



Investigating Nocturnal UAS Flights in an Applied Context to Prevent Gulls from Nesting on Rooftops

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Evaluating UAS technology for wildlife hazard management

- Outlined in USDA APHIS WS/FAA Interagency agreement
- Provide information on efficacy of UAS for wildlife hazing
- Selection criteria for UAS for monitoring wildlife

Linking Anti-predator Theory to UAS approach



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Predator-Induced Parental Neglect in a Ring-Billed Gull Colony

Author(s): John T. Emlen, Don E. Miller, Roger M. Evans and David

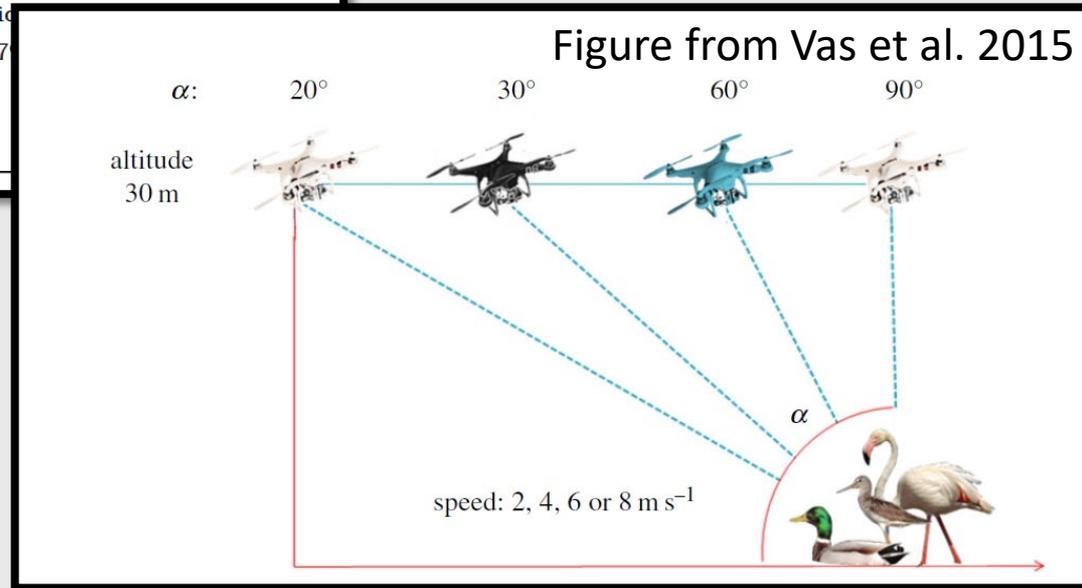
Source: *The Auk*, Oct., 1966, Vol. 83, No. 4 (Oct., 1966), pp. 677-678

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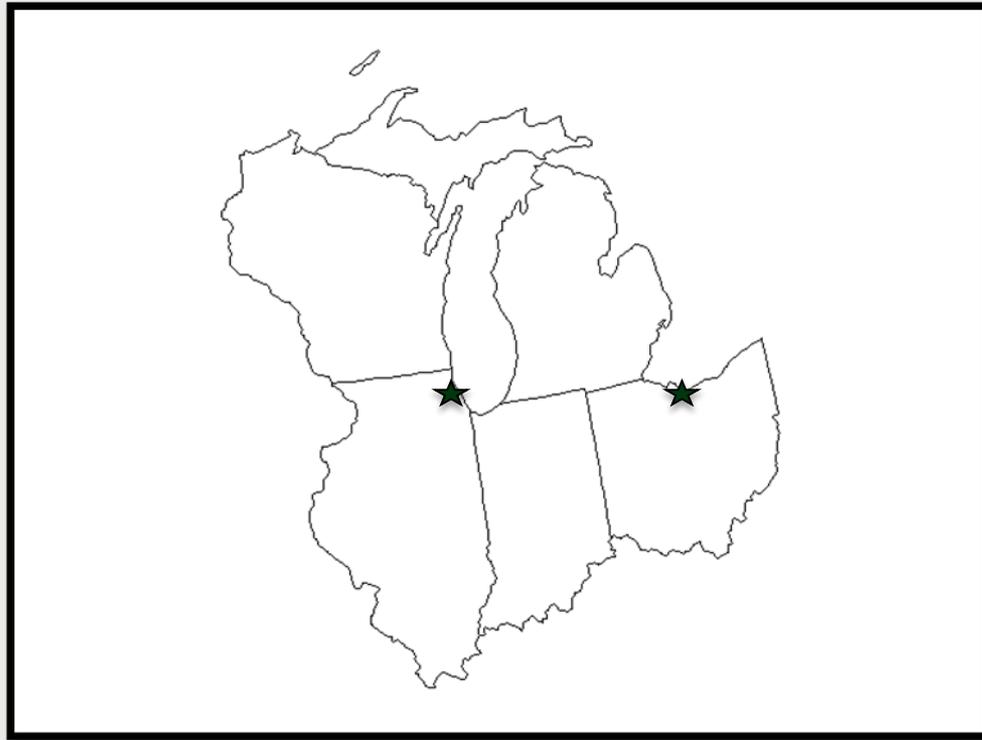
We hypothesized that nocturnal targeted UAS operation might induce nesting colony desertion. This action might reduce strike risk.

