UAVs in SAR - Regulations, Missions, Requirements, and Operations

Who Am I

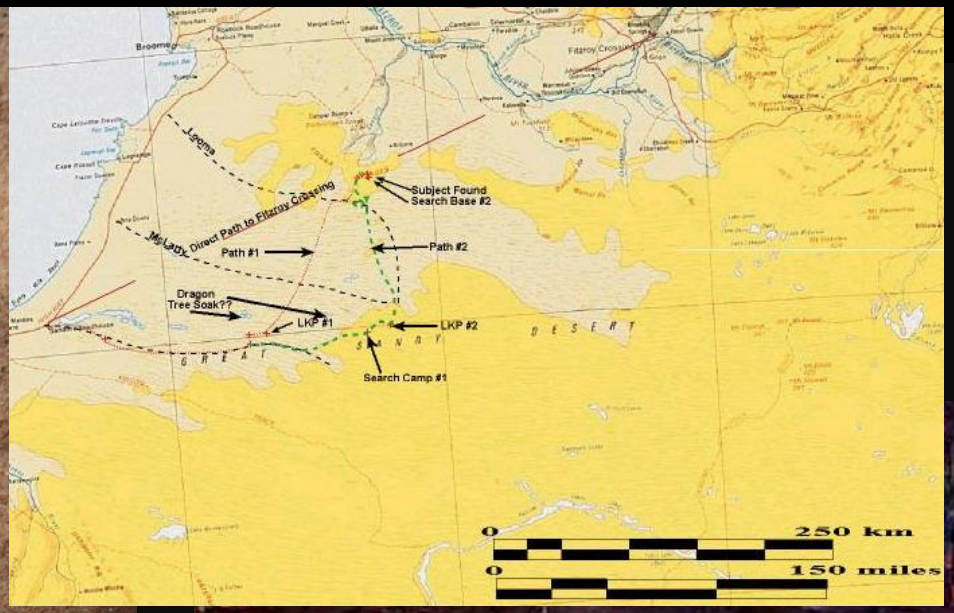
David Kovar

- 15+ years of SAR/DR experience
- Advocacy Director for NASAR
- Fixed wing and rotor pilot
- Commercial UAV owner/pilot
- Cyber security investigator specializing in UAVs

