

Getting Ready for Takeoff



The Turnpike's Efforts in
Implementing a UAV Program

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Agenda

- Background
- Proposed Uses
- Proposed UAVs
- FAA Considerations/Requirements
- Section 333 Exemption
- Operating Procedures
- Next Steps
- Small UAS Notice of Proposed Rulemaking



Background

- January 2015 Innovation Council presentation by Turnpike employee Drew Brant
 - “Inspections using Unmanned Aerial Vehicles (UAVs)”



Background

- Survey of Council members:
 - 100% of respondents believed that the innovation will improve **safety**
 - 100% of respondents believed the innovation will improve system **reliability**
 - 71% of respondents believed the innovation will **offer value to the customer**
 - 100% of respondents recommended that the innovation be **considered for implementation**

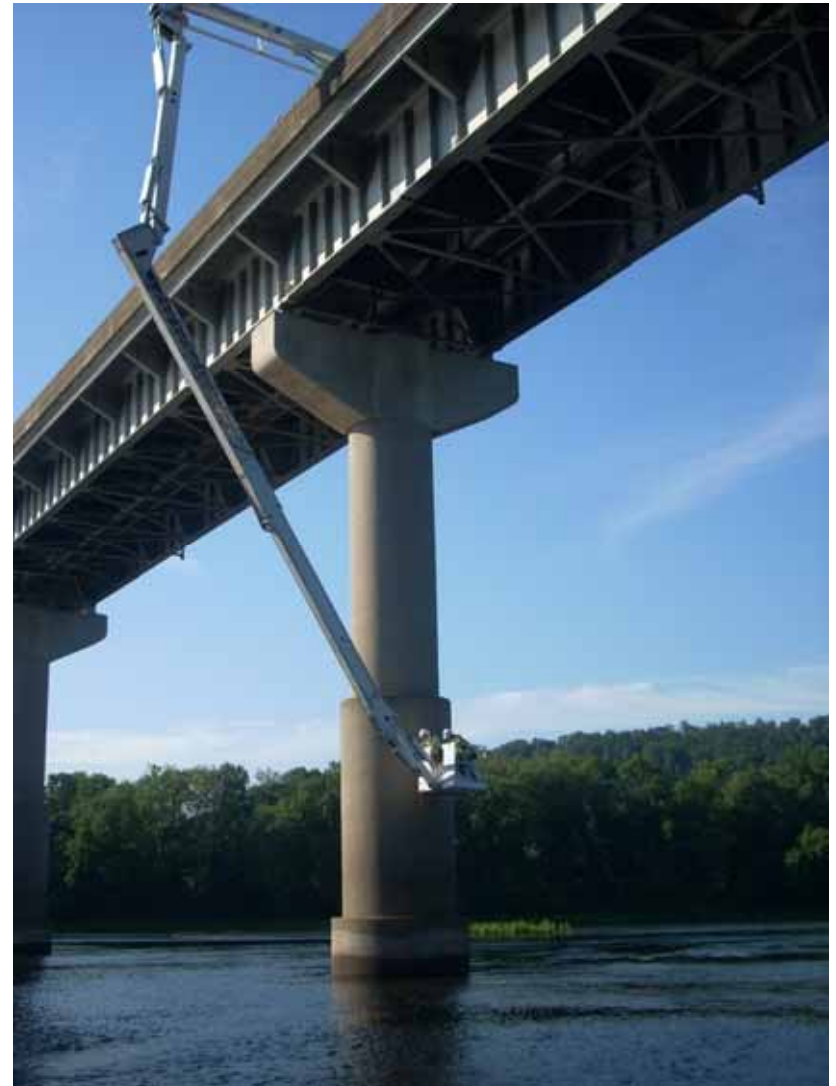


Proposed Uses

- Perform Inspections
 - Bridges
 - Microwave towers
 - ITS devices
 - Communications towers
 - Determine best height and location to install CCTV
 - Line of sight checks



UAV Bridge Inspection Demo Project by MN DOT



Proposed Uses

- High-resolution aerial imagery for mapping
- Videography for public awareness campaigns, educational videos, training, promotional videos



Proposed Uses

- Traffic incident management
 - Provide enhanced situational awareness
 - Determine magnitude of event
 - Determine appropriate personnel and equipment to dispatch
 - Coordinate and manage on-scene resources
 - Direct the movement of emergency vehicles
 - View length of backlog
 - Identify secondary incidents

