

Denver RTD's UAV Program

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Key Presentation Take-Aways

- Any agency can do this
- It does not have to be expensive
- It can save your agency money
- It does not require initial expertise
- Benefits outside of safety



Agency Facts

- 2342 Square Miles of Service Area
- 60 Miles of Light Rail
- 29 Miles of Commuter Rail
- 1023 Buses/172 LRVs
- 480 Million Dollar Operating Budget
- 2800 Employees

RTD UAV Program Facts

- RTD is currently flying UAVs
- RTD did not use a consultant
- This program was an effort of three employees
- Program was started part-time in addition to regular responsibilities



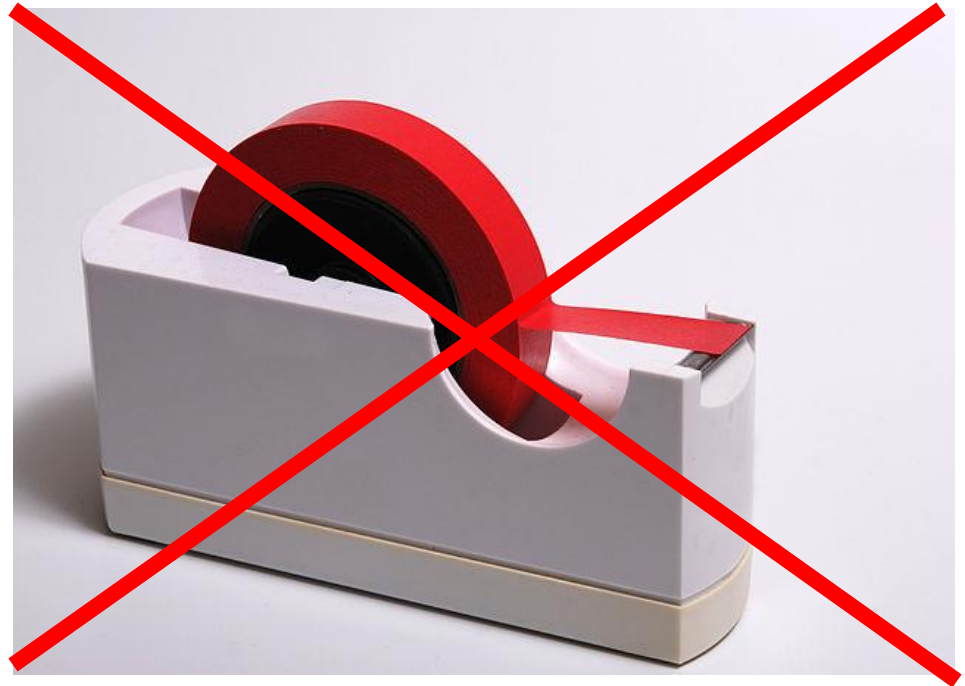
Unmanned Aerial Vehicles, Not Drones

- Internally Known as UAVs
- “Drones” has a certain connotation
- Security Functions are off limits
- Attempt to manage perception



How We Did It

- Initially applied for Section 333 exemption
 - Now deprecated
- Two Private Pilots on Staff
- Four Licensed aircraft mechanics on staff
- None of this is required now...more on this later



