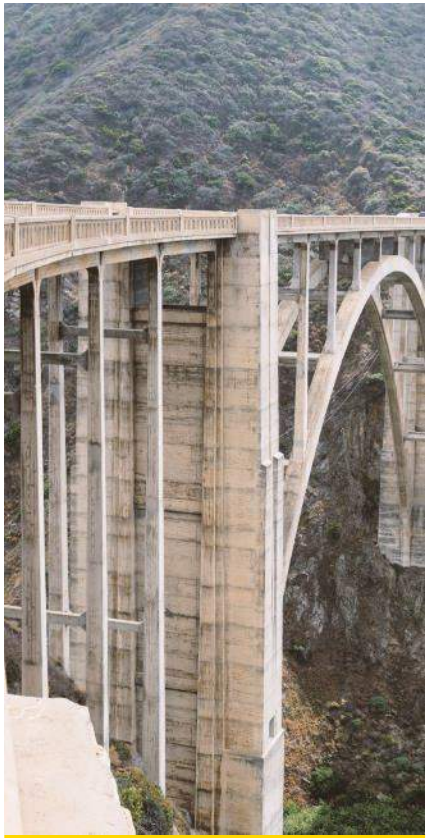
we believe in using technology to make work safer and more efficient.



Surveying & Construction

Mining & Aggregates

Agriculture



Inspection

senseFly – Pioneer of Professional Drone Solutions

Our Solutions

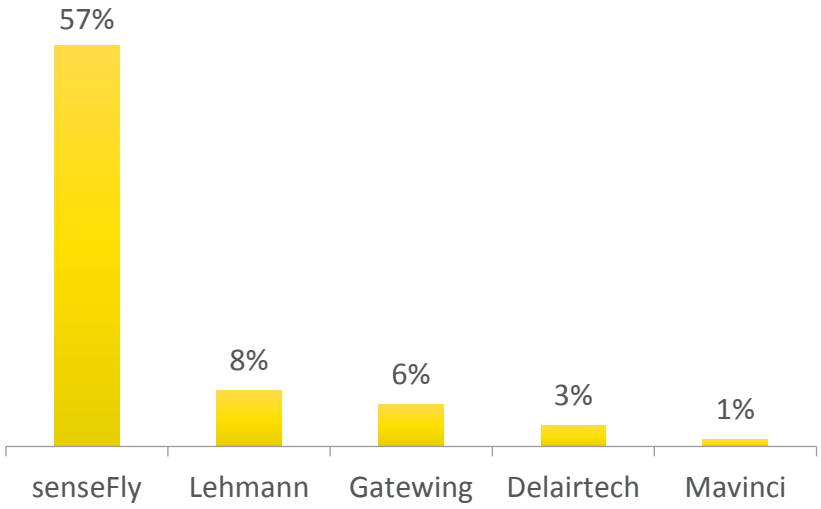
Customer Stories

senseFly pioneered professional drones in 2009 and is world leader in fixed-wing drones

- **Founded in 2009**
- **#1 used mapping drone**
- **Lightest in class**
- **49,421,076 ac mapped to date**

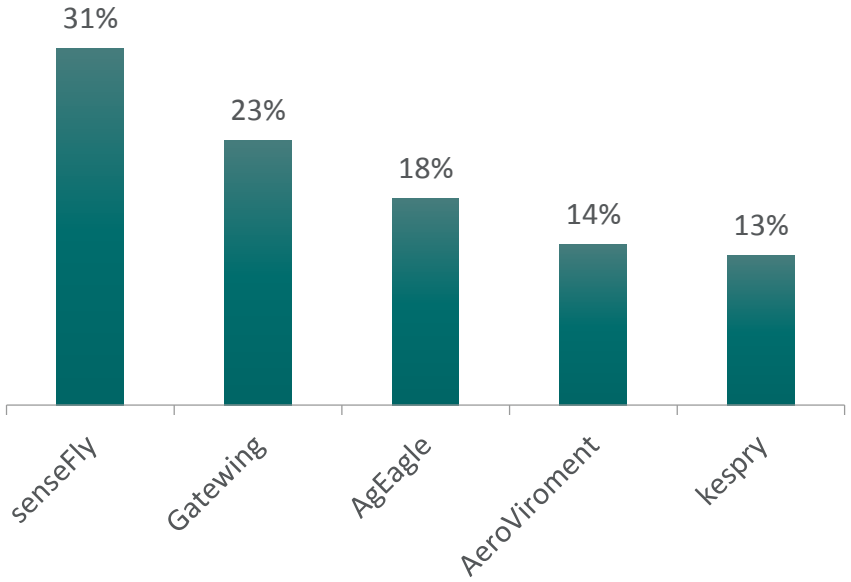
We’re the #1 fixed-wing drone
Largest market share in key countries

Market share – professional fixed-wing drones France



Source: DGAC, July 2016 (France)

