Drone Aerial Photography & Videography

Community Education – Fall 2024

By Greg Schulz – Pictures Over Stillwater
FAA Part 107 & MnDoT Aeronautics Licensed Commercial Drone Operator
Professional Photographer, Videographer and FPV - MN FAASTeam Rep DronePro

PicturesOverStillwater.com/links | facebook.com/PicturesOverStillwater
vimeo.com/picturesoverstillwater | twitter.com/POStillwater | Instagram.com/PicturesOverStillwater
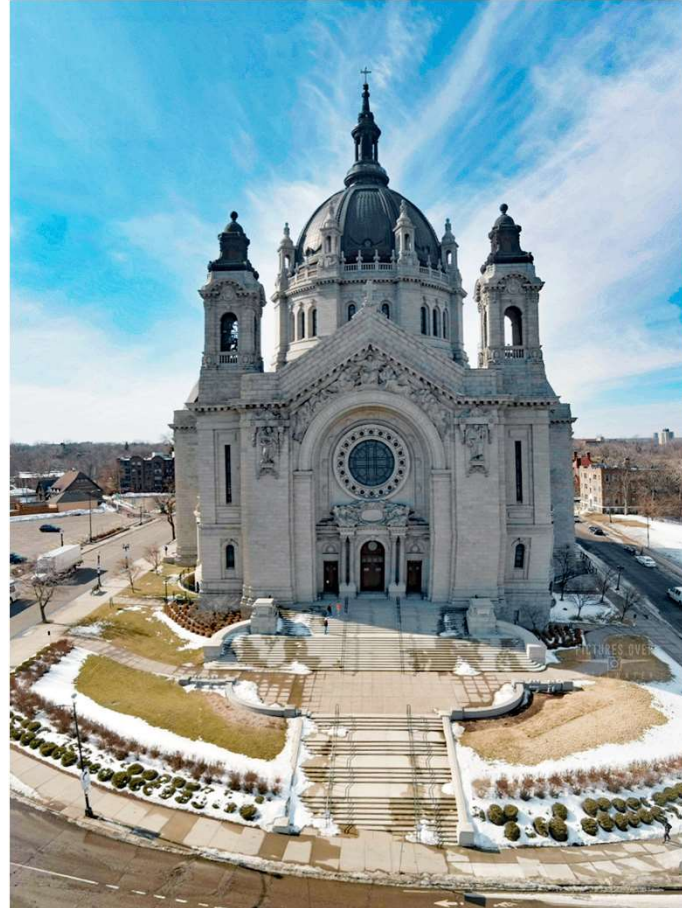picturesoverstillwater.smugmug | youtube.com/@picturesoverstillwater

Drone Aerial Photography & Videography – Various Subjects
Flying Fun, Flying Smart, Flying Safe – Getting Started

Drone Aerial Photography & Videography – Various Subjects
Flying Fun, Flying Smart, Flying Safe – Getting Started

Drone Aerial Photography & Videography – Various Subjects
Flying Fun, Flying Smart, Flying Safe – Getting Started

Drone Aerial Photography & Videography – The Big Picture
Flying Fun, Flying Smart, Flying Safe – Getting Started

Where Will You Be Flying From Relative To Your Subject
Reminder you are a drone operator 1st, camera operator 2nd

Basics & Fundamentals
Hobby/Recreational vs. Part 107
License/Cert. & Registration
(TRUST & Part 107)
Rules of Air and Ground
Where to Fly (Airspace & Ground)
When to Fly (Day, Night, WX)

PicturesOverStillwater.com/links

Drone Aerial Photography & Videography – Various Considerations
Flying Fun, Flying Smart, Flying Safe – Who Are You, What's You Intention?

Who Are You?

- Drone Enthusiast
- RPC/Pilot/Operator
- Photographer
- Videographer
- Photogrammetry
- Subject / Topic Specialist
(Real Estate, Construction, Agriculture, Journalist, Other)

Whats Your Intent or Objective

Hobbyist/Recreational
(e.g. TRUST cert & CBO
Fly just for fun, not for work
or anyone else or betterment)

Registration
No < 250g (.55lbs)
Yes >= 250g
RID = Yes if registered

See links at back of deck

Non-Hobby
(Part 107, Commercial & Fun
For others & Betterment
Ability for waivers & privs.
MnDOT License/Reg in MN)

Registration
Yes 0 to 55lbs
RID = Yes

Where to Fly
Airspace - UAS Regs, TFRs - FAA
Ground – Private, City, Cty, State, Fed

What & Where Is Your Subject

Weather Conditions
Day, Night, Wind
Clouds, Visibility

Drone Aerial Photography & Videography – Various Considerations
Flying Fun, Flying Smart, Flying Safe – The View is Different, More Going On…

- Whats different from being up in the air?
  - Aspect ratios, perspectives and elevations
  - Seeing things from different view vantage points
  - Clouds, sky, water glare, shadows and reflections
  - Birds, aircraft and other drones in the area
  - Airspace and ground location restrictions
  - Staying out of the shot (or hiding) maintain VLOS
  - Wind speed and direction, stabilization, rain
  - Flying the aircraft plus taking photos/videos
  - Avoiding flying over people and moving vehicles
  - Rules, regulations, privacy, licensing
  - Where will aircraft fly-in to or crash?
  - ***More going on and be aware of: Task Saturation***
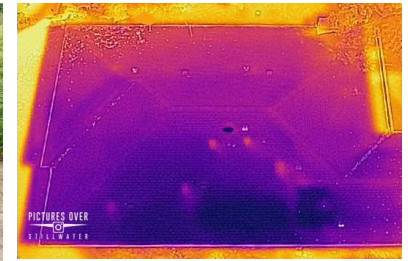
Drone Aerial Photography & Videography –Tools & Technology
Flying Fun, Flying Smart, Flying Safe – Various Options, Features, Functionalities