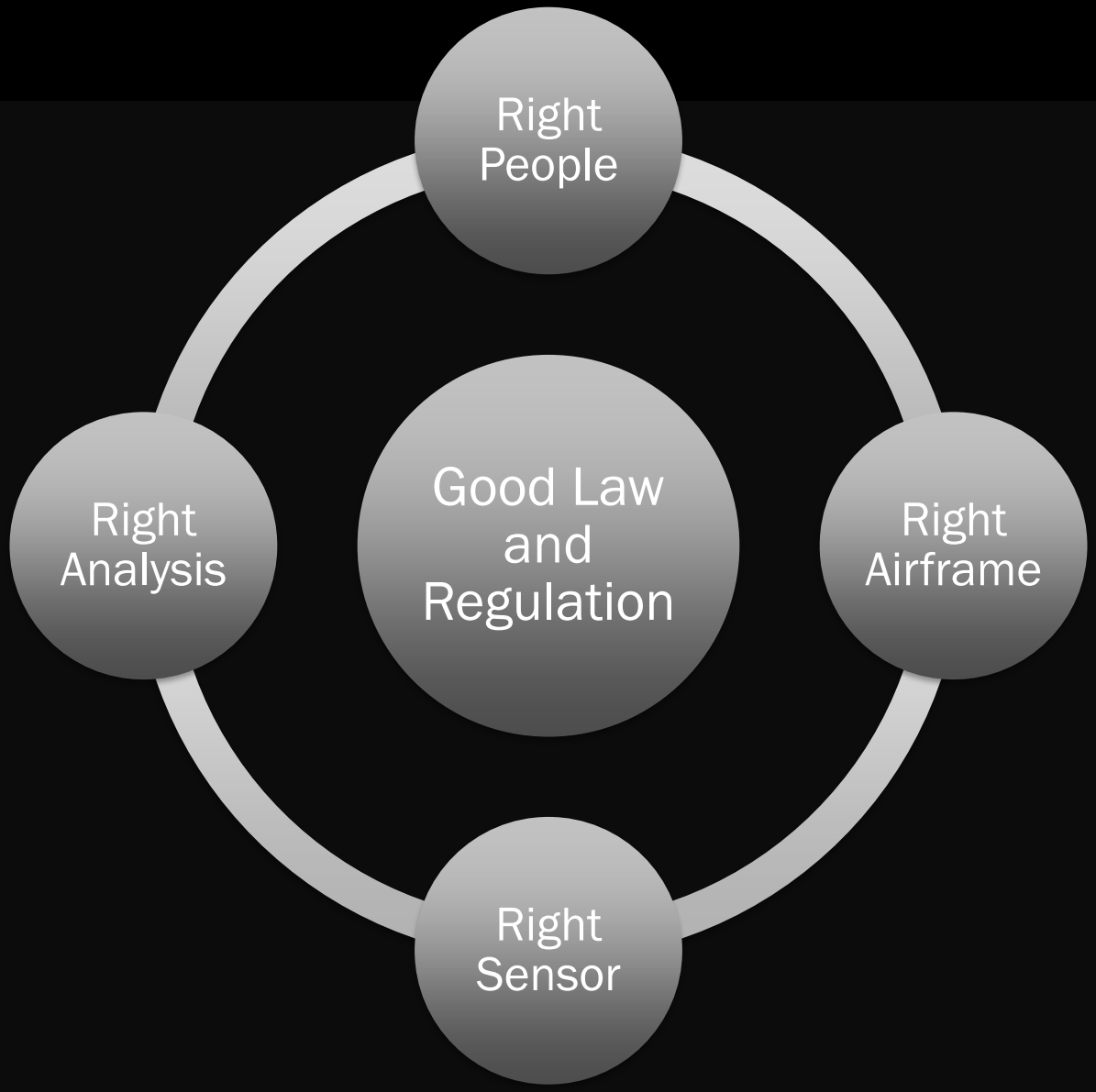
Right People, Right Place, Right Tools

Right People, Place, Tools

Right People, Place, Tools



Good Decisions Require ....



Overview

Reality Check

“2 hours waiting for a emergency COA when its not needed. Ya..try and explain that to the family of the missing. Especially if its a child with autism. COA or not my bird is in the air. ”

Source: Internet forum

Reality Check - Challenges

- Regulations prevent flight beyond visual line of sight
- Most multi-rotors are limited to 20 minutes of flight time at 20 mph
- Cannot see through vegetation
- Detecting a human at altitude via screen on mobile device is very difficult
- Hills, buildings, dense vegetation interfere with control and data links

NASAR Position

- NASAR supports the use of Unmanned Aerial Systems (UAS) by properly authorized Agencies Having Jurisdiction (AHJ) within FAA guidelines and regulations.
- Any agencies, private entities, or individuals assisting the AHJ must comply with same regulations imposed on the AHJ. NASAR supports the use of UAS by properly authorized civilians and companies under the direction of the AHJ.
- NASAR condemns the unsafe use of UAS by unauthorized individuals and organizations
- NASAR will continue to advance the safe and appropriate use of UAS in SAR through its position on government committees, standards organizations and industry committees

How Do We “Do” SAR in the U.S.?

National Search and Rescue Plan

- Yes, there is one.
- Covers all domestic SAR and international SAR relationships
- Designates key stakeholders and roles
- Delegates land SAR to state SAR Coordinators
- http://www.uscg.mil/hq/g-o/g-opr/nsarc/NSARC%20-%20Natl%20SAR%20Plan%20(2007%20-%20Final).pdf

