



*MITIGATING BIRD STRIKE RISK*

# Investigate or Litigate

**USA Birdstrike Conference, August 2018**

**Phil Shaw & Jeff McKee**



# International Society of Air Safety Investigators

## Certificate of Membership

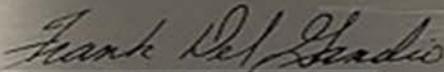
INCORPORATED  AUGUST 31, 1964

AVISURE CPO282

*Is a Corporate Member of*  
**THE INTERNATIONAL SOCIETY OF AIR SAFETY INVESTIGATORS**

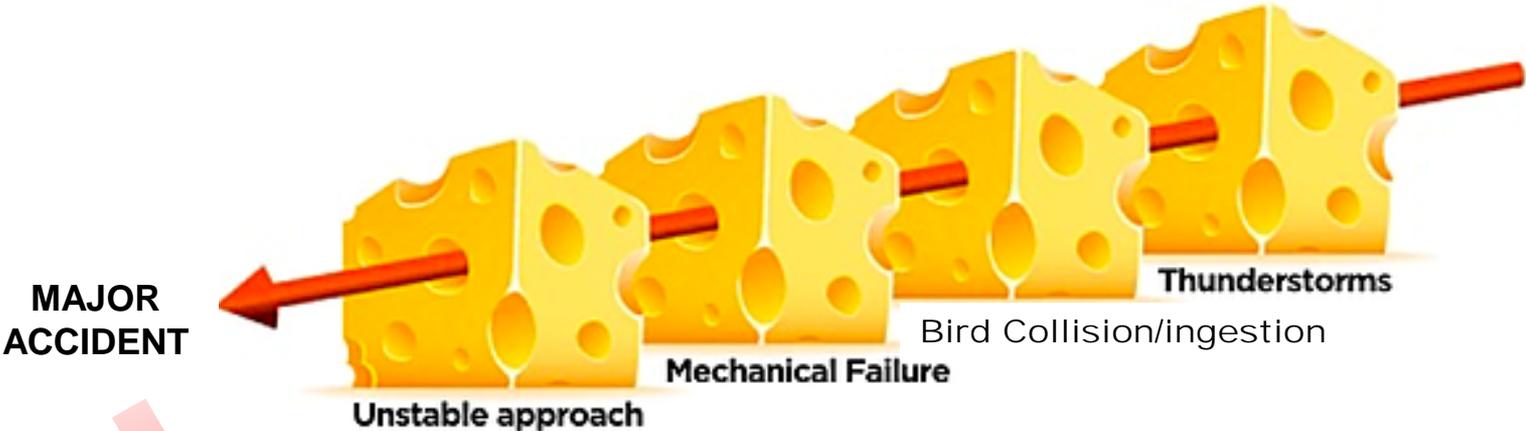
*which is dedicated to  
"promote that part of the aeronautical endeavor  
wherein lies the moral obligation of the Air  
Safety Investigator to the public."*