Figure from Vas et al. 2015



Methods: Study locations

1. Cedar Point Amusement Park in Sandusky, OH
2. Frain Industries building in Chicago, IL
3. Harbor locks in Chicago, IL (no UAS flights)



Methods: Study locations

- Cedar Point Amusement Park in Sandusky, OH



Methods: Study locations

- Frain Industries building in Chicago, IL



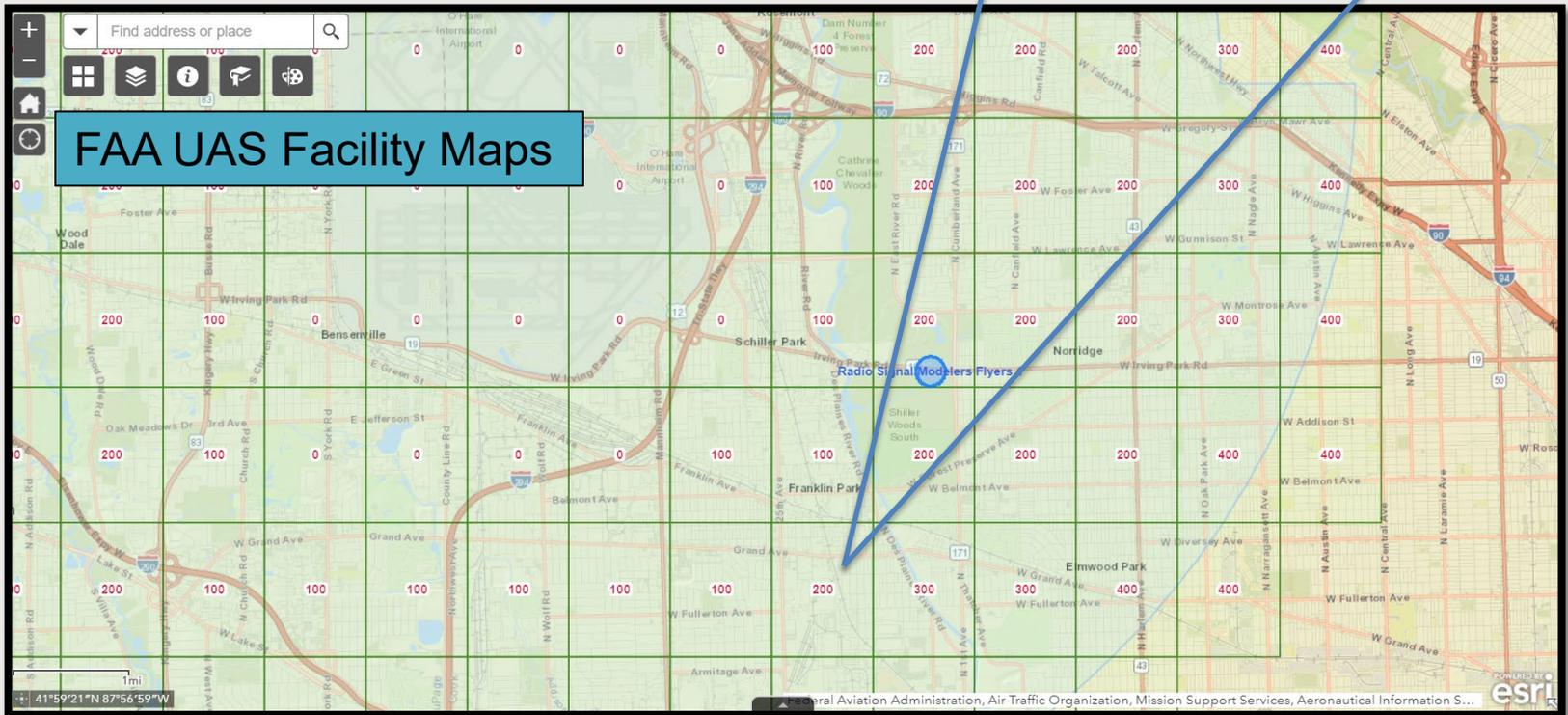
Methods: Study locations

- Harbor Lock in Chicago, IL



Methods: Airspace

	Cedar Point	Frain Industries
Airspace	Class G	Class B



Methods: Study locations



14 CFR 107.41 Wide Area Airspace Authorization
FAA Form 7711-1 2021-P107-CSA-05238

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DEPARTMENT OF TRANSPORTATION FEDERAL AVIATION ADMINISTRATION	
CERTIFICATE OF WAIVER OR AUTHORIZATION	
ISSUED TO	POC PHONE NUMBER
USDA-APHIS-Wildlife Services	419-202-3501
ATTN: Morgan Drabik-Hamshare	
This certificate is issued for the operations specifically described hereinafter. No person shall conduct any operation pursuant to the authority of this certificate except in accordance with the standard and special provisions contained in this certificate, and such other requirements of the Federal Aviation Regulations not specifically waived by this certificate.	
OPERATIONS AUTHORIZED	
Operations under this certificate of authorization are limited to the maximum altitude listed below. This altitude is an absolute value and it shall not be added to the height of any structures.	