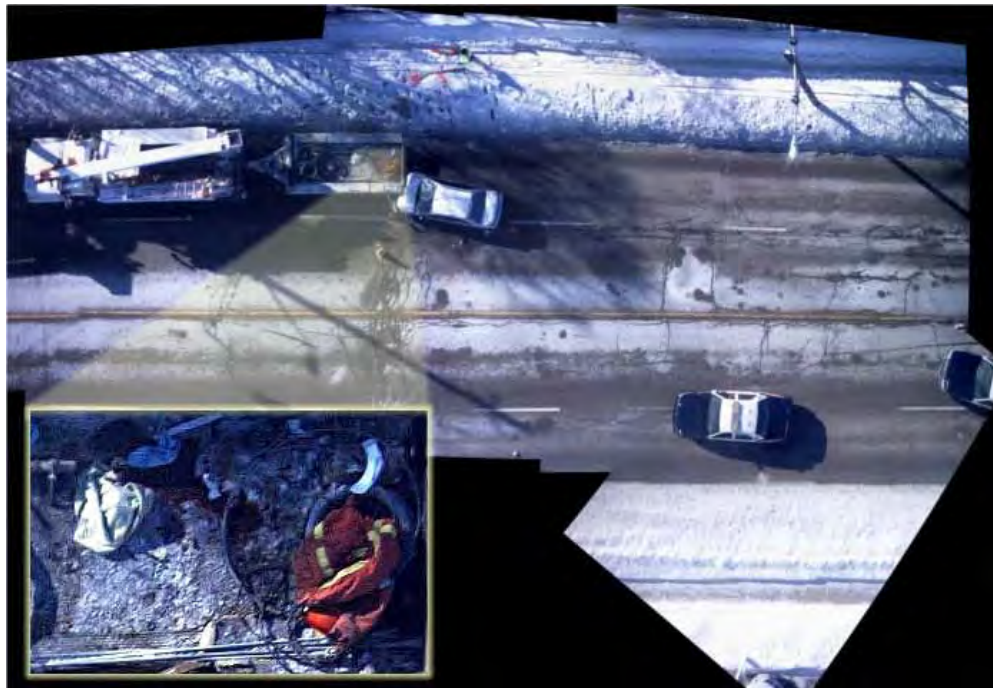


Proposed Uses

- During Winter Storm Jonas a tractor trailer was involved in a single-vehicle crash
- Turnpike waited until after the storm to recover the trailer
- News station WPXI used a UAV to record the tractor trailer recovery on January 28
- <http://www.wpxi.com/news/raw-drone-video-of-turnpike-truck-removal/54181130>

Proposed Uses

- Crash reconstruction
 - UAVs can collect aerial imagery and benchmark image-based measurements
 - Aerial image provides better view of tire marks
- Used by Royal Canadian Mounted Police



Proposed UAVs

- DJI Inspire 1
 - Integrated camera records high definition video
 - Optional dual-operator control – one person flies while the other controls the camera
 - Mobile app
 - See what the camera sees
 - Battery power display
 - View location of UAV on live map
 - Auto-takeoff and landing
 - Flight information display – altitude, speed, distance, etc.

