



# Search and Rescue with sUAS

## Small Unmanned Aerial Systems



# A Search and Rescue Story



# Overview

- Concept of Operations for Integrating sUAS into SAR (Search and Rescue)
- sUAS Basic Regulatory Info
- Concerns and Limitations
- sUAS use in SD by Civil Air Patrol



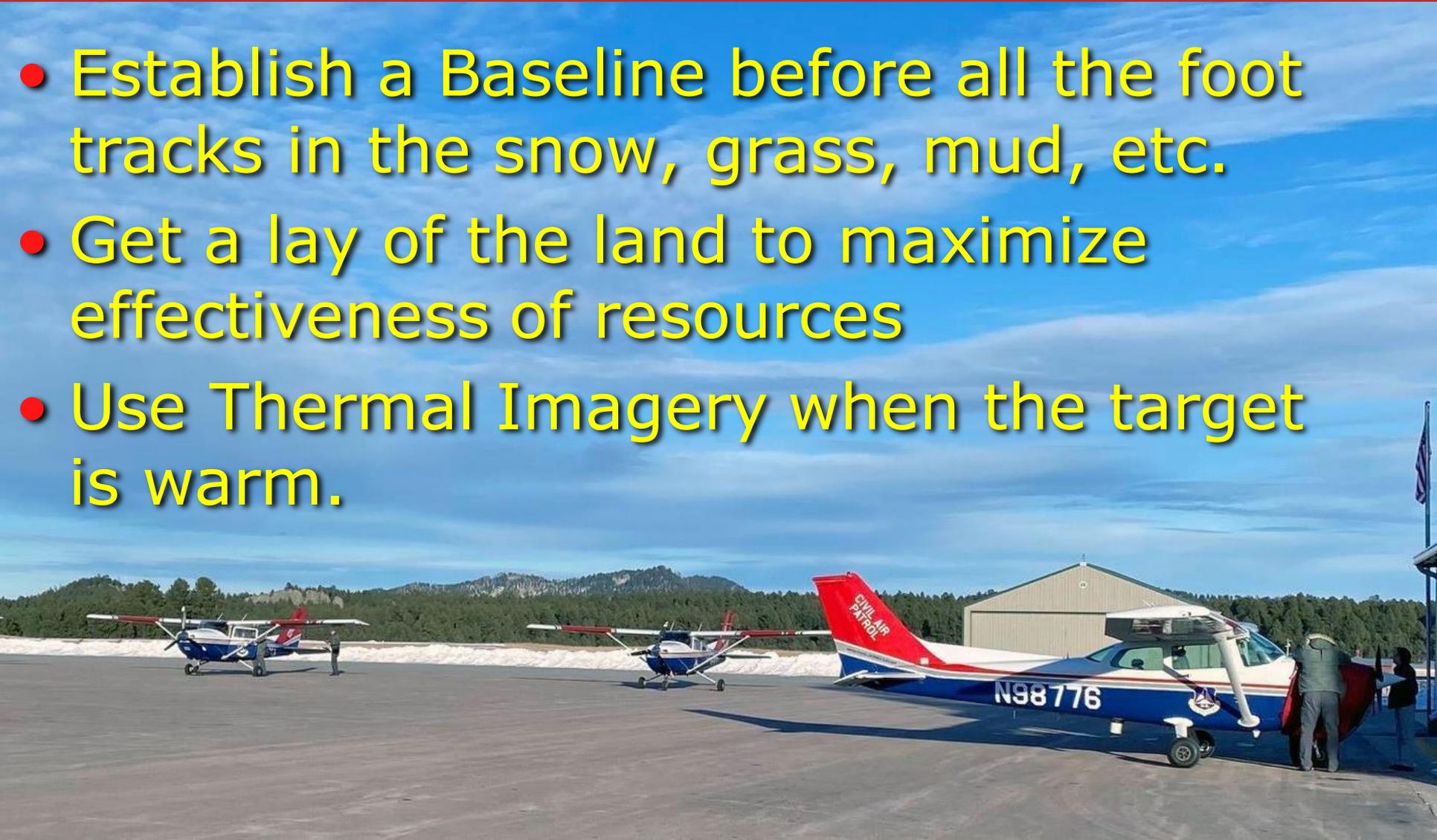
Search and Rescue

# SUAS CONCEPT OF OPERATIONS



# Use the sUAS Early

- Establish a Baseline before all the foot tracks in the snow, grass, mud, etc.
- Get a lay of the land to maximize effectiveness of resources
- Use Thermal Imagery when the target is warm.





