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September 2007

## Bald Eagles: A Threatened Species becomes a Threat to Aviation

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Wright, Sandra E., "Bald Eagles: A Threatened Species becomes a Threat to Aviation" (2007). *2007 Bird Strike Committee USA/Canada, 9th Annual Meeting, Kingston, Ontario*. 16.  
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Presented at Bird Strike Committee-USA/Canada, Kingston, Ontario Canada  
10-13 Sep 2007

**Bald Eagles: A Threatened Species becomes a Threat to Aviation**

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Presented at Bird Strike Committee-USA/Canada, Kingston, Ontario Canada 10-13 Sep 2007

## **Bald Eagles: A Threatened Species becomes a Threat to Aviation**

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**Abstract.** The bald eagle (*Haliaeetus leucocephalus*) population in the United States has made a tremendous recovery from fewer than 500 nesting pairs in 1970, to over 10,000 pairs in 2007. It is likely that the population will continue to grow. Every state, except Hawaii, now has nesting bald eagles. Because of the widespread recovery, the U. S. Department of the Interior removed the bald eagle from the Endangered Species List in August 2007. Bald eagles are still protected by the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act as well as by state laws. At airports across the United States of America biologists are finding it difficult to manage bald eagles that threaten aviation safety. This difficulty arises because of the restrictive laws which protect this species, and the intense public interest and concern for eagles. As the eagle population continues to grow, so do the number of eagle strikes with aircraft. Overall, there were 84 reported civil aircraft strikes with bald eagles in 18 U.S. states and one in Canada to a U.S. carrier from 1990-2006. The mean number of strikes/year has increased 7-fold in the lower 48 states since 1990.

### **1.0 Introduction**

This report presents information regarding the recovery of the bald eagle population in the United States of America, the laws that protect the bald eagle and its growing threat to aviation safety. This report summarizes bald eagle strikes with civil aircraft in the Federal Aviation Administration (FAA) National Wildlife Strike Database from 1990-2006.

### **2.0 Bald Eagle Status**

The bald eagle is the only eagle unique to North America. Bald eagles generally measure 71-96 cm in length and weigh from 3.0 to 6.3 kg. As in most other raptors, the female is about 25% larger than the male. They have a wingspan of 168-244 cm. (Beuhler 2000) The distinctive white head and tail feathers appear only after the bird is 4 to 5 years old (Figure 1).

The United States Continental Congress selected the bald eagle as the national emblem of the new republic in the 1782. Despite this honor, eagles were considered a nuisance and were hunted as predators, often with an official price tag on their head. Their population

also declined because of habitat loss, poisoning from eating game or fish containing lead, power line electrocution, pesticides such as DDT and other environmental contaminants, in spite of protection by the Migratory Bird Treaty Act (MBTA) since 1917. In 1940 the Federal Bald and Golden Eagle Protection Act (BGEPA) was passed for the lower 48 states. This Act prohibits killing, selling or otherwise harming eagles, their nests or eggs. Alaska's population of between 50,000 and 70,000 birds has never needed protection beyond the MBTA (U.S. Department of the Interior 2007).

In 1966, the bald eagle was listed as endangered under the Endangered Species Preservation Act in 43 of the lower 48 states and listed as threatened in 5 others (Michigan, Minnesota, Oregon, Washington, and Wisconsin). With the banning of DDT and other chlorinated hydrocarbon pesticides in 1972, captive breeding programs, reintroductions, law enforcement efforts, protection of habitat around nest sites, and land purchase and preservation activities, the eagle population started making a comeback (Figure 2). The bird's status was reduced to threatened in 1995 and in August 2007, the bald eagle was removed from the threatened and endangered species list (U. S. Department of Interior 2007). The bald eagle is still protected by the MBTA and BGEPA.

Bald eagles nest in all states except Hawaii, where it was never found. There were barely 400 nesting pairs of bald eagles in the lower 48 states in 1963; today there are some 10,000 nesting pairs in the contiguous United States a 25-fold increase in the last 40 years (U.S. Department of Interior 2007). If you include immature birds, the eagle population in the contiguous United States probably exceeds 40,000 birds (U S. Department of Interior, 2007).

### **3.0 Number of Reported Strikes**

The FAA's National Wildlife Strike Database contains 84 civil aircraft strikes with bald eagles from 1990-2006 (Cleary et al. 2007). The number of strikes in the lower 48 states has increased from 4 strikes between 1990-1995 (mean of 0.67 strikes/year) to 24 strikes between 2002-2006 (mean of 4.8 strikes/year) (Table 1). This rise is likely due to the increasing number of bald eagles in the United States and the increased awareness of the need to report strikes. The average number of strikes per year in the contiguous 48 states has increased 7-fold since 1990 while the average number of strikes in Alaska has decreased slightly.