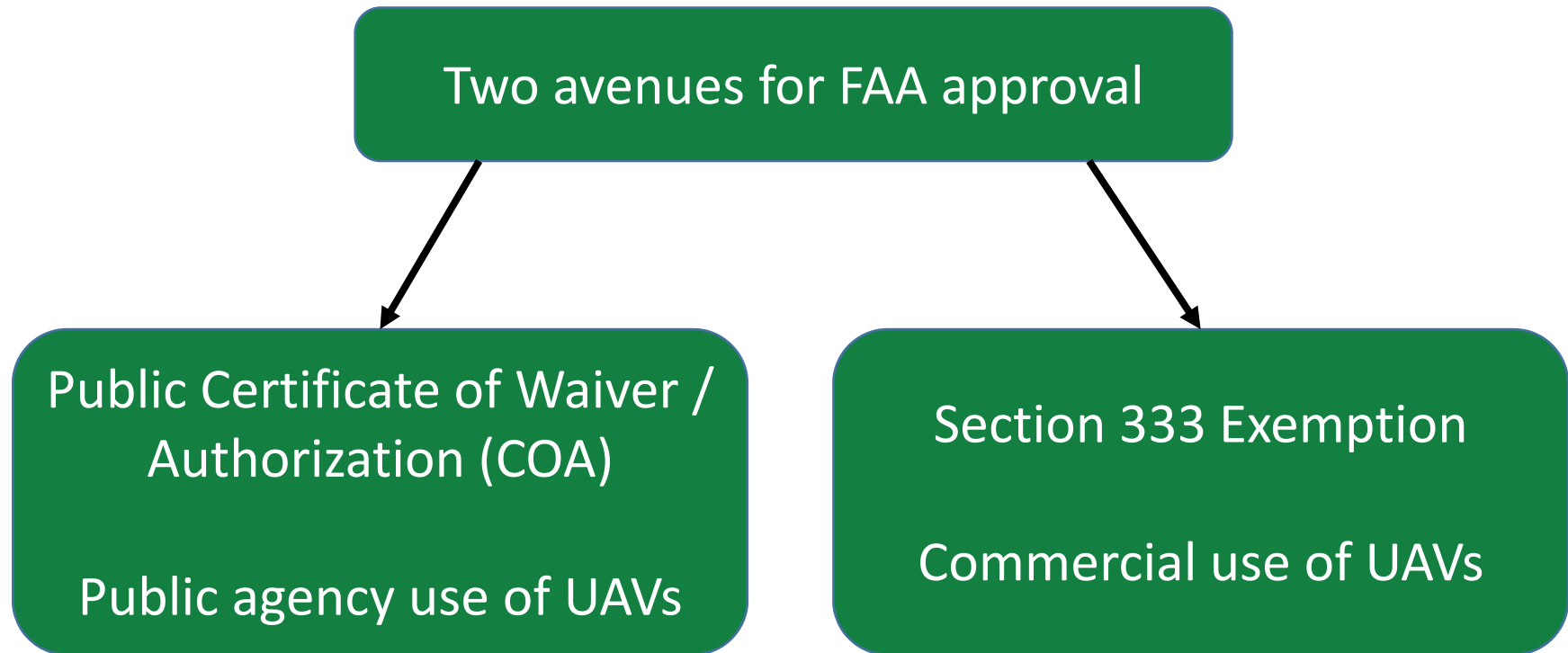


Proposed UAVs

- Aeryon SkyRanger
 - Designed to military specifications
 - Integrated camera records high definition video
 - 50 minute flight time
 - Ruggedized and weather-sealed
 - Stream live video through secure network
 - Navigation through touch screen
 - Training provided at Aeryon HQ in Canada
- Aeryon SkyRanger Map Edition Features
 - Provides survey-grade accuracy
 - Integrates with GIS, CAD, photogrammetry software
 - Used for crash reconstruction



FAA Considerations/Requirements



*Both require a pilot certificate to operate

FAA Considerations/Requirements

- Public COA
 - Permits public agencies to operate a particular aircraft for a particular purpose in a particular area
 - COA applications are managed through FAA's online system
 - To gain access to the online system, a “declaration letter” must be submitted from the city, county or state attorney's office certifying the agency is a political subdivision of the government



FAA Considerations/Requirements

- Section 333 Exemption
 - Section 333 of the *FAA Modernization and Reform Act of 2012*
 - Allows Secretary of Transportation to determine whether certain UAS may operate in airspace without meeting requirements for manned aircraft
 - Required for any civil UAS operation that is not for hobby or recreational purposes
 - Real estate agents
 - Engineering firms
 - Insurance companies
 - Media outlets

Petitions Granted	Petitions Closed
4,793	399
As of 04/14/2016	



FAA Considerations/Requirements

- Section 333 Exemption
 - Blanket COA for all flights 200 feet and below issued concurrently with grant of exemption
 - Need to apply for COA for operations above 200 feet and below 400 feet
- In March 2016, blanket COA altitude was doubled to 400 feet

FAA Doubles "Blanket" Altitude for Many UAS Flights

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March 29- After a comprehensive risk analysis, the Federal Aviation Administration (FAA) has raised the unmanned aircraft (UAS) "blanket" altitude authorization for Section 333 exemption holders and government aircraft operators to 400 feet. Previously, the agency had put in place a nationwide Certificate of Waiver or Authorization (COA) for such flights up to 200 feet.

