USDA
United States Department of Agriculture

The Immediate Spillover Delay Effects of Wildlife-Aircraft Collisions

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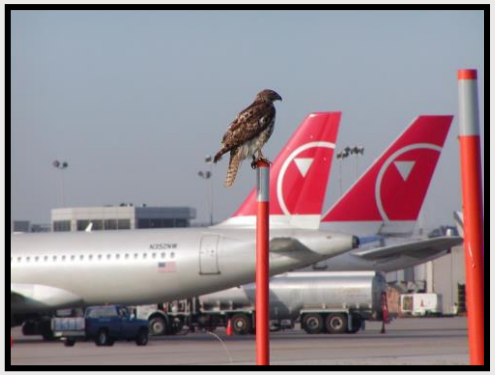
Introductions

United States Department of Agriculture (USDA)

- Animal and Plant Health Inspection Service (APHIS)
  - Wildlife Services (WS)
    - Airport Wildlife Hazards Program
      National Coordinator: Mike Begier
    - National Wildlife Research Center (NWRC)
      - Economics Project
        Project Leader: Dr. Stephanie Shwiff
      - Ohio Field Station
        Station & Project Leader: Dr. Bradley Blackwell



Why manage wildlife hazards at airports?


Air Force Boeing E-3 crash that claimed 24 lives on Sept. 22, 1995.

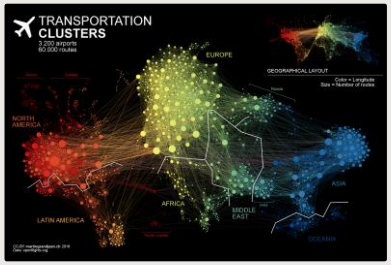

On November 17, 2012, a Cessna Citation II struck a deer during landing rollout.


US Airways Flight 1549 "Miracle on the Hudson" incident on January 15, 2009.

Spirit Airlines flight ingests a bald eagle into an engine on October 2, 2021.

Protect human lives.
Protect aircraft.

What else?



Promote network efficiency.

Who cares about cancellations & delay?

- Passengers
- Airlines
- The FAA & BTS

Total Cost of Delay in the U.S. (dollars, billion)

	2016	2017	2018	2019
Airlines	5.6	6.4	7.7	8.3
Passengers	13.3	14.8	16.4	18.1
Lost Demand	1.8	2.0	2.2	2.4
Indirect	3.0	3.4	3.9	4.2
Total	**23.7**	**26.6**	**30.2**	**33.0**

SOURCE: FAA APO-100 "Cost of Delay Estimates" 2019.

Promotion of network efficiency as one of the many benefits of management.

This work is both completed and ongoing…

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Spillover delay effects of damaging wildlife strike events at U.S. airports

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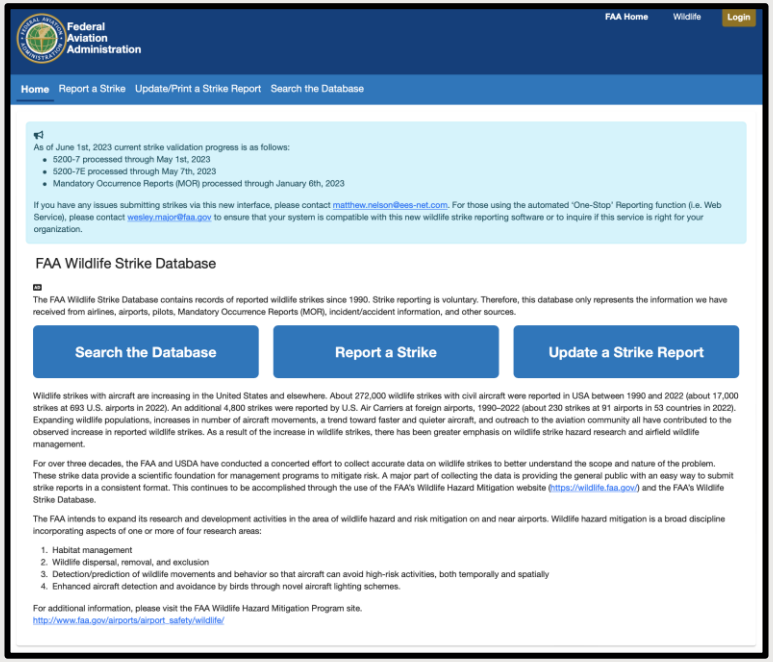
ABSTRACT