### **4.0 Source of Reports**

Reports were received from 18 U. S. states and Canada (Table 2). Strikes were reported at 40 airports (26 in the continental United States, 13 in Alaska, and 1 in Canada). Alaska and Florida airports were the states that had the most strikes (41 and 18 respectively). One would expect this because they have the largest population of bald eagles. The other states each only had from 1 to 3 strikes reported. Minnesota has the

second highest eagle population in the lower 48 states (US Fish and Wildlife Service 2007) and 14 bald eagle nests were within 1 mile of a runway at 9 airports in 2000 (US Fish and Wildlife Service 2005) (Figure 3) but there were only 2 reported strikes with bald eagles for that state. This discrepancy may indicate that many eagle strikes are not being reported.

## **5.0 Timing of Occurrence of Strikes**

In Alaska, the highest number of strikes occurred in May (26%) while in the lower 48 states April had the highest number (17%) (Table 3). Most strikes (83%) occurred during the day (Table 4). The majority of the strikes occurred during the approach phase of flight (33%) followed by landing roll (21 %) (Table 5). Altitude was reported for 68 of the strikes; 60% occurred between 0-100 feet above ground level (AGL) and 73% were below 501 feet AGL (Table 6). The highest recorded strike was 4,000 feet AGL.

## **6.0 Aircraft Components Damaged**

The aircraft components most commonly reported as struck by bald eagles were the wing, nose/radome, tail, engine and propeller (Table 7). The components most often damaged were the wing, nose/radome and tail. Only 2 strikes involved engines and both engines were damaged. Engines and airframe components are not made to withstand strikes with a bird this size.

## **7.0 Reported Damage and Effect-on-Flight**

Of the 84 bald eagle strikes reported, 76 provided some indication as to the extent of damage (Table 8). Of these, 40 (53%) indicated that the strike did not damage the aircraft; 21 (28%) indicated the aircraft had minor damage; 10 (13%) indicated the aircraft had substantial damage and 5 (7%) indicated an uncertain level of damage. No civil aircraft have been reported as being destroyed as a result of a bald eagle strike.

Effect-on-flight was reported for 69 strikes. Approximately thirty percent of the strikes had a negative effect on the flight: precautionary landing (17%), other (10%), aborted take-off (1%) and engine shut down (1%) (Table 9).

## **8.0 Economic Losses**

For the 17 year period, reported losses from bald eagle strikes totaled 5,258 hours of aircraft down time and \$309,724 in monetary losses. Only 18 reports (50% of the 36 reporting damage) provided at least some costs associated with damage. The FAA Form 5200-7 Bird and Other Wildlife Strikes, only asked for engine damage costs before the form was revised in 1997. However, the old forms were used for many years after that, so cost data for damage to parts other than engines was often under-reported. Only 19

reports indicated number of hours the aircraft was out of service. The mean cost reported totaled \$17,207. The mean time an aircraft was out of service was 277 hours.

## 9.0 Discussion

The bald eagle has made a remarkable comeback due to protective laws, habitat restoration, and the banning of harmful pesticides. The recovery is similar to that experienced by other species that have been on the endangered species list, such as the osprey (*Pandion haliaetus*) and peregrine falcon (*Falco peregrinus*) as well as many other large birds such as Canada geese (*Branta canadensis*) and double-crested cormorants (*Phalacrocorax auritus*) (Dolbeer and Eschenfelder 2003). Conservation efforts helped protect these birds and thus their populations have increased, but now we have to deal with the success in a responsible manner. There are going to be increasing numbers of conflicts with bald eagles and other previously uncommon birds at our nation's airports and airbases. Many airports are now dealing with the harassment of eagles, removal of nests and even removing eaglets to foster nests (Figure 4). These are sensitive issues that have to be handled carefully.

An analysis of 17 years of strike data reveals that the bald eagle is a growing concern to aviation. Not only is the eagle population increasing but the strikes are increasing as well. The eagle has been removed from the protection of the Endangered Species Act but is still protected by a more restrictive BGEPA and the MBTA. It is unclear which Act will govern the harassment of bald eagles that threaten aviation safety. Right now, the BGEPA does not allow for any harassment at airports, but may be amended to allow for this.

