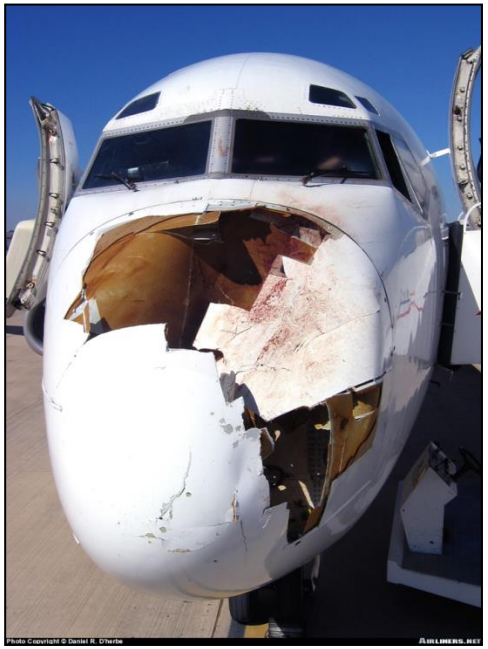
Classification of risk level for wildlife strikes

- **Richard A. Dolbeer, Science Adviser, USDA**
- **Michael J. Begier, National Coordinator, Airport Wildlife Hazards Program**
- **Patrick C. A. Forrester, Operations Research Analyst, FAA**



Bird Strike Committee-USA
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Commercial Aviation Safety Team (CAST)

Findings and recommendations expressed in this presentation do not represent the position of the FAA, USDA, or CAST

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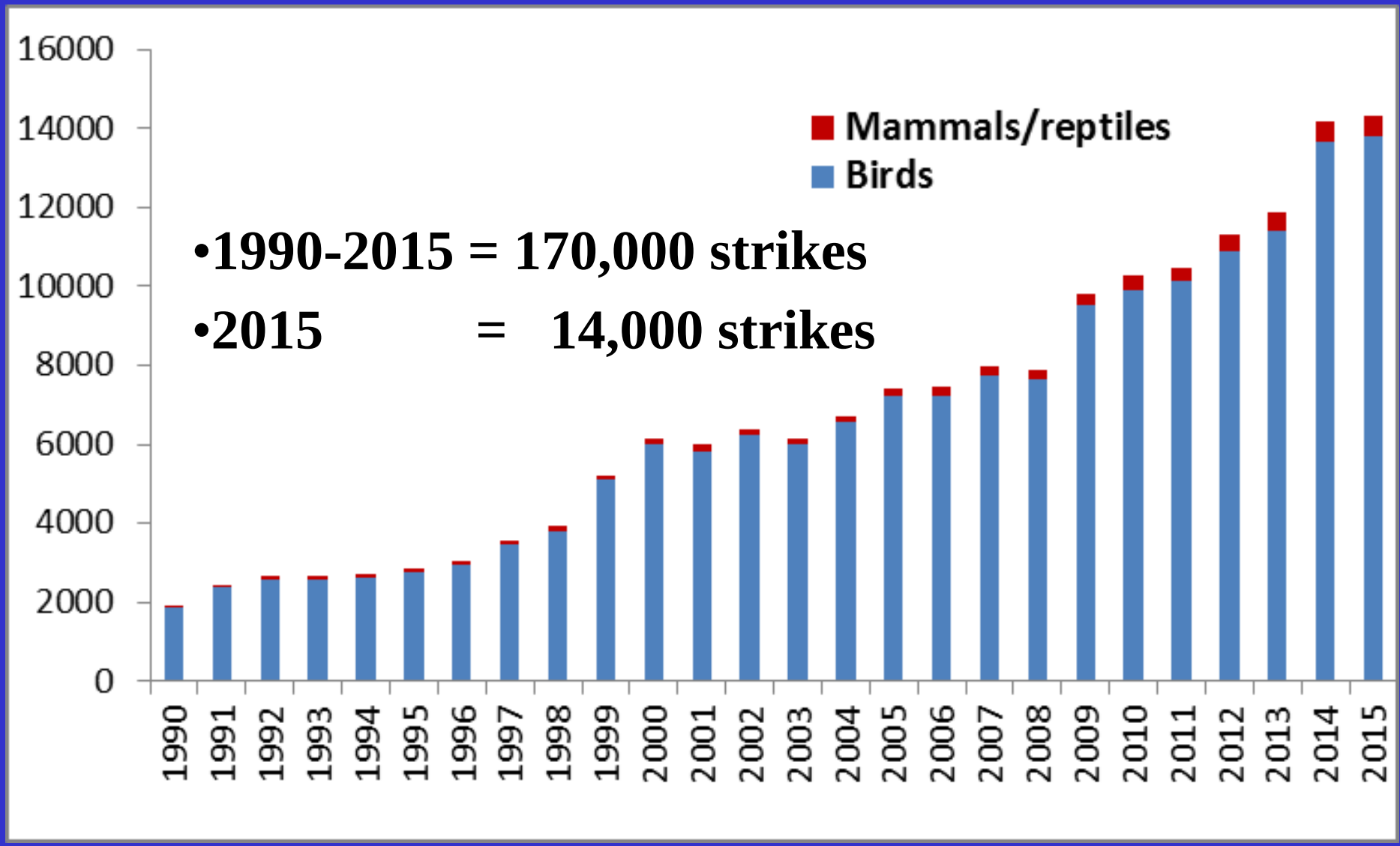
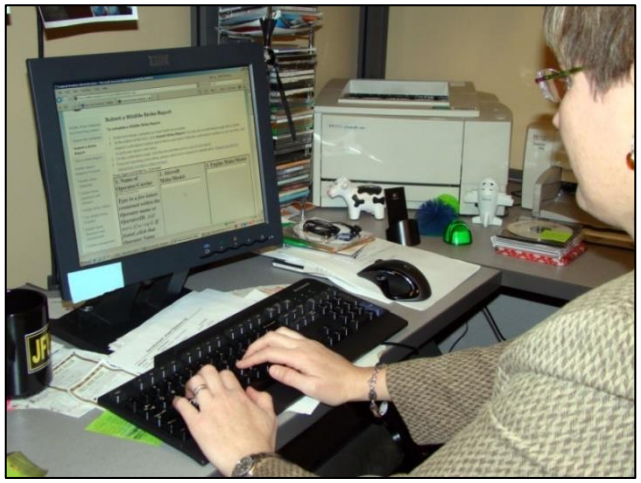
NWSD Manager,
1995-2015

•FAA National Wildlife Strike Database, 1990-2015



Classification of damage level in NWSD

The NWSD, based on ICAO guidance, classifies damage level of each strike event as:



1) None,
2) Minor,
3) Substantial,
4) Damage-unknown extent,
5) Destroyed,
6) Blank (not enough information to classify).

Merged STRIKE_REPORTS (Requires Filling)

PHASE_OF_F	DAMAGE	STR_RAD	DAM_RAD	STR_WINDSI	DAM_WIND:
Approach	N	☐	☐	☐	☐
Take-off run	S	☐	☐	☐	☐
Take-off run	N	☐	☐	☐	☐
Approach	M	☐	☐	☐	☐
Take-off run	N	☐	☐	☐	☐
Climb	M?	☑	☑	☐	☐
En Route	N	☐	☐	☐	☐
Approach	N	☐	☐	☐	☐
Climb	N	☐	☐	☑	☐
Landing Roll		☐	☐	☐	☐
Take-off run	N	☐	☐	☐	☐
Approach	N	☐	☐	☐	☐