In this paper, we investigate the spillover departure delay effects of damaging wildlife strike events that occur to commercial passenger airlines on flights scheduled to depart in the 24 h following a damaging wildlife strike event. Employing multiple empirical approaches, and investigating various differential effects, we identify significant excess departure delays in the 24-hour post-strike period. Our results suggest that the spillover delay effects of wildlife strike events are largely contained within the airline to which the strike occurred. The estimated effects are particularly large—5.4 to 8.3 times higher than expectation—for immediate within-airline, same-leg flights. Further, the behavior of the estimated spillover delay effects also depend on whether a strike flight's destination airport is an airline hub or not. Our estimated average treatment effects indicate that, during the 24-hour post-strike period, the average damaging wildlife strike event generates a minimum of 570 aircraft minutes and roughly 40,000 passenger minutes of within-airline excess departure delay. From this, we estimate that damaging wildlife strike events generate around $25 million (2020 U.S. $) in spillover delay costs each year—an external cost borne by *airlines*, *passengers*, and the *economy at large*.

How could we measure spillover effects?

Data Sources:

- Wildlife strikes com from *National Wildlife Strike Database* (FAA & USDA)
- Flight-level performance data come from *Airline On-Time Detailed Arrival & Departure Statistics* (BTS)
- Hourly weather data come from *Visual Crossing*.



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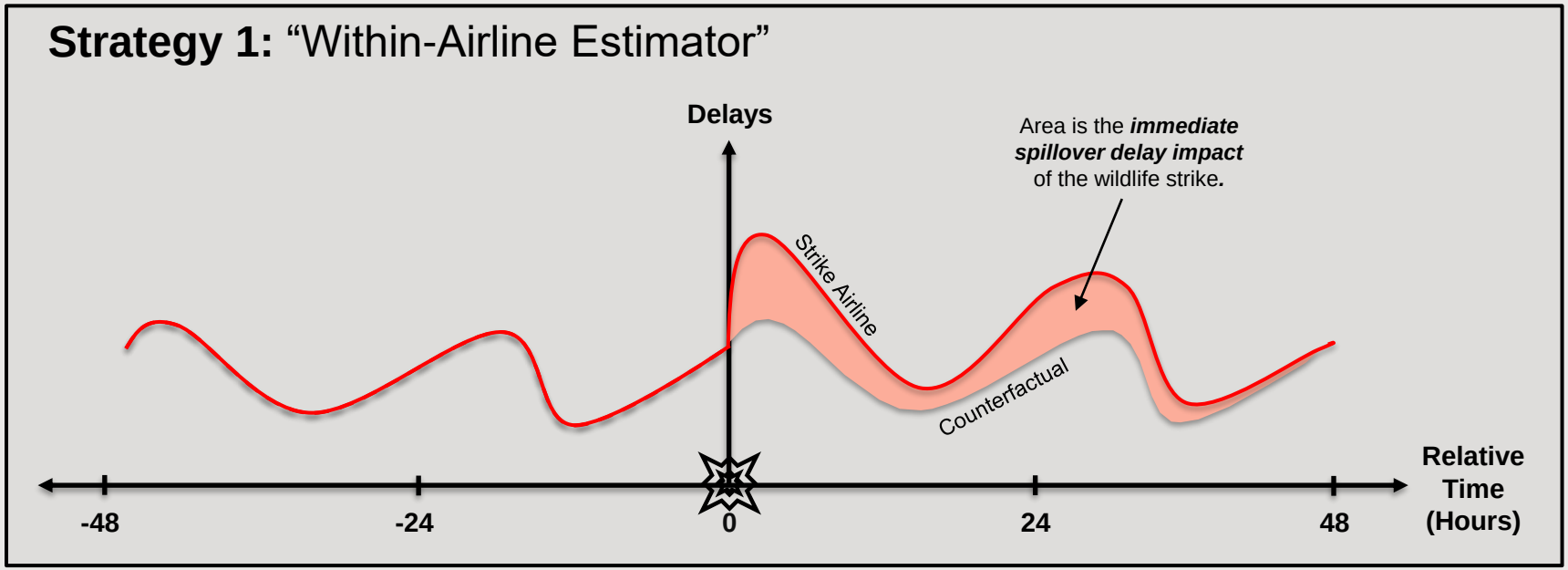