- Aircraft
  - Integrated gimbal stabilized camera/sensor
  - GPS enabled, optical and other sensors
  - Size, weight, max take off weight (MTOW)
  - Folding or non-folding arms, props, low noise props
  - Transmission distance (keep in mind VLOS)
  - **Remote ID (RID)** built-in or add-on module
    - 3/16/24 for all part 107 and Hobbyist A/C > 249g
  - Safety features:
    - Simulators & training tools (e.g. DJI Virtual Flight and others)
    - High visibility lights (various colors)
    - Prop guards/cage, altitude & distance limits, learning modes
    - Return to Home (RTH) automatic, push button on controller
    - Low battery and signal loss, what to do
    - Obstacle Avoidance (OA), aka AI or Vision (forward, around, full 360)

Folded Arms & Props

Removable Battery

Anttena

Camera Gimbal

Controller

"Sticks"

Display / App

Left Stick - Throttle: Up / Down; Sideway: Yaw / Orientation
Right Stick - Forward / Back; Sideway: Roll left/right

DB120 RID Module

Smart Controller

Drone Aerial Photography & Videography – General Topics
## Flying Fun, Flying Smart, FIying Safe – What Are You Capturing?

- Understanding your mission or objectives helps determine:
  - Are you looking for action (fast) or cinematic look (smooth)?
  - Are you flying manually or via autonomous modes?
  - What settings to use (e.g. WB, ISO, FPS, Resolution, style, EV, log)
  - Capturing fixed or stationary subject and you move slow = lower FPS & sharper footage
  - Capturing moving subject, or you are moving fast = higher FPS
  - What type of moves are you going to use?
    - Push in / out (zoom, dolly zoom/vertigo)
    - Pan left/right, gimbal/pan up/down
    - Raise/lower aircraft alt, orbit subject (inward or outward)
   - Compound shots using combination of above

Tips for Smooth Capture
- ✓ Use "Cine" Mode Controls
- ✓ Adjust Controller Sticks ESC
- ✓ Fly slow and smooth
- ✓ Leverage tracking modes
- ✓ Pay attention to wind

Drone Aerial Photography & Videography – Planning Your Flight
Flying Fun, Flying Smart, Flying Safe – Plan & Prepare

