

Effects of Drone Size and Speed of Approach on Territorial Red-winged Blackbird Antipredator Behavior

TAYLOR M. ALIFERIS, NDSU BIOLOGICAL SCIENCES

PAGE E. KLUG, USDA-APHIS-WS-NWRC



Blackbirds Damage Sunflowers

- ND and SD produce ~80% of US crop
- Harvest overlaps with peak depredation
- Annual damage of 8.7%, economic impact of \$18.7 million to ND sunflowers from 2009-2013
- Individual producers can have losses of 20+%



Blackbird (Icteridae) Life History

- Native migratory songbirds
- Continent-wide population declines
 - Increasing in Prairie Pothole Region
- Establish territory and breed over summer
- Enter hyperphagia in fall
 - Large mixed-species flocks



Three Species Do Most Depredation



Red-winged blackbird
(*Agelaius phoeniceus*)



Common grackle
(*Quiscalus quiscula*)



Yellow-headed blackbird
(*Xanthocephalus xanthocephalus*)

Drones are a potential hazing tool

- Wildlife monitoring tools
 - Less disturbing to animals
- Hazing wildlife
- Birds are particularly sensitive



PHANTOM 4
ADVANCED

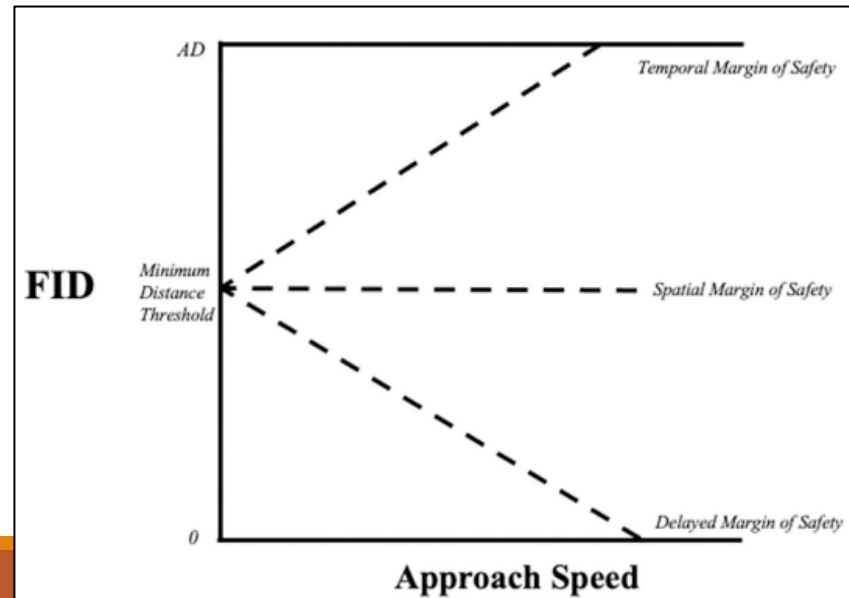
Taking Advantage of Antipredator Behavior

- Antipredator behavior
 - Perceive threat
 - Perform response
- What makes an object a threat?
- Can we make an object more threatening?
- Flight Initiation Distance (FID)
 - Higher = more threatening



My Research Questions

- Which drone sizes and speeds are most distressing to blackbirds?
 - Are larger and faster drones better?
 - Different theories for response to speed
- Do individual blackbirds and flocks respond similarly?



Breeding Season Treatments

- 3 drone platforms
 - a. Mavic Air 2 - small
 - b. Inspire 1 - medium
 - c. Agras MG-1P - large
- Speeds of approach
 - 1.68 – 8.05 m/s
- Perching male red-winged blackbirds, May - July