JUNE 16, 2009  
DATE

  
PRESIDENT

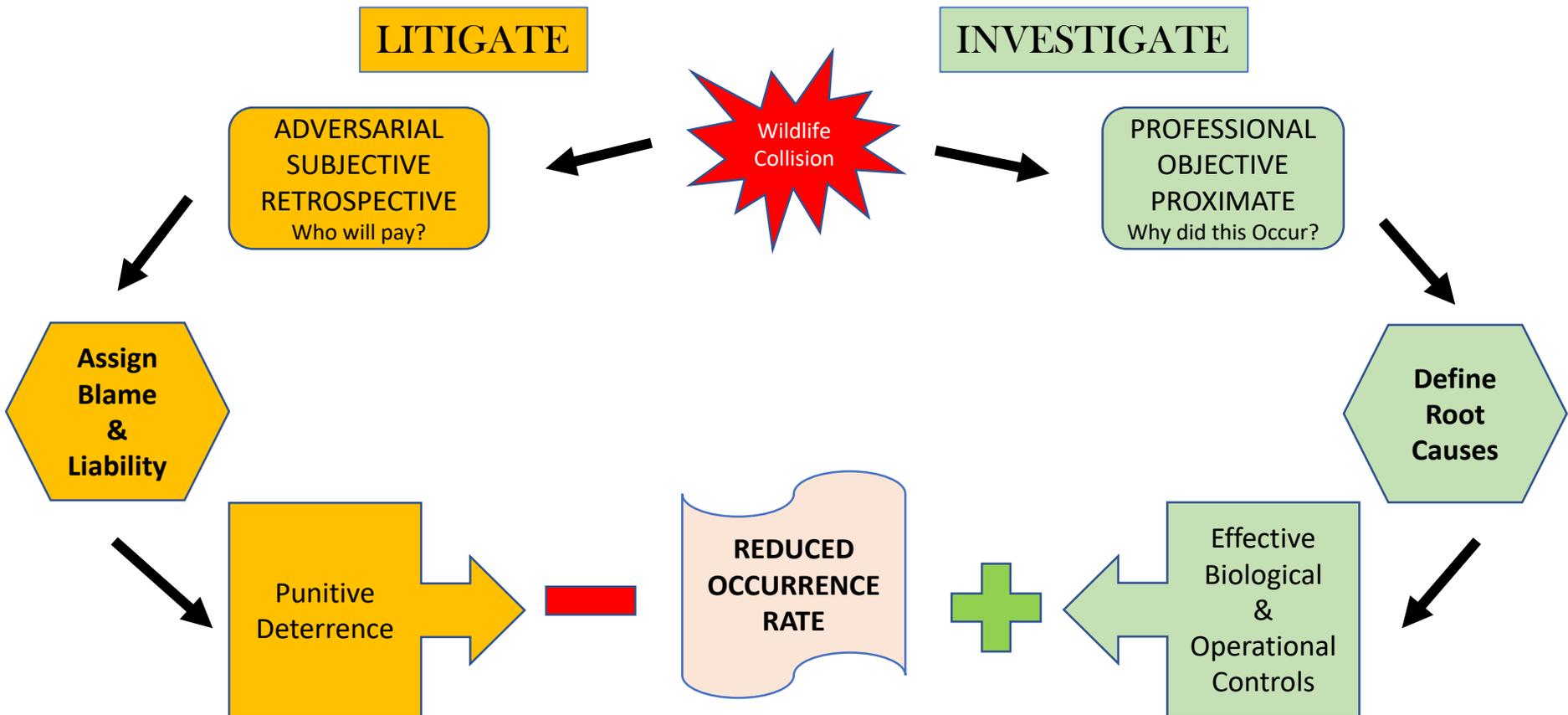
# Accident/Incident Investigation

A reactive (but necessary) process

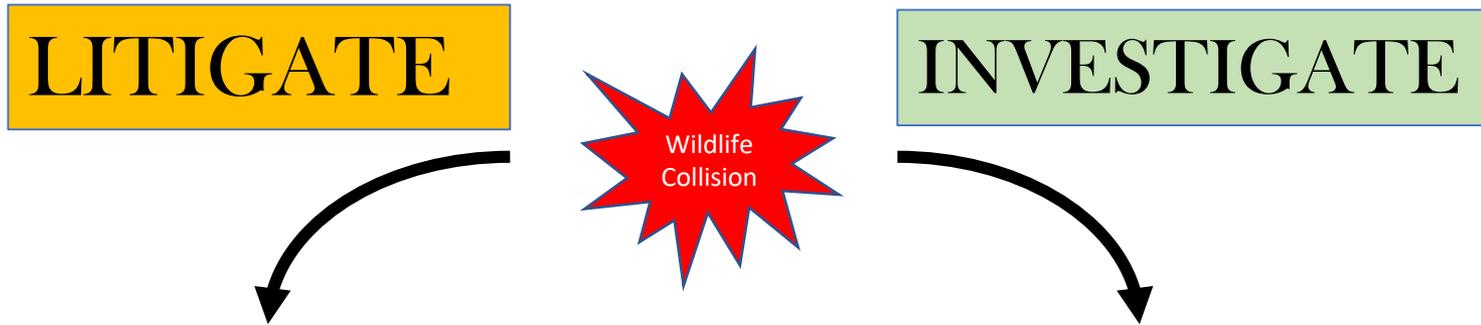


*INVESTIGATION ..... RUN!!!!*

# Reactive Roads to Accident Prevention



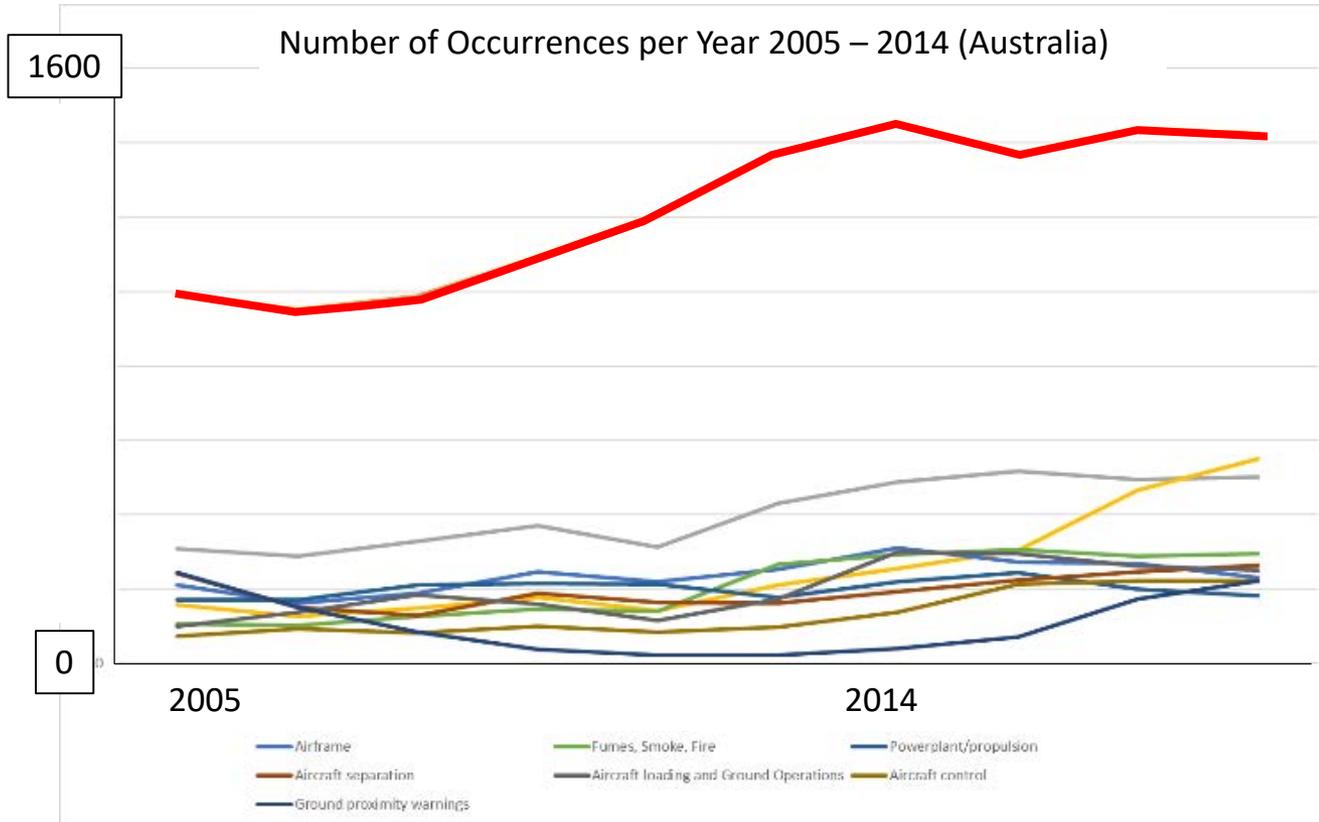
# Side Effects



REDUCED OCCURRENCE RATE



# Wildlife Strikes – Frequency of Occurrence



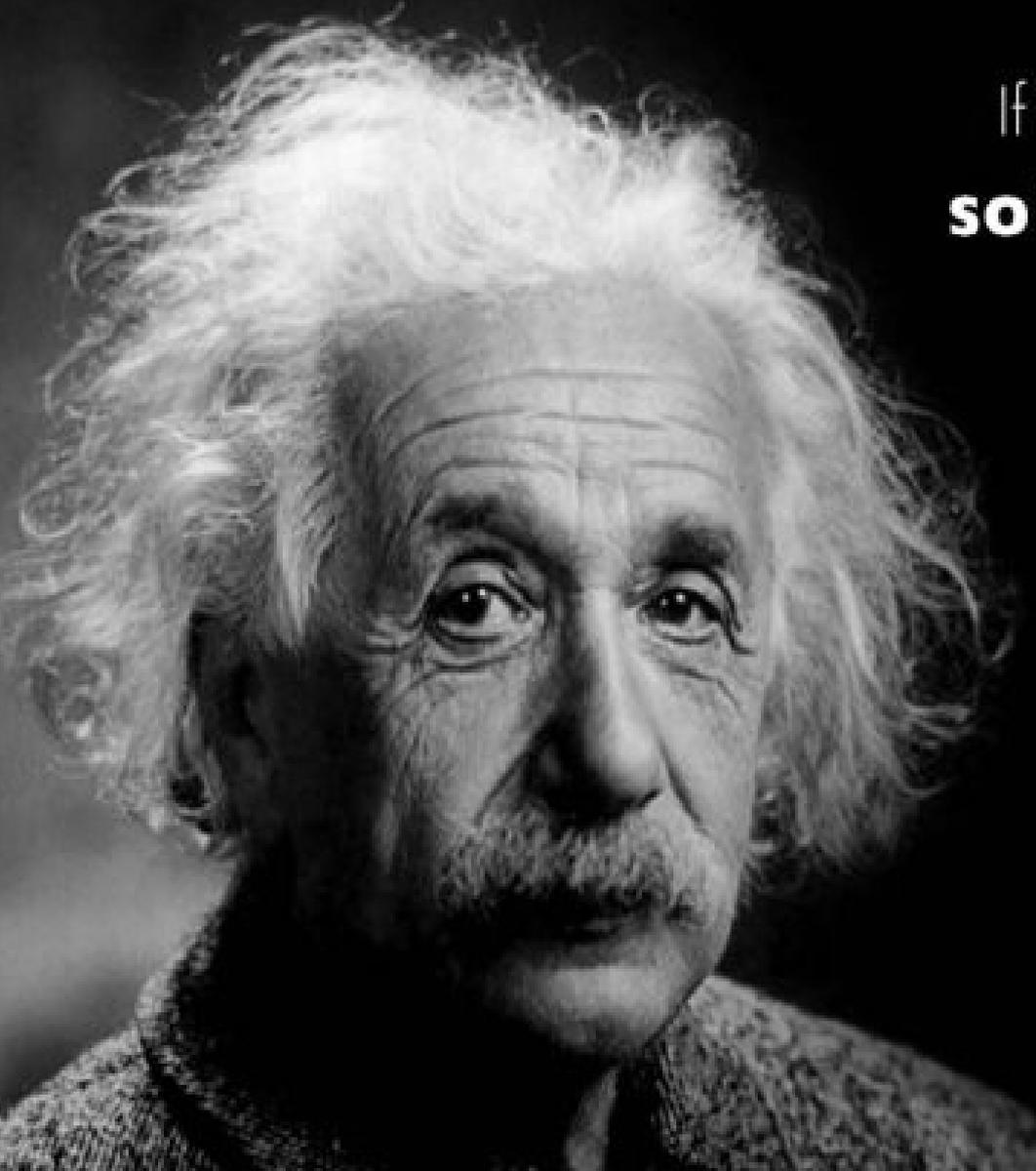
# Wildlife Strikes – Frequency of Investigation

Since 1968 (In Australia)

- Estimated Total Occurrences 150572