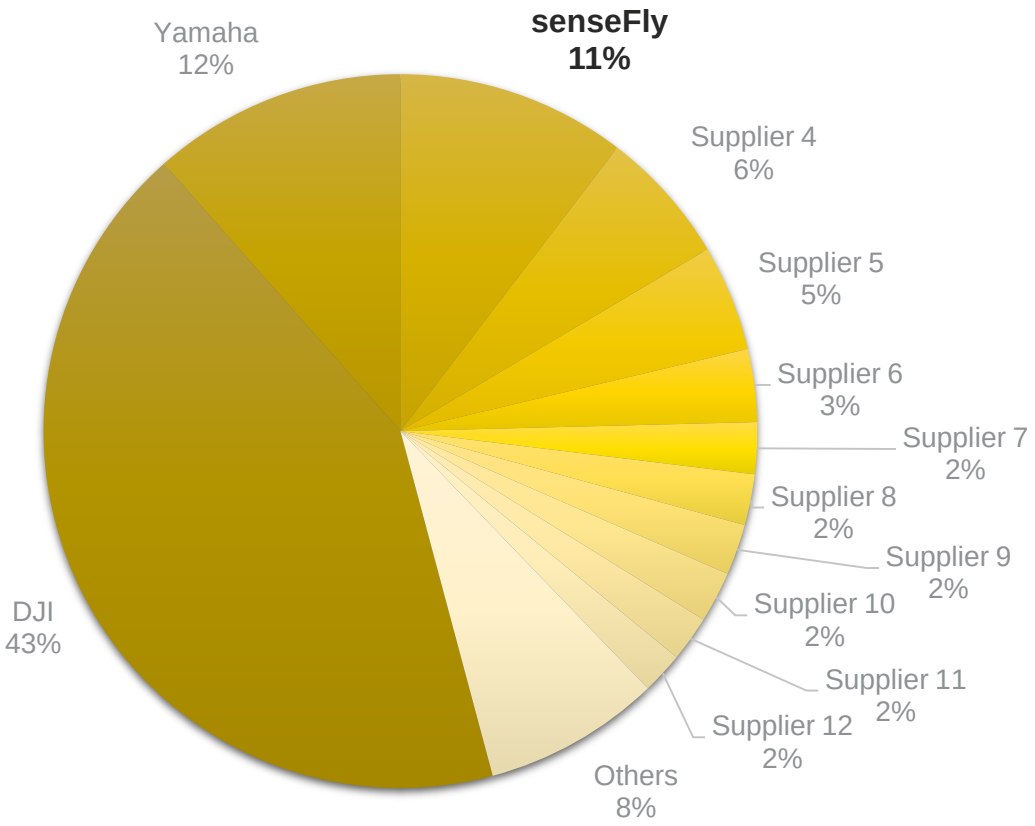
Market share – professional fixed-wing drones US



Source: FAA exemptions 2016 (USA)

senseFly among top 3 Industrial UAV Supplies
>10% share in a highly fragmented market

Commercial UAV Market Shares Excluding Prosumer Applications in 2016 (Revenues)



Notes: Includes revenues from hardware, software/analytics and service
Source: Interact Analysis, The Commercial Unmanned Aerial Vehicle (UAV) Market / August 2017

Our solutions help professionals across industries improve their business outcomes

Surveying & Construction

"We **charged one-fifth** of what we would have charged with conventional surveying" (AOC Ingeneria)

"The eBee has given me the **best ROI** of any survey tool I own" (GeoGIS Consultants)

"Using manned planes would have cost **significantly more**" (Survey Group)

Mining & Aggregates

"To get close to the same detail with terrestrial surveying would take **2-3 weeks, compared to 4-5 hours**" (ASM Ireland)

"We **saved hundreds of thousands** of dollars by using eBees in place of airborne LIDAR" (Energizer Resources)

"We can cover **much larger areas** with **better quality data** than through traditional methods" (Barrick Gold)

Agriculture

"OCEALIA's 300 farmers recorded an average **yield increase of 10%**" (AIRINOV)

"We **reduced fertiliser application by 20%**" (NPK GPS)

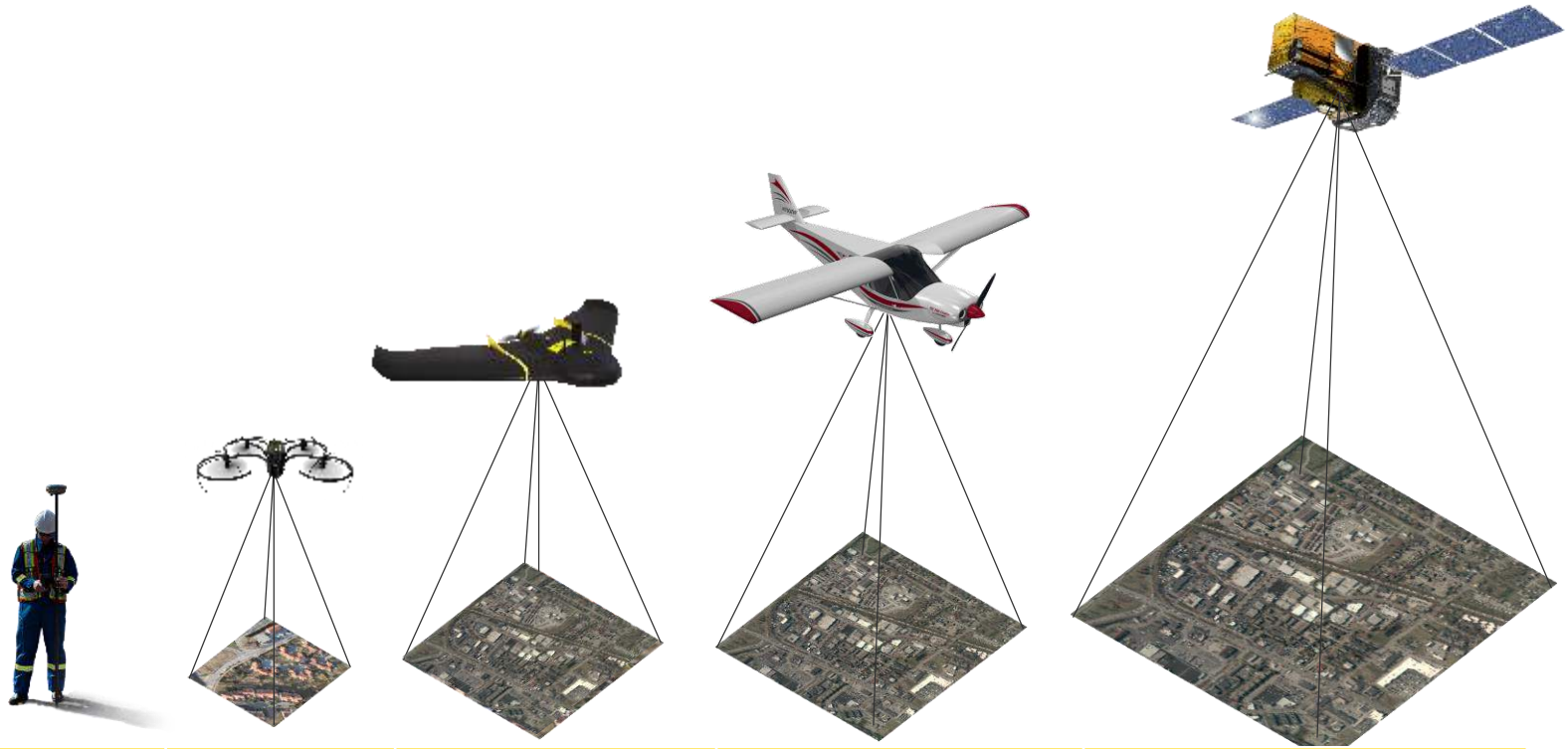
"It's **a remarkable tool** for identifying issues within crops before problems become too severe" (Signpost Surveys)