On 5 June 2007, the USFWS opened a 90-day public comment period on a proposal to create a permit program to authorize a limited "take" of bald and golden eagles where the take is associated with lawful activities such as when they pose a risk to human safety or to the eagles themselves, for example in close proximity to an airport runway (USFWS 2007). This is an opportunity for airport managers to provide comments on this proposal if they have bald eagles in the vicinity of their airport.

Finally, there is a need for increased reporting of strikes with bald eagles. The author believes that eagle strikes are often underreported due to a lack of awareness of the reporting process. Furthermore, some pilots may be reluctant to report strikes because of an unwarranted fear of legal reprisals for striking an eagle (U.S. Department of Agriculture, Personal communication, Paul Wolf). Without adequate data, it is difficult to justify the actions necessary to harass or remove bird and wildlife species from airports and their surroundings.



## Acknowledgments

I want to thank Dr. R. Dolbeer, U.S. Department of Agriculture for his advice and assistance, J. Metcalf, biologist at Orlando International Airport, for giving me the idea for this paper, Lt. M. Carstens, U.S. Navy and L. Stepko, U. S. Air Force BASH team for providing strike data, P. Wolf, U. S. Department of Agriculture for his information on bald eagles in Minnesota, G. Wright for editing and C. Corbeil for his photos. The USA wildlife strike database used in this analysis was supported by the U.S. Federal Aviation Administration (FAA), William Hughes Technical Center, Atlantic City, New Jersey, and Airport Safety and Operations Division, Washington, D.C. under agreement DFTACT-03-X-90031 with the U.S. Department of Agriculture. Opinions expressed in this study do not necessarily reflect current FAA policy decisions regarding the control of wildlife on or near airports.

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Table 1. Number of reported bald eagle strikes by range of years to civil aircraft, USA, 1990-2006.

Range of years	48 contiguous states		Alaska		Total	
	Number strikes	Mean strikes/yr	Number strikes	Mean strikes/yr	Number strikes	Mean strikes/yr
1990-1995	4	0.67	16	2.67	20	3.33
1996-2001	13	2.17	16	2.67	29	4.83
2002-2006	24	4.80	11	2.20	35	7.00
<b>Total</b>	<b>41</b>		<b>43</b>		<b>84</b>	

Table 2. Number of reported bald eagle strikes to civil aircraft by state, USA, 1990-2006.<sup>1</sup>

State	17-year total	% of total
Alaska	41	49
Florida	18	21
Virginia	3	4
Washington	3	4
Washington, D. C.	2	2
Idaho	2	2
Louisiana	2	2
Minnesota	2	2
California	1	1
Illinois	1	1
Maine	1	1
Michigan	1	1
Mississippi	1	1
North Carolina	1	1
Nebraska	1	1
New Jersey	1	1
New York	1	1
Wisconsin	1	1
<b>Total US<sup>2</sup></b>	<b>83</b>	<b>99</b>
<b>Foreign<sup>3</sup></b>	<b>1</b>	<b>1</b>
<b>Total</b>	<b>84</b>	<b>100</b>

<sup>1</sup> A total of 8 strikes involved multiple birds.

One each in LA and VA and 6 in AK.

<sup>2</sup> Strikes were reported at 38 USA airports.

<sup>3</sup> Strike to a US carrier was reported at 1 Canadian airport.

Table 3. Number of reported bald eagle strikes to civil aircraft in the contiguous 48 states and in Alaska by month, 1990-2006.

17-year total			
Month	48 contiguous states	Alaska	All states
Jan	3	1	4
Feb	3	3	6
Mar	4	4	8
Apr	7	1	8
May	3	11	14
Jun	0	8	8
Jul	5	2	7
Aug	3	3	6
Sep	1	6	7
Oct	5	0	5
Nov	3	3	6
Dec	5	0	5
<b>Total</b>	<b>42</b>	<b>42</b>	<b>84</b>

Table 4. Reported time of occurrence of bald eagle strikes to civil aircraft, USA, 1990-2006.

Time of Day	17-year total	% of total known
Dawn	7	10
Day	60	82
Dusk	6	8
Night	0	0
<b>Total known</b>	<b>73</b>	
<b>Unknown</b>	<b>11</b>	
<b>Total</b>	<b>84</b>	

Table 5. Reported phase of flight and number of strikes with damage at time of bald eagle strikes to civil aircraft, USA, 1990-2006.

Phase of flight	17-year total	% of total known	No. with damage	% with damage
Take off run	10	14	3	30
Climb	11	13	7	64
En Route	12	16	11	92
Descent	2	3	1	50
Approach	25	33	11	44
Landing roll	16	21	4	25
<b>Total known</b>	<b>76</b>	<b>100</b>		
<b>Unknown</b>	<b>8</b>			
<b>Total known</b>	<b>84</b>		<b>37</b>	

Table 6. Number of reported bald eagle strikes to civil aircraft by height (feet) above ground level (AGL), USA 1990-2006.