Plan Prepare | Pre Flight | Fly (Manual, Autonomous) | Post Process | Publish
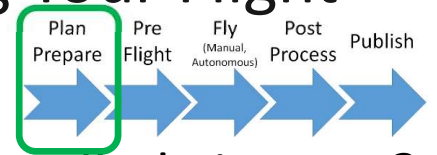
- Will you be flying from a new location and/or, in new or controlled airspace?
- What are the obstacles (people, trees, buildings, towers)?
- How far and high will you fly? How long at destination?
- What are your emergency and contingency procedures?
- Battery needed (round trip transit, on-location, reserve)?
- Flying manual or autonomous (is your mission tested)?
- If night, will you have chance to fly location during daylight for familiarization?
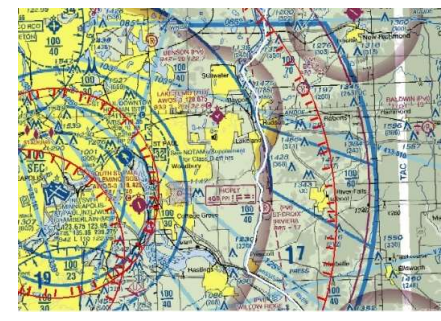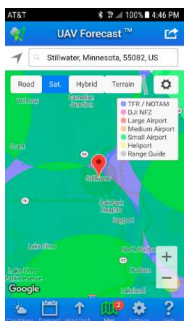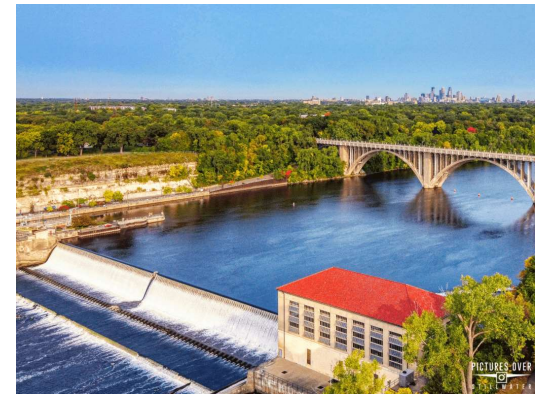
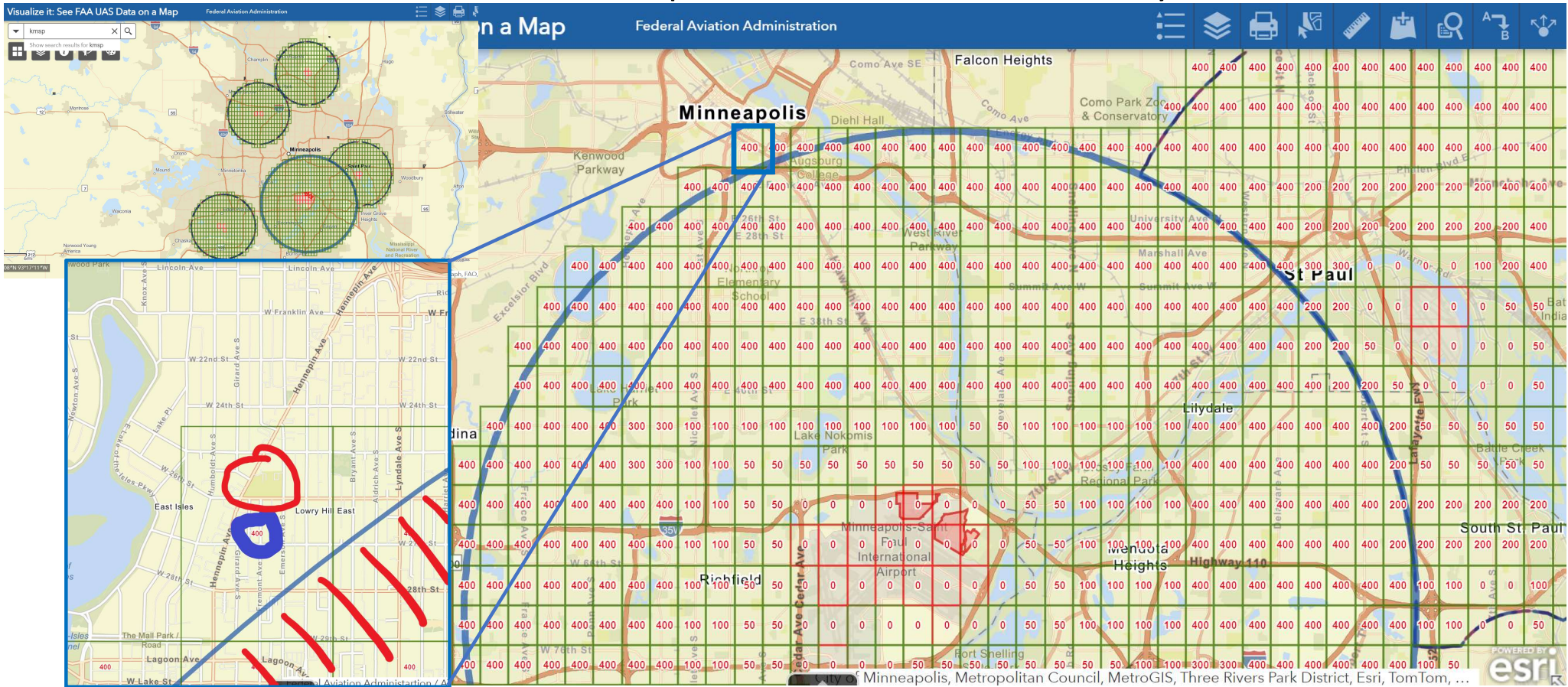# Drone Aerial Photography & Videography – Planning Your Flight
Flying Fun, Flying Smart, Flying Safe – Where Can You Fly?
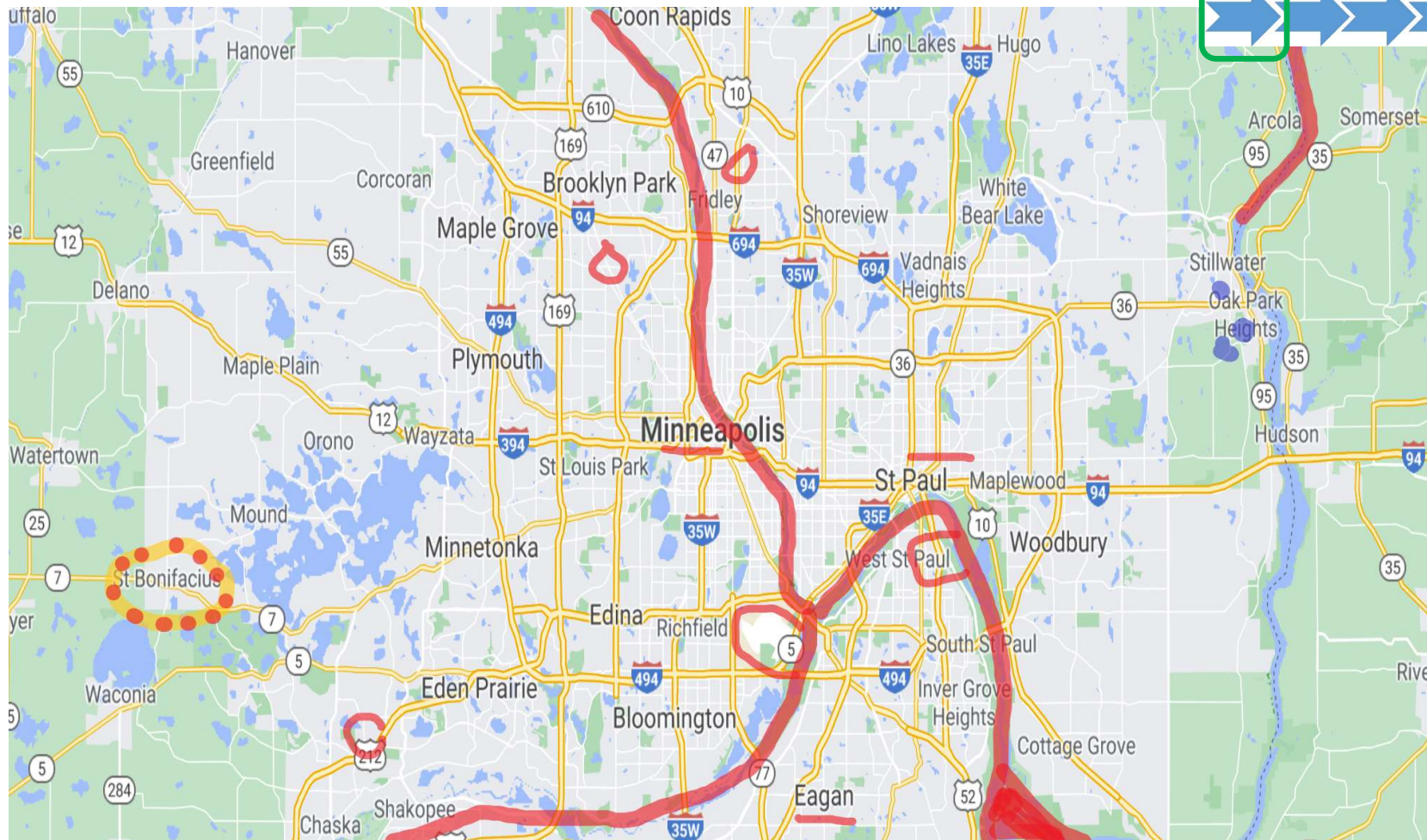
Drone Aerial Photography & Videography – Planning Your Flight
Flying Fun, Flying Smart, Flying Safe – Controlled and Uncontrolled Airspace