- Estimated Total Wildlife Strikes 37643 (25%)
  
- Aviation Investigations 6600 (4.4%)
- Wildlife Strike investigations 25 (0.37%)

12 X Discordance

# Are the right Questions Being Asked?



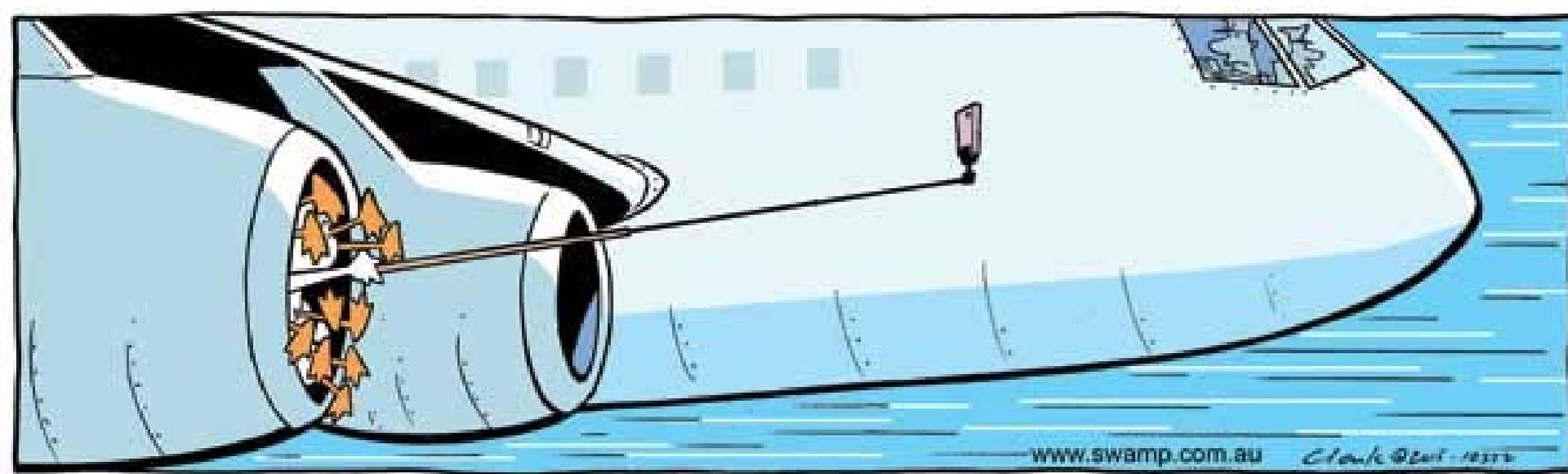
If I had an hour to  
**solve a problem** and my  
**life depended** on it,

I would use the  
first 55 minutes  
determining the  
**proper questions to ask.**

*Albert Einstein*

# Investigation – What is the right Question?

## WHY IS THIS HAPPENING?



WHY ARE THE ANIMALS AND THE AIRCRAFT TRYING TO OCCUPY THE SAME SPACE AT THE SAME TIME?