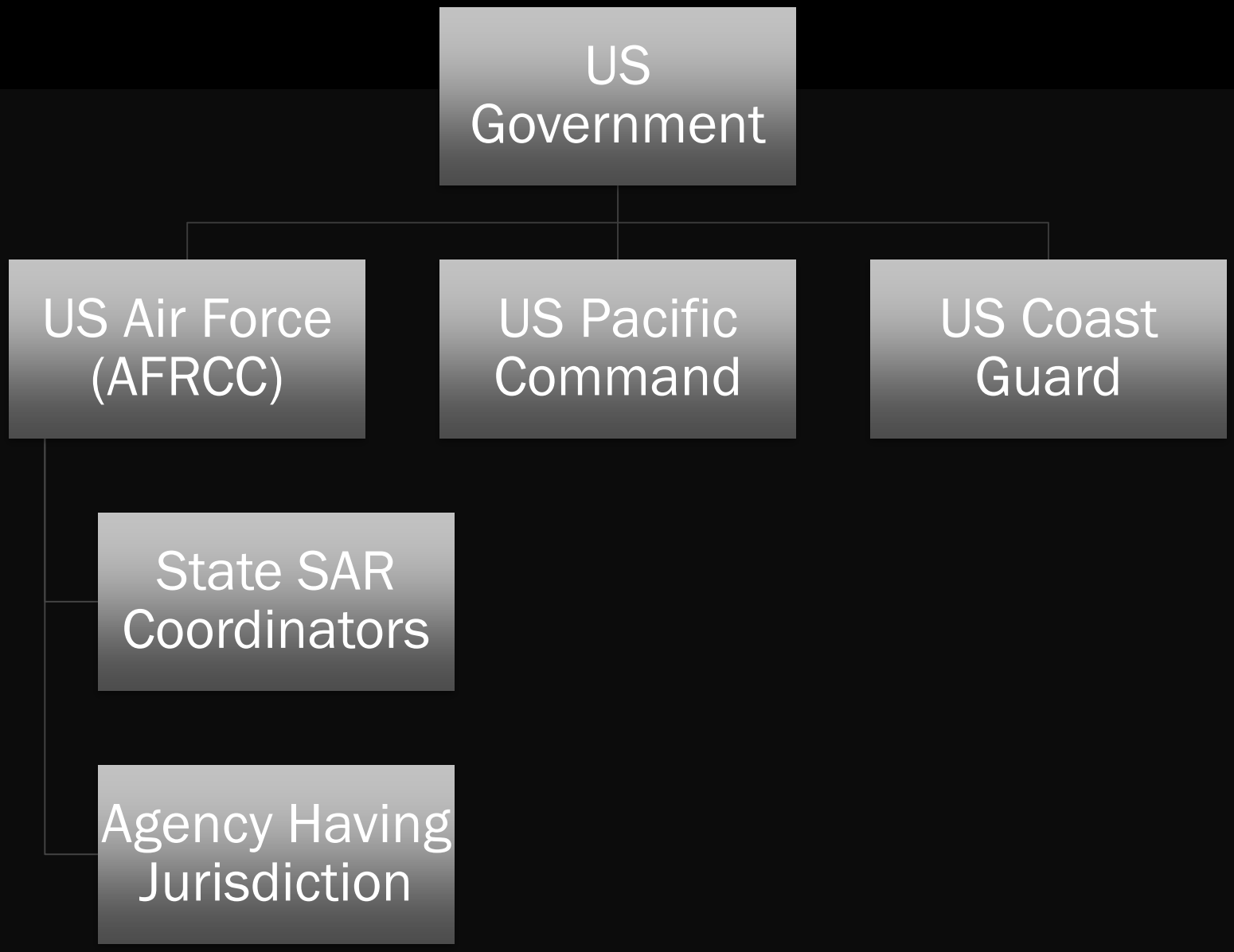
National SAR Structure

This Plan is solely intended to provide guidance to the Participants. State authorities may retain SAR responsibilities within their boundaries for incidents primarily local or intrastate in character. In such cases, appropriate agreements are generally made between federal civil SAR coordinator(s) and relevant State authorities.

State and local responsibilities: Outside the above listed national SAR Coordinator and federal civil SAR responsibilities, State and local authorities are responsible for land based SAR and designate a person to be "SAR Coordinator" within their respective jurisdictions. State SAR Coordinators are integral partners of the national SAR Coordinators and are critical to providing effective civil SAR services.

The type of incident command system adopted for use within the United States is the National Incident Management System (NIMS). When civil SAR operations are conducted in situations where the NIMS structure has been implemented, one or more representatives of the SAR mission coordinator should be assigned to work with the Operations Section of the active incident command post or unified command. Coordination procedures of this Plan will continue to be used under NIMS.

National SAR Structure



SAR Services

SAR SERVICES COVERED BY THIS PLAN 45. This Plan covers the following types of civil SAR services:

- a. Maritime (involving rescue from a water environment);
- b. Aeronautical (including civil SAR assistance in the vicinity of airports);
- c. Land (including civil SAR operations associated with environments such as remote areas, swift water, caves, mountains, etc.);
- d. Urban search and rescue (US&R);
- e. Provision of initial assistance at or near the scene of a distress situation (e.g., initial medical assistance or advice, medical evacuations, provision of needed food or clothing to survivors, etc.);
- f. Delivery of survivors to a place of safety or where further assistance can be provided, or further transportation arranged if necessary;
- g. Saving of property when it can be done in conjunction with or for the saving of lives;
- h. Mass rescue operations (MROs); and i. SAR services associated with Incidents of National Significance covered by the National Response Plan (NRP).

Charging for SAR Services

CHARGING FOR SAR SERVICES (National SAR Plan)

Each Participant will fund its own activities in relation to this Plan unless otherwise provided for by law or arranged by the Participants in advance, and will not allow cost reimbursement to delay response to any person in danger or distress.

Participants agree that unless required for by law, civil SAR services provided to persons in danger or distress will be without subsequent cost-recovery from the person(s) assisted.

In accordance with customary international law, when a nation requests help from another nation to assist person(s) in danger or distress, if such help is provided, it will be accomplished voluntarily; the United States will neither request nor pay reimbursement costs for such assistance.

CHARGING FOR SAR SERVICES (Mountain Rescue Association)

(San Diego, CA, August 1, 2009) — The Mountain Rescue Association (MRA), a coalition of 90 mountain rescue teams throughout North America, reminds the public that it has a long-established policy opposing charging subjects of search and rescue missions for the cost of their rescue.

SAR Teams Are ....

- 95% of personnel are volunteers
- Self funded or funded through parent agency
- Pay for own travel, equipment, training, uniforms
- Use vacation time and time off to respond to missions
- Professionals, paid or volunteer

Search is an Emergency

A SAR response must be rapid and effective. The subject may need emergency care, may not be able to protect himself or herself from the environment. Time and weather destroy clues and an urgent response and deployment of resources may reduce the size of the area that must be searched, making the area easier to search.

Types of Search and Rescue Missions

- Wilderness
- Mountain
- Wide Area Search
- Urban

- Swiftwater
- Flood
- Surf
- Maritime

- Missing Aircraft

- Mine
- Cave

- Mudslide
- Earthquake

- Damage Assessment

- HAZMAT
- Technical rescue

Quick Overview of How We Search

- Probability of Area
  The Probability of Area (POA) is the likelihood of a subject being in a particular area.

- Probability of Detection
  The Probability of Detection (POD) is the conditional probability that search of an area using a specific technique would locate the search object given that it is there

- Sweep width
  Sweep width is a single number characterizing the average ability of a given sensor to detect a particular search object under a specific set of environmental conditions.

- AMDR - Average maximum detection range
  The average distance beyond which a searcher cannot see a typical search object set out for the purpose of measurement

- Critical separation
  Critical Separation is the spacing in a grid search where, if the search objective is halfway between two searchers, the object will be at the limit of the visible range of both searchers.