# Programmed or Manual Flight Path?

- Environment
  - Night
  - BLOS
  - Terrain
- Time
  - Hasty Search
  - Grid Search
  - Detailed Search



# Video vs Photos

## Real Time Video

- Multiple Screens?
- Trained Scanners?
- Time since last contact?
- Cooperative Target?
- Environment?

## High Res Photos





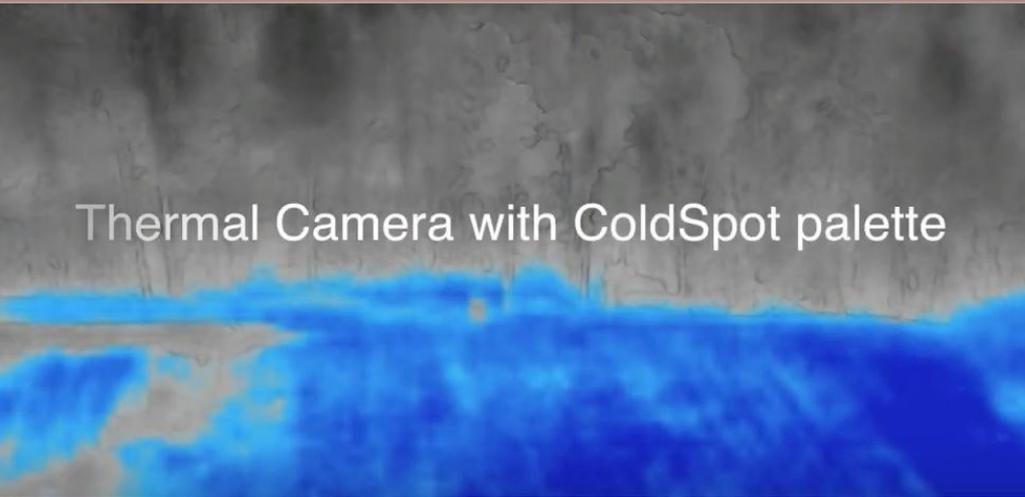
# Target Detection: Automated vs Human

- Automated is new technology.
- Automated is better for specific color searching.
- Human is quicker.
- Human scanners need training and proficiency.
- Technology also requires training and proficiency.