The new COA policy allows small unmanned aircraft—operated as other than model aircraft (i.e. commercial use)—to fly up to 400 feet anywhere in the country except restricted airspace and other areas, such as major cities, where the agency prohibits UAS operations.



FAA Considerations/Requirements

- Regulations were changing frequently
- Unsure about what direction to take
 - Section 333 Exemption seemed to be more flexible because of the blanket COA
 - We didn't know if we could apply
- FAA representative suggested the Turnpike file for Section 333 exemption



Section 333 Exemption

- Petitions for Section 333 exemption must include:
 - Description of proposed operations
 - Description of proposed make and model of UAS
 - Specific applicable regulations from which relief is required (CFRs)
 - Describe how the operator will maintain an equivalent level of safety or no adverse impact to safety
 - State how granting exemption would be in the public interest



Section 333 Exemption

- Specific CFR from which relief is required

In seeking authorization, petitioners will require exemptions from regulations with which they cannot fully comply. The table below provides guidance regarding regulations from which a petitioner may require exemption. However, some proposed operations may require exemption from regulations not listed here, while others may not require exemption from all regulations listed here.

14 CFR PART	SUMMARY OF REGULATION
Part 21 Airworthiness Certification	
21, Subpart H	Certification procedures for products and parts, Airworthiness Certificates
Part 61 Certification: Pilots, Light Instructors, and Ground Instructors	
Part 91 General Operating and Flight Rules	
91.103(b)(2)	Preflight action
91.105	Flight crewmembers at stations
91.109	Flight instruction
91.119	Minimum safe altitudes
91.121	Altimeter settings
91.151	Fuel requirements for flights in VFR conditions
91.405	Maintenance required
91.407	Operation after maintenance
91.409	Inspections
91.417	Maintenance records



Section 333 Exemption

- For each CFR describe how the operator will maintain an equivalent level of safety

5.7. 14 C.F.R. 91.121 – Altimeter Settings

14 C.F.R. 91.121 requires aircraft to maintain cruising altitudes using an on-board altimeter.

The PTC seeks exemption from 14 C.F.R. 91.121 because the proposed UAS will not have altimeters. An equivalent level of safety will be achieved because the altitude of the UAS will be reported and displayed using GPS.



Section 333 Exemption

7. PUBLIC INTEREST

Granting the PTC's Petition for Exemption would further the public interest and support the PTC's mission to operate a safe, reliable, customer-valued, limited-access highway system that supports national mobility and commerce. National policy set by Congress favors early integration of UAS into the NAS in controlled, safe working environments such as those proposed by the PTC in this Petition. Granting this Petition for Exemption will help the FAA to fulfill Congress' goal of permitting UAS to operate safely in the NAS before completion of the plan and rulemaking required under Section 332 of the Reform Act.

By using UAS to perform structure inspections, obtain aerial surveying, mapping and videography, enhance TIM, and reconstruct accidents, the public as a whole would benefit through reduced costs, enhanced safety, and reduced travel delay and emissions. The exemption will enhance safety by reducing risks to the operator, the general public and property owners from the hazards associated with performing the same type of work using conventional aircraft and rotorcraft or dangerous ground-based inspection methods.

The following explains how the PTC's proposed UAS operations would benefit the public interest as a whole:

7.1. Reduced Costs

Using UAS will help reduce direct costs to the PTC as follows:

Inspections – The cost to perform inspections with UAS will be less compared to conventional methods of inspecting structures. Conventional inspections usually require teams of inspectors and bucket trucks. Alternatively, if a UAS can be used, bucket trucks and multiple personnel would not be needed and the inspections can be performed faster and cheaper.


Aerial Surveying, Mapping, and Videography – By using UAS for aerial surveying, mapping, and videography, costs will be reduced by obtaining aerial imagery more cheaply and efficiently than by using piloted aircraft or rotorcraft. In addition, by using UAS to monitor construction work, problems can be discovered early in the construction phase. By finding problems early, they can be corrected more cost effectively than when they are found later in the construction.