Inspection

"The cost of a UAS contract to inspect the same approach spans of our bridge would be around $20,000 - a potential **cost saving of 66%**" (MnDOT)

"In terms of measurement speed and accuracy we've made a **big qualitative step forwards** with drones" (Geotest)

High accuracy at a lower cost - Professional Fixed Wings are the mapping tool of choice



	Traditional Surveying	Multirotor Drone	High Accuracy Professional FW	Plane	Satellite
Coverage	Very Low	**Low**	**Medium**	High	Very High
Accuracy	Very High	**Medium**	**High**	High	Medium
Cost / Effort	High	**Low**	**Low**	High	Medium

Via our partnerships we provide tested and reliable end-to-end solutions across industries

Surveying & Construction

- PIX4D
- esri
- MS

Mining & Aggregates

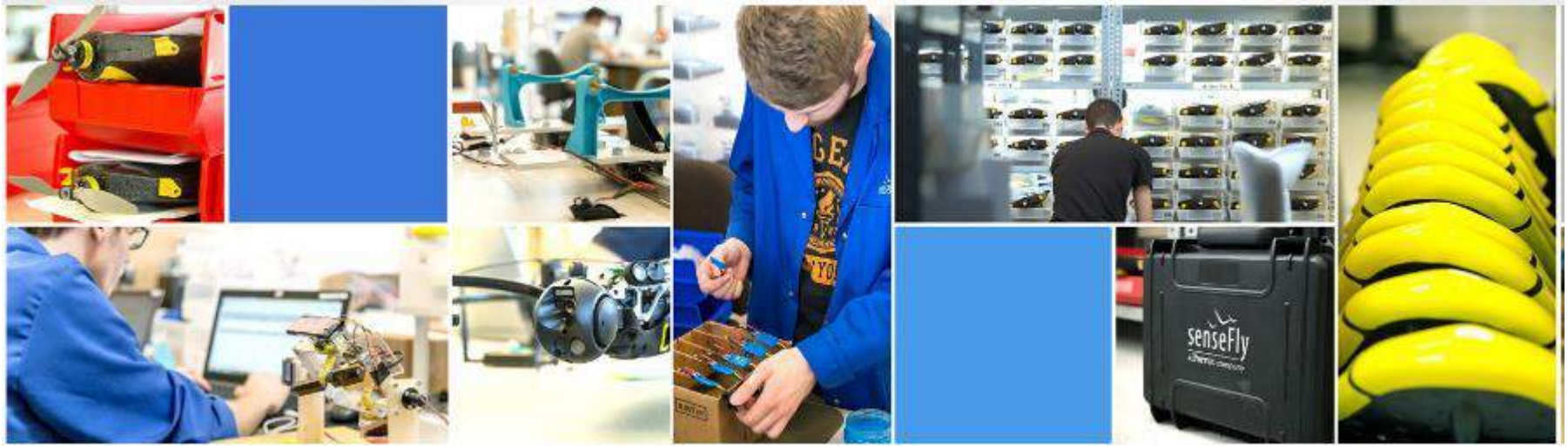
- PIX4D
- Airware
- MAPTEK

Agriculture

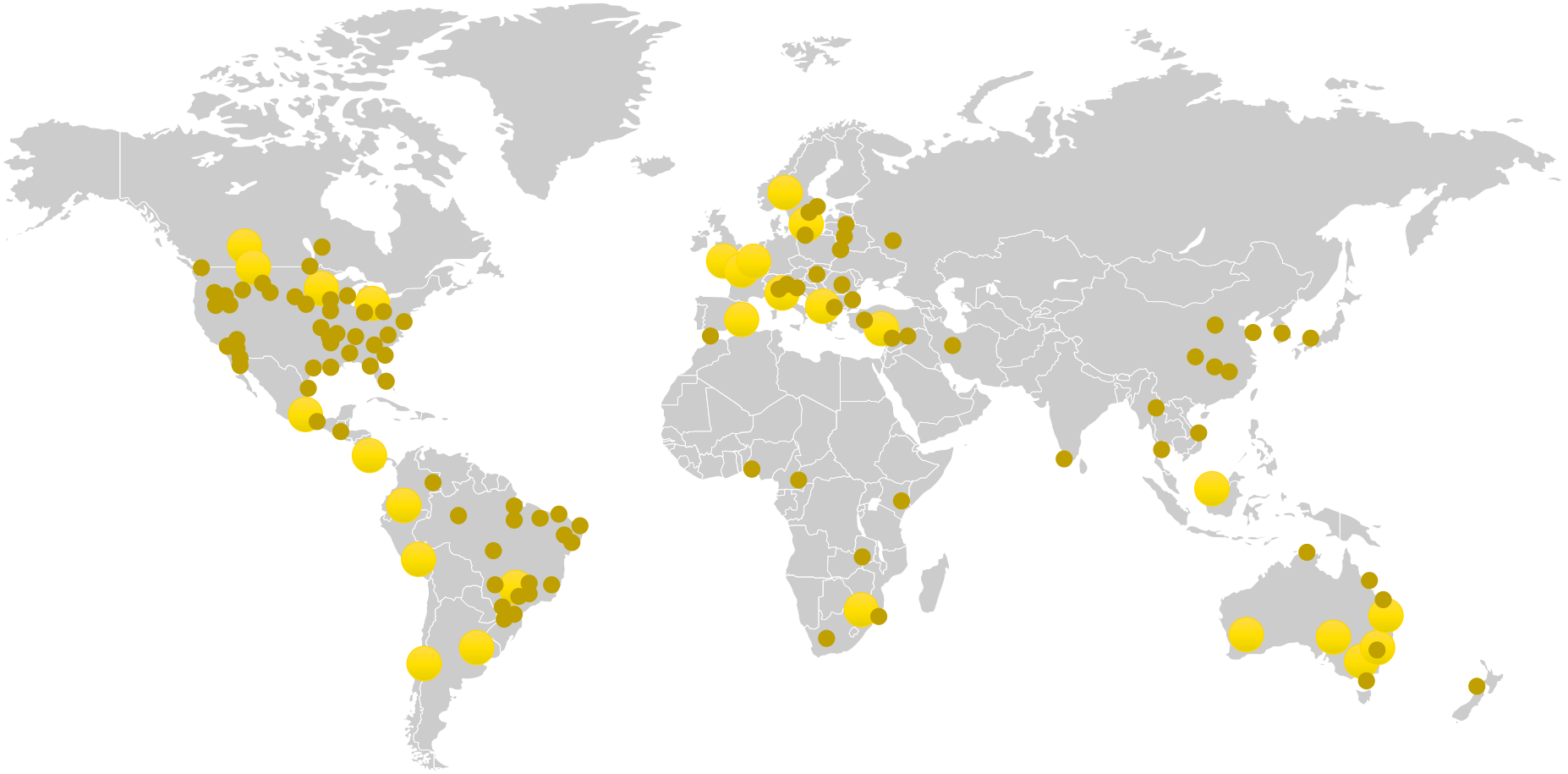
- PIX4D
- Agribotix
- AIRINOV
- MicaSense
- Hummingbird Technologies