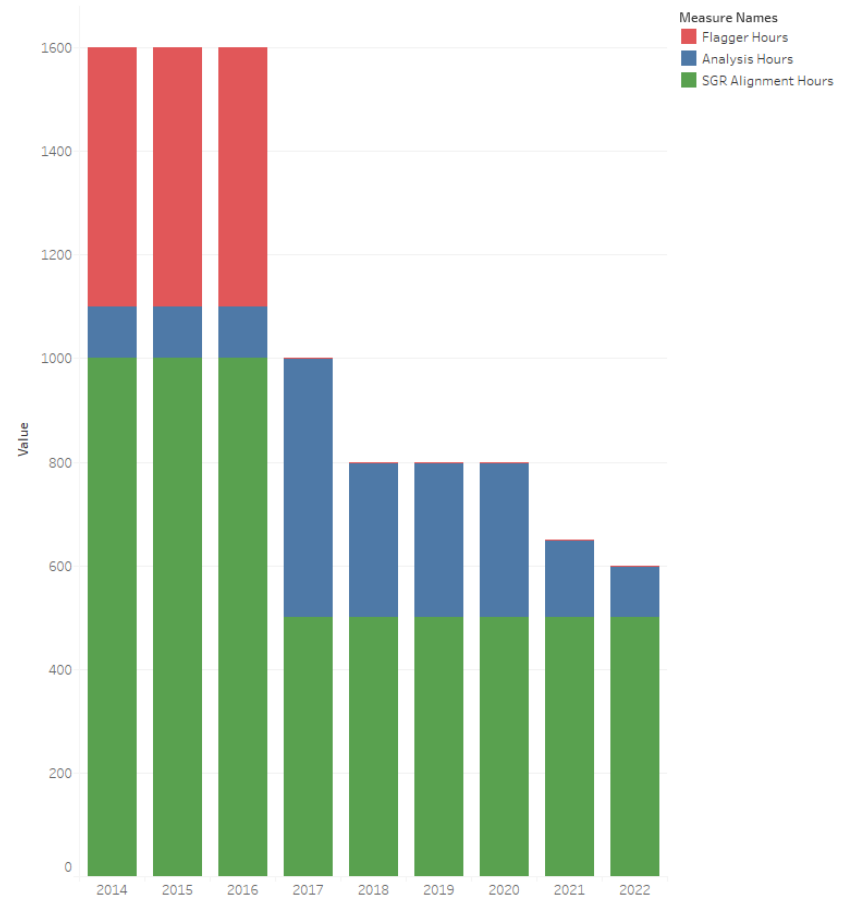
New Rules

- Must weight less than 55lbs
- Visual Line of Sight
- Cannot operate over people without a waiver
- Daylight only
- Visual observer optional
- Must yield to other aircraft
- Maximum speed of 100mph
- Maximum altitude of 400 feet above ground level
- 3 Miles visibility
- Operations are allowed in controlled airspace with permission
 - Now a website for getting this permission
- Most restrictions can be waived if you can demonstrate how to do it and still be safe

Program Costs/Savings

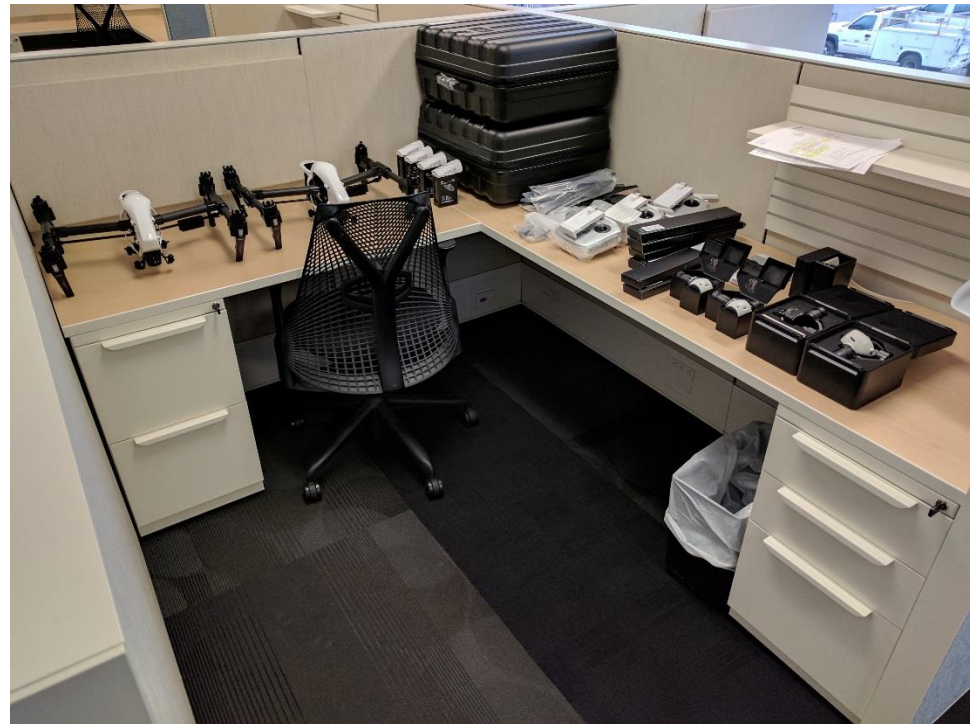
- \$18,078.98
 - Over 60% of this cost was thermal camera
- \$95,000/YR in recurring labor cost savings
 - Faster inspections
 - Less worker-hours required