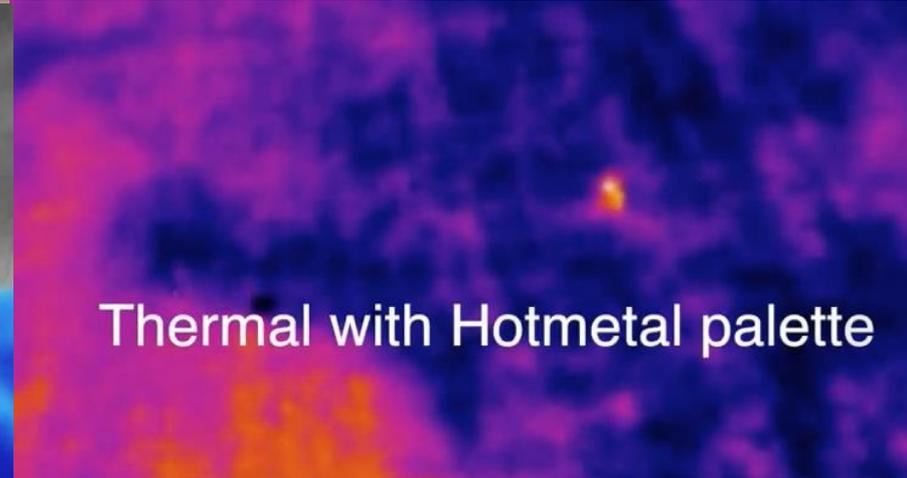


# What is the “Right” Technology?

Thermal Camera with ColdSpot palette



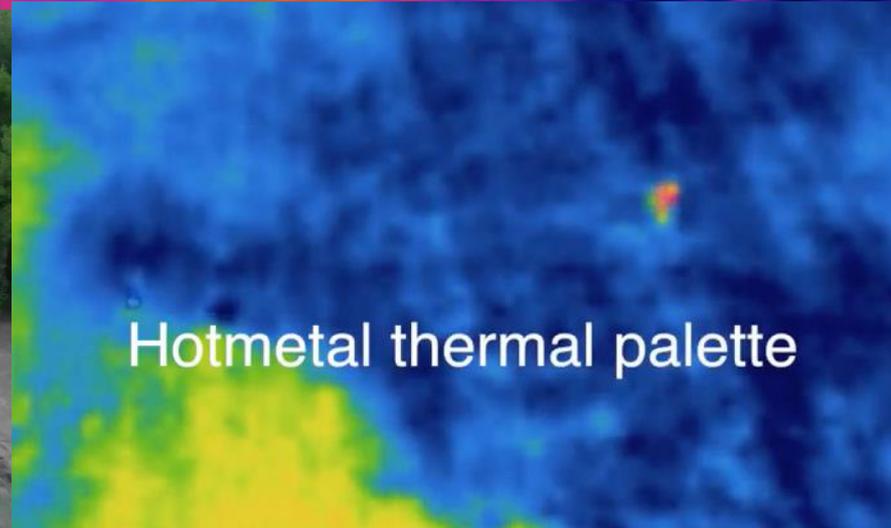
Thermal with Hotmetal palette



Visible Light - 125 ft AGL and 100 ft distance



Hotmetal thermal palette





# High Resolution Thermal





# **BASIC REGULATORY INFO**



# What Rules Apply?

- Overview:
  - Part 107
    - Search and Rescue
    - sUAS Team
    - Trained and Certified Professionals
  - AMA Guidelines / Part 101
    - Hobbyist
    - Can't get paid for using a drone
    - No waivers



# FAR Part 107

- Needed to get FAA Waivers (Controlled airspace, night, etc)
- Flight done for commercial purposes
- Aeronautical Decision Making and Risk Management
- Pass written knowledge test
- Complete security background check via TSA



# Part 101

- Public Law 112-95, Section 336 "For Hobby or Recreational Purposes."
- Examples: amateur rockets, moored balloons, unmanned free balloons, kites, public aircraft operations, and hobbyists conducting recreational drone flying. Those hobbyists should follow the guidance in Advisory Circular (AC) 91-57, "Model Aircraft Operating Standards".
- Not applicable to Search and Rescue



# Simplified Rules for All

- 400' AGL Maximum
- 3 Miles Visibility
- Operate within un-aided VLOS
- Daylight
- Not over people
- Drones must be registered with FAA if over .55 lbs



# CONCERNS AND LIMITATIONS



# Integration into Incident Command Structure

- Pre-planned Standard Operating Procedures
- Air Operations Branch or Ground Branch?
- Communication
- Hobbyist Joe Drone Pilot
  - Chain of Command
  - Safety
  - Public Affairs
  - Legal Considerations



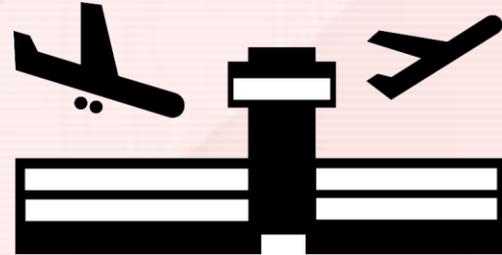
## LAANC: FAA's Low Altitude Authorization and Notification Capability system.