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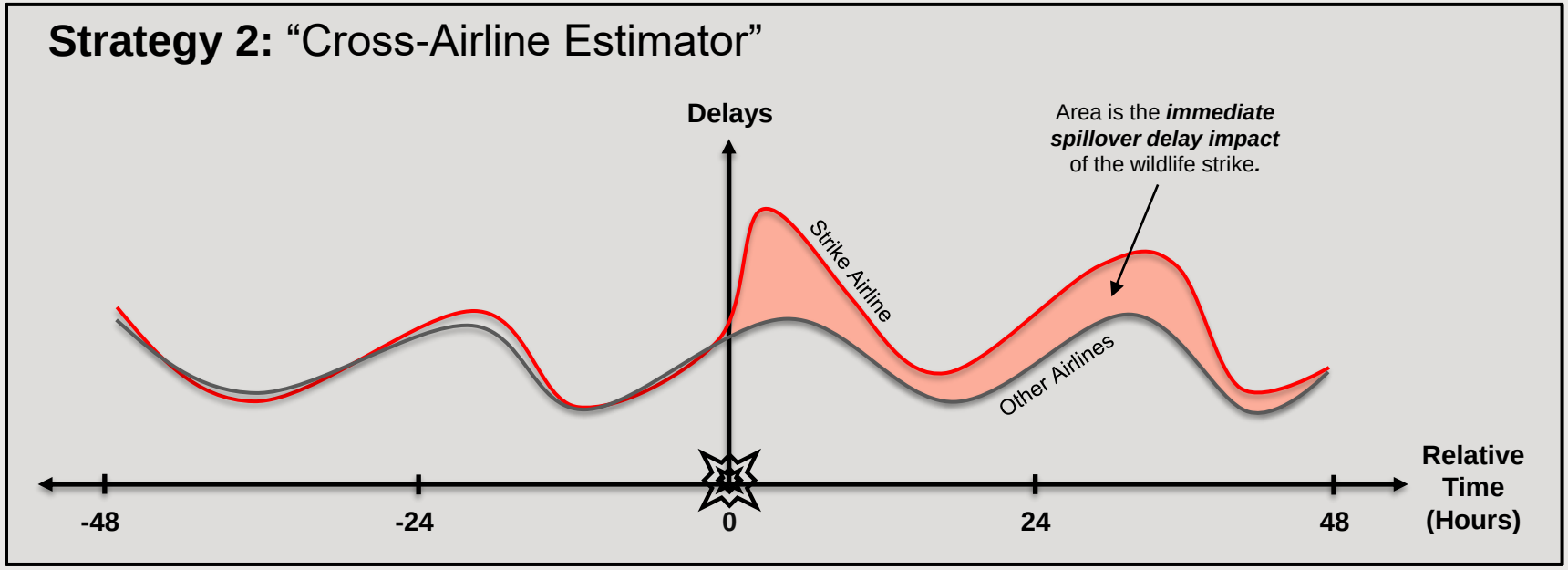
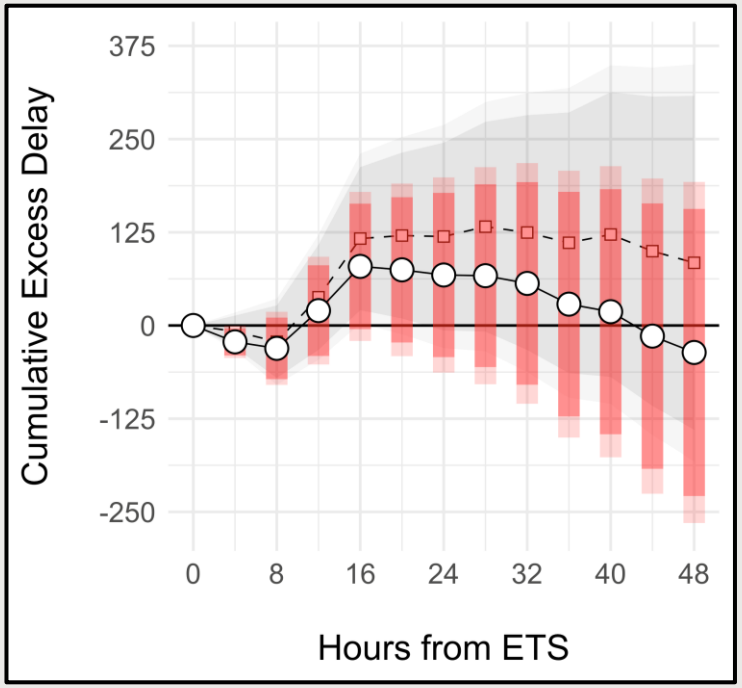
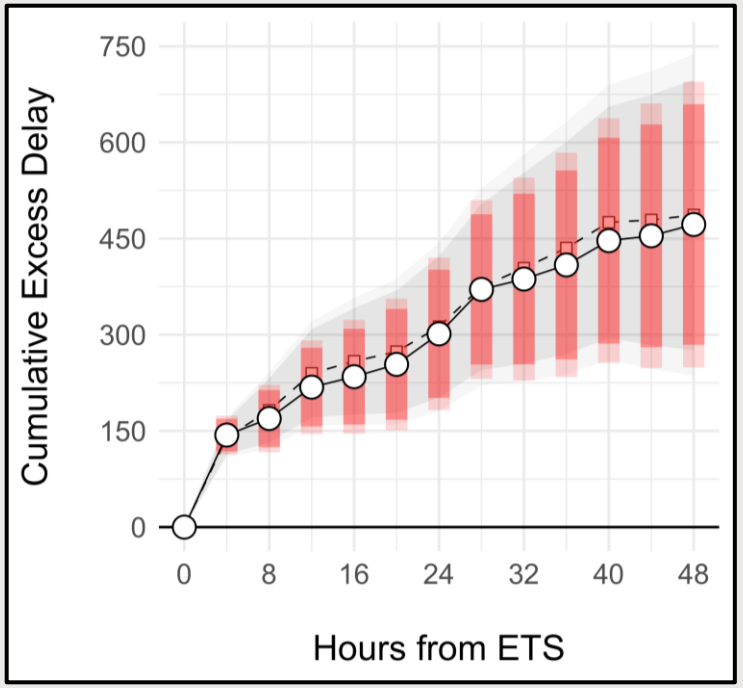


