Applications of Drones in Historic Preservation

Who are we?
Don’t worry, this part is brief
Using drones for ALL THE THINGS
What to buy and how to get flying
And you thought flying was the hard part...

Unmanned Aerial Vehicle (UAV)
Uncrewed Aerial System (UAS)
Radio Controlled
Used in agriculture, construction, surveying, search, and rescue, and many other fields.
Growth in popularity, FAA playing catch-up

Technology and pricing
Highly mobile
Cut down on in-field time
Wide variety of applications
Integration with existing software
Interest is fueling technological advancement.
Photogrammetry is acquiring measurements from 2D pictures.
Structure From Motion (SFM) is the process for rendering 2D pictures into a 3D object.
Not cost-prohibitive for most.
Increasingly accurate.
Polygonal meshes are needed to generate Digital Surface Models (and Digital Elevation Models) that vividly capture entire landscapes and their associated topography, vegetation, geomorphology, and anthropogenic elements.
An orthophoto is an aerial/overhead photograph that has been geometrically corrected or "ortho-rectified" so that the scale is uniform. The photo has the same lack of distortion as a map.

- Increased quality of recording
- Information (over manual drawings)
- Documents texture
Very new!• Can detect features up to 0.5 meters underground• Analysis is done by taking photos at different times of day (heating and cooling of ground impacts radiation)• Experiment with: time of day, height of UAV, sequence of frames, angle of camera
There are different types of drones... What should you look for?

The drone is only an aerial platform! Data acquisition needs to be performed by remote sensors, in this case by digital photographic cameras, i.e. a GoPro.

Factors: weight, memory, batteries, interval of shots

Besides your camera and battery, you need additional accessories for: FLIR, Magnetometry, LiDAR, etc.
Cost: Ranges from $1990 (Educational single license), $350/month or $3500/year (Pix4Dmapper Pro), to $8700 (perpetual license)

Cost: $59 (standard educational license) to $3499 (Professional stand-alone license)

Pilot Requirements
- Must have Remote Pilot Airman Certificate
- Must be 16 years old
- Must pass TSA vetting

Aircraft Requirements
- Unless exclusively operated in compliance with Section 336 of Public Law 112-95 (Special Rule for Model Aircraft), the aircraft must be registered if over 0.55 lbs.
- Must be less than 55 lbs.
- Must undergo pre-flight check to ensure safety for sub-operation

Location Requirements
- 5 miles from airports without prior notification to airport and air traffic control

Operating Rules
- Must ALWAYS yield right of way to manned aircraft
- Must keep the aircraft in sight (visual line-of-sight)
- Must fly under 400 feet
- Must fly during the day
- Must fly at or below 100 mph
- Must yield right of way to manned aircraft
- Must NOT fly over people
- Must NOT fly from a moving vehicle

Example Applications
- Educational or recreational flying only
- Flying for commercial use (e.g. providing aerial surveying or photography services)
- Flying in an emergency, during search and rescue operations or real estate photography

Legal or Regulatory Basis
- Public Law 112-95, Section 336 – Special Rule for Model Aircraft
There is a series of regulatory steps that any operator will have to take to fly commercially or for academic research. Study time, practice tests, cost.

The FAA is not likely to give up much jurisdiction over the greater U.S. airspace, even if it is above tribal lands, especially for flights at higher altitudes. However, it is possible that Tribes can realize sovereign control over low flying flights over tribal lands or issue regulations for such flights over tribal lands, that are consistent with FAA standards.

While the issue of Native American nation’s airspace is largely unlitigated in American courts, Native American nations have asserted authority over their own airspace and federal courts have upheld the rights of communities with authority than the federal government to create their own restrictions.

Several Tribes have asserted the right to sole control over their airspace. The Constitution of the Citizen Potawatomi Nation includes, “all waters and air space within the Indian country … over which the Citizen Potawatomi Nation has authority.”

The FAA asserts it is the one with exclusive right to determine flights. “A tribe has no authority over airspace and cannot charge people for using it. The federal government has sole jurisdiction over the nation’s airspace,” said FAA spokesman Ian Gregor. However, the Supreme Court has stated that “a hallmark of Indian sovereignty is the power to exclude non-Indians from Indian lands.”

Beginning in the 2013 legislative session, state lawmakers have frequently considered many pieces of legislation addressing UAS. To learn more about state UAS laws, bills and resolutions, please follow the link covering measures from a specific session below.

Wisconsin:

Flying related activities, including but not limited to, hang gliding, parasailing, hot air ballooning, land sailing, flying model airplanes or sky diving on state parks, state recreation areas, state natural areas, Kettle Moraine and Point Beach state forests and Lower Wisconsin state riverway shall be restricted to areas posted for their use.