- Under the small UAS rule, pilots planning to fly in controlled airspace must receive an airspace authorization from the FAA.
- Pilots can receive near real-time airspace authorizations via LAANC.



# Airspace Authorization Changes

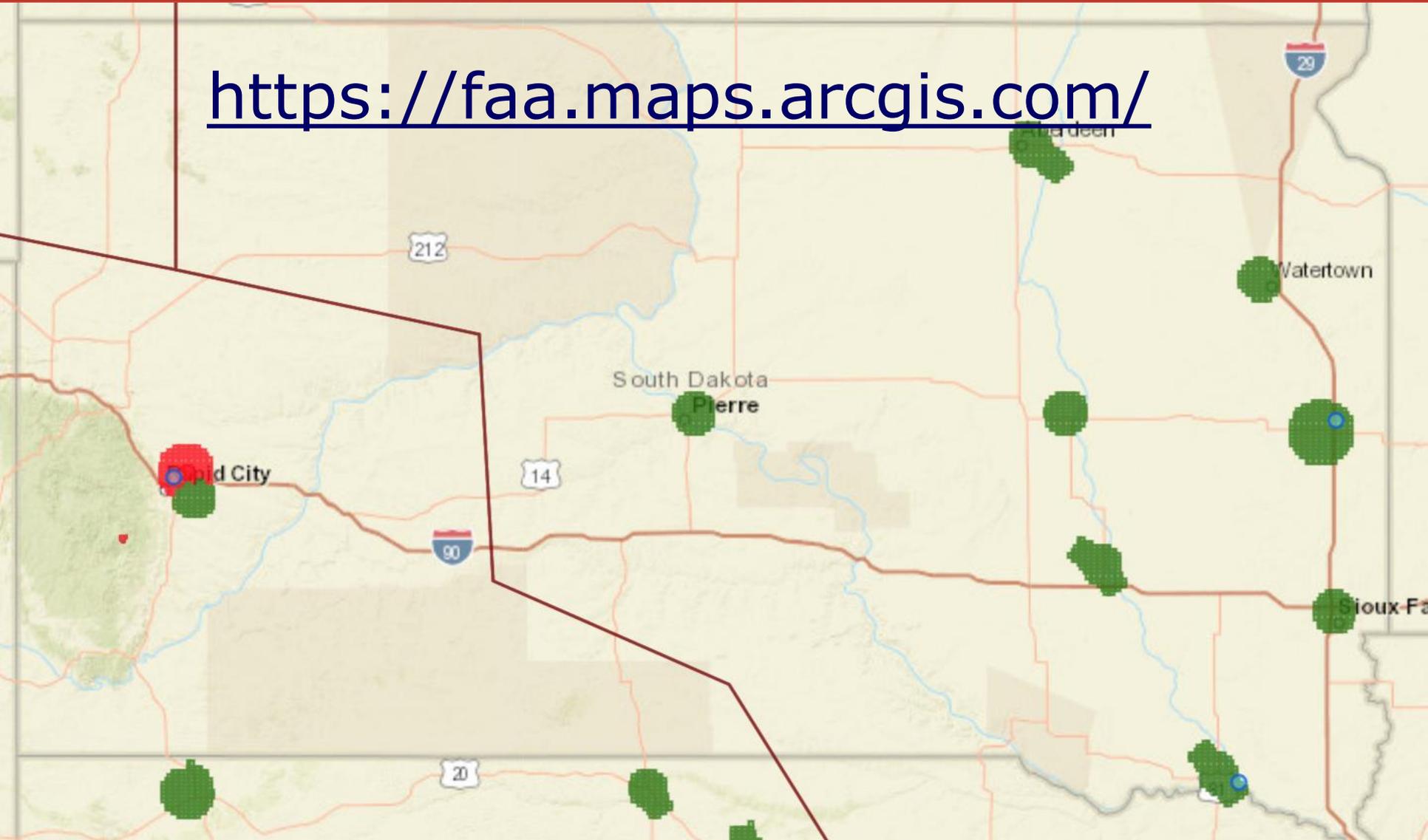
- It enables drone pilots access to controlled airspace near airports through near real-time processing of airspace authorizations below approved altitudes in controlled airspace.