Search Techniques

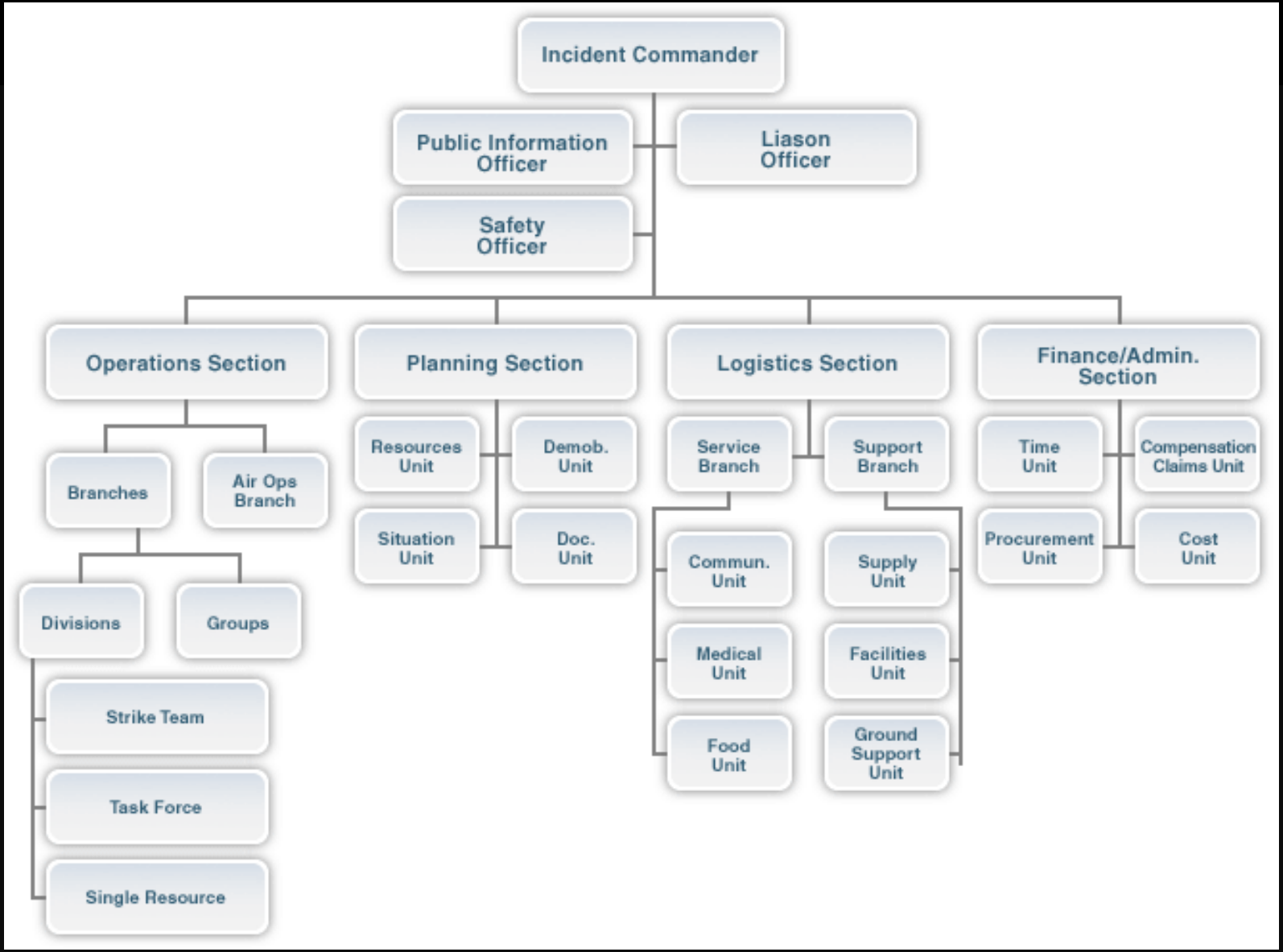
- Indirect:
  - Attraction
  - Containment
  - Track traps
- Direct
  - Tracking
  - Area search
    - Type 1 – hasty/initial search (also known as “routes and points”)
    - Type 2 – grid
    - Type 3 – evidence search

UAV workflow

Mission Planning	Approval	Execution	Analysis	Delivery
Criteria	Business	Logistics	Data validation	Product delivery
Airframe	Site logistics	Flight crew	Product generation	Product support
Payload	Safety	Weather	Quality assurance	Lessons learned
Operator	Legal	Flight operations		Reporting
Location	Risk			Billing
Time frame	Flight operations			

Who Manages the Workflow? AIROPS

Air Operations



Air Operations Responsibilities

- Organize preliminary air operations.
- Participate in preparation of the Incident Action Plan (IAP) through the Operations Section Chief (OPS).
- Perform operational planning for air operations.
- Supervise all air operations activities associated with the incident.
- Determine coordination procedures for use by air organization with ground Branches, Divisions, or Groups.
- Evaluate helibase locations.
- Establish procedures for emergency reassignment of aircraft.
- Report to the OPS on air operations activities.
- Report special incidents/accidents.