Class of Airspace: B	
At or Below: Altitudes in accordance with the published UAS Facility Map (UASFM)	
Under the Jurisdiction of: Chicago O'Hare International Airport Air Traffic Control Tower (ORD ATCT)	
Airport Identifier: KORD	

Methods: Gull Breeding Phenology

March 2021

	1 <u>HERG present</u>	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25 <u>HERG present</u>	26	27
28	29	30 <u>RBGU Nest building</u>	31			

April 2021

				1 <u>Cedar Point 1st egg</u>	2	3
4 <u>RBGU Eggs</u>	5	6	7	8 <u>RBGU nest building</u>	9	10
11	12	13	14	15 <u>RBGU 1st egg</u>	16 <u>HERG nest building</u>	17
18	19	20	21	22	23 <u>HERG egg</u>	24
25	26	27	28	29	30	

Methods: Study Timing

March 2021

	1	2	3	4	5	6
7	8	9	10	11	12	13
14 Cedar Point	15 Cedar Point	16 Cedar Point	17 Cedar Point	18 Cedar Point	19 Cedar Point	20 Cedar Point
21 Cedar Point	22 Cedar Point	23 Cedar Point	24 Cedar Point	25 Cedar Point	26 Cedar Point	27 Cedar Point
28 Frain	29 Frain	30 Frain	31 Frain			

April 2021

				1 Frain	2 Frain	3 Frain
4 Frain	5 Frain	6 Frain	7 Frain	8 Frain	9 Frain	10 Frain
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

Methods: Study Protocol

- 10 nights planned over a 14-day period
- At least 1 UAS flight per hour from 20:00h to 01:00h
- No precipitation. Wind gusts and mean wind speed < 36 kph
- 15-minute flights