What have we found?

Non-Damaging Arrival Strikes



Damaging Arrival Strikes



What have we found?

Total Delays (Minutes) Surrounding the Average Damaging Arrival Strike in Sample

Period	48-Hours Pre-Strike	48-Hours Post-Strike	Difference	% Change
Other Airlines	395.13	397.42	2.3	**0.58**
Strike Airline	1,297.85	1,751.64	453.8	**34.96**

35% INCREASE in **DELAYS** for strike airline at destination airport in the two days following a damaging arrival strike.

This does not include flight cancellations (COMING SOON)

What do we know so far?

1. Non-damaging strikes do not produce network significant disruptions.
2. Damaging strikes do produce significant network disruptions.
3. Strike-induced network disruptions are contained within the strike airline.
4. The size of the network disruption depends on whether the strike occurred at a "hub" or not.

Damaging Arrival Strikes
35% increase in delays at destination airport alone.

Damaging Departure Strikes
28% increase in delays at destination airport alone.

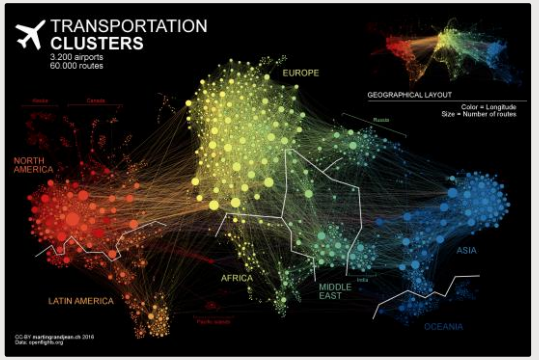
Cost of Spillover Delays
Destination airport delay effects add an additional $25 million in "spillover" costs to U.S. civil aviation each year .

What are the management implications?

1. The management of wildlife hazards can be justified beyond existential risks posed to humans and aircraft.

2. Management should continue to prioritize species that, if struck, have a high likelihood of damage (e.g., body mass and flocking behavior).

3. Through the lens of strike-induced network disruptions, wildlife hazard management produces a *positive externality* (i.e., management at one airport benefits flight efficiency throughout the network).



Questions?

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