Air Operations Responsibilities

External Coordination

- Request declaration (or cancellation) of restricted air space area, (Federal Aviation Administration Regulation 91.137).
- Coordinate with FAA.
- Schedule approved flights of non-incident aircraft in the restricted air space area.
- Resolve conflicts concerning non-incident aircraft.
- Arrange for an accident investigation team when warranted.

Temporary Flight Restrictions

- A TFR and positive control over air assets should be established at the start of the incident
- The Air Operations branch should be established at the start of the incident
- Air operations component of IAP must be established before commencing air operations
  - Minimize pilot workload
  - Include all possible types of air assets
- De-conflicting options must be established:
  - Operational areas
  - Vertical distance
  - Horizontal distance
  - Timed access

What Are The Mission Requirements?

Aircraft

- Range
- Speed
- Duration
- Useable payload
- Operational requirements (landing/takeoff)
- Logistics requirements

Payload

- Delivery
- Imaging
  - IR
  - Optical
  - Hyper-spectral
- Resolution
- Speed
- Post processing requirements

Requirement Examples

- Resolution:
  - What resolution do you get with a 12MP sensor at 300 feet and 75% overlap?
  - What resolution do you need?
  - How much time do you want to spend?
- Endurance
  - How far is the best launch point from the area to be searched?
  - How much time on station will you have?
  - How many missions will it take to cover the area of interest?
- Sensor selection
  - What are you looking for?
  - What is the terrain? How much tall vegetation?

Mission Plans

Situational Awareness

- Acquire high resolution imagery for entire search area, land, process, and deliver.
- If confined area, shoot 360's at various elevations
- If terrain component, consider printing a 3D model. (Mudslide, earthquake, collapsed structures)
- If complex terrain, may need to do vertical slices following contours

Structural Inspection

- Generally 3 stories and up, viewed straight on. (Elevation views)
- Favors real time video with structural specialist in the loop
- UAV will need to be in close proximity to structure. RF & GPS likely affected
- Engineers will not know what the best angle is, or what they are looking for, until they see it
- Current 3d models introduce artifacts that confuse the situation. Video likely best for the moment. LIDAR and laser better but expensive

Search

- Search for persons in distress or missing
- Take high resolution geotagged imagery and process with trained experts. (Mechanical Turk)
  - Studies show that it is difficult for field personnel to see clues due to screen size, glare, motion
  - Experts can tag points of interest for follow up missions
  - Formal methods exist for rating coder accuracy
- Infrared usefulness is limited to specific situations
- No current sensors penetrate foliage and detect humans

Search – Hasty/Initial

- Preplan flight routes along trails and to likely locations
- Execute plan on a schedule
- Include attraction component
- Real time and post flight analysis

Search - Grid

- Preplan grid – most GCS will do this
  - If not building orthomosaic, overlap can be reduced
- Consider sensor field of view and desired resolution
  - Higher resolution, longer flights, less area covered
  - Looking for clues, not subjects

Search - Evidence

- Specialized sensors may be required
- Unmanned ground vehicles may be more appropriate
- Good for scene documentation

Platform Selection

Primary Platform Considerations

- Does the payload and control style match the mission data needs?
- Does the platform match the environment?
- Is still imagery geotagged? Can telemetry be matched to video?
- Can the system be transported to the sites?
- Does the GCS capture a copy of the imagery or is it all on board the aircraft?
- Is the data in a proprietary format or require Internet access?
- Can the system be recharged, refurbished, repaired in the field?

Chose a Fixed Wing When ....

- Large areas need to be covered or area is a long distance from landing zone
- Extended time aloft is required
- Operations are over people and property and ability to glide away in the event of failure is desired
- Good landing zone is available

Chose a Rotorcraft When ....

- The landing zone is small or heavily obstructed
- The search area boundaries are small, or area of interest is next to a boundary
- The terrain is too complex for an automated flight planner
- Real time reconnaissance with man in the loop is required
  - “Wait, go back!” is hard in a fixed wing

In Some Ways, Very Similar

- Visual Line of Sight (VLOS) rules limit fixed wing's extended duration capabilities
- As batteries improve, rotorcraft are able to fly longer though UAVs will still win on energy efficiency
- Parachute recovery systems help fixed wings in tight spaces

UAV workflow

Mission Planning	Approval	Execution	Analysis	Delivery
Criteria	Business	Logistics	Data validation	Product delivery
Airframe	Site logistics	Flight crew	Product generation	Product support
Payload	Safety	Weather	Quality assurance	Lessons learned
Operator	Legal	Flight operations		Reporting
Location	Risk			Billing
Time frame	Flight operations			

Regulatory Framework

FAA Jurisdiction – FAA Perspective

Public Aircraft Operations are limited by federal statue to certain government operations within U.S. airspace. Title 49 U.S.C. § 40102(a)(41) provides the definition of "Public Aircraft" and § 40125 provides the qualifications for public aircraft status. Whether an operation qualifies as a public aircraft operation is determined on a flight-by-flight basis, under the terms of the statute. The considerations when making this determination are aircraft ownership, the operator, the purpose of the flight, and the persons on board the aircraft.