Height of strike (feet AGL)	17-year total	% of total known
1-100	41	59
101-500	9	13
501-1000	6	9
1001-2000	8	12
2001-3000	4	6
3001-4000	1	1
<b>Total known</b>	<b>69</b>	<b>100</b>
<b>Unknown</b>	<b>15</b>	
<b>Total</b>	<b>84</b>	

Table 7. Civil aircraft components reported as being struck and damaged by bald eagles, USA, 1990-2006.

Aircraft component	Number struck	Number damaged	% damaged
Wing	31	14	45
Nose/radome	15	10	67
Other	12	6	50
Tail	9	6	67
Engine <sup>1</sup>	9	3	33
Propeller	8	1	13
Fuselage	7	1	14
Landing gear	5	1	20
Windshield	5	1	20
<b>Total</b>	<b>100</b>	<b>42</b>	

<sup>1</sup> Two engines ingested eagles.

Table 8. Number of civil aircraft with reported damage resulting from bald eagle strikes, USA, 1990-2006.

Damage category	17-year total	% of total known
<b>None</b>	<b>40</b>	<b>53</b>
<b>Damage</b>	<b>36</b>	<b>47</b>
Minor	21	28
Substantial	10	13
Uncertain	5	7
Destroyed	0	0
<b>Total known</b>	<b>76</b>	<b>100</b>
<b>Unknown</b>	<b>8</b>	
<b>Total</b>	<b>84</b>	

Table 9. Reported effect-on-flight for bald eagle strikes to civil aircraft, USA, 1990-2006.

Effect on flight	17-year total	% of total known
<b>None</b>	<b>48</b>	<b>70</b>
<b>Negative effect</b>	<b>21</b>	<b>30</b>
Aborted take off	1	1
Precautionary landing	12	17
Engine shut down	1	1
Other	7	10
<b>Total known</b>	<b>69</b>	<b>100</b>
<b>Unknown</b>	<b>15</b>	
<b>Total</b>	<b>84</b>	



Figure 1. Bald eagles soaring in Homer, Alaska, 2007. The eagle population in Alaska is between 54,000 – 70,000 birds. (Courtesy of C. Corbeil)

## Nesting Bald Eagle Population in Contiguous USA (1963-2006)

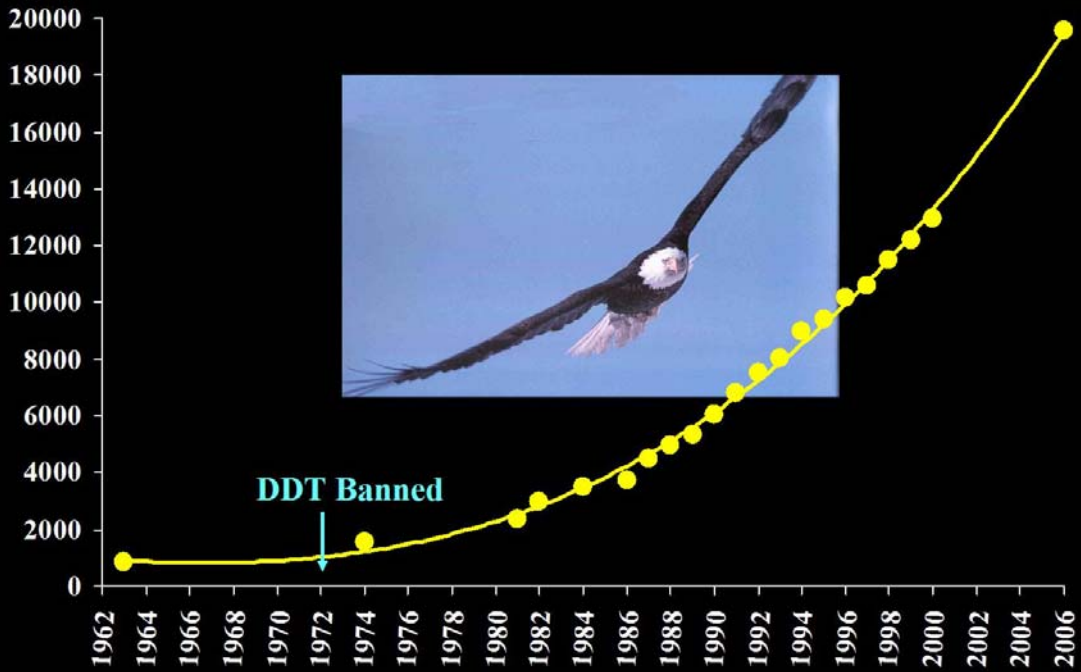


Figure 2. Nesting bald eagle population in the contiguous USA, 1963-2006. (R. Dolbeer)