a. 183×253×77 mm

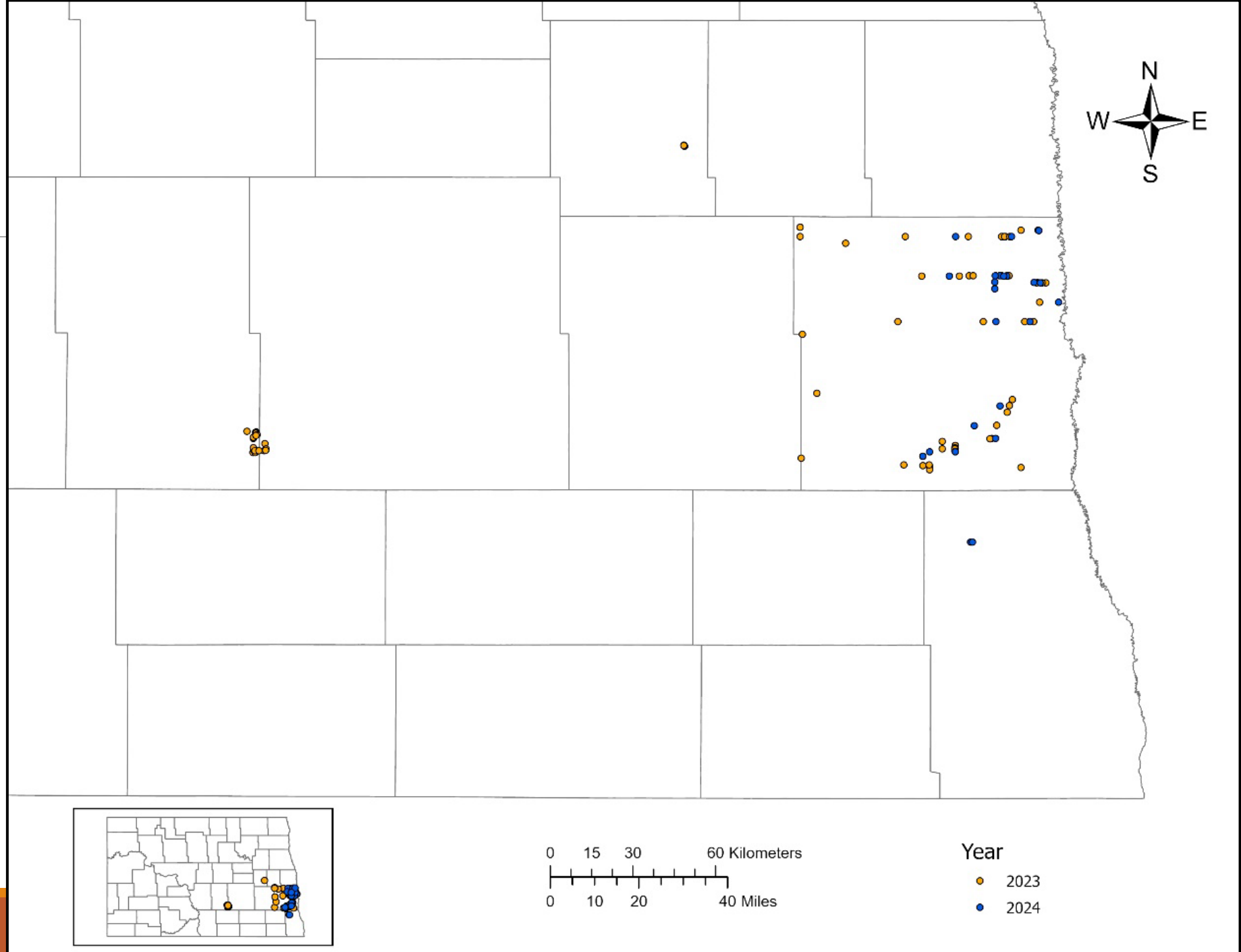


b. 438×451×301 mm



c. 1460×1460×578 mm



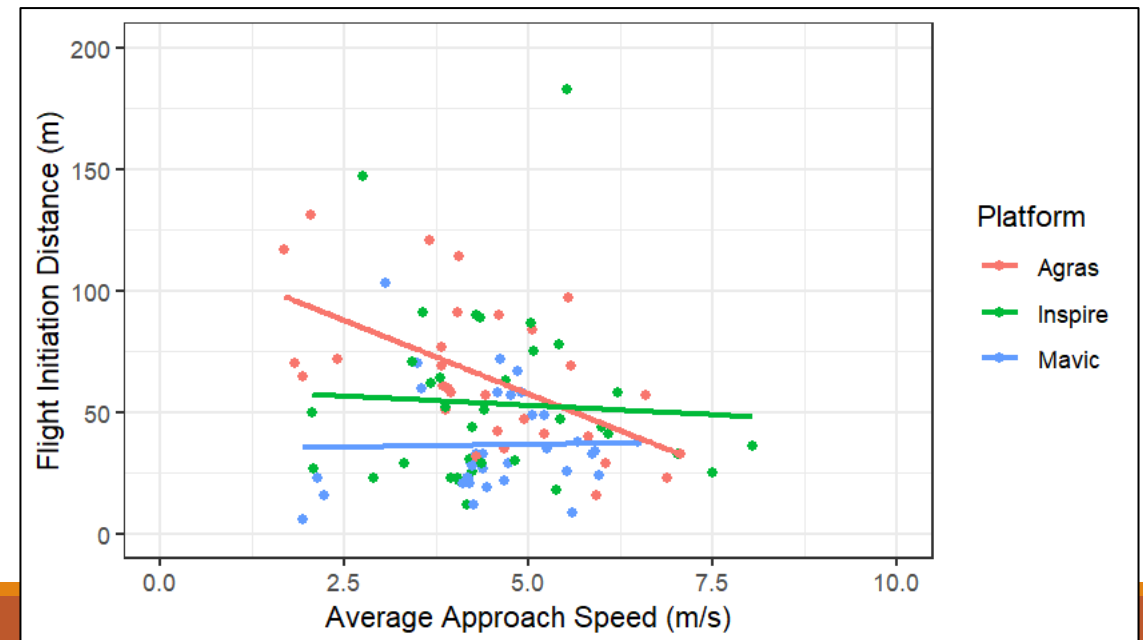
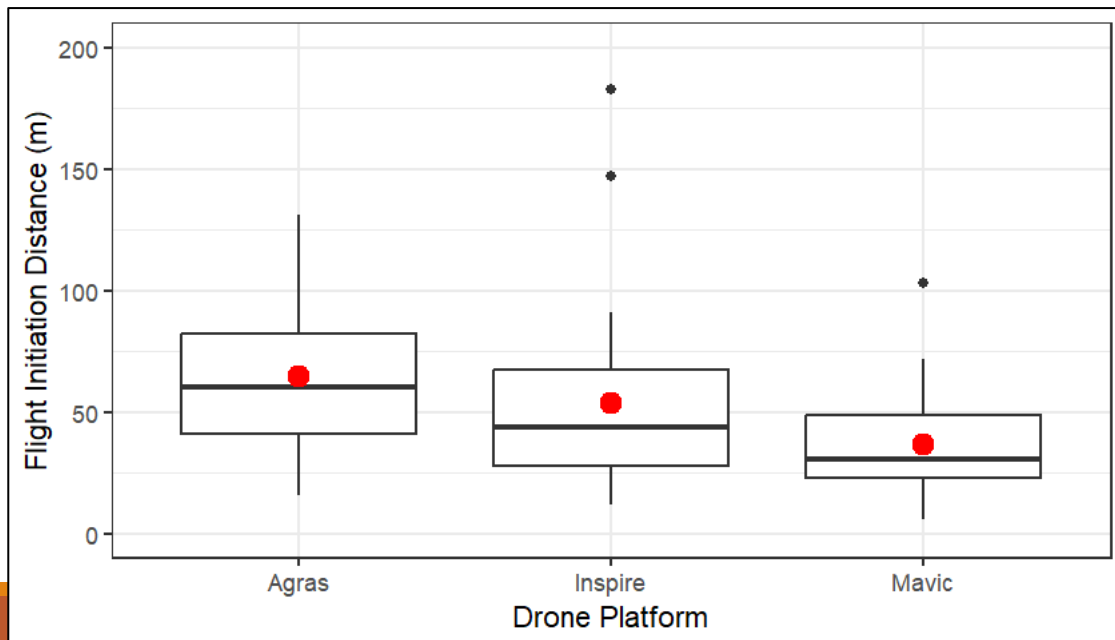


Breeding Season Trial Procedures

- Locate red-winged blackbird, set up blind at least 100 m away
 - Set up GoPro on spotting scope inside blind
 - Set up drone behind blind
- Fly the drone directly at the perching bird
 - GoPro records when the bird takes flight
- Land drone, wait up to 10 minutes for bird to return to perch
- Record perch and environmental data
- Trials conducted on the same day were at least 300 m away or obscured by topography