For public aircraft operations, the FAA issues a Certificate of Waiver or Authorization (COA) that permits public agencies and organizations to operate a particular aircraft, for a particular purpose, in a particular area. The COA allows an operator to use a defined block of airspace and includes special safety provisions unique to the proposed operation. COAs usually are issued for a specific period – up to two years in many cases.

https://www.faa.gov/uas/public_operations/

FAA Jurisdiction – Alternative View

“Not legal advice, but under federal law, they (public agencies) need only fly safely and responsibly, and abide by FAR Part 91. The Feds play no role in aircraft or pilot certification with respect to *public* aircraft (by statute), which COA applications *require*. The COA requirement for public use aircraft is simply something the FAA "made up" and has no basis in law.

The Feds may only regulate public aircraft with respect to how they interact with *all* aircraft (which is basically Part 91 stuff). The FAA claims otherwise of course, and most PDs will comply, but they need not. There's always been a clear distinction between the FAA's regulatory role for public vs. civil aircraft.”

Source: Public comment on internet forum

- Not the opinion of the presenter, NASAR, or CRASAR

FAA Jurisdiction – FAA Perspective

Any operation that does not meet the statutory criteria for a public aircraft operation is considered a civil aircraft operation and must be conducted in accordance with all FAA regulations applicable to the operation.

There are presently two methods of gaining FAA authorization to fly civil (non-governmental) UAS:

- Section 333 Exemption – a grant of exemption in accordance with Section 333 AND a civil Certificate of Waiver or Authorization (COA); this process may be used to perform commercial operations in low-risk, controlled environments. Instructions for filing a petition for exemption are available here.

- Special Airworthiness Certificate (SAC) – applicants must be able to describe how their system is designed, constructed, and manufactured, including engineering processes, software development and control, configuration management, and quality assurance procedures used, along with how and where they intend to fly.

FAA Jurisdiction – Alternative View

You have a wide range of legal positions to consider:

- You can take the position explained by Drone Line that, realistically, the FAA cannot catch up with all violators if they were to swarm the skies in huge numbers.
- Or you rely on Drone Law News which explains that the FAA wrongly argues the law.
- You can also track the FAA and Pirker positions in the litigation over commercial use as long as you note that the FAA has appealed the ruling in favor of the commercial user.

Source: dronelaw.net

FAA Jurisdiction – FAA Perspective

The FAA has partnered with several industry associations to promote Know Before You Fly, a campaign to educate the public about using unmanned aircraft safely and responsibly. Individuals flying for hobby or recreation are strongly encouraged to follow safety guidelines, which include:

- Fly below 400 feet and remain clear of surrounding obstacles
- Keep the aircraft within visual line of sight at all times
- Remain well clear of and do not interfere with manned aircraft operations
- Don't fly within 5 miles of an airport unless you contact the airport and control tower before flying
- Don't fly near people or stadiums
- Don't fly an aircraft that weighs more than 55 lbs
- Don't be careless or reckless with your unmanned aircraft – you could be fined for endangering people or other aircraft

The statutory parameters of a model aircraft operation are outlined in Section 336 of Public Law 112-95 (the FAA Modernization and Reform Act of 2012) (PDF). Individuals who fly within the scope of these parameters do not require permission to operate their UAS; any flight outside these parameters (including any non-hobby, non-recreational operation) requires FAA authorization. For example, using a UAS to take photos for your personal use is recreational; using the same device to take photographs or videos for compensation or sale to another individual would be considered a non-recreational operation.

FAA Jurisdiction – Alternative View

- There are thousands of drone flights with no incidents, I don't need to worry about this.
- If a drone falls on you, it will not do much more than bruise you. Less damage than a hockey puck.
- Cars kill more people than drones, why don't we worry about them?
- The FAA has no authority. They've not fined anyone. This isn't an issue.

Part 107 Will (Not) “Fix” This

Still need a 333 or COA for:

- Beyond Visual Line of Sight (BVLOS)
- Night operations
- First Person View

Regulation - Summary

- If someone from a public agency operates the UAS they must have an active COA for the jurisdiction.
- If the UAS is operated by someone from a public agency and they do not have an active COA for the jurisdiction then Incident Command must apply for and receive an emergency COA
- If the UAS is from a company or NGO they must have a valid 333 exemption and either operate under their own applicable COA or an emergency COA
- If the UAS is operated by an unaffiliated individual or company without a 333 exemption they may not fly in support of the incident and they cannot be covered by an emergency COA.
- Flying in support of search and rescue is not flying for sport or as part of a hobby and "hobbyist rules" do not apply
- All UAS must operate under an applicable Certificate of Authorization (COA) and at the direction of the AHJ
- All data collected by any UAS operator belongs to the AHJ and may be released only with the permission of the AHJ

Source – NASAR UAS Position Paper

UAV workflow

Mission Planning	Approval	Execution	Analysis	Delivery
Criteria	Business	Logistics	Data validation	Product delivery
Airframe	Site logistics	Flight crew	Product generation	Product support
Payload	Safety	Weather	Quality assurance	Lessons learned
Operator	Legal	Flight operations		Reporting
Location	Risk			Billing
Time frame	Flight operations			

Flight Crew

Flight Crew:

1. Pilot in Command (PIC)
2. Visual Observer (VO)
3. Logistics, Communications, Data Management, Mission Specialist, Safety

Equipment:

- Man portable
- Capable of multiple iterations without resupply
- Self sufficient for food, water, medical, transport, some comms