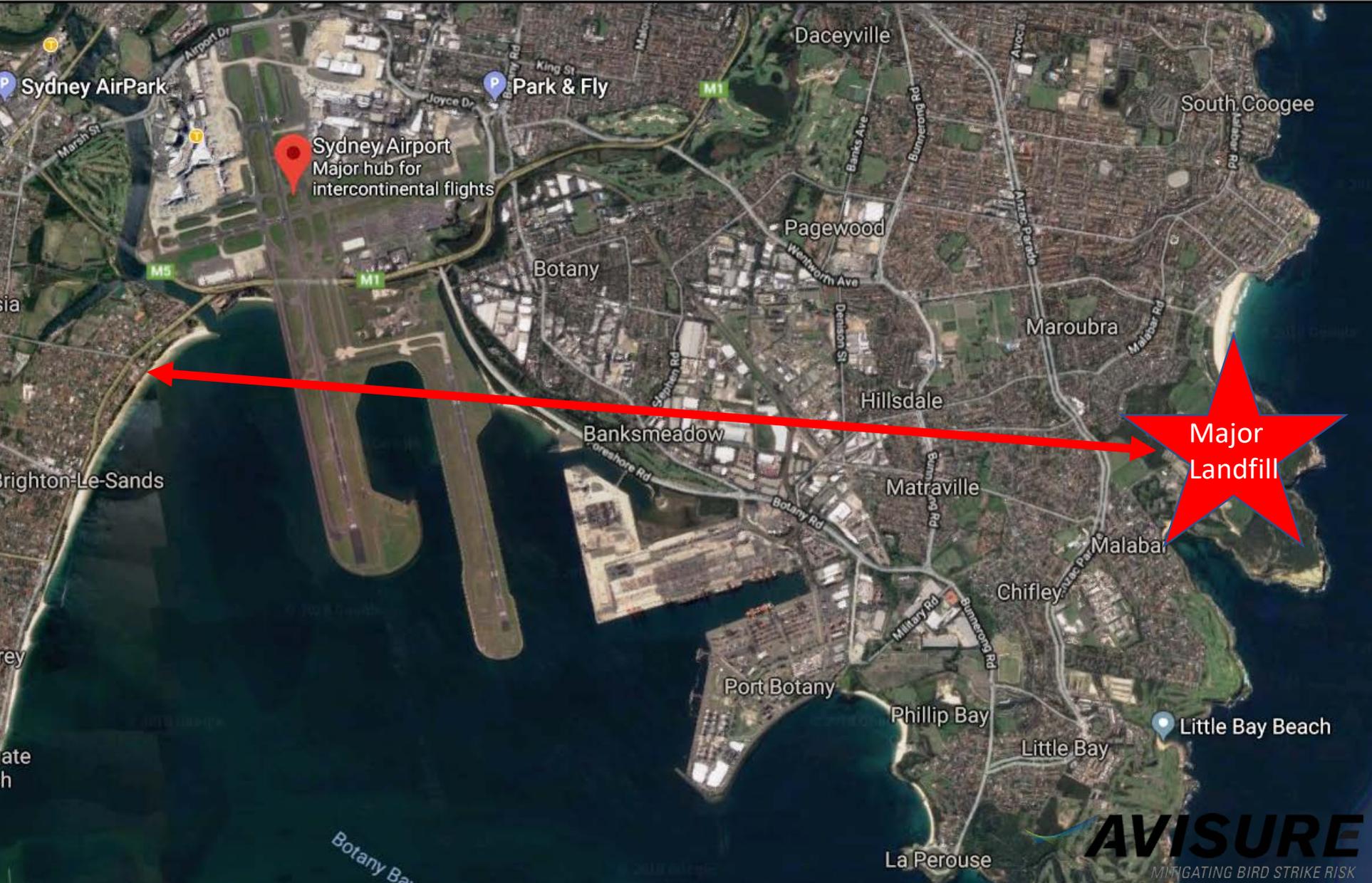
# Case Study: 10 Investigations Worldwide

INCIDENT	YEAR	LOCATION	AIRCRAFT TYPE	ADVERSE EFFECT	SPECIES	SPECIES STATUS	WHY DID THEY COLLIDE?
1	1969	Sydney, Australia	B707-321	EFTO ABORTED TO HULL LOSS	"seagulls" species not confirmed	Not Addressed	
2	1998	Sydney, Australia	B733	EFATO RTB	"seagulls" species not confirmed	Not Addressed	
3	2006	Melbourne, Australia	B763	DUAL INGESTION	"small corella" (Cacatua spp)	Not Addressed	
4	2008	Brussels, Belgium	B742	EFTO ABORTED TO HULL LOSS	European Kestrel (Falco tinunculus)	Not Addressed	
5	2009	Hudson River, USA	A322	DUAL EFOC HULL LOSS	Canada Geese (Branta canadensis)	Not Addressed	
6	2010	Amsterdam, Netherlands	B734	EFATO RTB	Canada geese (Branta canadensis)	Not Addressed	
7	2012	New Zealand	A322	EFOA	Southern BB Gull (Larus dominicanus)	Not Addressed	
8	2012	Kathmandu, Nepal	Do228	EFATO HULL LOSS	Black Kite (Milvus sp)	Not Addressed	
9	2015	Australia	SF34	THROWN PROP	Galah (Eolophus roseicapilla)	Not Addressed	
10	2017	Australia	A333	EFATO RTB	Masked lapwing (Vanellus miles)	Not Addressed	

# PAN-AM 707 Aborted Takeoff and Runway Over-run - 1969



# PAN-AM 707 Aborted Takeoff and Runway Over-run - 1969



# PAN-AM 707 Aborted Takeoff and Runway Over-run - 1969

## Reports Conclusion:

12. The probable cause of the accident was that, in the circumstances of an abandoned take-off, the aircraft could not be brought to a stop within the nominally adequate runway length because of an error in the calculation of load, a reduction in wind velocity from that forecast and the use of rolling start and braking techniques which would not ensure most effective use of the available runway length.