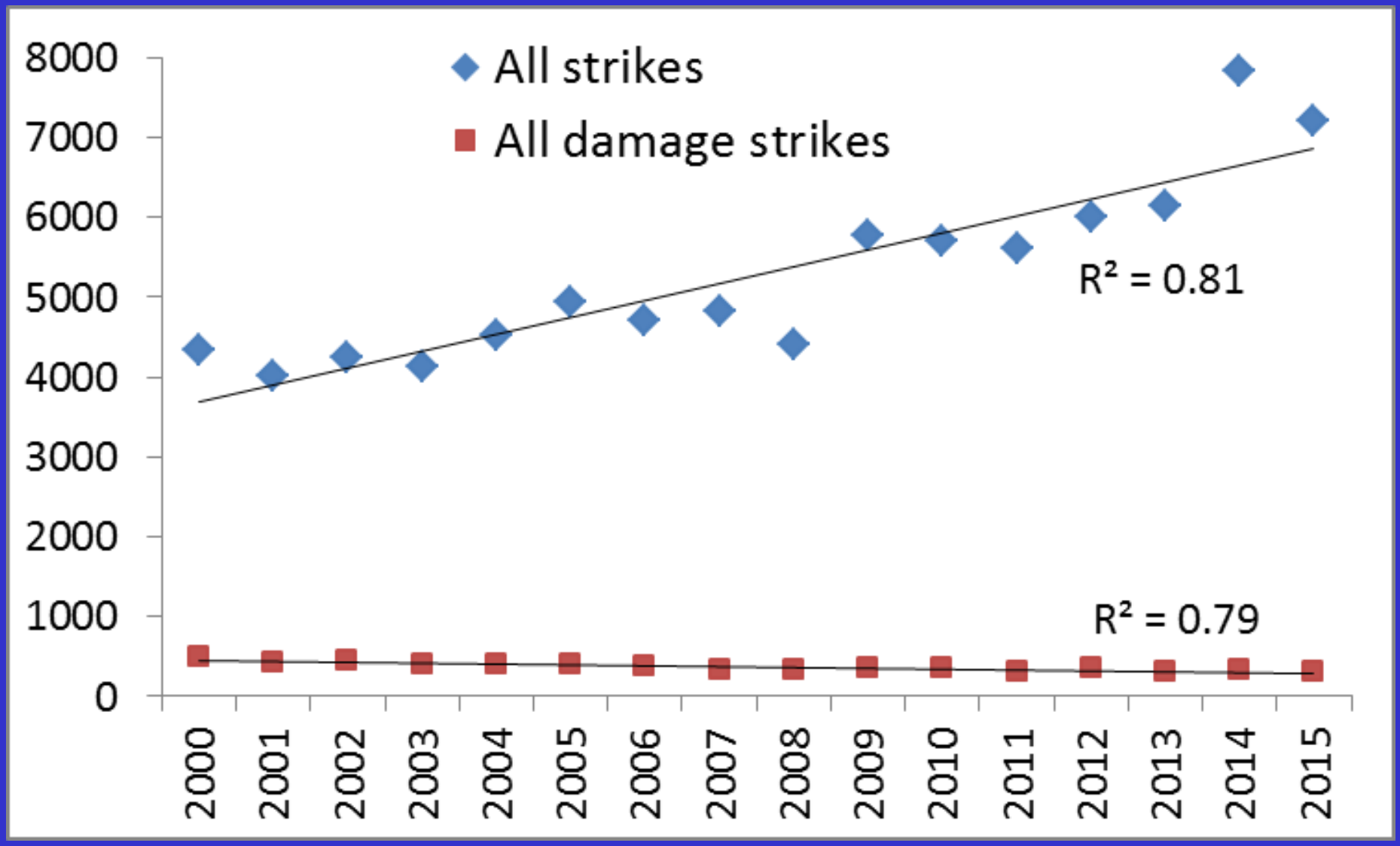
•Substantial = the aircraft incurs damage or structural failure that adversely affects the structure strength, performance, or flight characteristics of the aircraft and that would normally require major repair or replacement of the affected component.

(specifically excluded are bent fairings or cowlings; small dents or puncture holes in the skin; damage to wing tips, antenna, tires, or brakes; & engine blade damage not requiring blade replacement)

Damage classification of strikes in USA, NWSD, 2000-2015

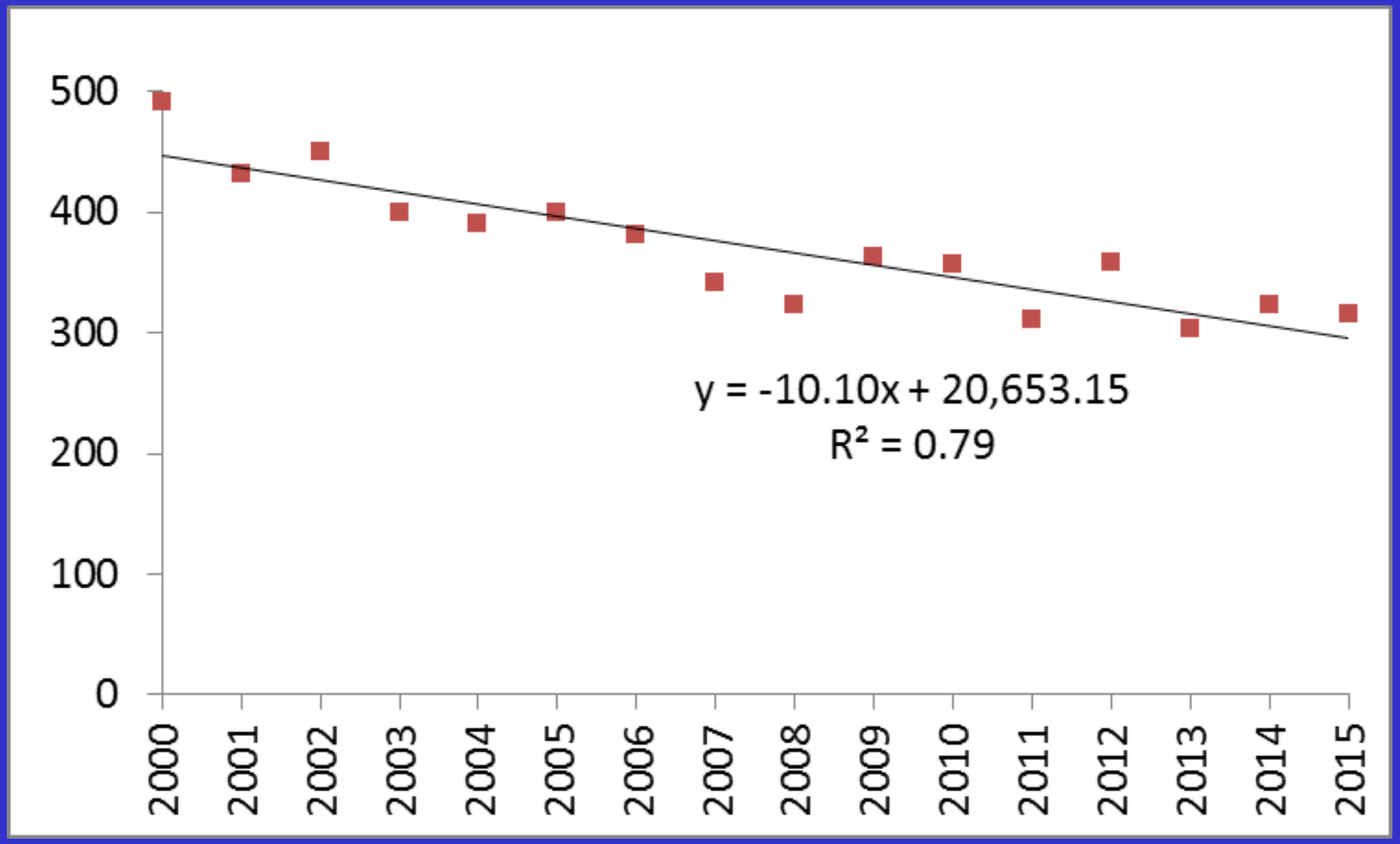
Damage status	General Aviation	Commercial Aviation
Destroyed	36	3
Substantial	793	1,346
Damage-unknown level	721	1,313
Minor	1,534	3,294
None	8,233	108,958
Blank	816	7,116
Total	12,133	122,030