Our world class platforms are designed and assembled in Switzerland

- **Robust**, work-tough solutions
- Checks at each stage of production
- Components individually **tested & calibrated**
- Finished drones **flight tested**
- & re-verified before shipping
- **1-year limited warranty & lifetime support**



We have global presence through our distribution and service network



>70 distributors & 200+ points of sale

Our highly skilled in-house support engineers ensure 98% customer satisfaction

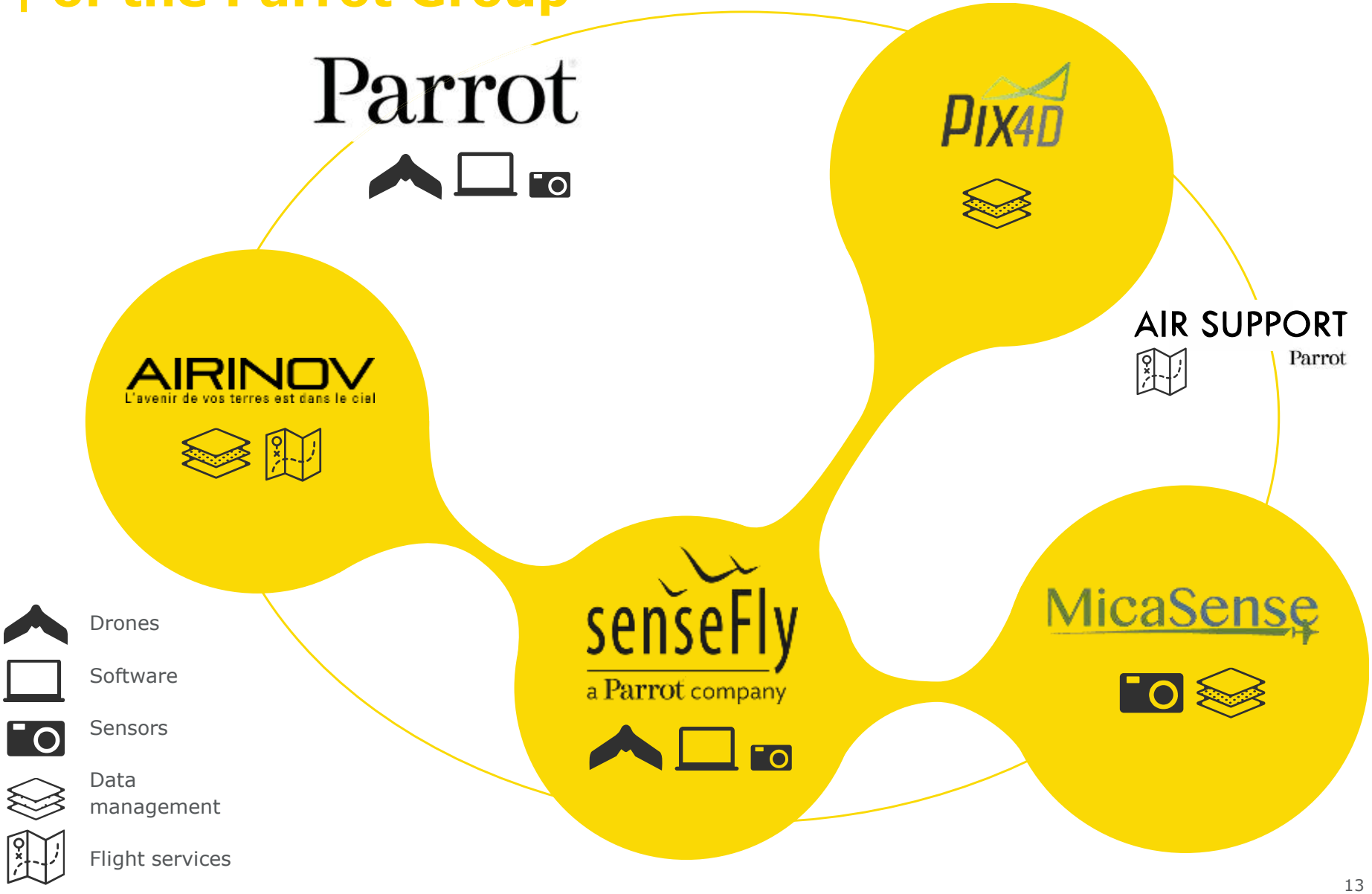
Local support

Professional one-to-one support is provided in-country by carefully selected and fully trained senseFly distributors

senseFly customer service

Advanced second-level support is available from senseFly's qualified service engineers. With their industry-specific backgrounds, they can advise on everything from eMotion and hardware questions to data processing.