# AirAsia 333 MAYDAY Landing Alternate Airport - 2017



# AirAsia 333 MAYDAY Landing Alternate Airport - 2017

Figure 1: Damage to Rolls Royce Trent 700 engine fan blades



Source: Rolls Royce

# AirAsia 333 Emergency MAYDAY Landing Alternate Airport - 2017

Figure 2: Ultraviolet light showing bird remains on damaged fan blade



Source: Rolls Royce

## Reports Conclusion:

- It is concluded that in this event a rare combination of 0.85lb bird ingestion at adverse forward speed during the take-off roll (close to  $V_1$  but lower than  $V_R$ <sup>8</sup>) and angle of incidence combined to cause the release of a small section of blade which [led] to the engine producing only idle thrust after approximately 2 minutes and leading to commanded shutdown approximately 4 minutes after the release of fan blade material.

## Reports mentions:

- Species
- General strike histories in Australia
- One statement on species behaviour
- That there was no dispersal or culling of species in prior 4 days

## Reports does not mention:

- Specific strike histories at this airport
- Last bird patrol
- Recent grass cutting history (or grass length)
- Detailed statement on species behaviour
- Adequacy of the wildlife hazard management plan specific to this species

# Investigative Effort (10 Reports) - Words

**TOTAL EFFORT  
(118502 words)**

**Operational, Crew and Post Incident Response  
60% (70643)**

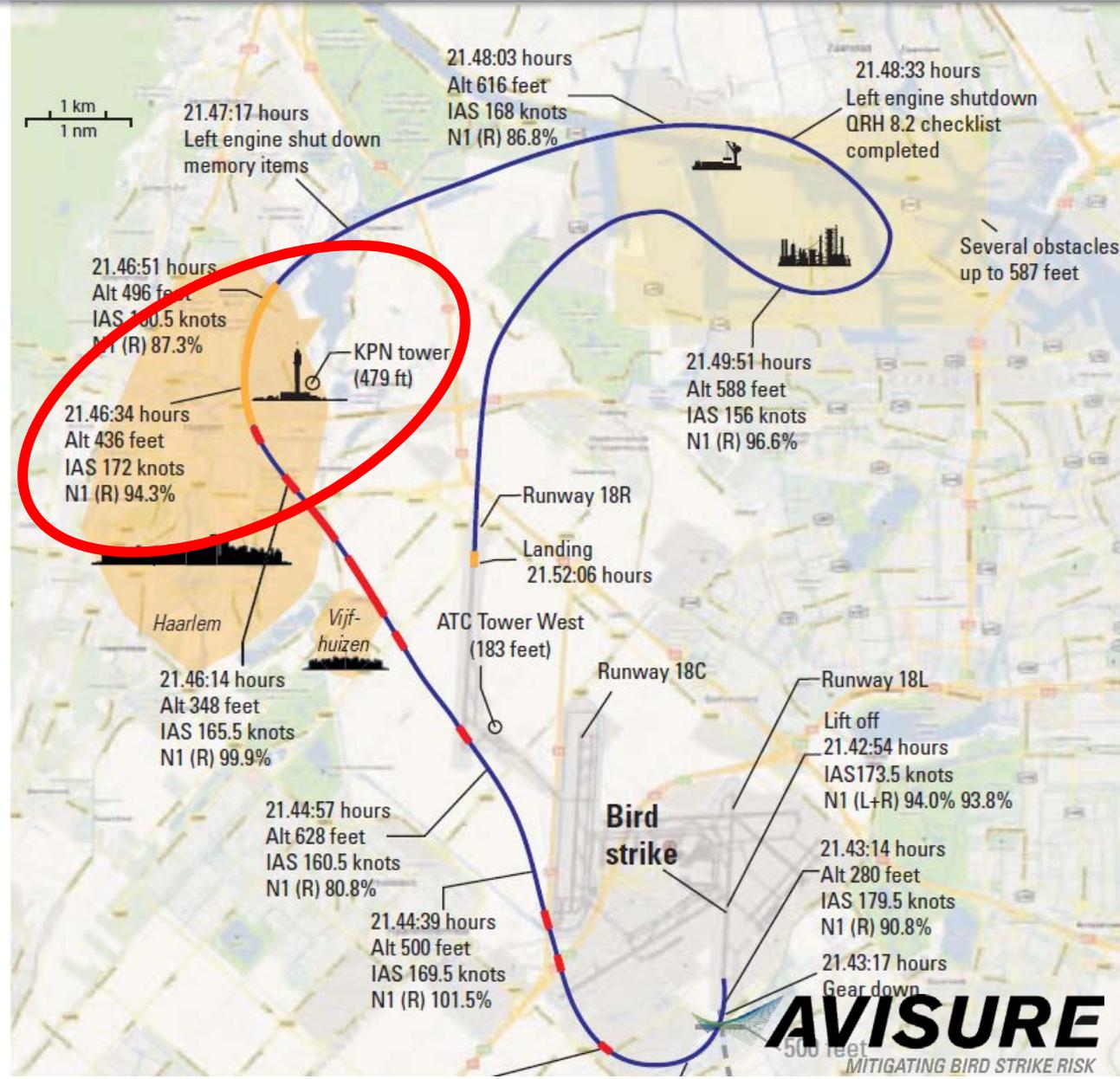


**Biology & W/L Mgt  
19% (23016)**

**Engines, Airframes & Systems  
21% (24843)**

# Air Maroc Engine Failure and Emergency Return - 2010

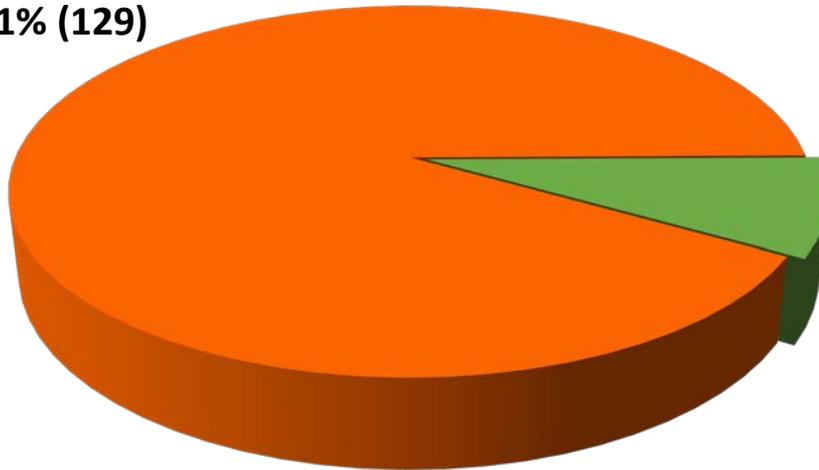
<https://onderzoeksraad.nl/en/onderzoek/1777/emergency-landing-royal-air-maroc-amsterdam-schiphol-airport-6-june-2010?s=5CC21833AFD46CD7D04AF636DB182E1BDD754082>