FL (Flight Level) 600 (60,000')

Class A

18,000 MSL

UAS Facility Maps (UASFMs)

Class B

Class C

Class E (E2/E3/E4)

700' AGL Class E

1200' AGL Class E

Class D

Class E (Surface)

Class G

Class G

Class G

https://www.faa.gov/regulations_policies/handbooks_manuals/aviation/phak/media/17_phak_ch15.pdf

Drone Aerial Photography & Videography – Planning Your Flight

Flying Fun, Flying Smart, Flying Safe – Controlled Airspace Authorizations & Unlocks

Via FAA Visualize It – To Get LAANC Airspace Authorization Use B4UFly, Aloft, & Others

Drone Aerial Photography & Videography – Planning Your Flight
Flying Fun, Flying Smart, Flying Safe – Controlled Airspace Authorizations & Unlocks

Via notams.aim.faa.gov/notamSearch/nsapp.html#/   **Also see tfr.faa.gov/tfr2/list.html**

Drone Aerial Photography & Videography – Planning Your Flight

Flying Fun, Flying Smart, Flying Safe – Controlled Airspace Authorizations & Unlocks

Via Skyvector and UASidekick
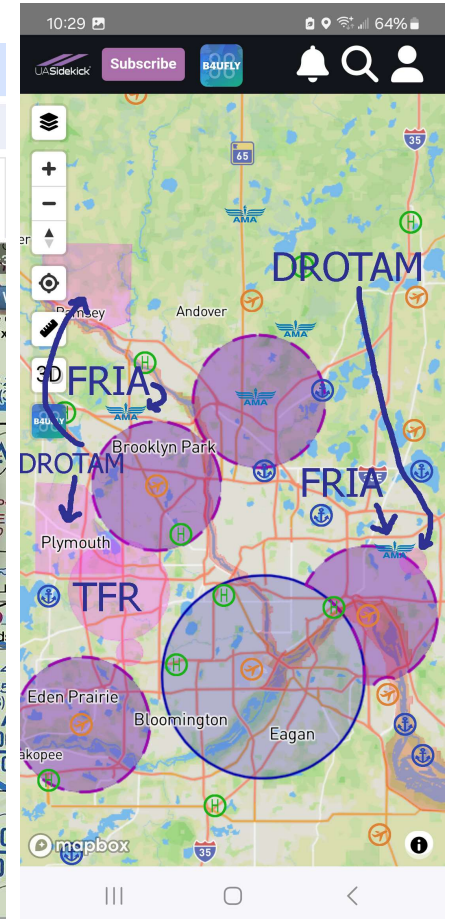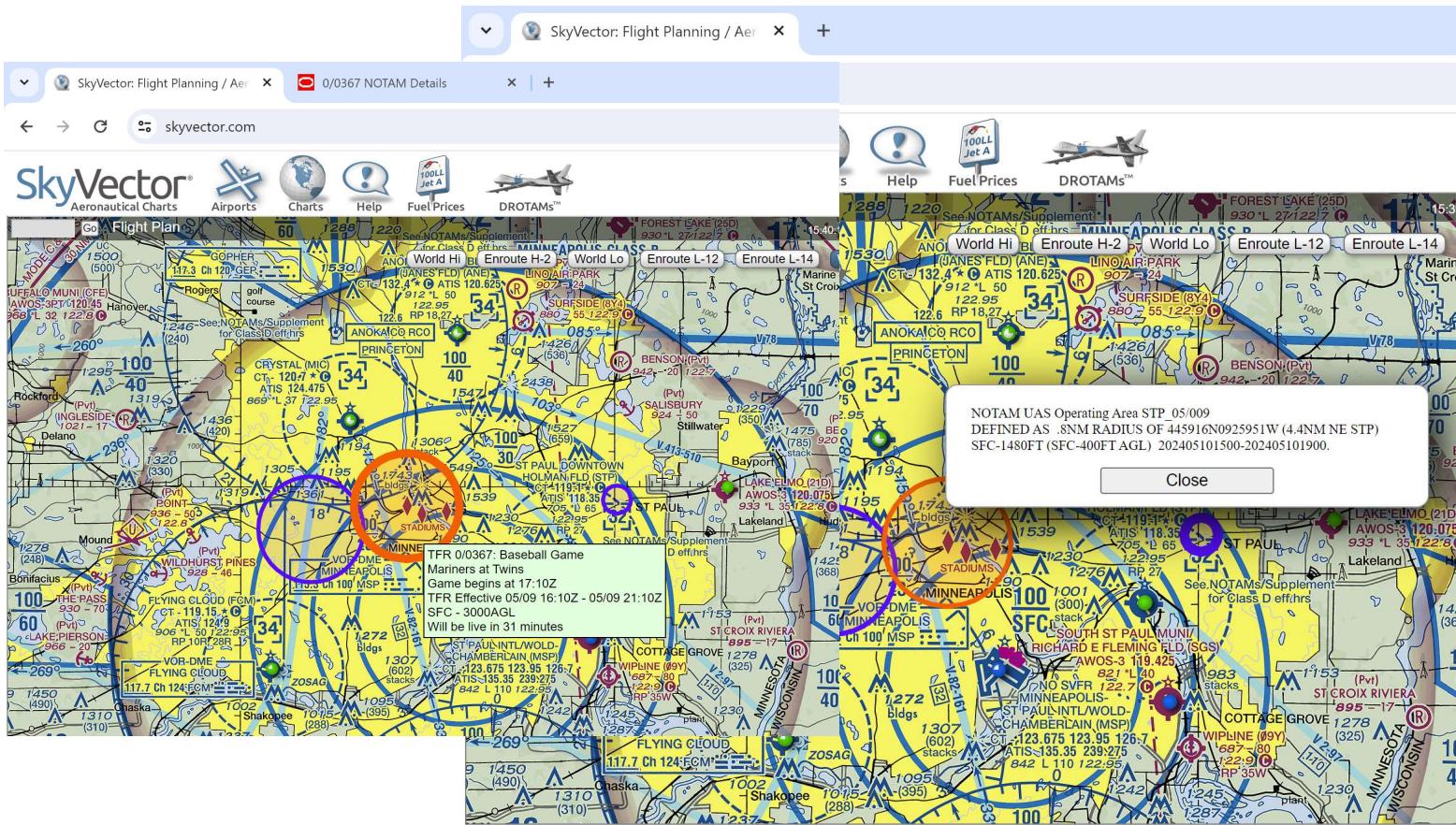
Drone Aerial Photography & Videography – Weather Considerations
Flying Fun, Flying Smart, Flying Safe – Wind, Temperature, Visibility, Low Clouds