# FAA : Airspace Authorization Changes

<https://faa.maps.arcgis.com/>







# BIG PICTURE STUFF: PRIMARY CONSIDERATIONS

## Getting Permission

**Drone pilots who want to fly in controlled airspace, have to obtain airspace authorization/waiver.**

- How?
  - [FAA Drone Zone Online Portal](#)
  - Review the form instructions on the website
  - Submit your online application as soon as possible prior to the planned flight (at least 90 days prior)
  - LAANC (Low Altitude Authorization & Notification Capability)



sUAS Operations in  
the South Dakota Wing  
of the

# CIVIL AIR PATROL





# CAP - Largest sUAS Operation in the US

We currently have over:

- 1,700 FAA registered airframes
- 1000 sUAS pilots





# SD: DJI Mavic Enterprise 2

- 2 Airframes – Dual: W/ FLIR (Lepton) 160 x160 resolution.
- 2 Airframes – Zoom (4K)
- Locations – Subject to Change, but generally:
  - Rapid City, Custer, Miller, and Sioux Falls

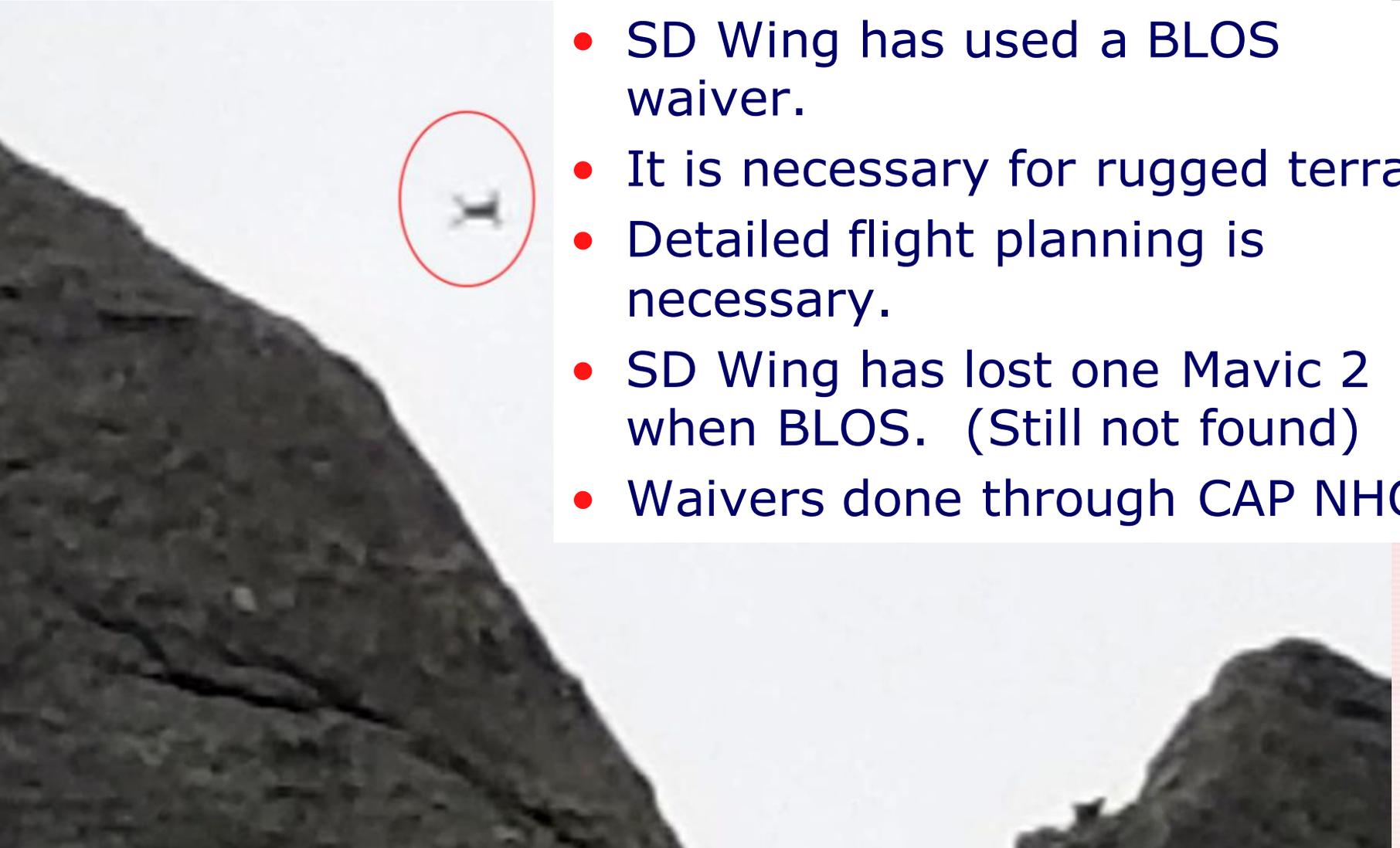


# Night

- FAA Waiver is Required
- CAP National HQ works directly with the FAA for waivers.
- The FAA Waiver requires specific stipulations such as being able to track the sUAS electronically, and have an anti-collision strobe plus position lights.
- (This negates the ability to use the search light on the Mavic 2 Enterprise.)



# BLOS – Beyond Line of Sight



- SD Wing has used a BLOS waiver.
- It is necessary for rugged terrain.
- Detailed flight planning is necessary.
- SD Wing has lost one Mavic 2 when BLOS. (Still not found)
- Waivers done through CAP NHQ.



# Flight over Personnel

- Search Teams are NOT considered by the FAA to be part of the UAS operation.