# Investigative Effort – Photos, Illustrations, Tables and Appendices

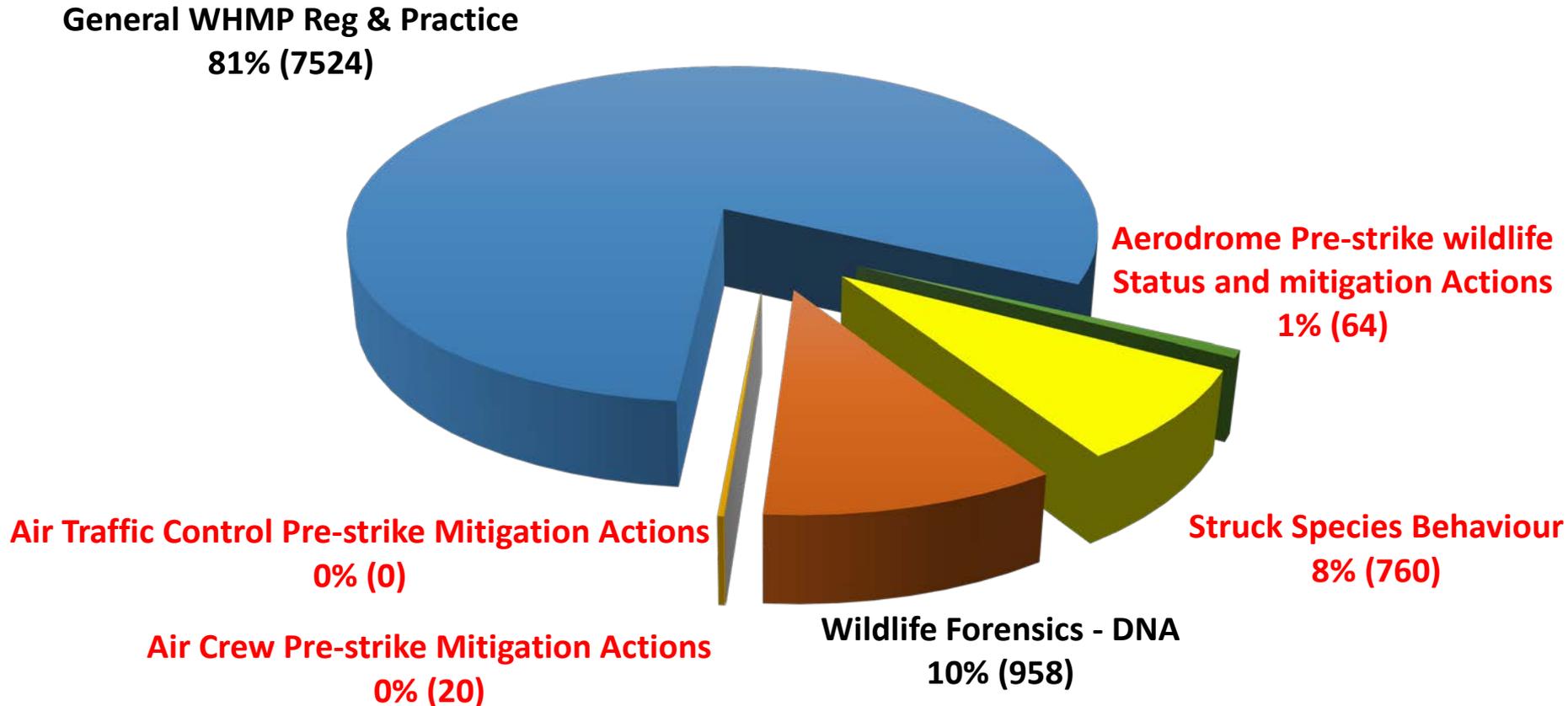
## TOTAL EFFORT (131 Photos, Illustrations, Tables & Appendices)

Engineering and Operations  
91% (129)



Biology and W/L Mgt  
9% (12)

# Biology and Wildlife Management



# US Airways Flt 1549, Hudson River Ditching - 2009

Flight 1549 Alternate Audio, Multi-Perspective Composite Animation

exosphere 3D

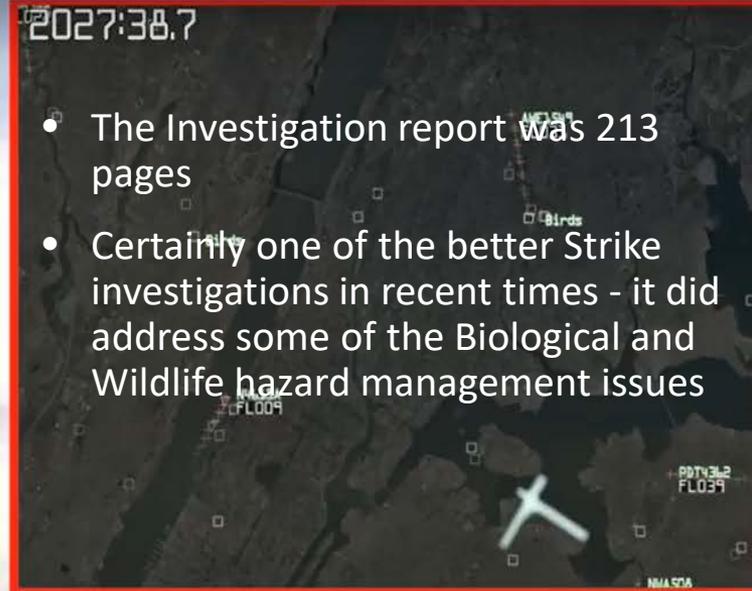


LGA SouthTC - Other  
N461SA: okay university  
request to take it over  
yankee stadium central  
park empire state building  
check out the east river (  
LGA South Control



