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## General Aviation Pilots' Strategies to Mitigate Bird Strikes

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# General Aviation Pilots' Strategies to Mitigate Bird Strikes

**FLAVIO A. C. MENDONCA - Ph.D.**  
**THOMAS Q. CARNEY - Ph.D.**



The background of the slide features several black film strips with white sprocket holes, arranged in a dynamic, overlapping pattern. The strips are set against a clear, bright blue sky with a few wispy white clouds. The overall aesthetic is clean and professional, suggesting a focus on visual media or a structured presentation.

# **OVERVIEW**

**Wildlife Hazards to Aviation**

**Safety Management of Wildlife  
Hazards to Aviation - Pilots**

**Case Study**

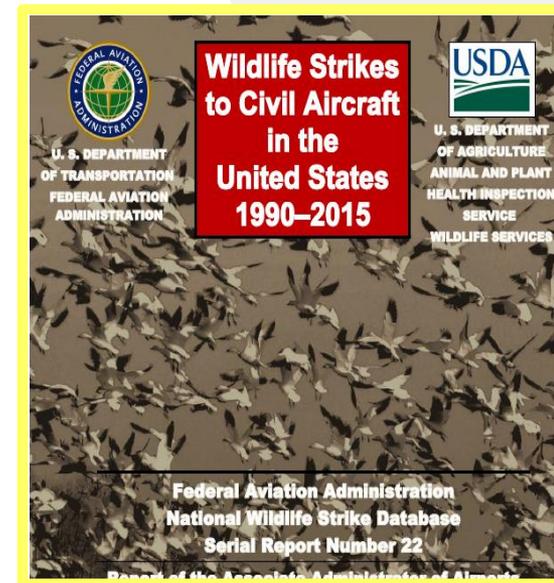


## US Airways Flight 1549

# Safety Management of Wildlife Hazards

✈️ The U.S. Department of Agriculture (USDA) has partnered with the FAA since 1995

- ✈️ USDA has assisted the FAA with production of yearly and special reports on wildlife hazards to aviation:
- ✈️ Develop or enhance existing wildlife hazard management programs (including pilots)
- ✈️ Create refinements in the development and implementation of integrated research and operational efforts to mitigate the risk of bird strikes.



# Safety Management of Wildlife Hazards

## ✈ Some relevant statistics:

✈ 169,856 wildlife strikes

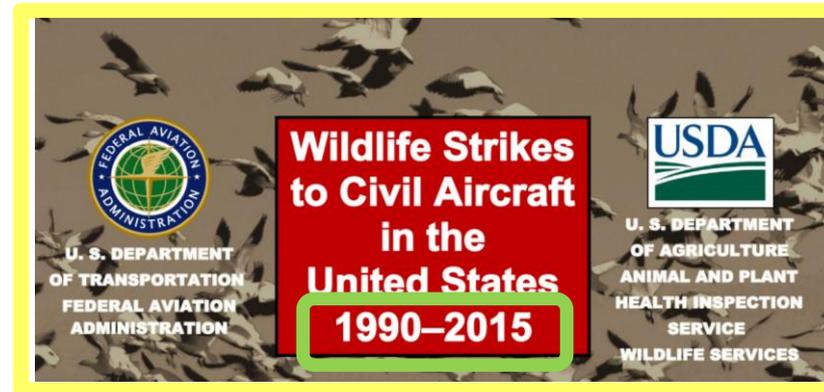
✈ 97% - involved birds

✈ 63% - during the day

✈ 52% of strikes - between July and October

✈ 61% - during the arrival phases of flight

✈ Strikes above 500 feet AGL  Higher probability of damage!



# Safety Management of Wildlife Hazards

## ✈ Findings:

- ✈ 73% (GA) occurred below 500 feet AGL
- ✈ 88% within the airport environment (below 1,500 feet AGL)
- ✈ 97% below 3,500 feet AGL (the Bird Rich Zone)
- ✈ Analyses of data indicate that for GA aircraft the rate of damaging strikes has not declined since 2000
- ✈ The rate of damaging strikes has increased outside the airport environment!



# Safety Management of Wildlife Hazards

- ✈ How can the risk of wildlife strikes be mitigated?
  - ✈ Science and/or Technology
    - ✈ Avian radar
    - ✈ Falconry
    - ✈ Dogs (Border Collies);
    - ✈ Laser...
  - ✈ Certification Standards
  - ✈ Actions by crewmembers

# Aeronautical Decision-Making

✈ Safety risk management (SRM) process:



✈ Hazard identification → First step in the SRM process

✈ Hazard identification processes may include:

- ✈ Aeronautical Information Manual (AIM)
- ✈ Aeronautical Information Publication (AIP)
- ✈ Notice to Airmen (NOTAM)
- ✈ FAA Airport Facility Directory
- ✈ Avian Hazard Advisory System (AHAS)
- ✈ FAA Annual Wildlife Hazard Reports...



## ✈ Safety risk management process – RISK ASSESSMENT

**Risk Assessment Matrix**

Likelihood	Severity			
	Catastrophic	Critical	Marginal	Negligible
Probable	High	High	Serious	
Occasional	High	Serious		
Remote	Serious	Medium		Low
Improbable				

✈ The level of aircraft damage and effects on the flight from wildlife strikes are directly related to the kinetic energy (KE) involved

$$KE = \frac{M \times V^2}{2}$$

M = Bird Mass

V = Speed of Bird Relative to Aircraft

# Safety Management of Wildlife Hazards - Pilots

- ✈ The risk of an engine failure is substantially higher during the departure phases of flight (takeoff/initial climb)
  - ✈ Pilots should use speed and flap settings that provide the best angle of climb ( $V_x$ )!
- ✈ Birds usually exhibit evasive behavior in response to an approaching aircraft
  - ✈ Pilots should use the aircraft external lights (where possible) whenever flying in the bird-rich zone
    - ✈ During the taxi phase of flight, a moving radar unit may enhance escape response by birds.