senseFly is a member of the Parrot Group




senseFly – Pioneer of
Professional Drone Solutions
Our Solutions
Customer Stories

Our fixed and rotary wing drones are adapted to the needs of multiple industries

eBee senseFly

Aerial efficiency,
photogrammetric accuracy

eBee senseFly

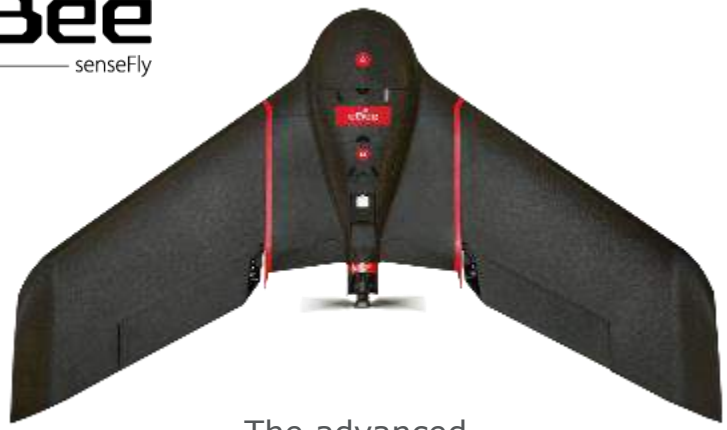
The professional
mapping drone

Wide payload range

Our fixed and rotary wing drones are adapted to the needs of multiple industries

Agriculture

eBee senseFly



The advanced agricultural drone

Parrot Sequoia

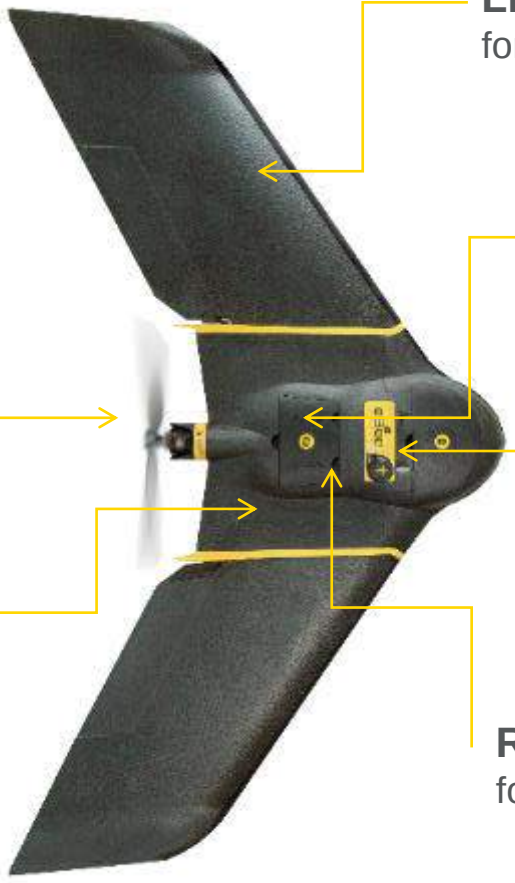
Inspection

albris senseFly

The close mapping & inspection drone

TripleView Head

Our platforms are robust, long lasting
and targeted at professional applications



Light, shock-absorbent material
for maximum safety & durability

Long lasting battery
for maximum flight endurance

Rear-facing propeller
for safe operation & easy maintenance

Industry-leading autopilot
Aviation-inspired with numerous fail-safes built-in

Robust belly design
for landing on any surface

Ruggedised & high-grade sensor
for smooth operation in harsh environment

Our surveying solutions allow high precision mapping and support a wide range of payloads

eBee senseFly

- High Precision on Demand (upgradeable RTK/PPK)
- Up to 59 min. flight time
- senseFly S.O.D.A. for photogrammetry
- eMotion 3
- Multiple camera options

thermoMAP

Parrot Sequoia

senseFly S.O.D.A.

eMotion senseFly

Our surveying solutions allow high precision mapping and support a wide range of payloads

- <1 kg (1.5 lb)
- Up to 50 min. flight time
- eMotion
- Multiple camera options

eMotion
senseFly

senseFly S.O.D.A.

Parrot Sequoia

thermoMAP

Our simple E2E workflow seamlessly integrates with best in class software

PLAN

- Define the site (or sites) to map
- Choose & configure your high precision methodology (e.g. RTK using VRS)
- Survey one or more sites per flight

CAPTURE

- Capture high-resolution, georeferenced RGB images
- Up to 220 ha (540 ac) at 120 m/400 ft AGL (cover 1,320 ha/3,260 ac per day*)

GENERATE

- Process the drone's georeferenced photos(choose local/cloud processing)
- Analyse geo-accurate orthomosaic, pointcloud & surface model outputs

ACT

- Create client deliverables (contours, cadastre plans, classified point cloud etc.)
- Import drone outputs into third-party software (CAD etc.) as required*)

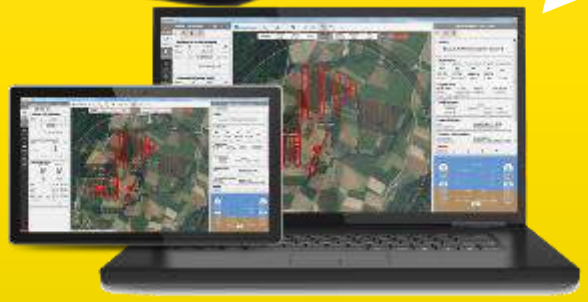
Our agriculture solution comes with the reference multispectral sensor