Traffic Incident Management – In the past, Pennsylvania State Police helicopters were used during major traffic incidents to obtain aerial views of the ground scenes, thereby

- State how granting exemption would be in public interest
 - Reduced costs
 - Enhanced safety
 - Reduced travel delay and emissions

Section 333 Exemption

- Petition filed on September 16, 2015
- Posted for comment on November 24, 2015
- FAA has 120 days from posting to issue a decision

 Due to the high volume of Section 333 petitions received, we are experiencing delays in processing petitions. We will do our best to process petitions being posted to the docket as soon as possible, and in the order they were received. We appreciate your patience as we work diligently to process your request.

- FAA granted request for exemption on March 24, 2016

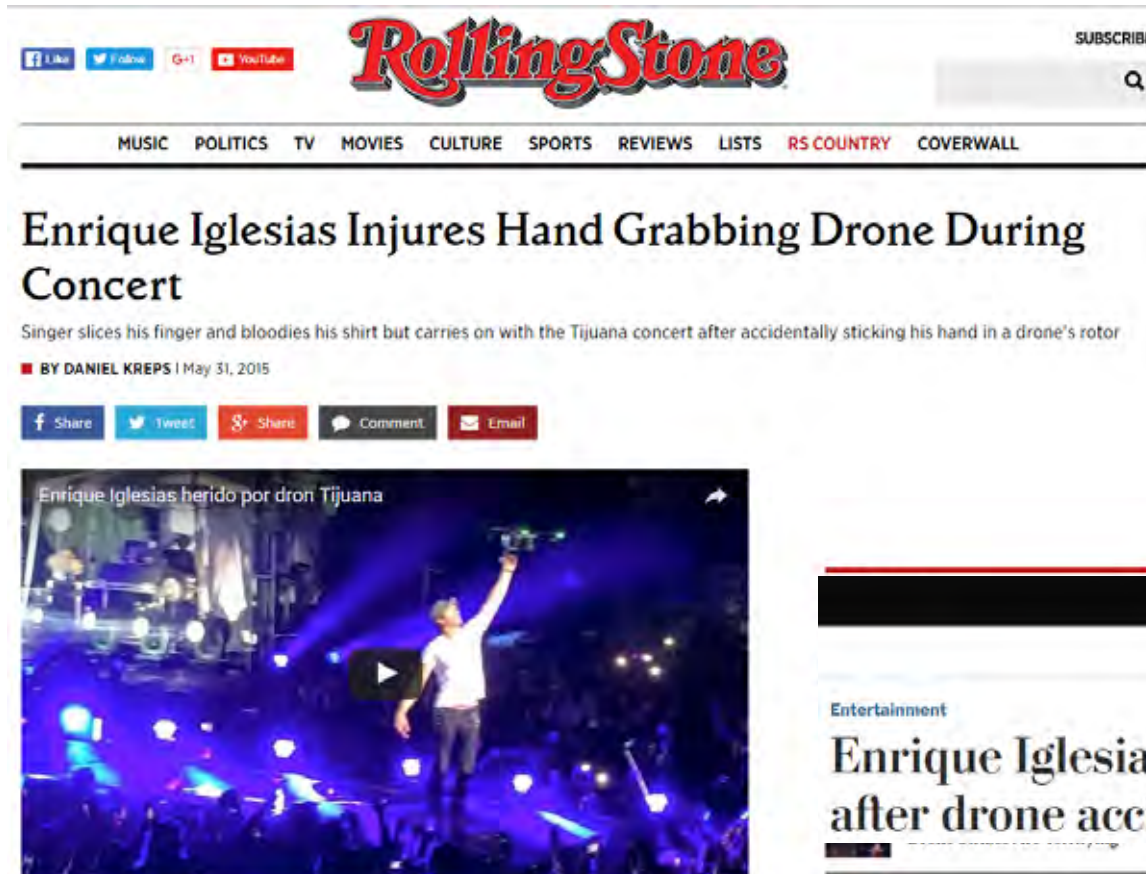
Operating Procedures

- Flight Operations Manual created and filed with 333 exemption petition
 - General Protocol – incorporation of FAA requirements for using UAS with Section 333
 - Flight Log
 - Training Requirements
 - Pre-Flight Protocol
 - Post-Flight Protocol
 - Maintenance Log