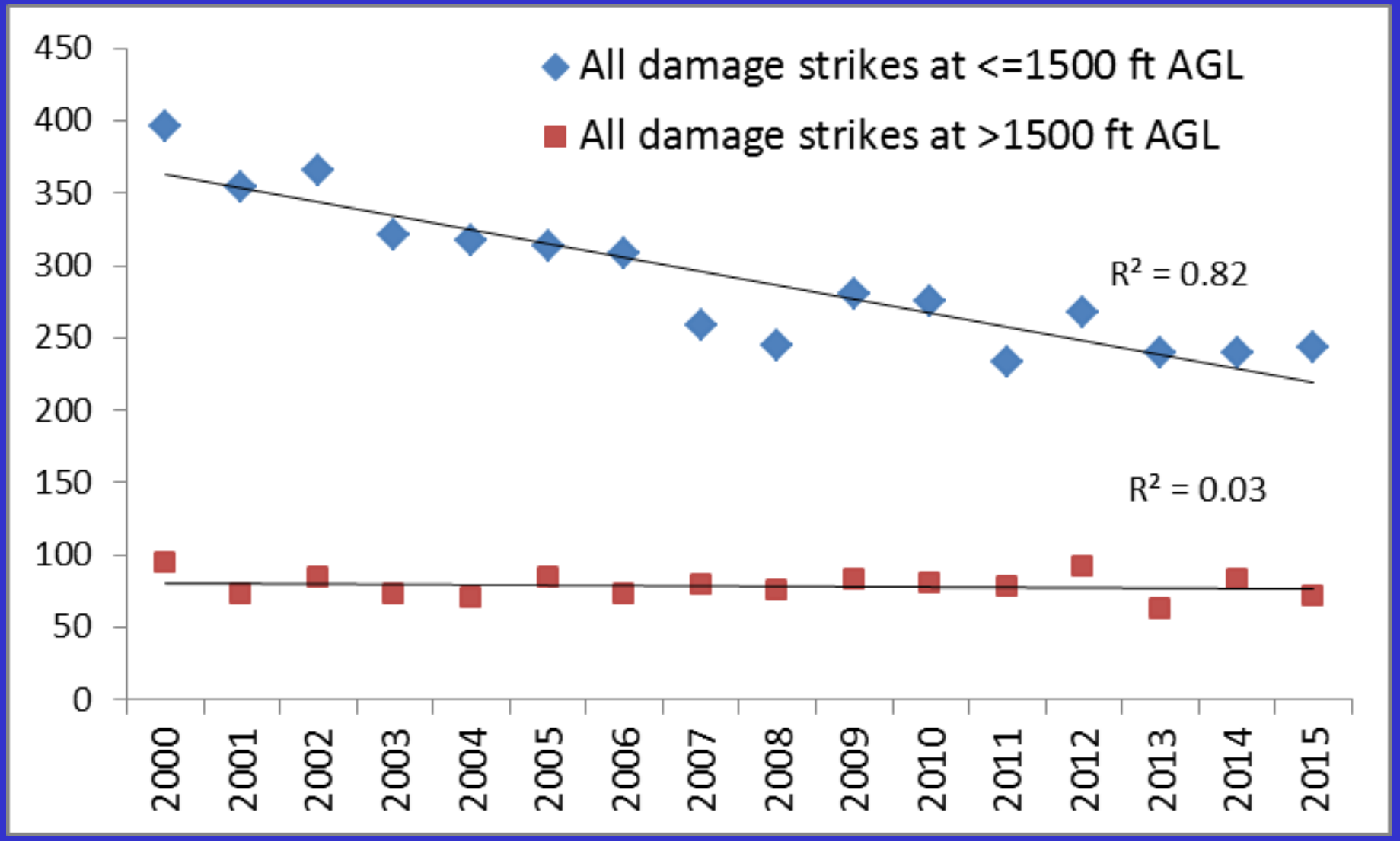
Commercial aircraft, USA, 2000-2015



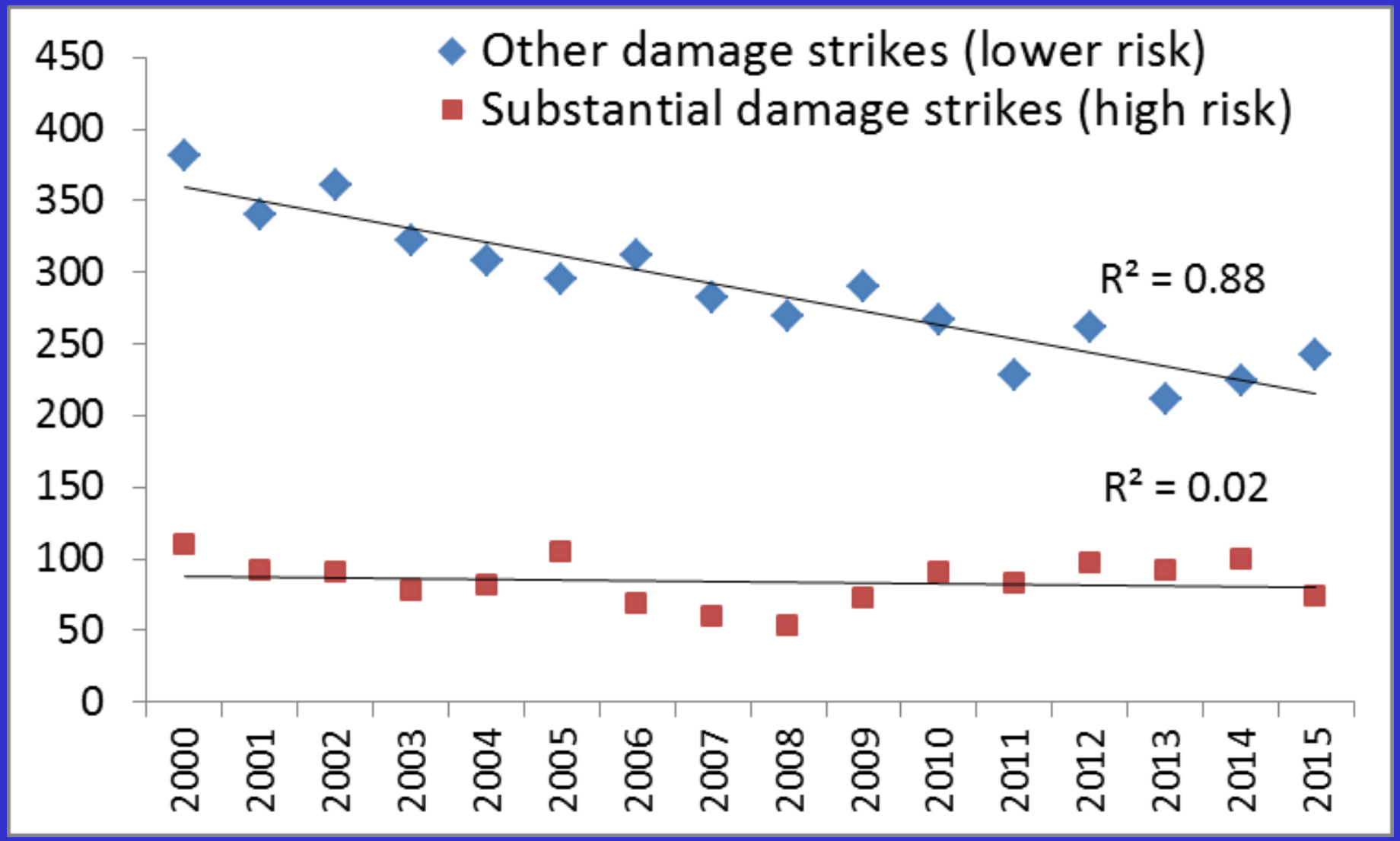
$R^2 > 0.39$ ($P < 0.01$); >0.25 ($P < 0.05$) with 14 df

All damage strikes to commercial aircraft, 2000-2015




All damage strikes at <=1500 ft AGL
All damage strikes at >1500 ft AGL
R² = 0.82
R² = 0.03
450
400
350
300
250
200
150
100
50
0
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015

Other damage strikes and substantial damage strikes to commercial aircraft, 2000-2015



Trends (2000-2015) in high-risk strikes for commercial aircraft based on damage criteria used in NWSD, USA

1) Number of reported strikes increased from ~4,200 to 7,000.

2) Overall number of damage strikes declined from ~500 to 320.

3) Decline in damage strikes was in airport environment; not at >1500 feet AGL.

4) Number of substantial damage strikes (high risk based on NWSD criteria) did not decline; remained flat (about 100/year).