# Safety Management of Wildlife Hazards - Pilots

- ✈ Birds are more active during dawn and dusk
- ✈ In case of a bird encounter, pilots should pull up, consistent with good flying techniques, to attempt to pass over them
- ✈ If operationally possible, pilots should heat the windshield during preflight preparation
- ✈ Pilots should consider delaying takeoff until birds have been dispersed
- ✈ Report wildlife activities to ATC and other aircraft.

# Safety Management of Wildlife Hazards – Case Study

- ✈ On March 4, 2008, about 1515 central standard time, a Cessna 500, N113SH, entered a steep descent and crashed about 2 minutes after takeoff from Wiley Post Airport (PWA) in Oklahoma City
- ✈ The pilot, the second pilot, and the three passengers were killed
- ✈ The airplane was destroyed by impact forces and post-crash fire.

# Safety Management of Wildlife Hazards – Case Study

- ✈ Probable cause → airplane wing-structure damage sustained during impact with one or more large birds, which resulted in a loss of control of the airplane
- ✈ The FAA Airport Facilities Directory entry for PWA included the remark, “Flocks of birds on [and in the vicinity of] the airport in ... all quadrants”.
- ✈ The Bird Avoidance Model (BAM) indicated a medium-risk of bird strikes in the PWA area...



**American White Pelicans**

# AVIAN HAZARD ADVISORY SYSTEM (AHAS)



SELECT AREA TYPE BELOW

- Visual Routes
- Instrument Routes
- Slow Routes
- Airfields
- ICAO
- MOAs
- Ranges
- Alert Areas
- Air Force Units
- Other Units



SELECT AREA AND DATE FORMAT

Select a Flying Area

Select Month  Select Day  Select Z Hour

SELECT CONTENT DISPLAY

Show Chart

AHAS users online = 130

[Printer Friendly](#)

AHAS RISK FOR WILEY POST 12 HOUR LOOKUP

USE THE AHAS RISK FIELD TO DETERMINE RISK

WILEY POST					
SEGMENT	DateTime	NEXRAD	BASED ON	HEIGHT (Ft AGL)	AHAS RISK
WILEY POST	2018/03/1 20:42Z	LOW	NEXRAD	NA	low
WILEY POST					
SEGMENT	DateTime	NEXRAD	BASED ON	HEIGHT (Ft AGL)	AHAS RISK
WILEY POST	2018/03/1 21:42Z	LOW	BAM	NA	moderate
WILEY POST					
SEGMENT	DateTime	NEXRAD	BASED ON	HEIGHT (Ft AGL)	AHAS RISK
WILEY POST	2018/03/1 22:00Z	NA	BAM	NA	moderate
WILEY POST					
SEGMENT	DateTime	NEXRAD	BASED ON	HEIGHT (Ft AGL)	AHAS RISK
WILEY POST	2018/03/1 23:00Z	NA	BAM	NA	moderate

# Safety Management of Wildlife Hazards – Case Study

- ✈ The pilot held an ATP certificate with a rating for airplane multi-engine land and type ratings for the CE-500 (Cessna 500), Cessna CE-650 (Citation III), and Learjet airplanes;
  - ✈ 6,100 total flight hours
    - ✈ 5,000 pilot-in-command hours
    - ✈ 668 hours in turbine-powered airplanes.
- ✈ The second pilot held a commercial pilot certificate for airplane single-engine and multi-engine land and instrument airplane
  - ✈ 1,378 total flight hours
    - ✈ 1,245 pilot-in-command hours
    - ✈ 78 hours second-in-command time in turbine-powered airplanes.

# Safety Management of Wildlife Hazards – Case Study

- ✈ The flight was cleared for takeoff from runway 17L
  - ✈ The flight crew's departure clearance was to turn right to a heading of 200° and maintain an initial altitude of 3,000 feet above mean sea level (MSL)
  - ✈ Approximately thirty seconds later, the flight crew reported they were level at 3,000 feet MSL
  - ✈ The aircraft was headed south-southwest at approximately 200 knots when its flight track intersected the flight track of primary returns
  - ✈ The aircraft entered a rapid descent and crashed

# Safety Management of Wildlife Hazards – Case Study



# Safety Management of Wildlife Hazards – Case Study

- ✈ Did the pilots know about the risk of bird strikes at PWA airport, at that time of year, and altitude?
  - ✈ If not, why not?
- ✈ If they knew that information, did they have the technical knowledge and skills to mitigate the risk of an accident due to birds?
  - ✈ In hindsight, it is reasonable to postulate that with adequate planning and actions by the flight crew, the risk of this deadly aircraft accident due to impacts with birds could have been mitigated.



# Safety Management of Wildlife Strikes to Aviation - Conclusions

✈️ Several factors influence the risk of an accident due to a bird strike, including actions by crewmembers

✈️ Pilots should:

- ✈️ Integrate risk management into flight planning for all phases of flight
- ✈️ Reduce flight time and/or airspeed when flying through the bird-rich zone
- ✈️ Use aircraft external lights while flying in the bird-rich zone to enhance the escape behavior of certain species of birds.



# Questions



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**Thank you!**



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