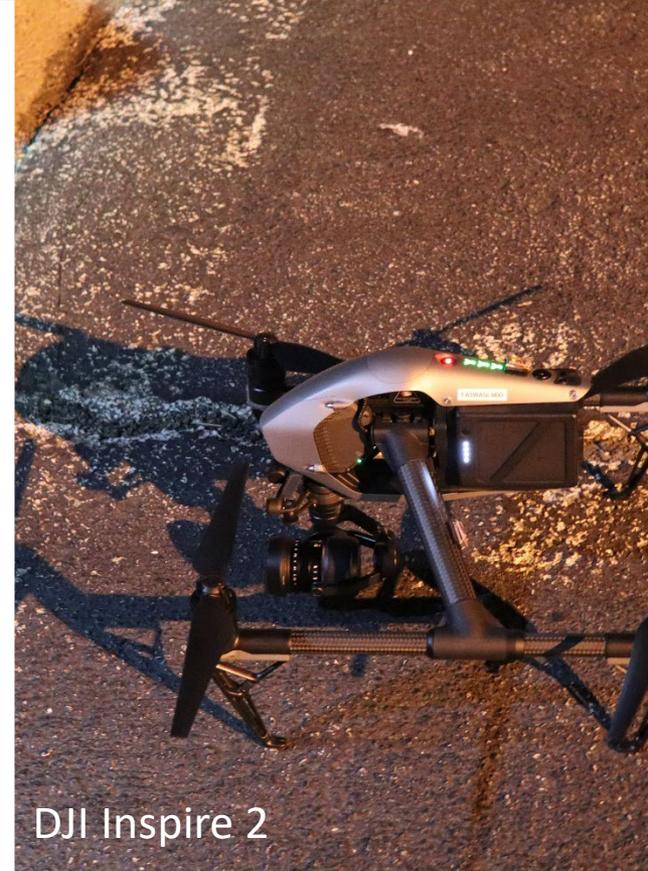




DJI Phantom 4 Pro



3DR Solo



DJI Inspire 2

Methods: UAS

Methods: Study Protocol

- Pilot-in-command would climb to the vantage point
- UAS was launched from the ground
- Environmental variables: wind speed, direction, temperature, and cloud cover
- Response: Gull remaining index and latency to return



Methods: Statistical Analysis

- Temporal Autocorrelation
 - Gull remaining index
 - Latency to return
- Gull nesting numbers



Able to fly 57% of nights for Cedar Point and 43% for Frain Industries

March 2021

	1	2	3	4	5	6
7	8	9	10	11	12	13
14 Cedar Point	15 Cedar Point	16 Cedar Point	17 Cedar Point	18 Cedar Point	19 Cedar Point	20 Cedar Point
21 Cedar Point	22 Cedar Point	23 Cedar Point	24 Cedar Point	25 Cedar Point	26 Cedar Point	27 Cedar Point
28 Frain	29 Frain	30 Frain	31 Frain			

April 2021

				1 Frain Cedar Point egg	2 Frain	3 Frain
4 Frain	5 Frain	6 Frain	7 Frain	8 Frain	9 Frain	10 Frain
11	12	13	14	15	16 Frain egg	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

Wind and precipitation kept us grounded

- Mean wind speed = 25 kph
- Mean wind gusts = 52 kph
- Three days with over 10 mm of precipitation
- One day of sub-freezing temperatures



Gulls present on roofs only 16% of flights

- Range: 1-130 individual gulls
- Most gulls flushed within the first flight of the night and did not come back until the morning
 - Only 1 flight did not disperse all gulls (before = 17, after = 1)
- 2 nights gulls returned
 - March 17
 - Latency to return = 40 minutes
 - March 24
 - Latency to return = 52 minutes
 - Latency to return = 89 minutes



Moved 130 gulls to the adjacent roof



UAS Mishap



No significant reduction in nest numbers

- No reduction in number of nests at colonies monitored
 - 2020/2021 seasons
 - Paired t-test
 - $P = 0.10$
- Unable to analyze data on gull remaining index or latency to return
- Not statistically significant
 - What is biologically or economically meaningful?

Discussion

- Small sample size
- Feasibility
 - High winds and high probability of precipitation
- Effort of disturbance
 - How far into the nesting season to fly?
- Strike risk
 - Will the nesting colony be pushed far enough away?

Management Implications

- UAS has potential
 - Beyond-line-of-sight
- Costs and benefits to be weighed
- Relates back to strike risk?



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