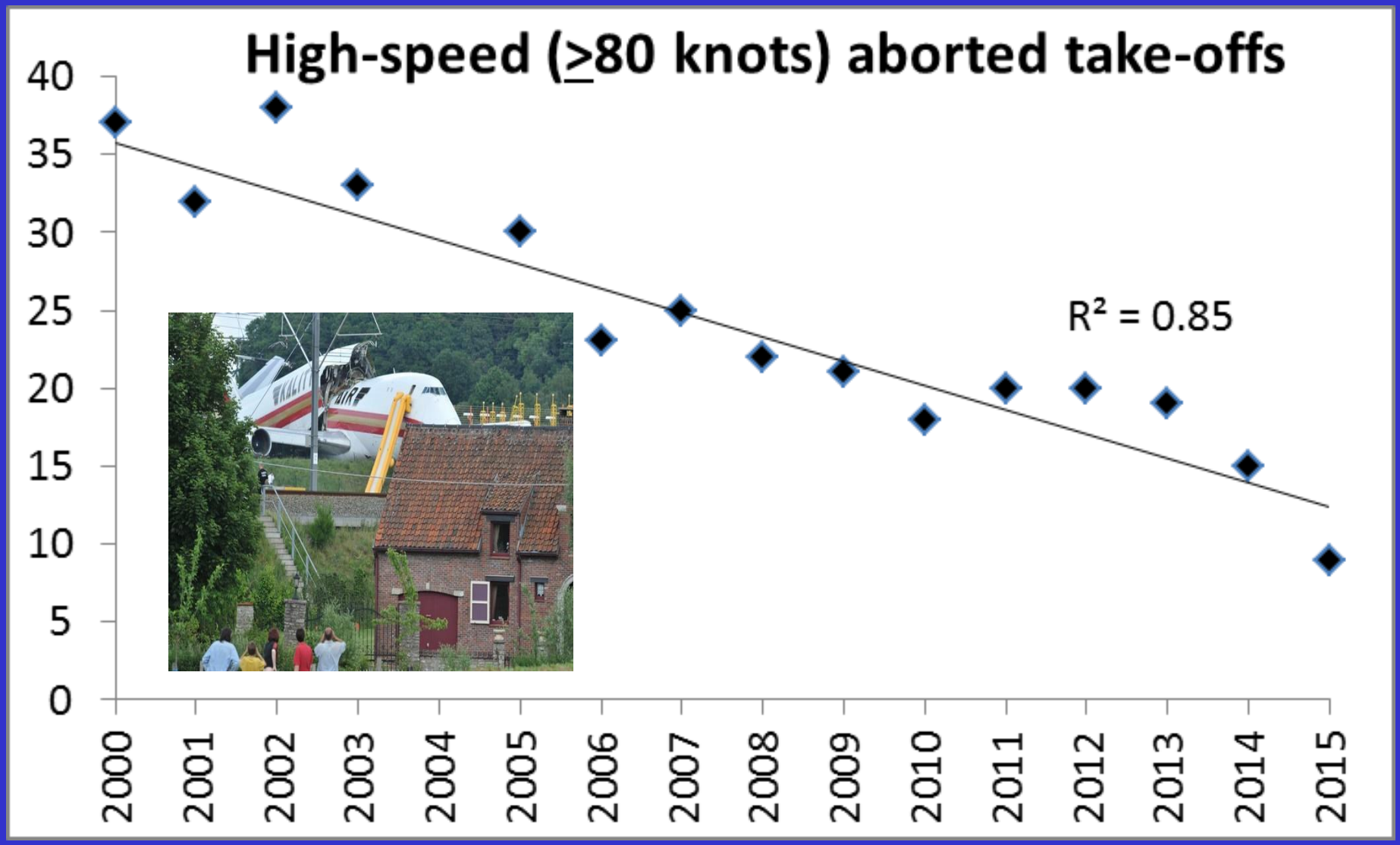
CAST | The Commercial Aviation Safety Team

- **Founded in 1998, CAST has developed an integrated, data-driven strategy to reduce the commercial aviation fatality risk in the USA and promote new government and industry safety initiatives throughout the world.**

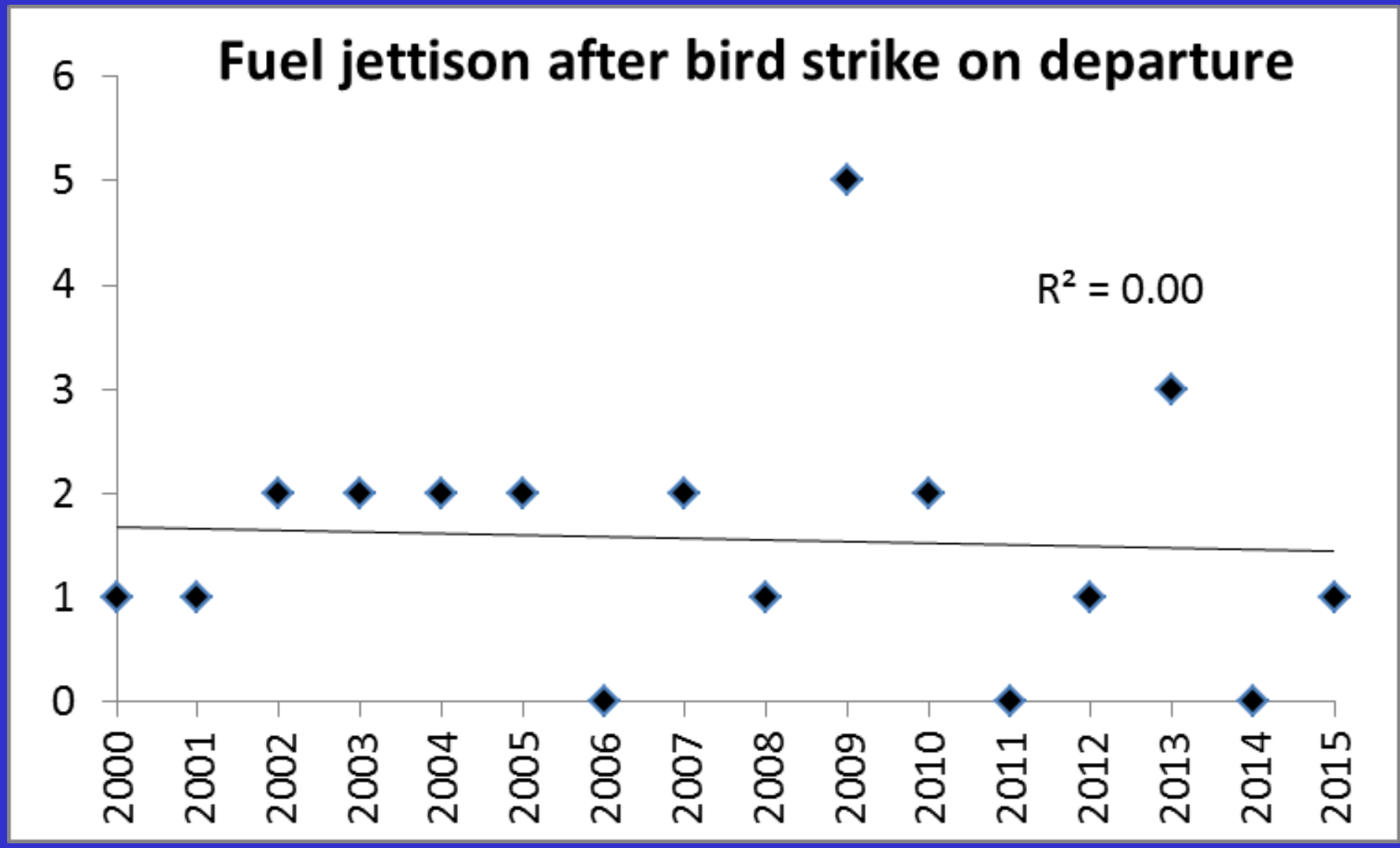
CAST has initiated a project to monitor bird strikes in USA by the level of risk posed to commercial aviation.