2027:38.7

- The Investigation report was 213 pages
- Certainly one of the better Strike investigations in recent times - it did address some of the Biological and Wildlife hazard management issues



NYDEP Freq. - Other

New York Departure

CAPT Sullenberger  
mayday mayday mayday.  
uh this is uh Cactus fifteen  
thirty nine hit birds, we've  
lost thrust (in/on) both  
engines we're turning back

F/O Skiles

LGA Twr Freq. - Other  
NYFNL: yeah piedmont  
forty three sixty two  
overhead ah i'd like to go  
overhead behind his  
company

LGA Twr Cab Coordinator

**AVISURE**

MITIGATING BIRD STRIKE RISK

# US Airways Flt 1549, Hudson River Ditching - 2009

On The HUDSON – did the investigation help?

Yes - if you are interested in the details of :

- Engine ingestion certification standards
- The ‘Departures’ controller’s decision to filter display correlated primary radar targets only
- Efficient life vest donning and evacuation procedures
- The efficacy of pre-flight briefings
- Dual engine-out restart procedures in the A320
- “Ditching” protocols for large aircraft

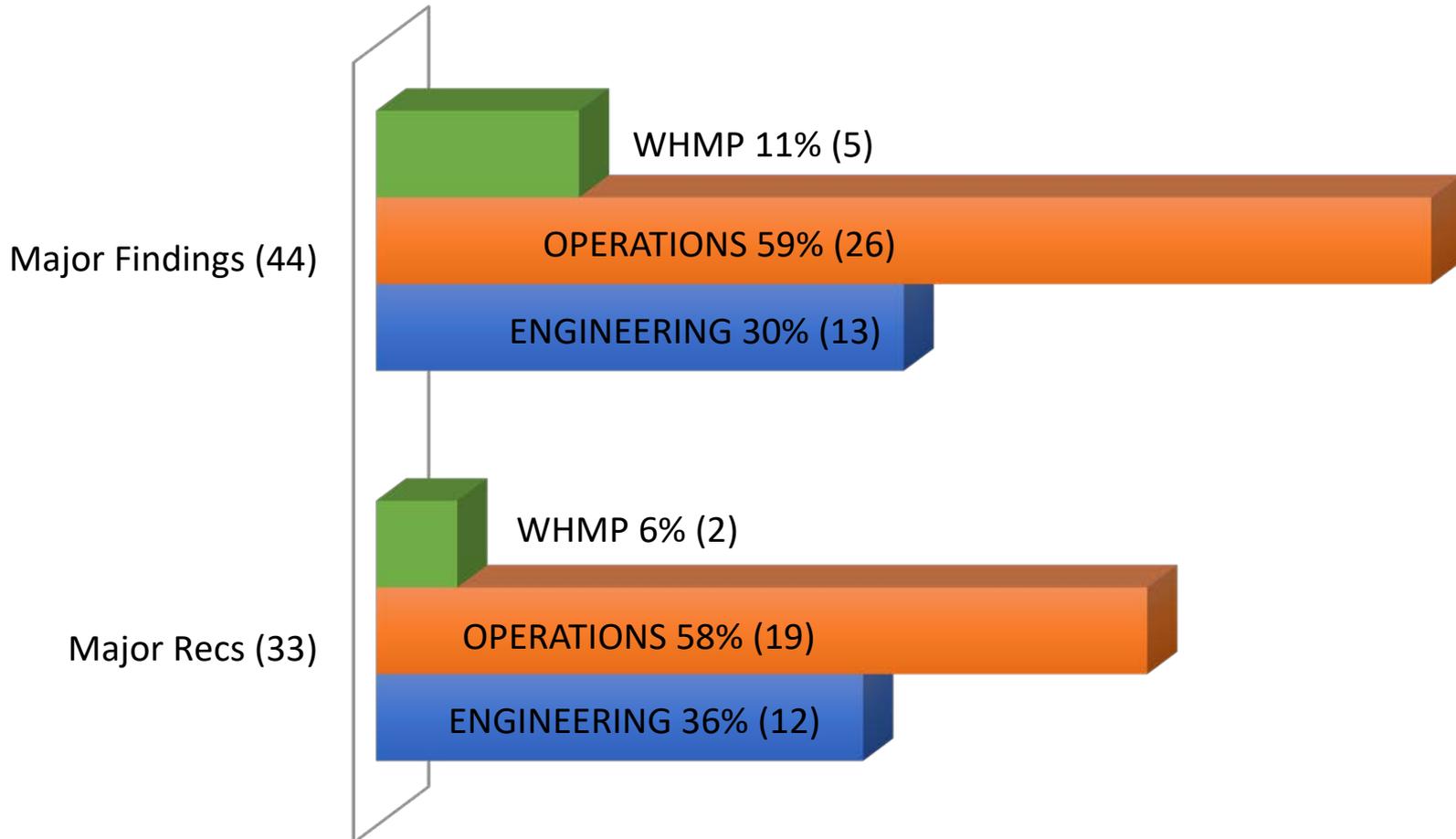
# US Airways Flt 1549, Hudson River Ditching - 2009

On The HUDSON – did the investigation help?

.....BUT what if you are interested in the details of why the geese and the aircraft collided in the first place? What questions do we need to ask and answer to prevent in-flight collisions between high risk species and HCAT aircraft in NYNJ airspace? .....

# US Airways Flt 1549, Hudson River Ditching - 2009

## Findings & Recommendations



# US Airways Flt 1549, Hudson River Ditching - 2009

## Major Findings (paraphrased) 5/44

- This accident was not a typical bird-strike event but was nonetheless, hazardous
- The accident was beyond the range of LaGuardia Airport's (LGA) wildlife hazard responsibility
- A proactive approach to wildlife mitigation would provide a greater safety benefit than the current strategy
- Although currently no technological, regulatory, or operational changes related to wildlife mitigation, including the use of avian radar, could be made that would lessen the probability of a similar bird-strike event from occurring, considerable research is being conducted in this area
- Research on the use of aircraft systems such as pulsating lights, lasers, and weather radar may lead to effective methods of deterring birds from entering aircraft flightpaths and, therefore, reduce the likelihood of a bird strike.