Sunshine sensor

- 55 min flight time
- 200 ha (540 ac) coverage @ 122 m (400 ft)
- 1.1 kg (2.42 lb)

Parrot Sequoia

Includes eMotion Ag!



eMotion Ag
senseFly

Area coverage
Rotary vs fixed-wing

GSD [cm/pixel]	Inspire [ac]	eBee [ac]	eBee Plus [ac]
2	42	271	400
3	66	343	555
5	108	402	978
10	180	1260	1897

senseFly fixed-wings cover up to 10x more ground in a single flight

With the albris we offer a professional grade inspection drone

albris
senseFly

- Close object operation
- Advanced situational awareness
- Automatic, interactive & manual flight modes
- Look up/forward/down
- 1 flight, 3 types of imagery
- 38 MP RGB still, HD video & thermal

Flight planning

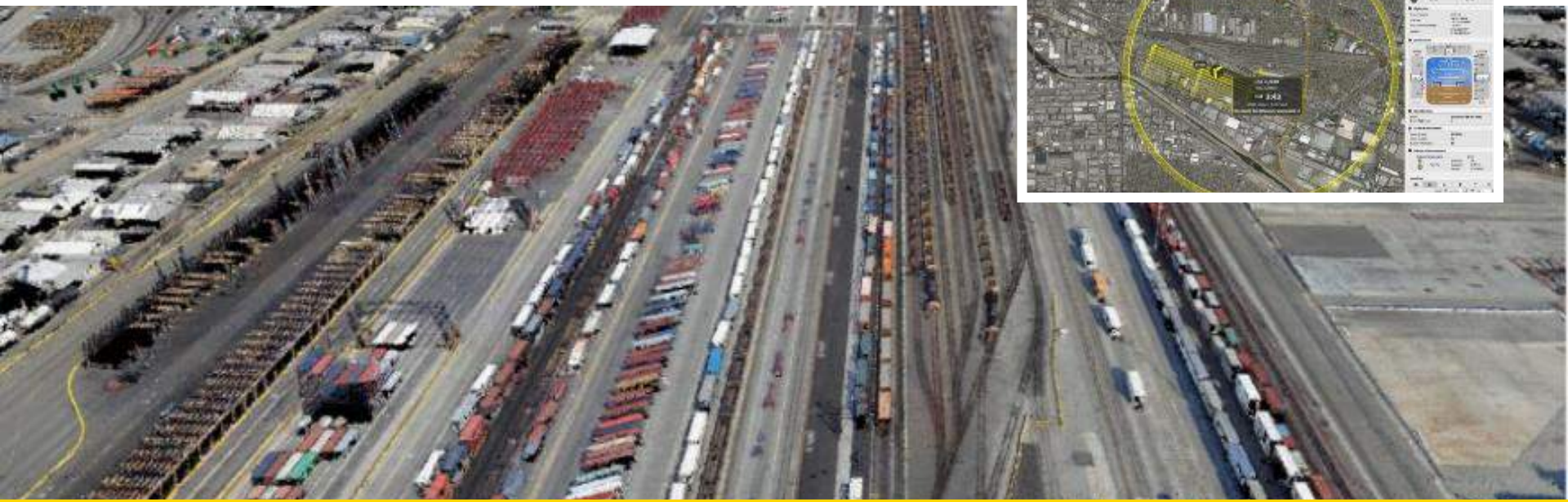
PIX4D

Image processing


senseFly – Pioneer of
Professional Drone Solutions
Our Solutions
Customer Stories

Surveying a new high-speed rail route

- Customer: Jacobs (USA)
- Challenge: California rail route too large for terrestrial measurement & manned aircraft expensive
- Solution: eBee RTK survey-grade mapping drone
- Results:
  - **4x time saving** over terrestrial surveying
  - **2x cost saving** over manned aircraft data collection



Using drones to boost quarry safety & survey efficiency

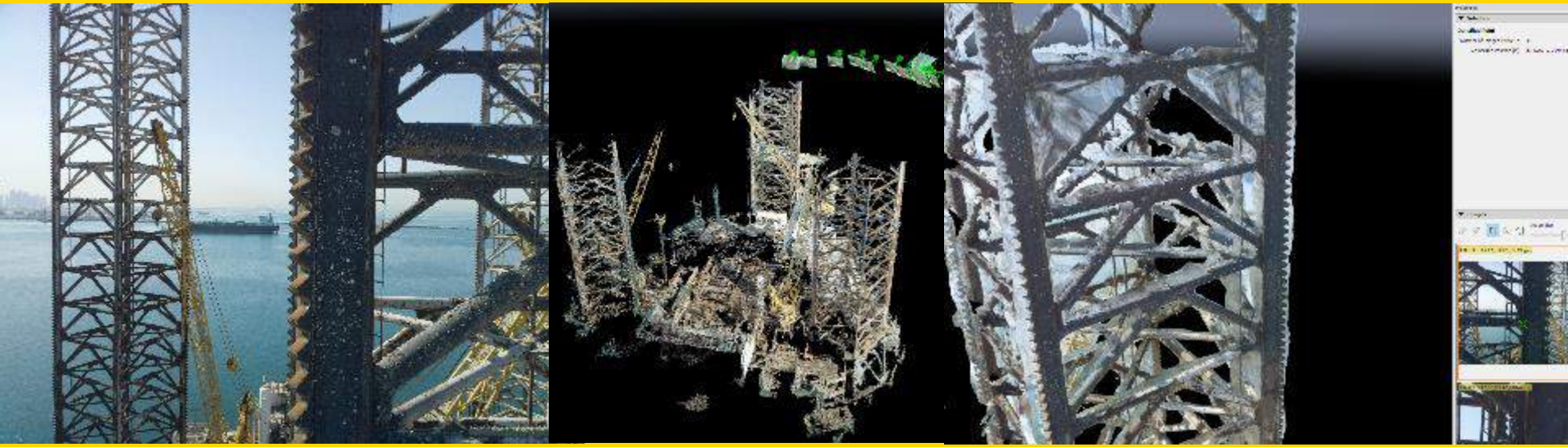
- Customer: Redbird (now Airware)
- Challenge: improve survey efficiency & safety across nine CB Groupe quarries
- Solution: combine automated eBee aerial data collection with Redbird cloud data & analytics solution
- Results:
  - Improved worker safety (significantly **less ground work**)
  - Quicker delivery of geospatial data (**24 hr** turnaround)
  - Cost savings (UAV projects **5x cheaper** than traditional surveys)