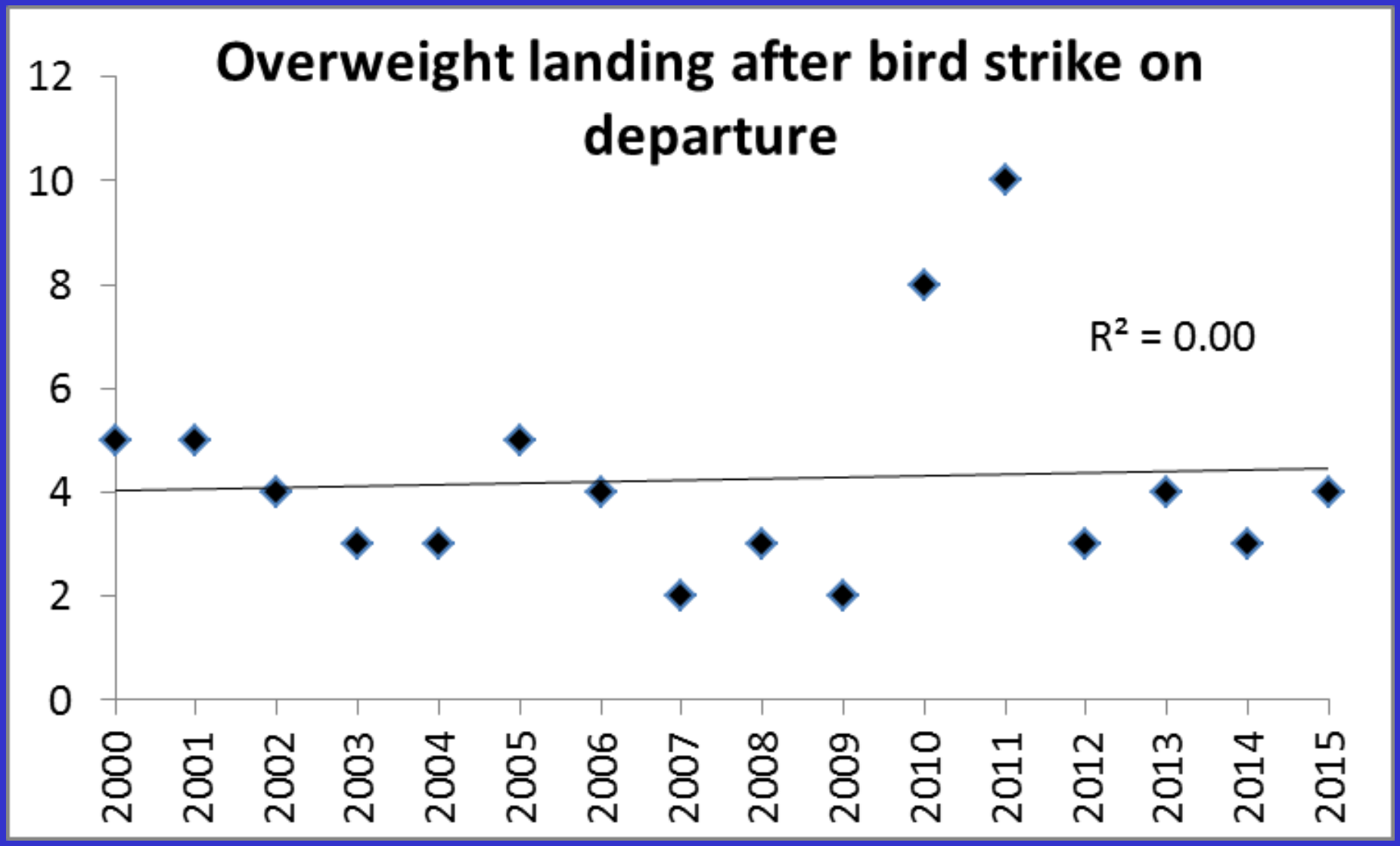
Criteria used by CAST for "High risk" strikes include:

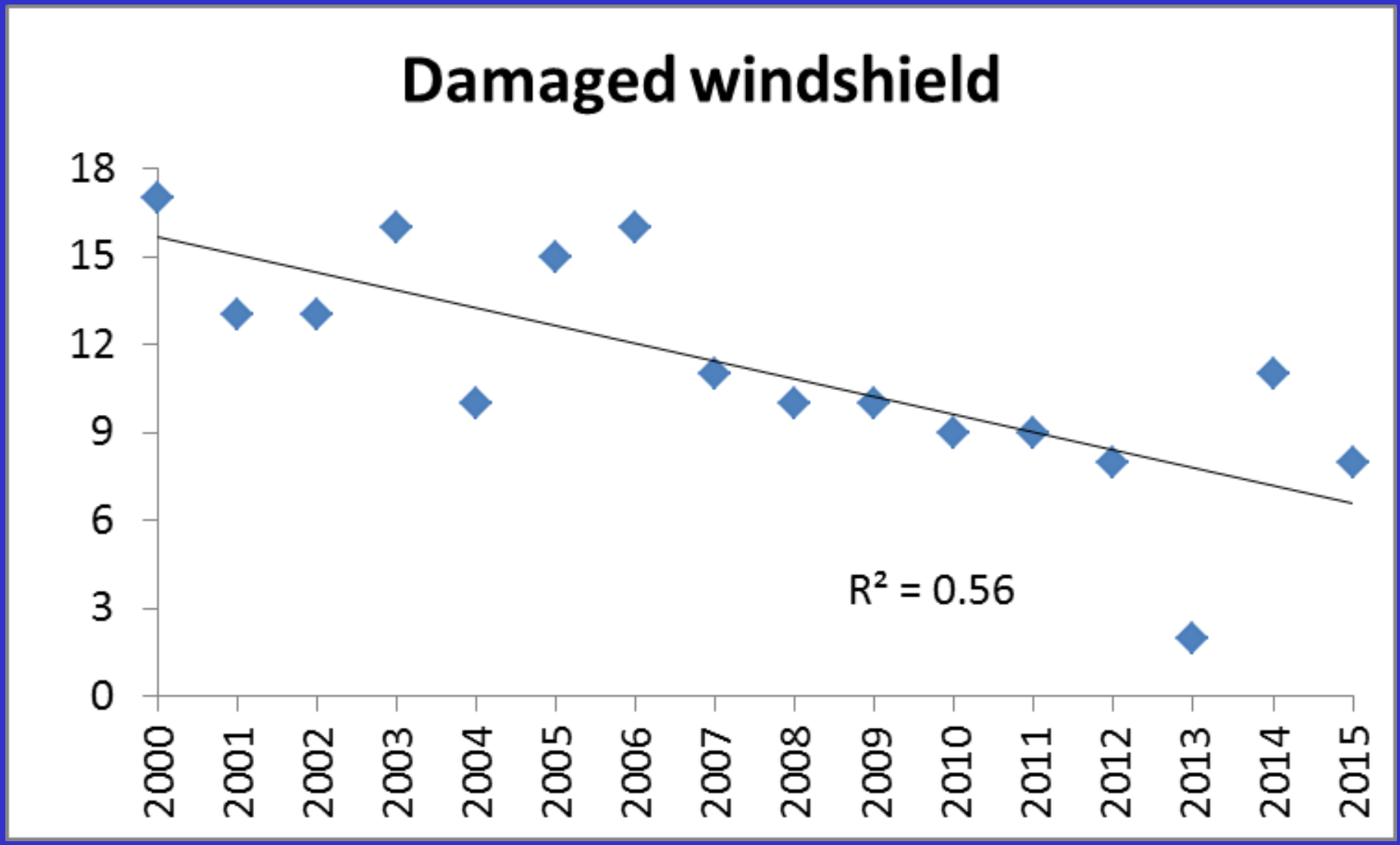
- **High-speed aborted takeoff.**
- **Return after T/O with fuel jettison.**
- **Return after T/O with overweight landing.**
- **Pilot vision obstruction or cockpit intrusion.**
- **Multiple engines ingested large birds.**
- **Multiple engines damaged.**
- **1 Engine damaged + other part(s) damaged.**