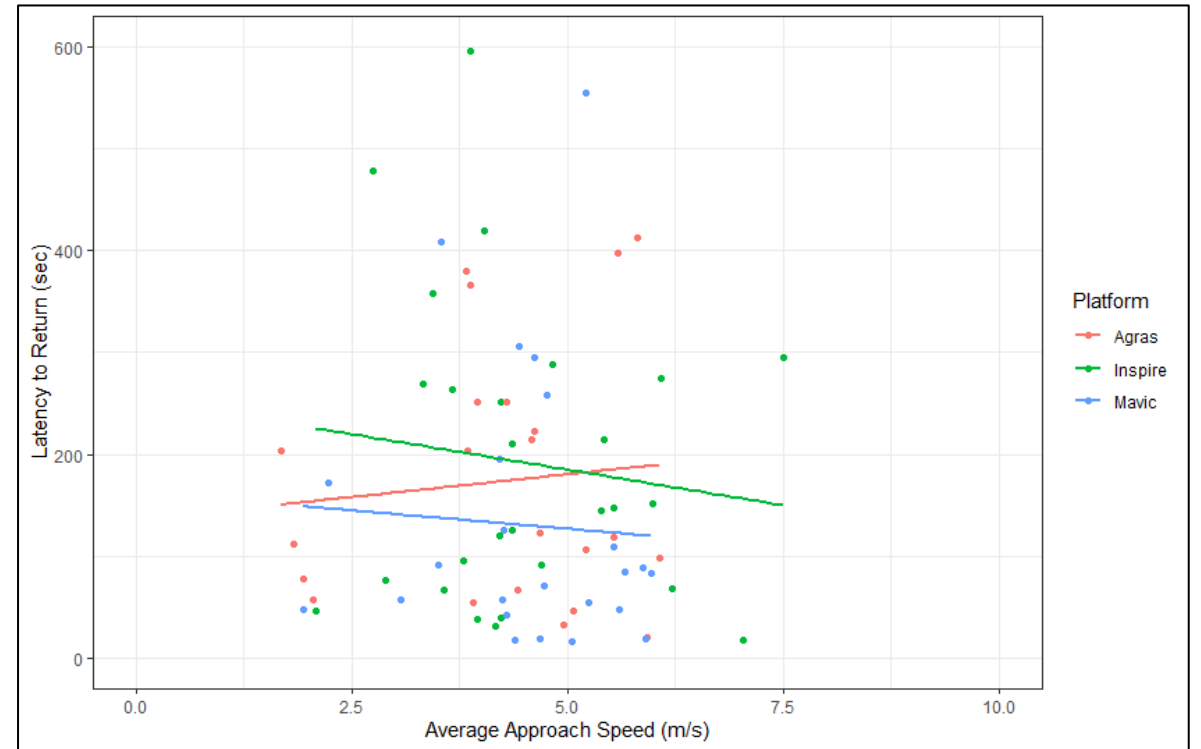
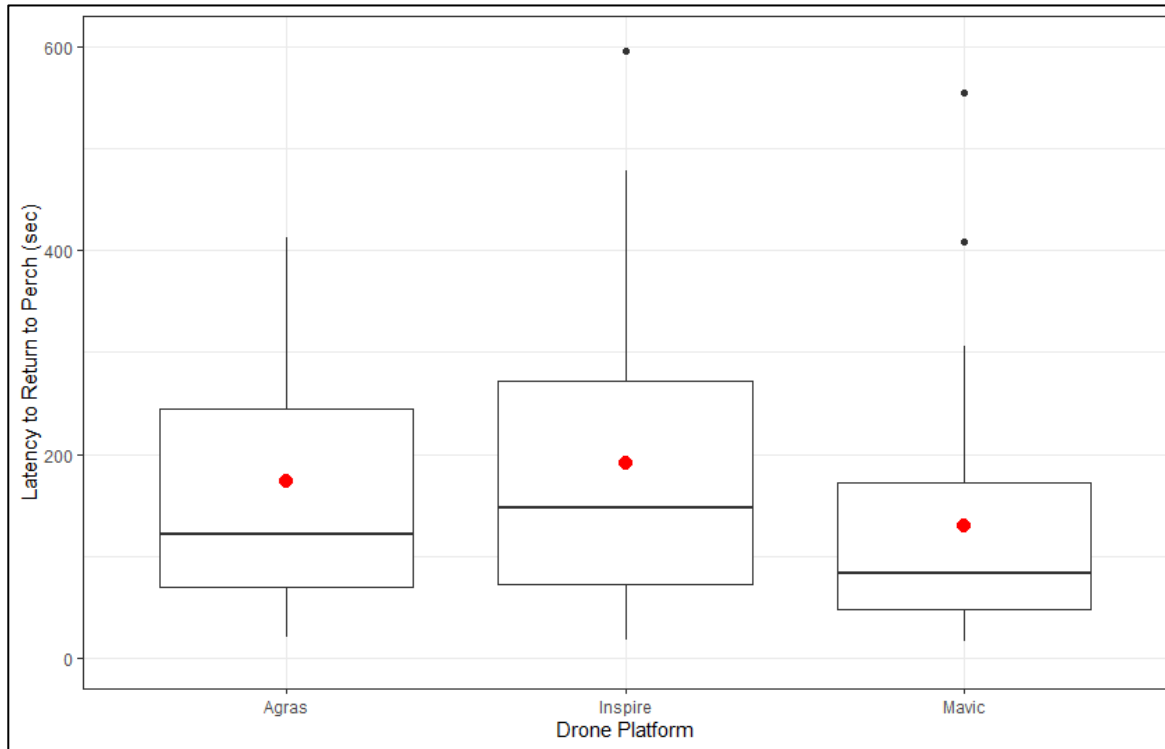
Flight Initiation Distance Results