Where Will You Be Flying From Relative To Your Subject
How Will Weather Impact Your Flight Planning and Missions?

Weather
Surface and At Altitude
Temp (Absolute & Wind Chill)
Wind Speed, Direction
Ceiling, Visibility, Precipitation
Day and Night
Sun Angle, Shadows

Reminders: Stay 500' below clouds (Ceiling), have 3 mile visibility, Lights for Night, VLOS of Aircraft

Drone Aerial Photography & Videography – Cold Weather Flying
Flying Fun, Flying Smart, Flying Safe – Being Prepared

When Was The Last Time You Used Your Equipment?
Is Your Equipment, HW, SW, Settings, Aircraft, Tools Ready To Fly?

Equipment
Batteries Charged, Keep Warm
Acclimate Equipment
Review Manufactures Specs
Use of UV/ND Filters or Not
Touch Pen for Touch Screens
Inspect for Cracks or Damage

Gloves (Flip Fingers, Touch Pad Sensitive)
Stylus Touch Pen
Extra Batteries
Pocket Heater

Drone Aerial Photography & Videography – Panoramas
Flying Fun, Flying Smart, Flying Safe – Various Types of Panoramas

- Panoramas (Vertical/tall, horizontal, wide, super wide, 180, 360x360)
  - Manual vs. automated capture
  - Automated in camera vs post production stitching/compositing
- Time-lapse and hyperlapse
  - Stationary, short duration (minutes, hours) vs. longer duration (days, weeks, months)
  - Moving on a line, up or down, orbit or on a pre-determined pattern
  - Manual vs automated including waypoint autonomous missions

Drone Aerial Photography & Videography – Camera Considerations
Flying Fun, Flying Smart, FIying Safe – Frame Size, Resolution, Various Settings

Resolution

UHD 4K 3840 x 2160

4K 4096 x 2160

2720 x 1530

2.7K

1920 x 1080
FHD 1080p
720p

16:9   4:3   3:2   1:1

Aspect Ratios

For Still Cameras
**MP (Megapixels)
4, 8, 16, 20, 40, 48**

For Still & Video
**RAW/DNG/Flat vs JPG
Cine/True Color/Log
Exposure Settings
ISO (Lower vs Higher)
Frame Rate/FPS
White Balance
Sharpness, Contrast
Saturation**

Drone Aerial Photography & Videography – Camera Settings
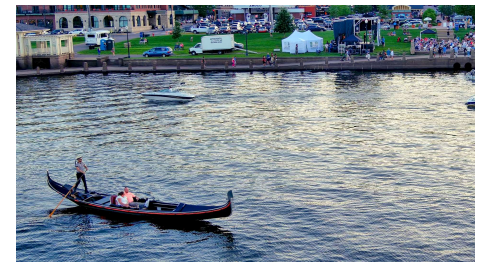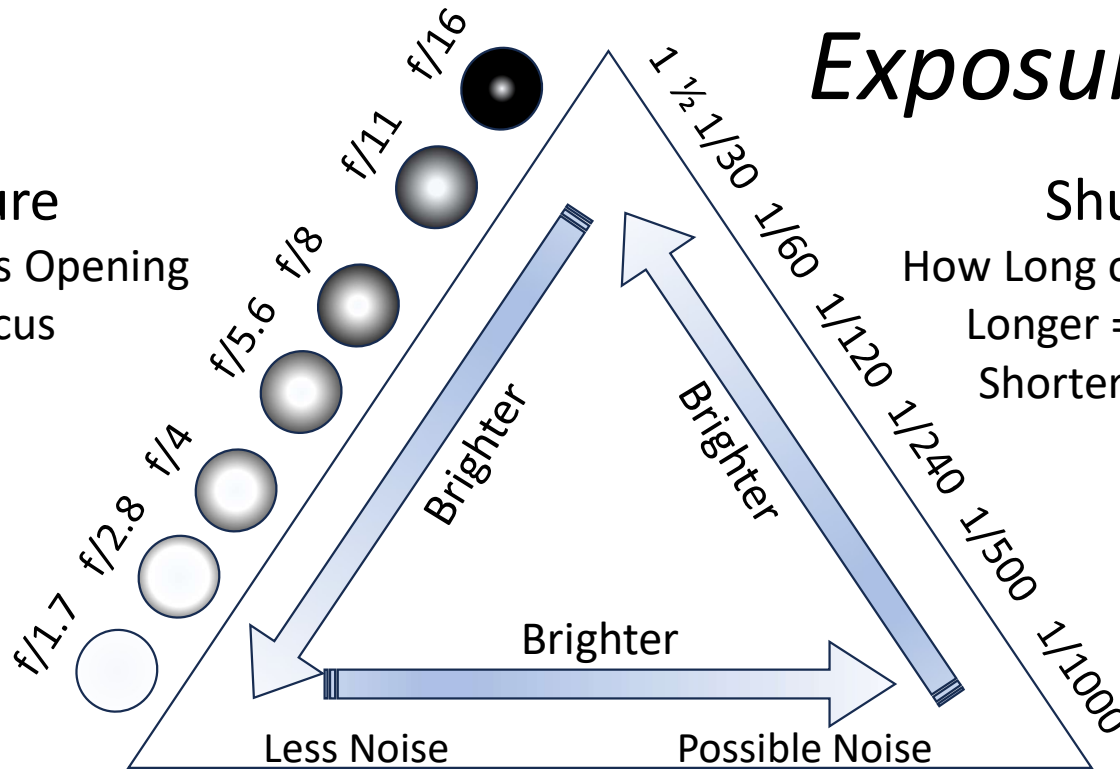## Flying Fun, Flying Smart, Flying Safe – Exposure Triangle (ISO, Shutter, Aperture)