Manned Aviation Best Practices

- Aviate, Navigate, Communicate
- Sterile cockpit
- Checklists
- Clear, concise, acknowledged communication
- Hot washes/lessons learned

Post Flight Data Logging

- **Aviation compliance, disaster coordination, and future planning require meta data about flights**
- **For each flight, record:**
  - Vehicle type, weight, dimensions, payload, control method – planned route, manual, or both
  - Date, time, and duration of flight
  - Mission details
  - Team members
  - Wind conditions, weather conditions (temperature, precipitation, cloud cover, average altitude, base elevation, furthest distance from home
  - Satellite image of area with: landing zone, planned path, bread crumbs of flight, sensor coverage, estimated polygon of imagery
  - Orthomosaic (if produced)

UAV workflow

Mission Planning	Approval	Execution	Analysis	Delivery
Criteria	Business	Logistics	Data validation	Product delivery
Airframe	Site logistics	Flight crew	Product generation	Product support
Payload	Safety	Weather	Quality assurance	Lessons learned
Operator	Legal	Flight operations		Reporting
Location	Risk			Billing
Time frame	Flight operations			

Data Validation

Did you collect imagery of the area specified in the assignment?

Is it complete?

Any flaws in the imagery?

Product Generation

Is image analysis an Air Operations function? (No.)

Is image analysis the responsibility of the UAV operator (Yes!)

Who receives the final product? (GIS in Situation Unit under Plans)

What products are needed?

When are they needed?

How best to get them done on schedule?

Who owns the data?

Why UAV Teams Generates Product

- UAS Team/Unit should have the best understanding of the capabilities of their sensor(s)
- Data processing likely requires specific, probably custom, workflow
- Data processing likely requires custom or platform specific tools
- Data processing likely requires more computational power than is available in the GIS unit

Requirement helps ensure that UAV team has thought through entire workflow rather than focusing on just flying

UAV workflow

Mission Planning	Approval	Execution	Analysis	Delivery
Criteria	Business	Logistics	Data validation	Product delivery
Airframe	Site logistics	Flight crew	Product generation	Product support
Payload	Safety	Weather	Quality assurance	Lessons learned
Operator	Legal	Flight operations		Reporting
Location	Risk			Billing
Time frame	Flight operations			

Delivery & Data Policy

- If flying for an agency then the agency controls the data and all press goes through their PIO.
- Establish written policy in advance – UAV operator turns over all data and meta data to agency. Operator may keep a copy but may only release it with approval from agency.
- Chain of custody is crucial as it is impossible to know who will use the data and what is in the data
  - Agencies may have public accountability issues
  - There may be legal or forensics data in the data set
  - There may be deceased individuals or personally identifiable information in the data that is not initially obvious

Lessons Learned

- **What Points of Interest (POIs) produced actionable results?**
  - Feedback to planners, operations, UAV teams, experiments
- **What was the effectiveness of each UAV platform for each mission?**

How to Get Involved in SAR with UAVs

How To Get Involved

Volunteering during an incident with no established relationship will likely not be effective.

AFTER the incident is over and everybody has had time to recover:

- Make professional presentation
- Make an appointment
- Show up looking neat and professional
- Have something on 1 or 2 sheets of paper
- Remember that we may not have your enthusiasm about UAVs so keep it oriented towards emergency services and "what can I do for you”
- Leave out all the neat bells and whistles about UAVs
- Have a video presentation ready on a laptop or tablet
- Be prepared to do a demo, then to participate in training exercises

Introducing UAV Capabilities to SAR

Questions that an Incident Commander might ask an unknown UAV pilot who wanted to volunteer to assist.
This should occur before an incident, not at the incident.

- Are you a 501(c)3, private company, or individual?
- Are you insured?
- Are you covered by workman's compensation insurance?
- Have you taken ICS-100, ICS-200, ICS-700 and ICS-800?
- Are you interoperable with our agency?
- Have you been NIMS resource typed in the local and state EMA?
- Do you have a agreement of mutual aid for us to examine?

Based on discussion with Daniel P Dolata (former fire chief)

- Is this free, or do you charge?
- Who pays for lost or damaged equipment?
- How do we contact you, and are you committed to a certain maximum response time?
- Do you have an FBI criminal background check?
- Do you have a doctors examination and statement of health?
- Do you have a FAA N number?
- What logistical support would you require?
- Do you understand that all images (data) you collect belongs to the incident?

Build Relationships Early

Rescue robots are typically deployed fairly late, toward the middle of the response phase or later. My analysis of robot deployments worldwide in 2010 (Murphy, 2011b) showed that the average time between an incident and the actual use of a robot was 6.5 days. If the analysis considers only the five deployments where the mission was clearly to search for survivors (e.g., Upper Big Branch Mine; Wangjialing Coal Mine; Haiti earthquake; Prospect Towers; Pike River Mine), then the average was 4.2 days for a robot to arrive, well after the 48-hour peak in the mortality curve—too late to be of value. The biggest predictor of whether a robot would be deployed and how quickly was whether the agency in charge had a robot or a partner with robots. In four of the 2010 deployments, the agency or industry that held incident command responsibility either already used the robots in day-to-day operations (BP at Deepwater Horizon; Italian Coast Guard for a missing balloonist) or prior lines of authority were already in place [MSHA for Upper Big Branch Mine; New Jersey's regional Urban Area Security Initiative (UASI) teams at Prospect Towers]. In those four cases, robots arrived on the scene and were put to use in one-half day on average.