- Drone size and speed were significant, as well as the interaction between them
 - Agras-Mavic and Inspire-Mavic significant, Agras-Inspire not significant
 - Speed significant only for Agras
 - Starting distance also significant



Latency to Return Results

- Neither size nor speed were significant



Breeding Season Discussion

- Agras (large) and Inspire (medium) were equally threatening
- Mavic (small) was less threatening
- Speed only had an effect with the Agras, and higher speeds had lower FIDs
 - Delayed margin of safety
- Blackbirds returned around the same time regardless of drone size or speed

Flocking Season Treatments

- 3 drone platforms
 - a. Mavic Air 2 - small
 - b. Inspire 1 - medium
 - c. Agras MG-1P - large
- 2 speeds of approach
 - 5 m/s
 - 10 m/s
- Blackbird flocks depredating sunflower fields, August - October

a. 183×253×77 mm



b. 438×451×301 mm



c. 1460×1460×578 mm

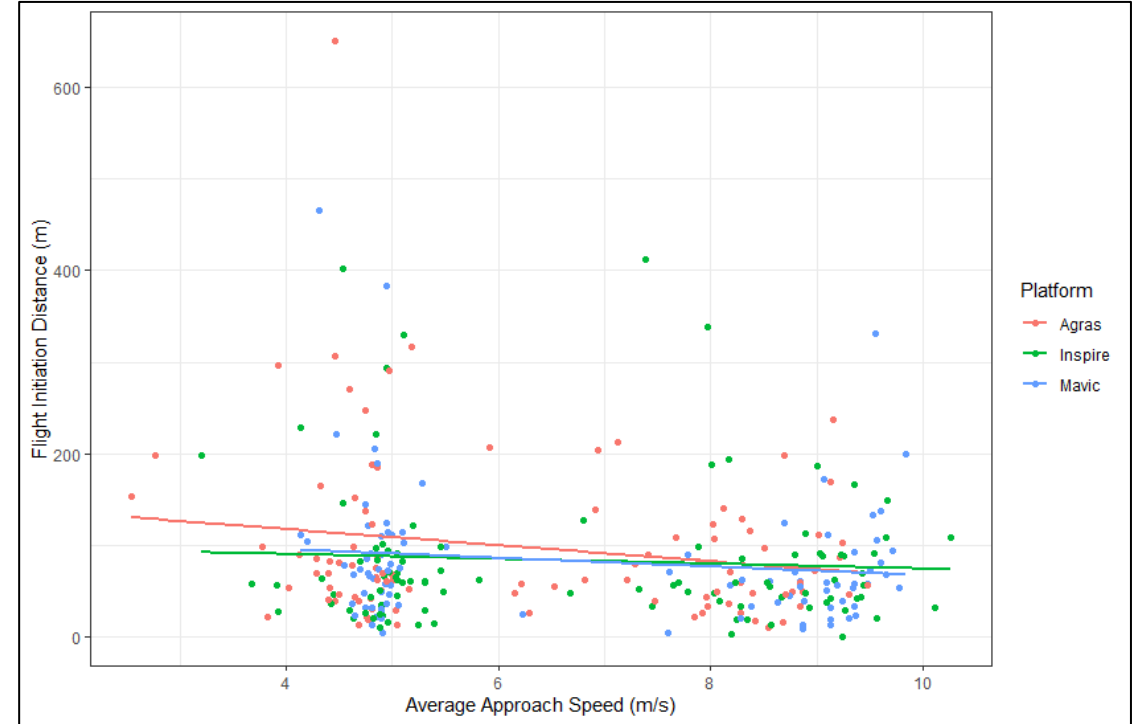
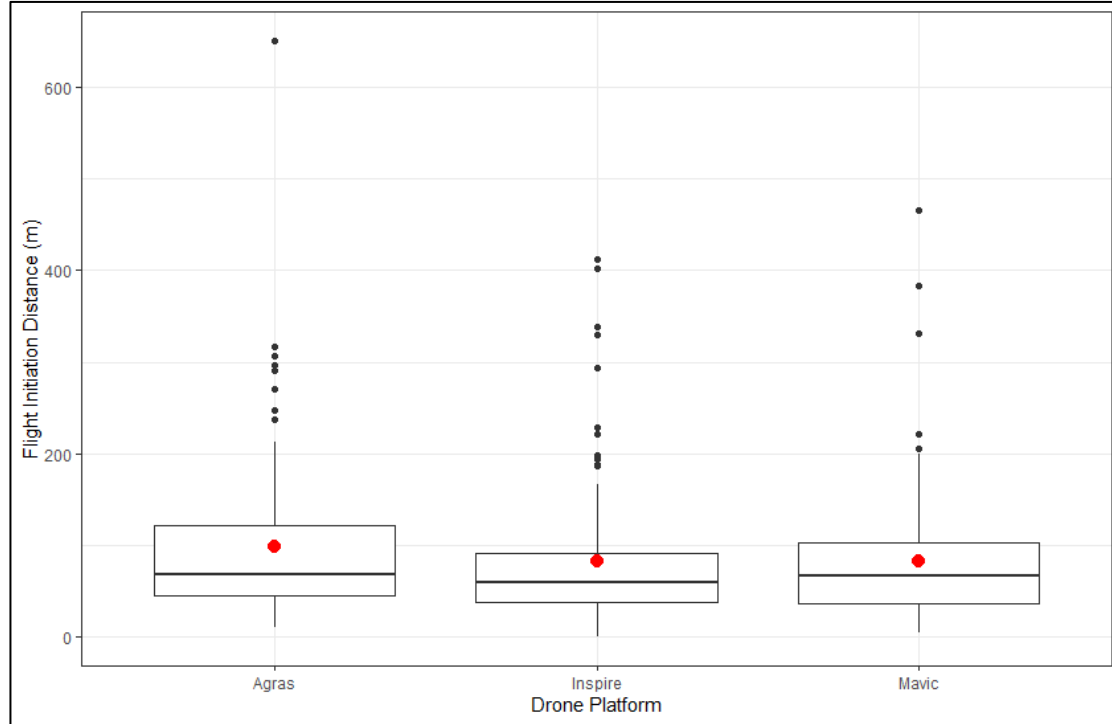


Flocking Season Trial Procedures

- Locate blackbird flock in sunflower field
- Record flock and environmental data
- Fly treatment drone directly at flock
 - Use rangefinder binoculars and compass to calculate flock location
 - Record time flock initiates flight
 - Repeat with all drone treatments

Preliminary Flock FID Results

- Neither size nor speed are significant



Preliminary Flock Discussion

- Unlike breeding season, no differences in blackbird response based on drone size or speed
- Possible explanations
 - Hormonal changes – less territorial
 - Flock vs individual behavioral differences
- Data processing and analysis still in progress!

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Questions?