Exposure Triangle

Aperture
f/stop, Iris, Lens Opening
Background Focus
Depth of Field
And Light

f/16   f/11   f/8   f/5.6   f/4   f/2.8   f/1.7

1 ½ 1/30 1/60 1/120 1/240 1/500 1/1000

Shutter Speed
How Long of Exposure In Seconds
Longer = More Light & Motion
Shorter = Less Light & Motion

Brighter

Brighter

Brighter

Less Noise   Possible Noise

X	X	X	X	X	X	X
100	200	400	800	1600	3200	6400

ISO (Sensitivity To Light)

Drone Aerial Photography & Videography – Camera Settings
Flying Fun, Flying Smart, Flying Safe – Various Options

Besides exposure (ISO, Aperture, Shutter, EV):

- Focus (AF, AFC, Infinity, Manual)
- White Balance (WB) Auto or Manual
- Contrast, Sharpness, Saturation, Style settings
- Raw, JPG, Raw+JPG, Camera Raw (not common on lower end)
- Frame size (1:1, 3:2, 4:3, 16:9, etc.)
- Camera selection (if available)
- Enable grid views, peaking, histogram on display
- Special modes:
  - "Night" mode, toggle between RGB & Thermal (if available)
  - Single shot, burst, timelapse/hyperlapse, AEB/Bracketed
  - Panoramas (wide, tall, 360, in camera stich or manual)
  - Some drones have a virtual tri-pod/dual stability mode
  - Tracking, Point of Interest (POI), Spotlight, Orbit

Note: Some cameras & drones have global settings, others are per camera, some are common for photo and video.

Note: Keep Camera Sensor size in perspective e.g. ½", 1", 1/1.3", 4/3. Also keep FOV and lens equivalent in mind.

Drone Aerial Photography & Videography – Camera Settings
Flying Fun, Flying Smart, Flying Safe – Various Options

Besides exposure (ISO, Aperture, Shutter, EV):