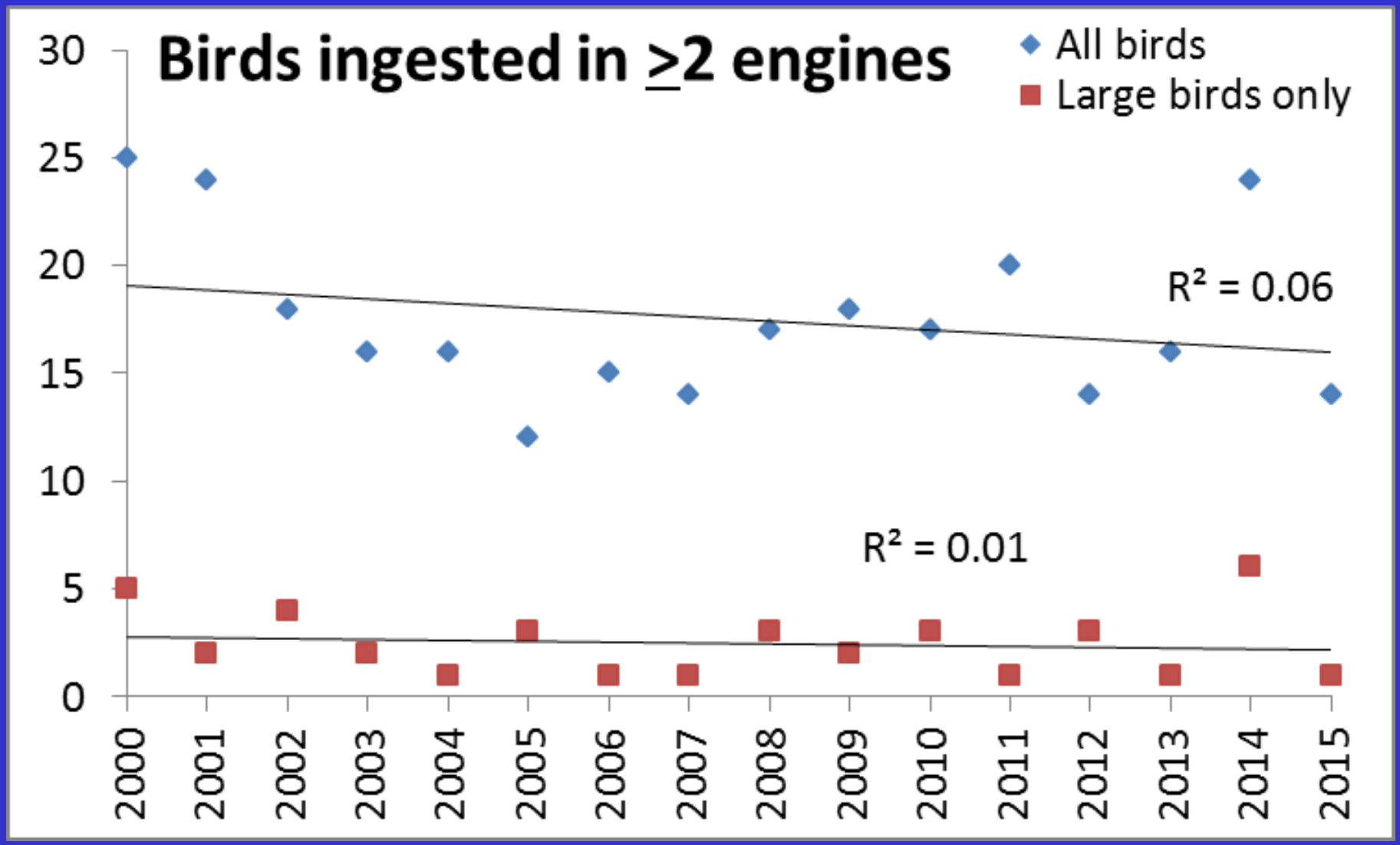


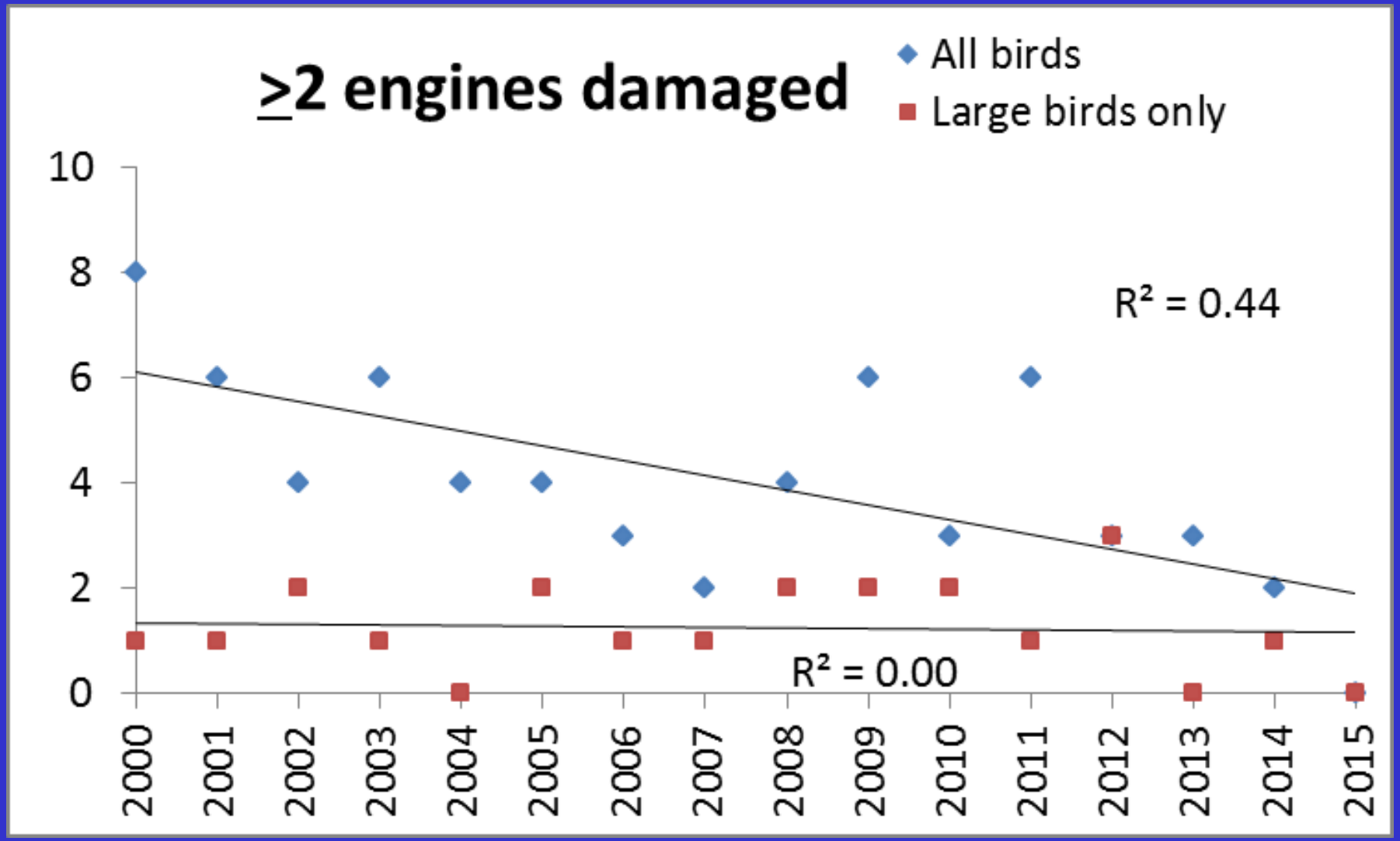
Kalita Airlines, May 2008, Aborted T/O

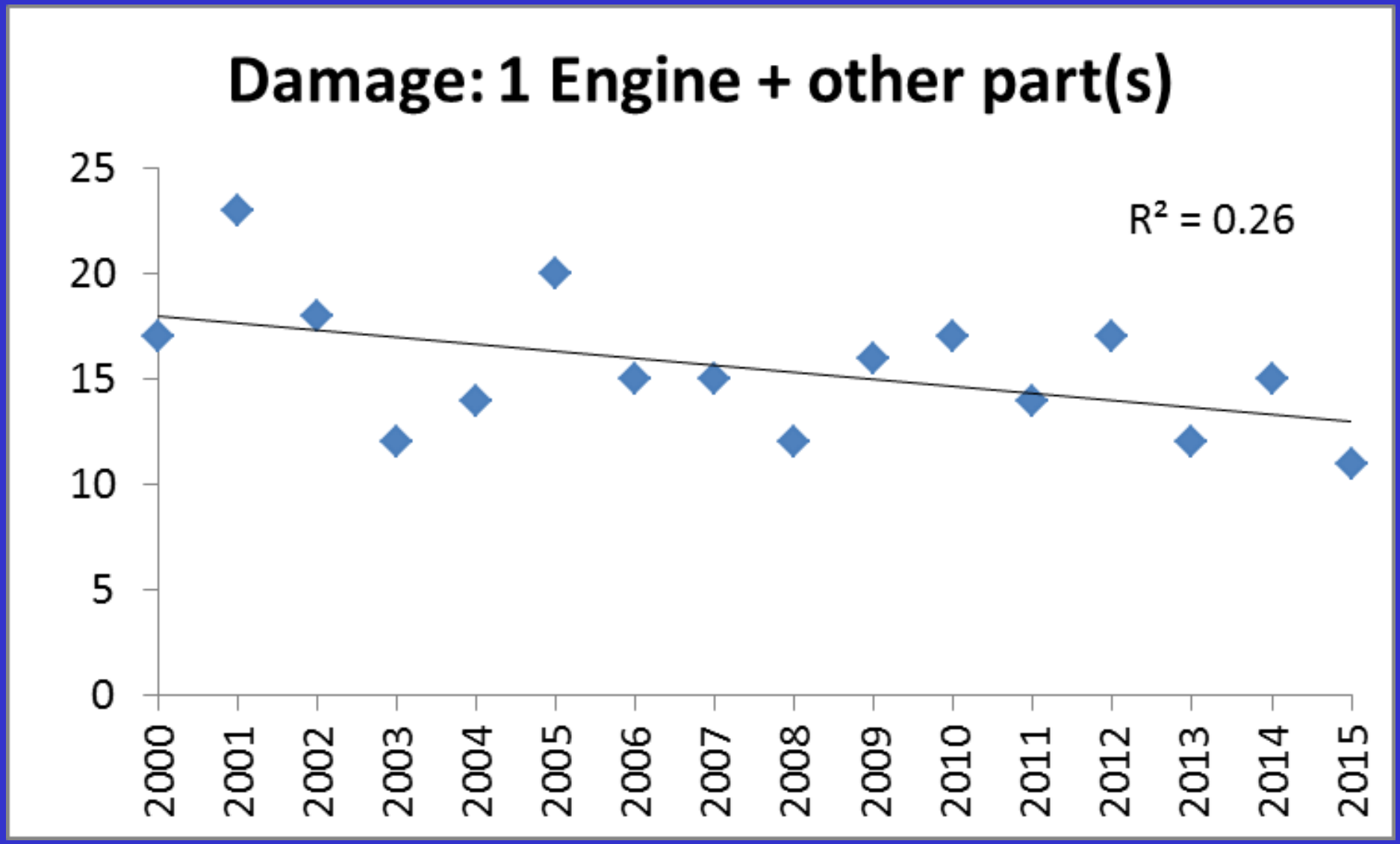

Fuel jettison after bird strike on departure
6
5
4
3
2
1
0
R² = 0.00
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015


Overweight landing after bird strike on departure
12
10
8
6
4
2
0
R² = 0.00
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015


Damaged windshield
18
15
12
9
6
3
0
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
R² = 0.56


Birds ingested in ≥2 engines