Labor Hours By Year



Hardware Overview

- All Commercial Off The Shelf
 - DJI Inspire
- Lower cost than specialized systems
- Easier to Train
- Community support
 - Open API
 - Dozens of 3rd Party Software
 - Informal support through web forums and user groups



DJI Inspire 1 Unmanned Aerial Vehicle



Zenmuse Z3 Zoom Camera



Zenmuse XT Infrared Camera



Current Use Case and Benefits

- Asset Inspections
 - SGR Rail Infrastructure
 - Facilities
- On-Demand Inspections
 - Non-standard at request of internal business group
- Utility Locates
- Marketing Films
- No need to hire outside firm for marketing videos
- Removes inspectors from hazardous situations
- Can perform visual inspections in less time, more simply (think bridges)
- No need for slow zones during rail inspections
 - Passengers no longer affected



Future State

Forecast Asset Replacement Intervals

Asset Deterioration

Autonomous Inspections

Computer Vision

Future Use Cases

- Automated Inspections
- Computer Vision
- Emergency incident response



Computer Vision

- People can identify mountains, computers cannot
- Google API
- Can be utilized to automatically identify specified elements in footage

I'm not a robot

reCAPTCHA
Privacy - Terms

Submit

Select all images with mountains.
Click verify once there are none left.

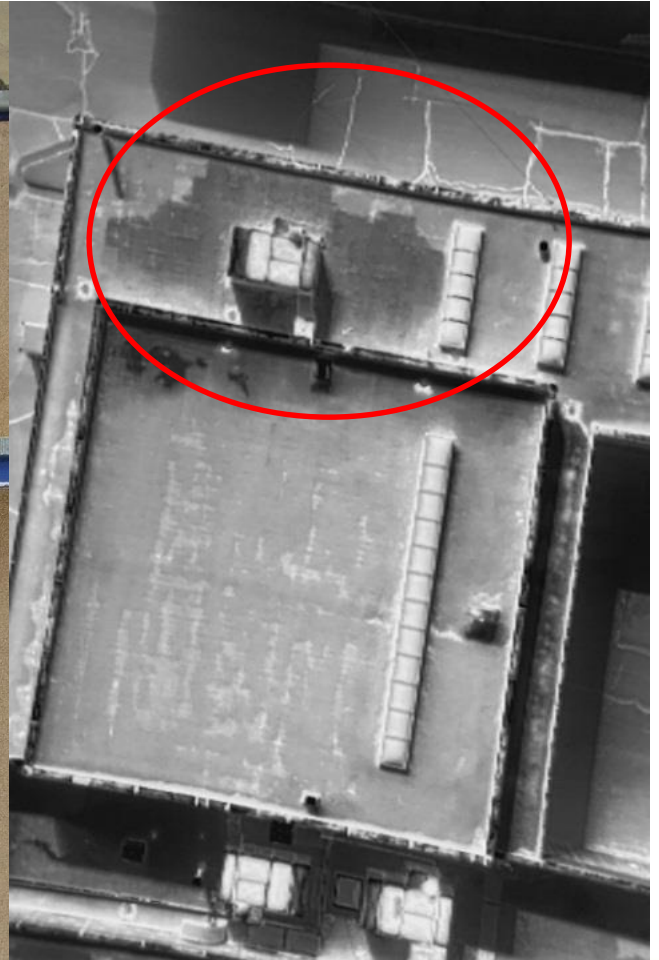
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VERIFY