# US Airways Flt 1549, Hudson River Ditching - 2009

## Major Recommendations (paraphrased) 2/33

- Require all certified airports to conduct wildlife hazard risk assessments and to implement a WHMP into the airport certification manual. (A-10-75)
- Work with the U.S. Department of Agriculture to develop and implement innovative technologies that can be installed on aircraft that would reduce the likelihood of a bird strike. (A-10-76)

# Where to From Here?

- Formalise and standardize wildlife strike investigations. Make sure the right biological questions are being addressed.
- US/Canada BSC + AAWHG to work together with ISASI:
  - Standardise the approach to Wildlife strike investigations
  - Ensure appropriately trained aviation biologists /aeroecologists are included on all formal strike investigations
  - Train aviation biologists /aeroecologists in proper air safety investigation procedures
  - Train conventional Air Safety Investigators in the basics of WHM



# Where to From Here?

- Above all, formally investigate more strikes – many more - start with simple least costly ones.
- Collate and analyse the results of strike investigations in a centralized repository
- Distribute relevant results to industry

**WHY ARE THE ANIMALS AND THE AIRCRAFT TRYING TO OCCUPY THE SAME SPACE AT THE SAME TIME?**



# Do You Really Want to Litigate?



# Do You Really Want to Litigate?

I am:

Satisfied

Dissatisfied

with my experience



# What Happens When the Law is Tested?

## Case Studies in Litigation

- Warthogs In South Africa, B200 King Air, 2015
- Plovers in France, Falcon BJ, 1995
- Gulls in Croatia, B732, 1996
- Gulls in Italy, AN124 1997



# Pilansberg International Airport, South Africa, 2015



- A B200 on landing struck a Warthog and sustained substantial damage to the value of ~ USD\$500K
- The A/C operator sued the A/D operator for damages and court costs
- The A/D operator argued that they were not liable as they had:
  - a substantial fence around the airport which was patrolled every three hours and immediately repaired as required.
  - No previous issues or history with warthogs on the A/D



# Pilansberg International Airport, South Africa, 2015

The Judge awarded full damages and court costs to the Plaintiff



- Warhogs frequented the off airport area and so should have been included in the off-airport risk assessment
- The A/D operator should have been aware that warhogs are semi fossorial and could easily burrow under their fence design.
- Local and ICAO Annex 14 Regulations were clearly breeched “an aerodrome should have a fence or other suitable barrier to prevent the entrance to the movement areas of animals large enough to be a hazard to aircraft.”
- The fence design was clearly unsuitable to the specific needs of that airport



# Pilansberg International Airport, South Africa, 2015

## WHAT DIDN'T HELP

The airport (local government) had a documented history of ignoring wildlife management and fencing recommendations

*“.....in her testimony the expert witness stated that she did engage the airport manager about the state of the fence but didn't get any answers or co-operation.....”*



# Paris, France 1995



- Falcon Business Jet 10 POB
- Lapwings on take-off, crashed
- Fatalities: 10
  
- **Judgment: airport staff failed to perform routine bird scaring “negligently failing to follow normal security procedures”**
- **Criminal charges: Involuntary manslaughter charges for three Paris Airport Authority staff**



# Pula, Croatia 1996



- Croatian Airlines B737-200 ingested a gull on take-off
- Rejected take-off, engine destroyed
- Airline insurer billed the airport for the engine replacement (US\$1.4 million)
- Airport refused payment and litigation ensued
  
- **Judgment: The airport was liable for damages**
- **Airport argued they had a permanent NOTAM stating 'Bird Hazard Exists'.**
- **The JUDGE commented that the permanent NOTAM only acknowledged that the hazard existed . It DID NOT prove that they took adequate steps to mitigate**

# Pula, Croatia 1996



**WHAT DIDN'T HELP** – the A/D had a mature and reasonably well resourced Wildlife Hazard Management Plan - But they were out of the habit of logging management activities.

- There was no record of proof that they did any management at all !!!
- The Judge assumed that in fact they didn't do anything at all and they were attempting to “hide behind” the NOTAM.

# Genoa, Italy 1989



- A BAE 146 departing Genoa Airport at night flew through a flock of gulls at rotation.
- Three engines were damaged and the A/C RTB.
- The carrier sued for damages
- After 11 years of litigation, judge awarded the carrier USD \$2 million in compensation.
- Liability was assigned as 50% to the Ministry of Transport, 30% to A/D operator, and 20% to the Port Authority (Battistoni 2003)



# Genoa, Italy 1997



- AN 124 multiple strike on rotation
- 40 Gulls dual ingestion, and dual Engine Failure (#2,#3), went round and followed up with an emergency overweight landing on remaining engines
- Major damage, both #2 & #3 engines replaced, ~USD\$2.5M in damage repair delays and inspections
- The carrier's insurance company sued for damages
- Final Judgement in 2006 – Italian Courts.  
NOT A NATURAL EVENT  
IS AN AVOIDABLE EVENT  
INSUFFICIENT EFFORT PUT TO MITIGATING THE HAZARD
- In favour of the Plaintiff.  
35% Genoa Airport Operator; + 35% ENAC (ATS); + 22.5% Italian CAA;  
+ 7.5% Former airport operator/owner who was subcontracting the A/D OPS



# Accidents, Incidents and Litigation – Avoid Them All

- ICAO regulations & Local Legislation outline the minimum requirements. The minimum may not be enough to protect life, aircraft and legal status
- Modern legislation is deliberately vague and non-proscriptive - Safety Outcomes are much more important than the letter of the law
- Create a reputation and history for pro-active rather than reactive safety compliance
- Investigate all strikes – collect and analyse the information from these investigations and use it to avoid serious strikes in the future
- Be demonstrably innovative in safety management. Try new techniques, test new equipment, modify and streamline operations
- Work to an SMS framework that is regularly reviewed and document everything





# AVISURE

THE BIRDSTRIKE SOLUTION

[www.avisure.com](http://www.avisure.com)

*Phil Shaw*