- Video encoding (MP4, MOV, Prores, HEVC/H.265, H.264)
- Resolution 1K, 2.7K, 4K, 6K, 8K, 10K
- Eight bit or Ten bit HDR
- Frame Rate (24/24/29.9/30/48/50/59.9/60/120 fps)
- Video mode Normal, Log, Dlog, Hlog among others
- Display option to show natural vs. flat on screen for log
- Missions using waypoint for repetitive autonomous flights
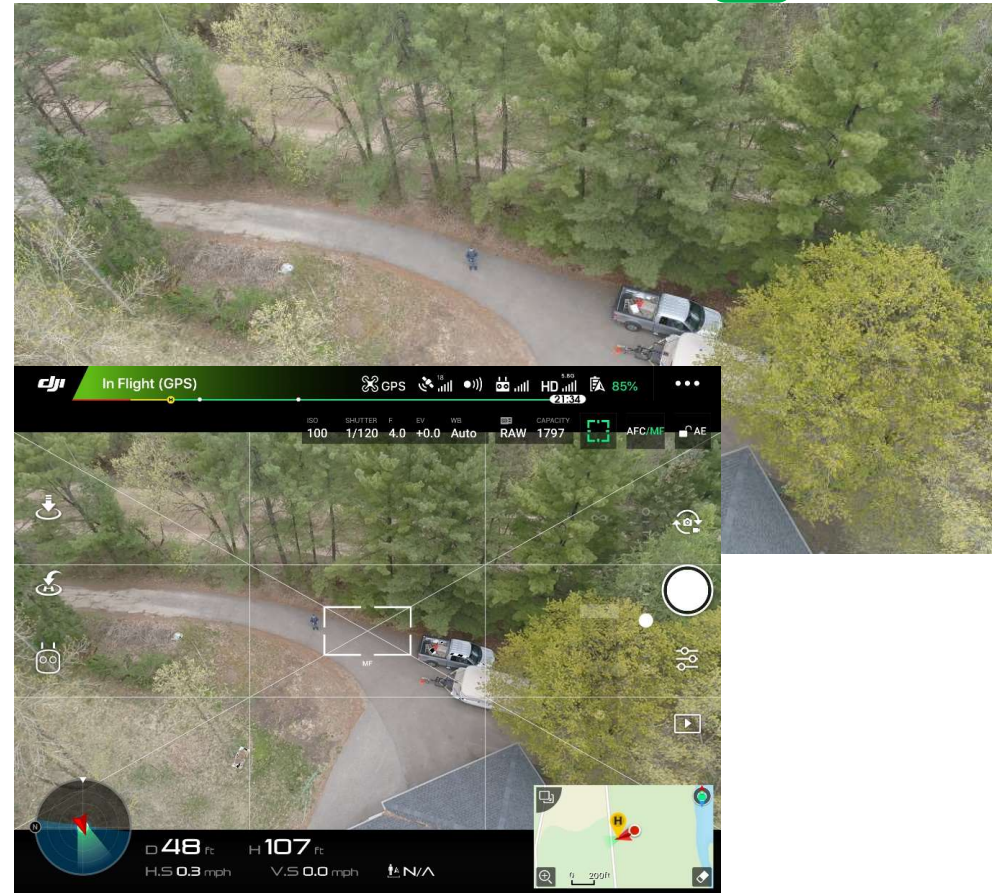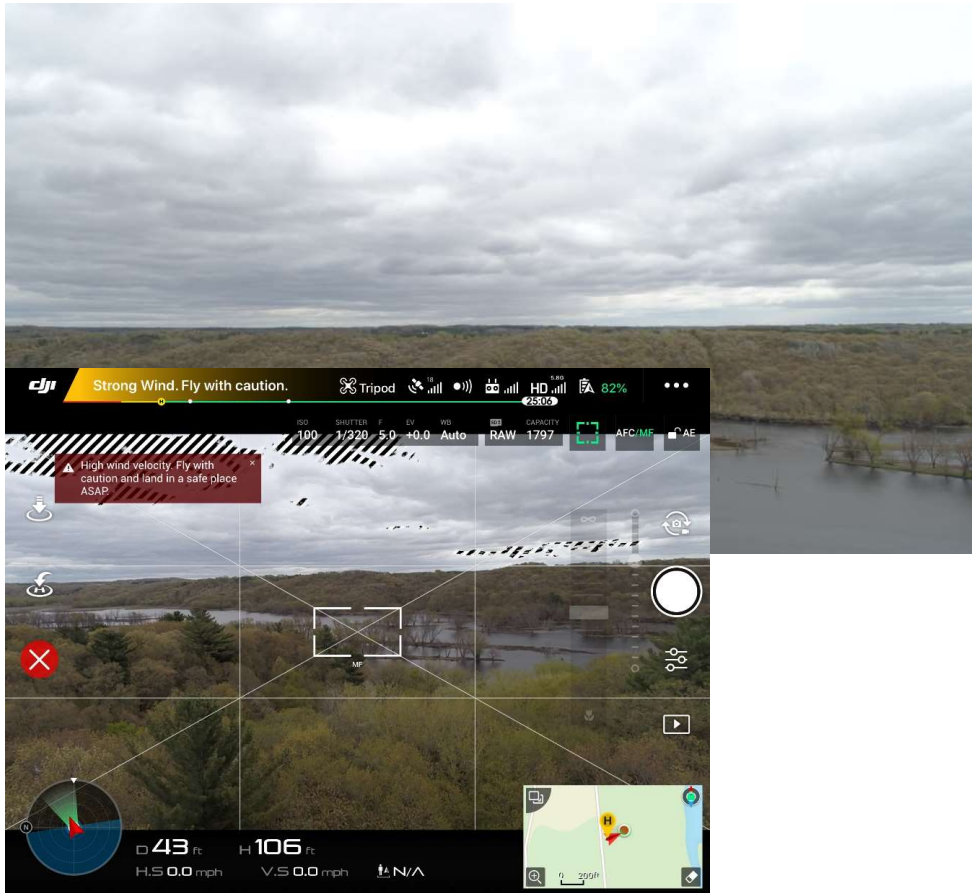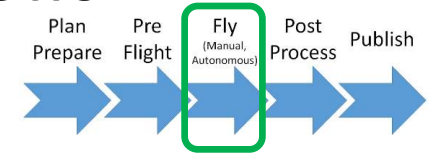- Many other options vary by make, model, price

Reminder: Higher resolution and frame rates need faster MicroSD cards (e.g. U3/V3 or faster) not just more capacity.

Note: Some Drones have LUTs or color mgmt. plugins for color correction.

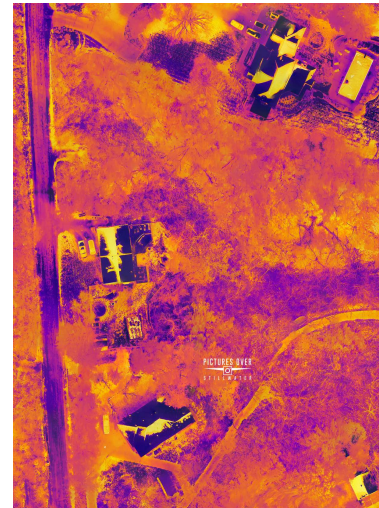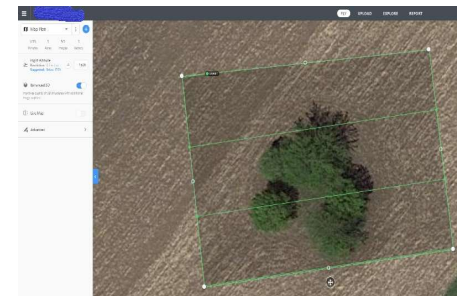# Drone Aerial Photography & Videography – Work Flows
Flying Fun, Flying Smart, Flying Safe – In Flight

Drone Aerial Photogrammetry – Mapping and Imaging
Flying Fun, Flying Smart, Flying Safe – Creating 2D, 3D, Maps and Models

- Inspection, survey, image, mapping, model, construction, mining, agriculture, real estate
- Sensors and cameras (RGB, IR/FLIR, Radiometric, LIDAR, NDVI)
- Models, maps, volumes, progress reports
- 2D, 3D, surface, elevation, vegetation, cut & fill
- Flight planning and mission software (autonomous flights)
  (DJI, Litchi, DroneDeploy, Pix4D, Autel and others)
- Post processing software (DroneDeploy, Pix4D, WebODM, Agisoft Metashape)

Drone Aerial Photography & Videography – Data Storage Topics
Flying Fun, Flying Smart, Flying Safe – How and Where Will You Store Your Images

- Device Storage (Camera and Sensor) e.g. SD/MicroSD among others

  o Look beyond just capacity and cost

  (Speed of SD/MicroSD cards, USB-B vs. USB-C)

  Lossless vs. Lossy compression, space savings

- Post processing? Local or via cloud?