How you can do it

- You can:
 - Pilot program for <\$1,000
 - Full Program for <\$20,000
- Companies offer training for FAA Knowledge Test
- Companies offer technical training for flying
 - Likely unnecessary
- **To become a pilot you must:**
 - Be at least 16 years old
 - Be able to read, speak, write, and understand English (exceptions may be made if the person is unable to meet one of these requirements for a medical reason, such as hearing impairment)
 - Be in a physical and mental condition to safely operate a small UAS
 - Pass the initial aeronautical knowledge exam at an FAA-approved knowledge testing center
- **Pilot certificate Requirements**
 - Must be easily accessible by the remote pilot during all UAS operations
 - Valid for 2 years – certificate holders must pass a recurrent knowledge test every two years

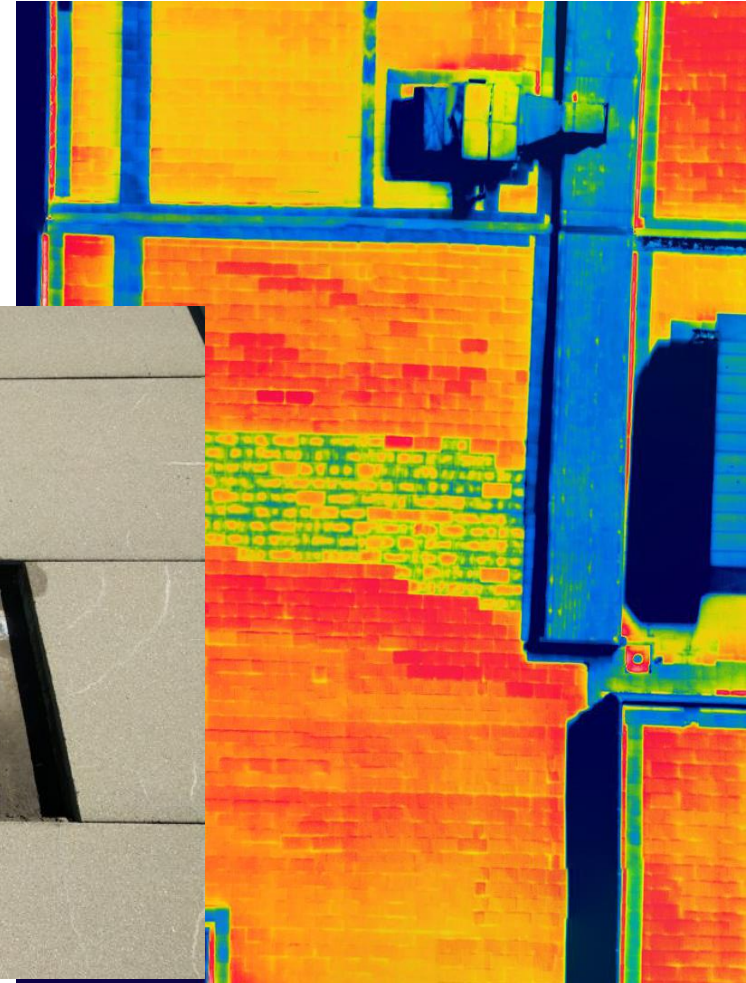
Water Damage



Boulder Bus Garage Roof Inspection



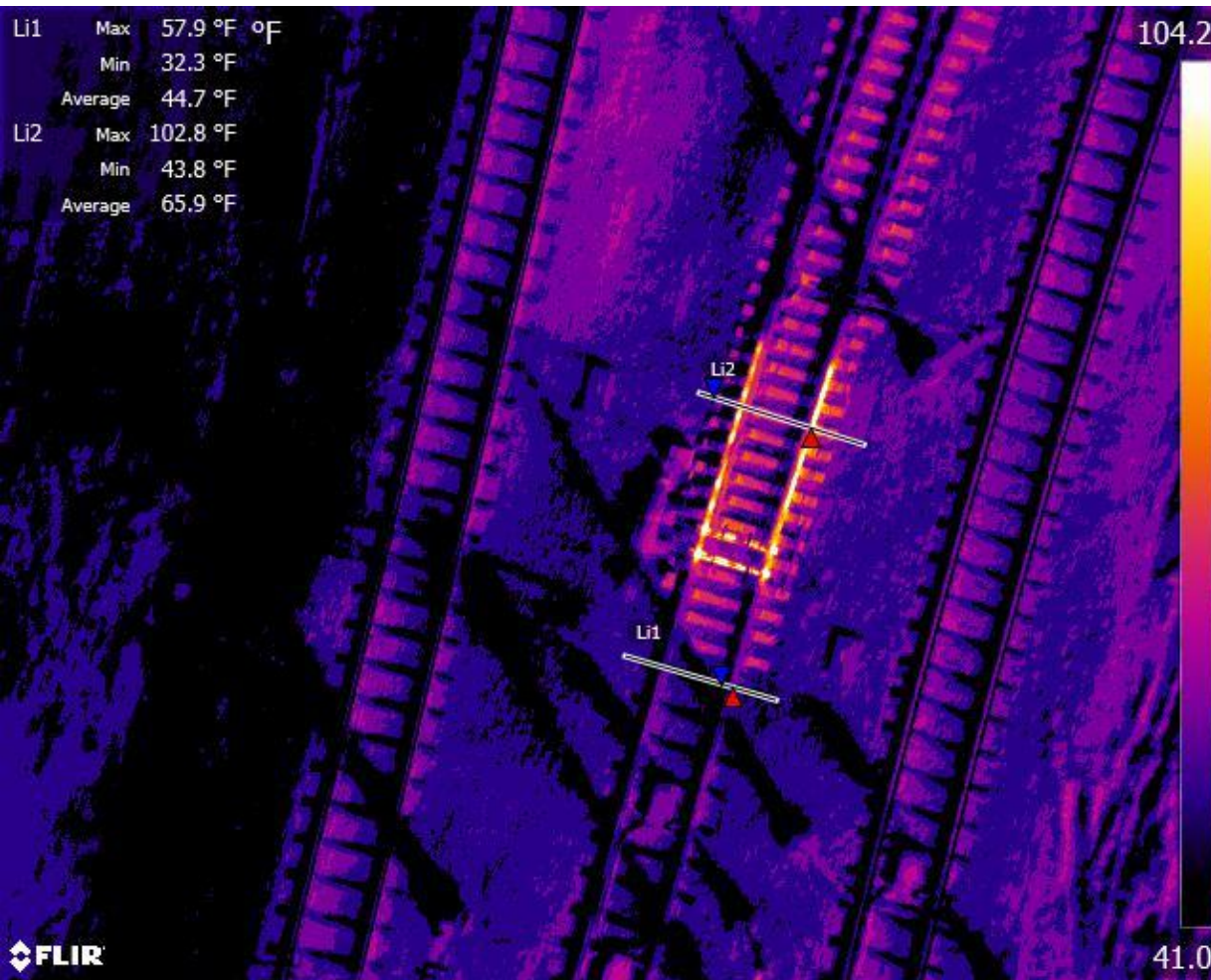
Moisture beneath tile



Emergency Response Training



Track Switch



- Track switch identified as potentially malfunctioning by activating on warm day
- Not feasible to identify this sort of failure without physical presence on the alignment

Easy Property Survey



Image Detail



Questions?

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