Operating Procedures – General Protocol

- Rule #1 – Don't grab a drone while it is in flight



The image shows a screenshot of a Rolling Stone article. At the top, there are social media icons for Facebook, Twitter, Google+, and YouTube, followed by the Rolling Stone logo and a search bar. Below the logo is a navigation menu with categories: MUSIC, POLITICS, TV, MOVIES, CULTURE, SPORTS, REVIEWS, LISTS, RS COUNTRY, and COVERWALL. The main headline reads "Enrique Iglesias Injures Hand Grabbing Drone During Concert". Below the headline is a sub-headline: "Singer slices his finger and bloodies his shirt but carries on with the Tijuana concert after accidentally sticking his hand in a drone's rotor". The byline is "BY DANIEL KREPS | May 31, 2015". There are social sharing buttons for Facebook, Twitter, Google+, Comment, and Email. Below the text is a video player with a play button and a caption: "Enrique Iglesias herido por dron Tijuana".



The image shows a screenshot of a The Washington Post article. At the top, there is a black bar with the text "The Washington Post" in white. Below this is a red horizontal line. The article is categorized as "Entertainment". The main headline reads "Enrique Iglesias undergoes hand reconstruction after drone accident".



Operating Procedures – General Protocol

- Each flight requires a Pilot in Command (PIC) and Visual Observer (VO)
 - PIC is responsible for operation and safety
 - VO assists the PIC by observing UAV and providing situational awareness
- Unaided visual line of sight at all times
- Each aircraft must have identification markings as large as practicable
- Daytime operation only
- Cannot be operated from a moving vehicle



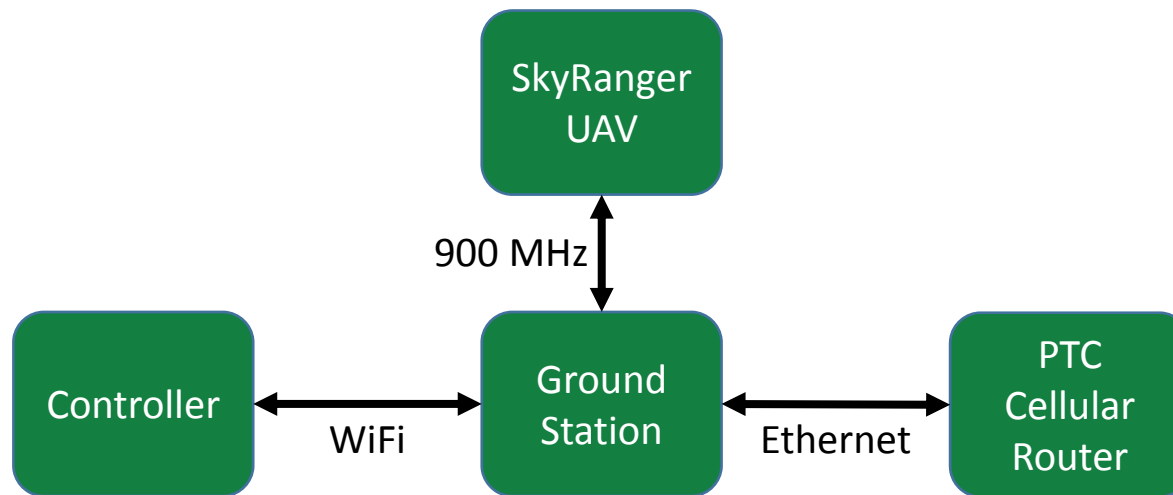
Operating Procedures

- Pilot – Brad Hackman, Fleet Resources
- Copilot/Visual Observer – Drew Brant, Construction



Operating Procedures – IT/Comm.

- DJI Inspire 1
 - Controlled using DJI Go app on tablet/phone
 - Livestreaming via YouTube
- Aeryon SkyRanger
 - Controller and ground station
 - Ground station has Ethernet connection and can output encoded video



Next Steps

PA Turnpike

- UAV procurement
- Staffing for flight operations
- Potential on-call contract

FAA

- Small UAS Notice of Proposed Rulemaking
 - Published in February 2015
 - Public comment period ended in April 2015
 - Final rule expected in June 2016

Small UAS Notice of Proposed Rulemaking

- Maximum altitude – 500 feet
- Maximum speed – 100 mph
- Operators must pass knowledge test and recertify (pass test) every 24 months
 - No pilot certificate needed
- Visual observer not required
- Many of the same requirements as Section 333 exemption
 - Must maintain visual line of sight, daylight only operations, etc.





Thank you!



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