All birds
Large birds only
R² = 0.06
R² = 0.01
30
25
20
15
10
5
0
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015

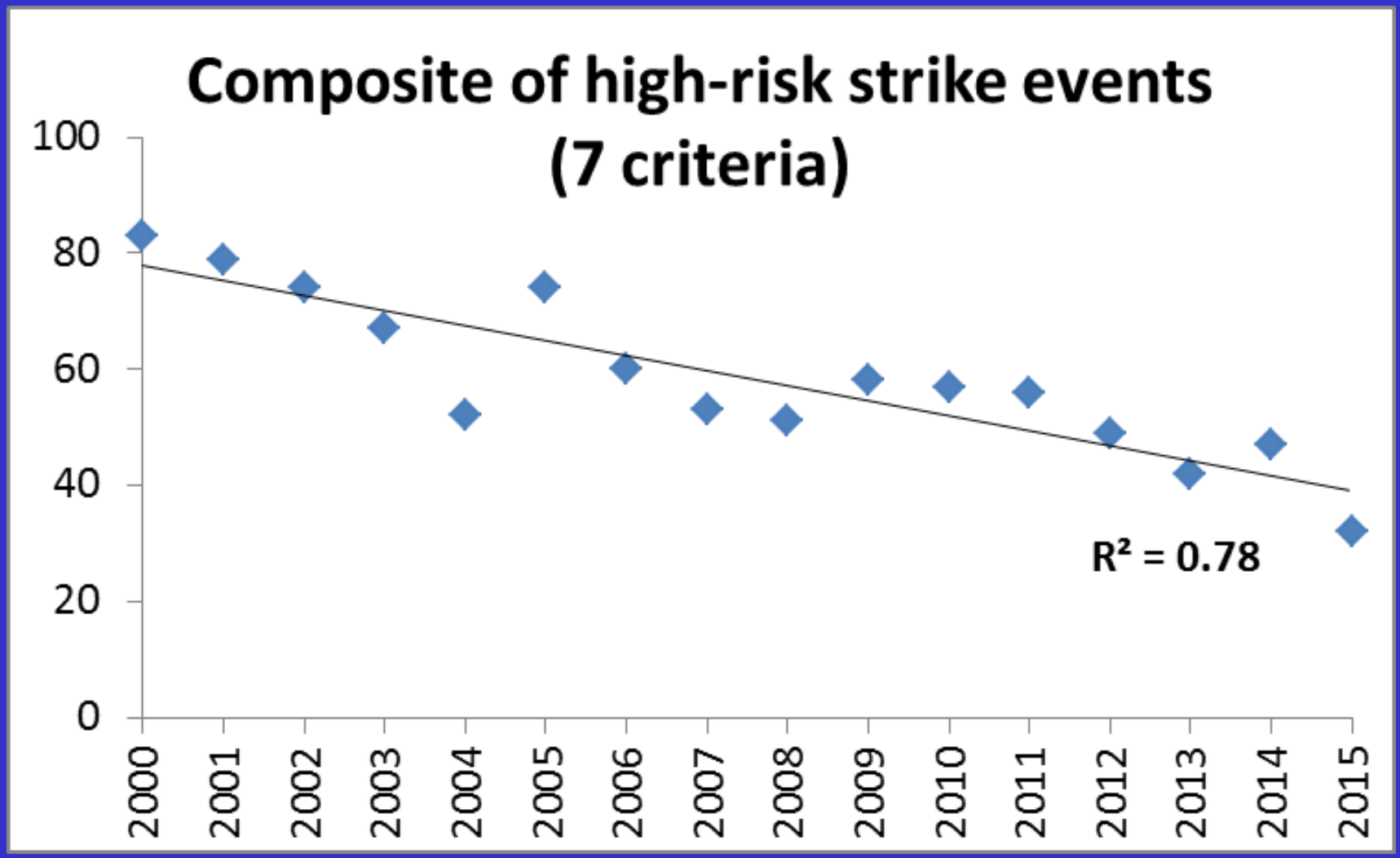

≥2 engines damaged
All birds
Large birds only
10
8
6
4
2
0
R² = 0.44
R² = 0.00
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015


Damage: 1 Engine + other part(s)
R² = 0.26
25
20
15
10
5
0
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015

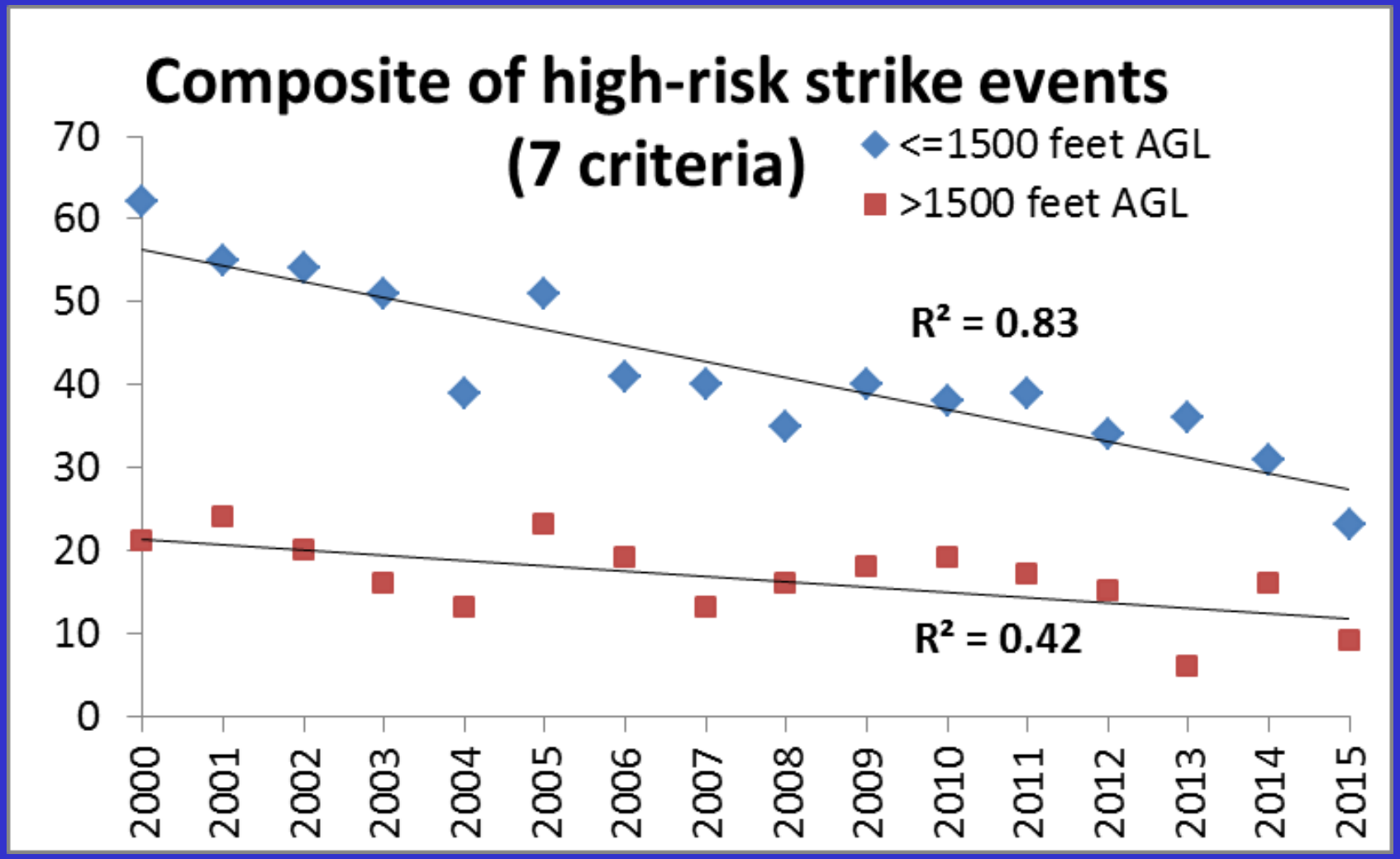
Trends (2000-2015) for commercial aircraft based on “High risk” criteria used by CAST