Selling UAVs for Search & Rescue

Humanitarian Aid UAV Acquisition

- **Search & Rescue should not be used to market unproven technologies. Vendors claiming to have a product that supports SAR should conduct testing with a reputable SAR team and submit test data to support their claims.**

- **Acquisition of dual use technology to support humanitarian missions such as SAR should be supported by publicly available documentation showing:**
  - That the humanitarian mission(s) are routinely conducted by the agency
  - The agency's team responsible for conducting the missions has evaluated and approved the proposed technology
  - The agency audits the use of the technology with respect to the humanitarian mission and publishes the audit
  - That the agency performing the humanitarian mission has a legislated responsibility for that mission.
  - That the agency performs in compliance with NIMS (jn the U.S.) or other locally legislated emergency management system

Humanitarian Aid UAV Perceptions

"... emphasized that the $97,000 worth of drones and related equipment, funded from the agency's own budget, were not going to be used for surveillance."

"The reason for specifically acquiring this is search and rescue," he said, adding later that the agency responds to "25 to 30" such major incidents per year and "hundreds" of minor search operations.

Source: Press conference defending purchase of UAVs by Sheriff's Office

What I Want From UAV Vendors

Sell solutions, not products

Understand our missions, challenges, and realities

Don’t use us for marketing and then ask us to pay list prices. We’re helping you (marketing) and we’re serving the public. We make no money from this, please don’t make money from us.

- At cost equipment
- At cost data analysis tools
- Regulatory support
- R&D support

Help us look for clues, not just subjects

Help with incident management, not just search

What I Want in a SAR UAV

Sell solutions, not products

Help us look for clues, not just subjects

Help with incident management, not just search

At cost equipment

At cost data analysis tools

Regulatory support

R&D support

Military grade modified for SAR NOT Consumer grade modified up

Not military pricing

Better sensors

Not solutions looking for problems

- UAVs delivering medicine

What Is The Right UAV?

- Appropriate to mission
- Hot swappable, intelligent, standalone payloads
- Cost effective
  - Individual - < $4,000
  - Volunteer SAR team - < $8,000
  - County - $10,000 - $30,000
  - State - < $80,000

Developing Solid UAV Experimental Data

Why Experimental Data

- **We need to know:**
  - What works
  - What does not work
  - What to do when things fail
  - What solutions (people, process, technologies) are appropriate for what missions
- **Who should conduct them**
  - Vendors
  - SAR teams
  - Scientists

Some Questions

- What is the POD for a Phantom 2 V+ operating in lightly wooded terrain searching for an unresponsive subject?

Example: What Can a UAV “See”?

- https://integriography.wordpress.com/2015/08/23/what-can-a-drone-actually-see/

Example: Deployment & Effectiveness

- https://integriography.wordpress.com/2015/08/23/uavs-in-sar-deployment-and-effectiveness/

Privacy

Privacy Case Law

Katz v. United States (1967)

Two part test - If (1) the individual "has exhibited an actual (subjective) expectation of privacy", and (2) society is prepared to recognize that this expectation is (objectively) reasonable, then there is a right of privacy in the given circumstance.

CA v. Ciraolo (1986)

Did the warrantless, aerial observation of Ciraolo's back yard from an altitude of 1,000 feet constitute an illegal search and violate the Fourth Amendment?

The divided Court found that the observation did not violate the Constitution. "Any member of the public flying in this airspace who glanced down could have seen everything that these officers observed," concluded Burger.

FL v. Riley (1989)

... arguing that the accused did not have a reasonable expectation that the greenhouse was protected from aerial view, and thus that the helicopter surveillance did not constitute a search under the Fourth Amendment.

Also vital to the Court's ruling was the fact that the helicopter did not interfere with the normal use of the property:

As far as this record reveals, no intimate details connected with the use of the home or curtilage were observed, and there was no undue noise, no wind, no dust, or threat of injury. In these circumstances, there was no violation of the Fourth Amendment.

Privacy Case Law

Dow Chemical v. United States (1986)

The court held that the open areas of an industrial facility are not subject to the same Fourth Amendment protections as the curtilage around a home and, on the basis of Ciralolo, the government does not necessarily violate the Fourth Amendment by viewing private property from navigable public airspace. Unlike in Ciralolo and Riley, the government made its observations with technological aids rather than naked-eye observations. The use of a sensory device that was publically and commonly available to augment human observations did not render the aerial search impermissible.

Questions

- What will you do if UAV data identifies illegal activity?
- What will acting on this information do for support for UAVs in SAR? Or, not acting on it?
- Who will manage chain of custody for UAV collected data?

With Thanks To ....

The following groups were instrumental in developing this presentation through publications and discussions. All errors, opinions, and statements are mine alone and are not the responsibility of these groups who donate their time and experience to assist us all.

- Members of UAV Legal News & Discussion Group on Facebook
- Members of WiSAR GIS Discussion Group
- Authors of "Using Unmanned Aerial Systems During a Natural Disaster in Texas"
- CRASAR

Wrap Up

Please contact me with questions, pointers, suggestions.

- dkovar@gmail.com
- @dckovar