How a French cooperative used eBee drones to improve 300 farmers' crop yields

- Customer: OCEALIA Groupe (French cooperative with 300+ farmer members)
- Challenge: optimize 300 farmers application of nitrogen across wheat & rapeseed crops
- Solution: collect accurate crop growth data with senseFly drones & combine with AIRINOV agronomy expertise
- Results: avg. **10% yield increase**

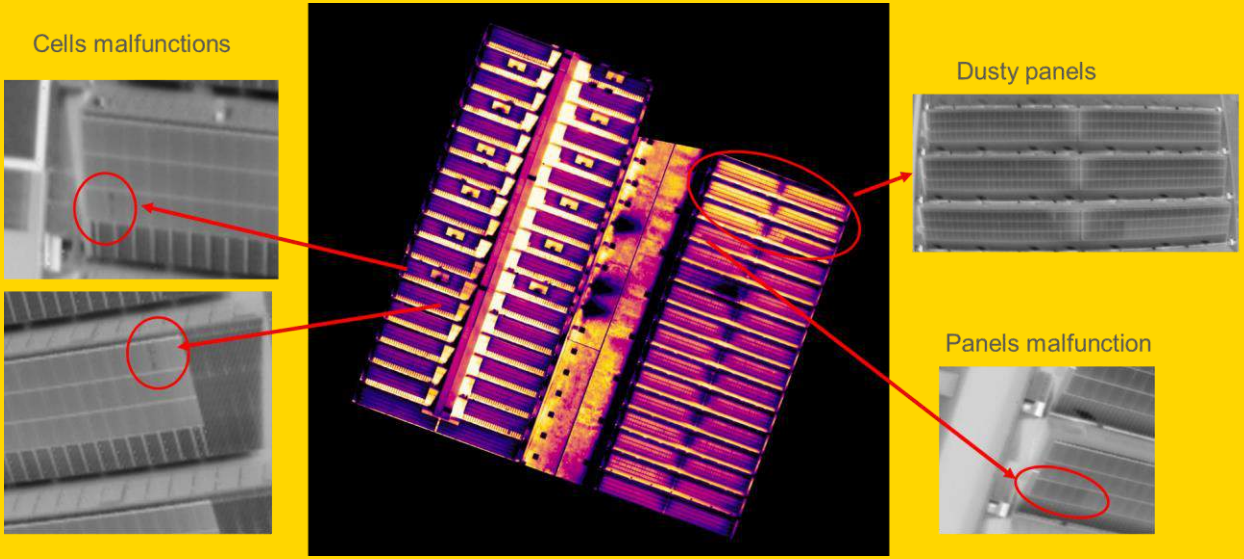
Inspecting an Oil Rig in the UAE

- Customer: UAE Oil Producer
- Challenge: inspection of the jack
- Solution: senseFly albris & Pix4D mapper
- Results:
  - **Significantly reduced** costs
  - **Significantly improved** documentation
  - **Increased** worker safety



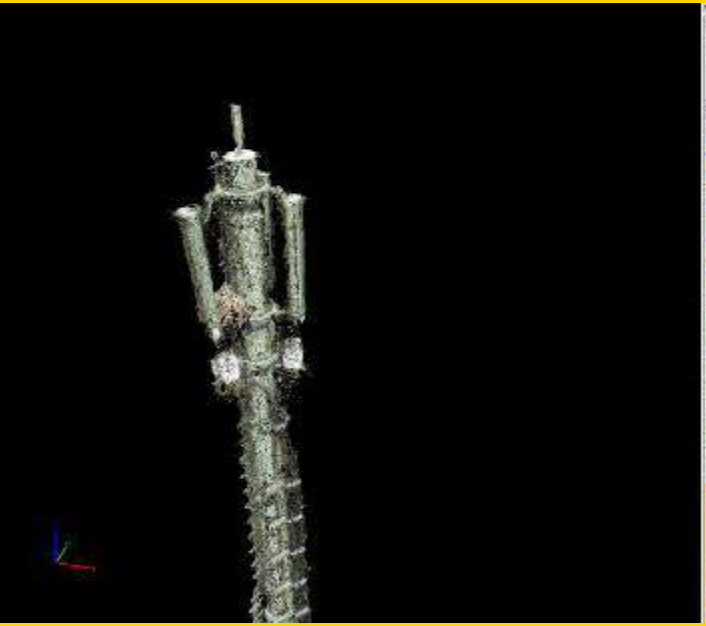
Inspecting an Solar Panel Field

- Customer: European Utility
- Challenge: Identification of underperforming cells in a large installation
- Solution: eBee Plus, Thermomap & Pix4D mapper
- Results:
  - **Significantly reduced** work time (1 hour vs. 1 day)
  - **Increased** productivity and cost efficiency