1) **High-speed aborted take-offs declined.**
2) **Overweight landings (~4/yr) & fuel jettisons (~2 yr) unchanged.**
3) **Windshield damage declined.**
4) **Bird ingestions in 2 engines unchanged.**
5) **Damage to 2 engines declined.**
6) **Damage to 1 engine + other parts s) declined.**

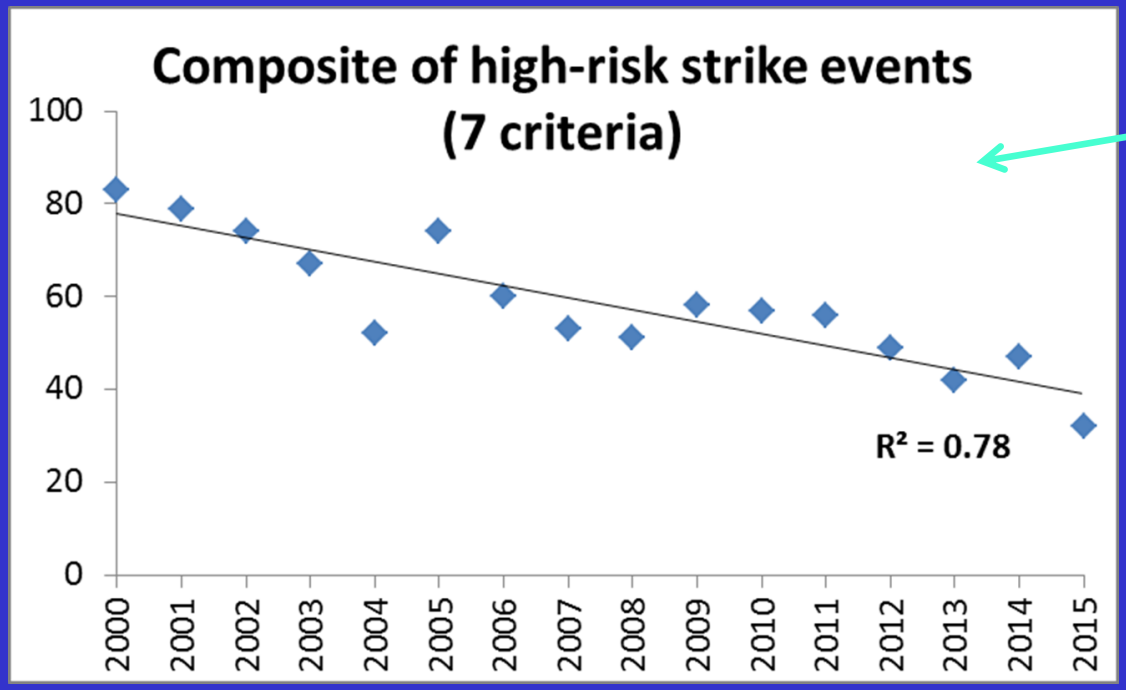
None of the “high risk” criteria showed a trend of significant increase and 4 criteria showed declines.



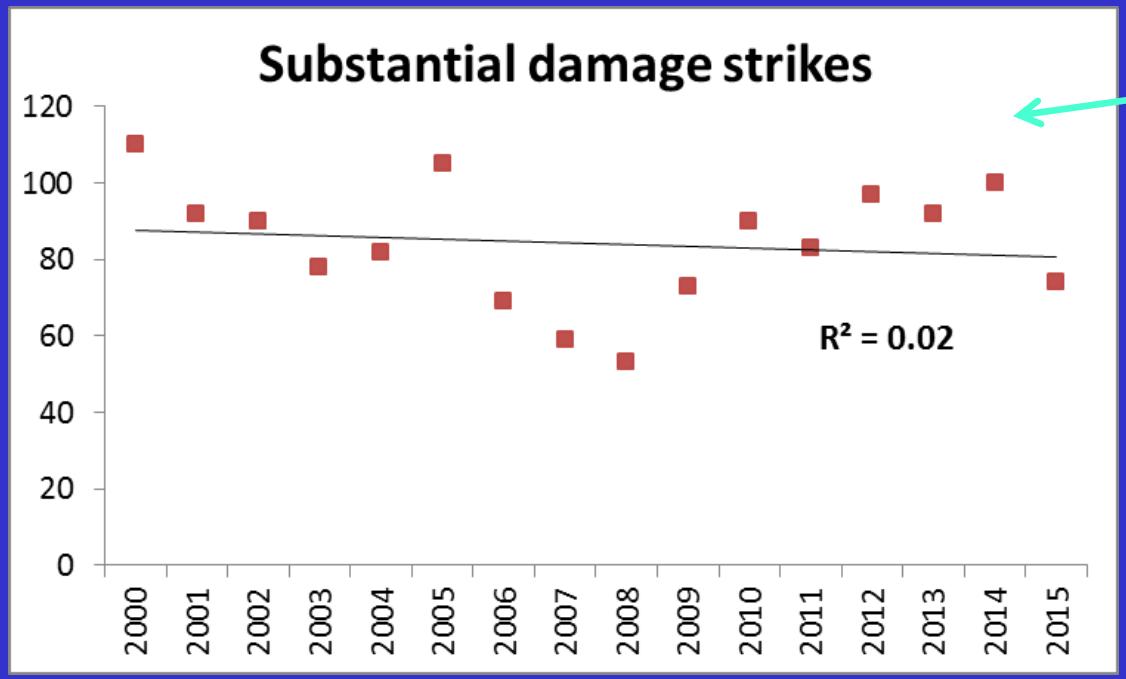
- Damage to 2 engines
- Damage 1 engine +other part(s)
- Large birds ingested in 2 engines
- High-speed aborted take-off
- Damaged windshield
- Heavy landing
- Fuel jettison



- Damage to 2 engines
- Damage 1 engine +other part(s)
- Large birds ingested in 2 engines
- High-speed aborted take-off
- Damaged windshield
- Heavy landing
- Fuel jettison



CAST criteria



NWSD criteria

Conclusions

The NWSD uses categories for damage level that do not necessarily mesh with criteria being used by CAST to define “high risk” strikes.

Based on NWSD criteria, high-risk strikes (substantial damage) are not declining.

Based on the 7 CAST criteria, high-risk strikes are declining significantly.

I propose that the FAA, in conjunction with CAST, develop a procedure to classify all strikes in NWSD by Risk as a supplement to the damage categories now used.

This would allow a more standardized procedure for tracking trends in “high-risk” strikes.