- Therefore, the UAS may not be flown over searchers without an FAA waiver.





# National Airspace System (NAS): Temporary Flight Restrictions (TFR)

- A TFR is a regulatory action that temporarily restricts certain aircraft from operating within a defined area in order to protect persons or property in the air or on the ground.
- DJI automatically prevents flight within a TFR. However...
  - If there's no internet, the controller doesn't know there is a TFR.
  - If internet is available, there is a process to bypass the automatic grounding.



# TFR's for SAR

- The CAP will normally issue a TFR for SAR operations for both sUAS areas, and Search Areas with high numbers of search airplanes and helicopters.
- The local CAP Incident Commander is normally the authority for TFR's. However, if the local SAR has their own AOBD, the AOBD may be the authority.



# SD Wing Qualified Individuals

- 8 sUAS Mission Pilots
  - (Part 107 Pilots)
- 2 sUAS Technicians
  - (Visual Observers, also in training for MP)
- 9 more in training status





# On-going Operational Test and Development

- How do we use low-res IR for SAR?
  - What Settings to Use?
- How do we use 4K res for SAR?
- Scanner Skills for Viewing Video Feed
- Uploading Videos & Photos to Servers for Crowd Sourcing and Immediate availability to search assets
- Ground Team / Mission Base Coordination



# Wrap Up

- USAF Missions
  - Aircraft
  - Ground Teams
- Corporate Missions
  - sUAS
  - Photography
- Mission Notification
  - County Sheriff / 911
  - State EOC
  - AFRCC
  - CAP

**Lt Col Craig D. Goodrich**

**605-787-8230**

**[Craig.Goodrich@sdwg.cap.gov](mailto:Craig.Goodrich@sdwg.cap.gov)**