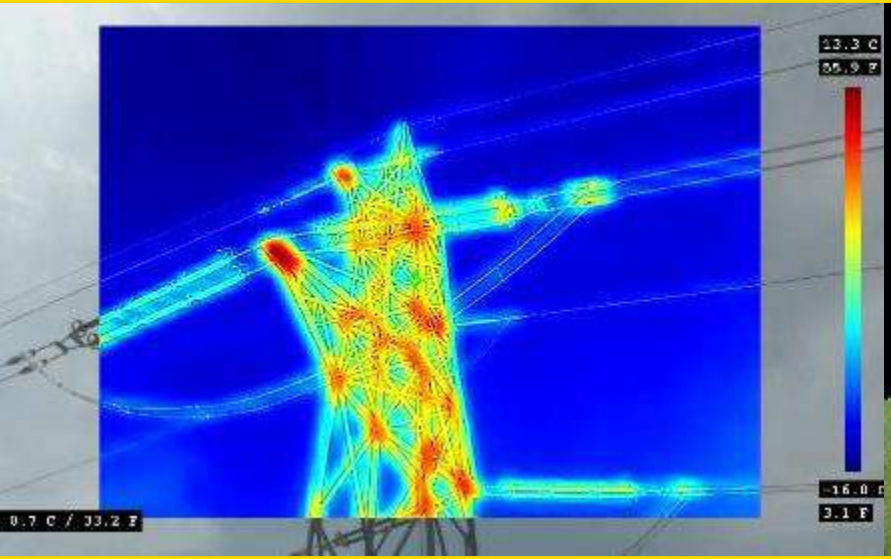
Inspecting am GSM tower in Switzerland

- Customer: Mobile equipment manufacturer
- Challenge: Realize precise measurement of the antennas (height, orientation, pitch etc.)
- Solution: senseFly Albris & pix4d mapper
- Results:
  - **Significantly reduced** costs
  - **Increased** worker safety



Inspecting an Transmission Towers in France

- Customer: French power company
- Challenge: inspection of insulator for detection of anomalies
- Solution: senseFly albris using thermal sensor for anomaly detection
- Results:
  - **Significantly reduced** costs
  - **Increased** worker safety



Inspecting am Dam in Switzerland

- Customer: Energie Sion Région (ESR)
- Challenge: Inspecting a 130*380 meter dam with sub-millimeter resolution
- Solution: Albris & pix4d mapper
- Results:
  - **Significantly reduced** costs
  - **Increased** worker safety
  - **Consolidated** documentation (1 defect map vs. 200 manually annotated drawings)

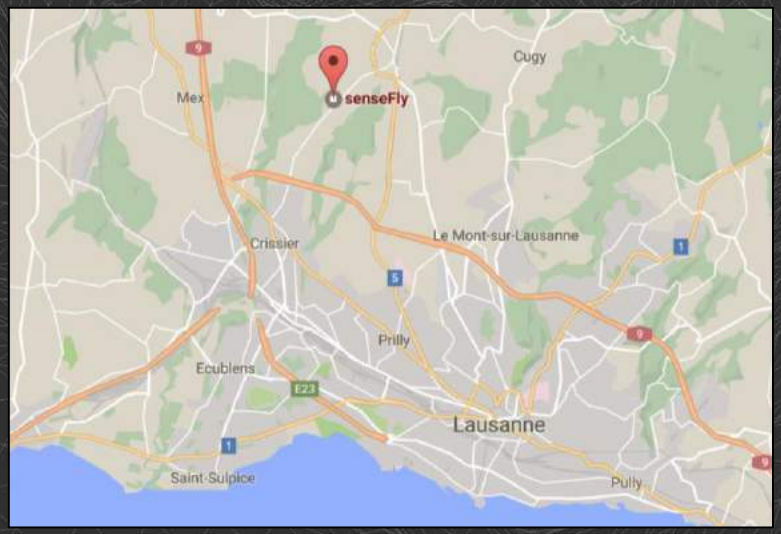
Inspecting Minnesota's road bridges

- Customer: Minnesota Department of Transport (MnDOT)
- Challenge: identify safer, more efficient method of inspecting Minnesota’s road bridges
- Solution: large, multi-year inspection study based on use of senseFly albris
- Results:
  - **Significantly reduced** costs
  - **Increased** worker safety

Our solutions help professionals across industries improve their business outcomes

Segment	Operator	Application	Results
Land surveying	PORTOVIEJO	Cadastral mapping for tax auditing	• 10,500 undeclared constructions identified • Leading to $800,000 USD additional yearly revenues
Land surveying	JACOBS	Rail route pre-surveying	• Project time reduced by 75% vs. traditional terrestrial surveying • Half the cost of manned aircraft • Highly accurate terrain model
Land surveying	AOC Ingeniería	Large feasibility survey in a mountainous region	• Project cost reduced by 80% compared to originally planned surveying method
Urban Planning & Land Management	THE WORLD BANK	Creating a high-resolution map of Zanzibar	• World's largest drone mapping project (>2,300 km2) • 7 cm/pixel GSD vs. 25 cm/pixel of previous manned aircraft survey
Urban Planning & Land Management		Land tenure in Tanzania	• Drone survey enabled future issue of estimated 300,000 land titles
Mining, Quarries & Aggregates	Airware	Stockpile monitoring	• 5x cheaper than traditional surveys • 24 hr stockpile data recovery vs 5 day terrestrial
Mining, Quarries & Aggregates	BARRICK	Mine surveying & stockpile monitoring	• 1/9th cost of LiDAR scanner • 15-20 min flight vs. <5 hrs scanning
Mining, Quarries & Aggregates	ENERGIZER	Surveying of exploration site	• "We saved hundreds of thousands of dollars by using eBees in place of airborne LiDAR"
Mining, Quarries & Aggregates	ASM Ireland	Quarry monitoring	• 88 ha survey completed in 4-5 hrs vs 2-3 weeks (terrestrial) • Virtual copy of quarry in under 24 hrs • "30x higher resolution than next option"
Mining, Quarries & Aggregates	VISTA SAND	Stockpile monitoring	• 30% reduction in fuel cost via regular, eBee-based stockpile measurement
Construction & earthworks	VENTUS Geospatial	Site monitoring	• Substantially reduced "in field" time • Improved planning through highly accurate terrain model

Thank you for your attention!



Address

senseFly SA
205 New York Avenue NW
Washington, DC 20001
www.senseFly.com
HQ: Lausanne, Switzerland

Phone

+1 202 450 1506

senseFly
a Parrot company