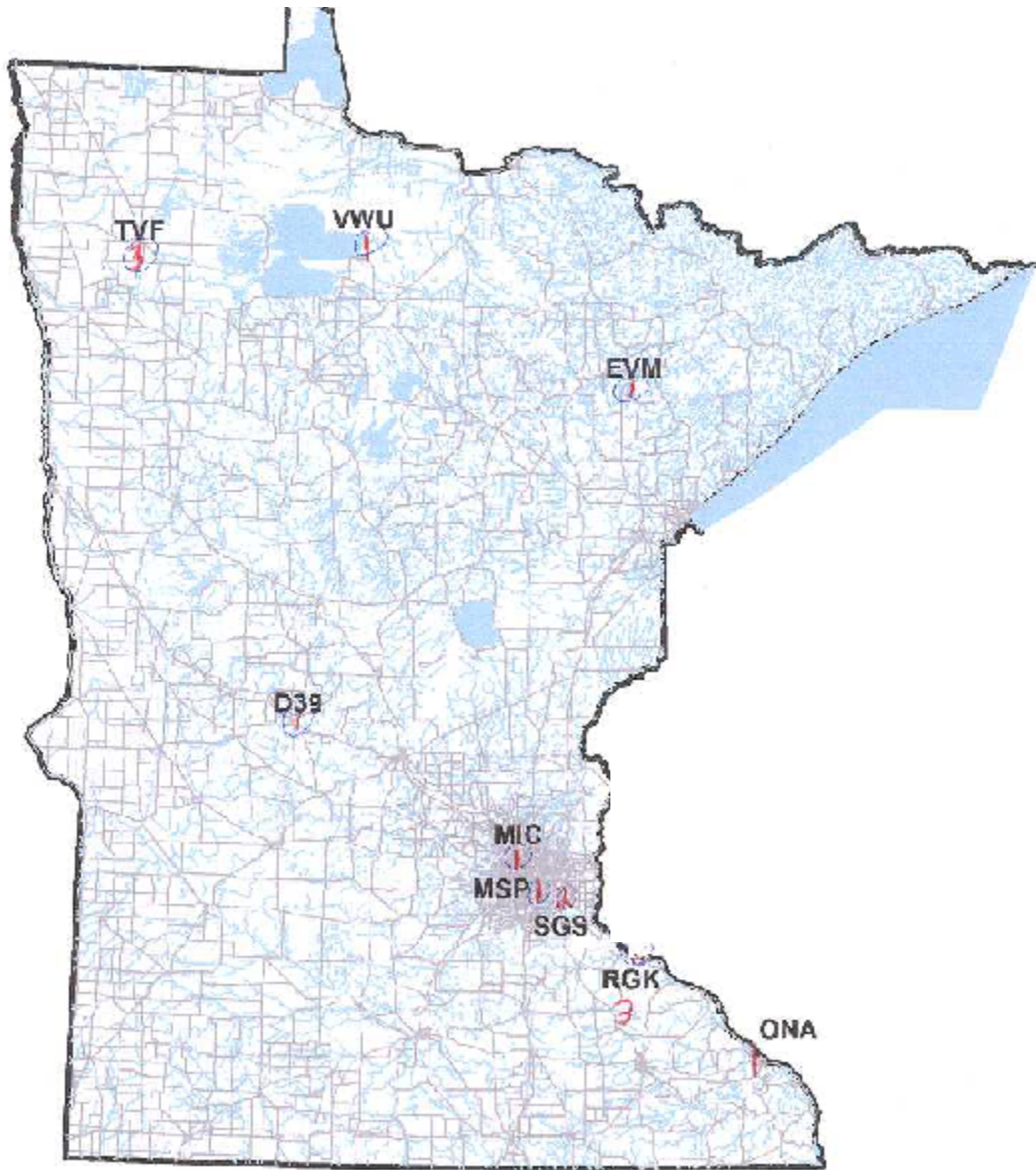


Figure 3. Bald eagle nests within 1 mile of Minnesota Airports in 2000. (U.S. Fish and Wildlife Service 2005).



Figure 4. Bald eaglet is removed from nest near Orlando Sanford International Airport while parent flies overhead, 2007. (Orlando Sentinel)