- Local storage (SSD or HDD, USB, NVMe, SATA, NAS)

- Cloud storage? How will you get TBs to cloud?

- Where backup, protect, archive your data to?

- Where will you store your finished photos and videos? What format?

  o YouTube, Vimeo, Facebook, Instagram, Website, MLS or elsewhere?
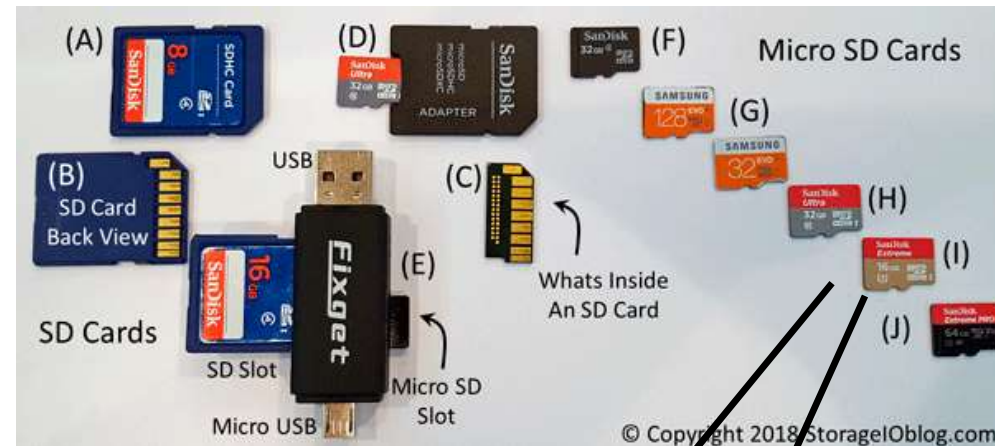
SD/Micro SD = Form factor
A2 = Application Speed = 4K R, 2K W Iops – 10MB/s
SD = <=2G, SDHC = <=32G SDXC = <=2TB
Class 10 = 10MB/s writes

$U3$ = UHS 30MB/s

$U1$ = UHS 10MB/s

V_{90}	90MB/s	8K
V_{60}	60MB/s	4K
V_{30}	30MB/s	4K
V_{10}	10MB/s	HD
V_{6}	6MB/s	SD

Drone Basics Beginner – Links, Where To Learn More
Flying Fun, Flying Smart, Flying Safe – Various Resources With More Information

Some Drone Sites and Resources

- Federal Aviation Administration (FAA) Drone sites Faa.gov/uas & faasafety.gov
- Drone registration for Hobby (> .55lbs) and part 107 (anything under 55 lbs) https://faadronezone.faa.gov/#/ (Watch out for fake or over priced sites)
- Rec/hobby 44809 TRUST test (online, its free, follow the links) https://www.faa.gov/uas/recreational_fliers/knowledge_test_updates/
- B4UFLY (FAA Free App, Info, LAANC authorizations) - faa.gov/uas/getting_started/b4ufly
- DJI Virtual Flight Simulator (Free) - dji.com/downloads/djiapp/dji-virtual-flight
- MnDoT Aviation (Commercial Drone License & Registration dot.state.mn.us/aero/drones
- Facebook: The Mighty Drones – FPV Drone Racing facebook.com/groups/themightydrones
- Facebook: MN sUAS facebook.com/groups/1860070477555048
- Pictures Over Stillwater https://PicturesOverStillwater.com/links facebook.com/PicturesOverStillwater Instagram.com/PicturesOverStillwater

Drone Basics Beginner – Links, Where To Learn More
Flying Fun, Flying Smart, Flying Safe – Various Resources With More Information

Some Recommended Tools/Apps/Links:
- ✓ B4UFly and UAV Forecast and FAA Visualize It
- ✓ Aloft App (Air Control) – LAANC
- ✓ FAA TFR Map - tfr.faa.gov/tfr2/list.html
- ✓ FAA The Recreational UAS Test (Trust)
- ✓ Skyvector.com & vfrmap.com
- ✓ https://faadronezone-access.faa.gov/#/
- ✓ https://faasafety.gov
- ✓ View more at PicturesOverStillwater.com/links

ASA 2024 Remote Pilot Test Prep (Via Amazon.com) - https://amzn.to/3yPqPl1

Part 107 Small Unmanned Aircraft Systems (small UAS) Recurrent
https://www.faasafety.gov/gslac/ALC/CourseLanding.aspx?cID=515

Part 107 Small Unmanned Aircraft Systems (small UAS) Initial
https://www.faasafety.gov/gslac/ALC/CourseLanding.aspx?cID=451

Drone Aerial Photography & Videography

Community Education – Fall 2024

Thank You

By Greg Schulz – Pictures Over Stillwater
FAA Part 107 & MnDoT Aeronautics Licensed Commercial Drone Operator
Professional Photographer, Videographer and FPV - MN FAASTeam Rep DronePro

PicturesOverStillwater.com/links | facebook.com/PicturesOverStillwater
vimeo.com/picturesoverstillwater | twitter.com/POStillwater | Instagram.com/PicturesOverStillwater
picturesoverstillwater.smugmug | youtube.com/@picturesoverstillwater