

An airport perspective on airline-wildlife strike reporting

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Abstract. Recently Alaska Air Group (Alaska, Horizon and Virgin Air; AAG) designed a dashboard to identify priority airports needing to be contacted to improve their hazardous wildlife mitigation efforts. AAG contacted the Port of Seattle (Port) because the AAG strike rate was relatively high at the Seattle-Tacoma International Airport and SEA is Alaska Airlines' primary hub. The Port was given access to AAG data for direct comparison with SEA strike records. Only 2018 data were evaluated. Knowing the AAG dashboard assigns a strike by default to the airport where their aircraft lands, we cross-checked each AAG strike record to determine strike location if possible. This evaluation allowed us to eliminate 50 (13.6%) records from the original 367 because some were duplicates or occurred elsewhere. The remaining 317 AAG strikes, including those lacking location, altitude, or phase of flight information, were temporarily assigned to SEA, the destination airport, because it's known that more strikes (64%) occur during the approach/landing phases of flight rather than the take-off/en-route phases (National Wildlife Strike Database; NWSDB).

Sharing data had a positive effect on the quality and number of actual strikes known to have occurred at/near SEA in 2018 for both cooperators. Prior to receiving AAG data, the Port documented a total of 80 AAG strikes. Twenty-seven of those were known to have occurred within 5-miles of SEA and the other 53 were undeterminable. Of the 317 AAG strikes assigned to SEA, about 30 were new to the Port. Conversely, of the 27 strikes confirmed for AAG, 8 were new to AAG. All new AAG strikes were from bird remains recovered immediately after an AAG flight via the SEA FOD detection system. While the AAG Strike Dashboard has already proven effective for highlighting priority airports, the impacts of submitting all AAG dashboard data now to the NWSDB and the Smithsonian could become unmanageable. Airport operators might be equally impacted by the submission of airline maintenance bird strike data unless all unknown-location strikes were submitted as such. The new AAG data has already increased the overall reported strike for the Port. In 2018, the Port's "finalized" strike rate was 2.5 strikes/10,000 operations (109 strikes/432,190 airline operations). The additional 30+ AAG strikes increased our rate to at least 3.2. If all 317 AAG assigned SEA strikes were factored in using the approach/landing figure of 64% above, the AAG strike rate alone would be 17.7 strikes/10,000 operations. If that rate were applied to all 2018 SEA operations, our annual of strike number would be 763 strikes/year or 7 times higher than originally documented. It is recommended that a greater emphasis be placed on obtaining phase of flight information or at least altitude.

I knew that Troy would be a tough act to follow so you will see that I broke my presentation down into two presentations (Slide 1). There are two parts to this (Slide 2). The first is strike reporting kit program at Sea-Tac Airport and the second one is a comparison with the data for Seattle that Troy's dashboard just spit out for us. That is

the 2018 data. The first thing is in 2011 we began distributing strike reporting kits to the airline maintenance offices - line maintenance and so on (Slide 3). And the idea was to make sure that we had quarterly visits, to insure that we had the same amount of face time as much as we could control that, and to make sure that they always had

ten reporting kits in their hands somewhere that they could use to report. We are trying to get some consistency. The goals were to improve airports based on strike rate by creating consistency in the 'ask', improve species identification rate by collecting more snarge and improve reporting rates for all airlines (Slide 4).

And the results are (Slide 5): the baseline rate improved and when you see that 2011 mark you are going to think – wow – they are really effective – giving strike reporting kits. What is really going on there is we had really high vole numbers, grasshopper numbers. We never had another year like that so those were just some of the confounding variables. The other thing of course that happened is the Miracle on the Hudson in 2019¹ we know that there was an increase in reporting as a result of that making the headlines and people taking wildlife strikes more seriously. This is a really interesting slide and thanks to the Smithsonian the species ID rate improved significantly and it makes so much sense (Slide 6). Now that you've actually given airline maintenance folks a bag, gloves, something to put that snarge in - they probably would have taken it before, but we really didn't give them the equipment or tools and we didn't have that face time with them. They were very responsive to that that's a very positive and significant trend. Reporting significantly improved and you know there's a high P value for FedEx and all airlines together so there certainly was a huge increase in numbers of strikes that were reported to us (Slide 7). We ended up with a new baseline. That's important because you are dealing with SMS and so on. You are comparing this year to last year to the last 3-year rolling average or whatever

it may be. So now we have a new baseline and better information. One thing that was a little interesting is not the fact that those airlines in the centre were also significant, significantly increased reporting, but the ones that were not significant (Slide 8). You look at Alaska Airlines, the reason they were not significant is because they already had the highest reporting rate in the past. United was not significant – did not significantly improve and I started thinking about that last night. I know a lot of those people. They are on night shifts when they are doing the aircraft maintenance [inaudible] and I don't think we had as much face time with them. You look at Horizon which was also significantly increased. What's happening there, I was just talking with Troy about this, is that half their fleet is the Dash 8 Q400 which supposedly has about four times less strike rate than some of the other aircraft that are being flown. Just because you look at these airline strike rates does not tell you that all things are equal as much as we try to make them equal with respect to reporting.

Here is something that is pretty interesting. Whatever airline you are, I mean Alaska has a lot of operations that is why they are more of a blue line - that navy blue line, but look at FedEx. I just got done saying that they had the highest increase in submitted reports, but they also had probably the greatest variability as well. Just to let you know that managers change, people change; you could have buy outs of an airlines, there are a lot of things that go into it. I know from my experience working at the Port of Seattle. Union negotiations. We have seen rises and falls that I could point to exactly what is going on politically at times. As much as people try to do a good job, we are all humans. So here is something that I really thought was really, probably of everything that I'm showing here, airline

¹ The Miracle on the Hudson took place in 2009

reporting rate versus airline size (Slide 9). My assumption is that a larger airline, more maintenance facilities, more people on staff they have a high reporting rate. That is not true.

The benefits of providing strike reporting kits (Slide 10): there was an overall increase in the baseline rate, and it became more consistent, more snarge collected and species ID, significant improvement in reporting. Hard to quantify, but the data quality - there were improvements. That is something we didn't get a chance to actually look at. You have to trust our gut feeling on that one. Kits are inexpensive, they are less than a buck apiece. You just get down to the core thing – what is needed. Strike kits can't fix everything (Slide 11). Individually, airline reporting rates remained dissimilar between years and also within the same air group and different aircraft type. Airline size did not seem to have any influence on reporting rate. Kits alone get lost in drawers or repurposed and we received less than 20% of them back. Funny stories is that we go to some of these places and say “do you need more strike kits” and they go “I don't know they are in that drawer”. So they don't all know where it is and that's why we came up with these holders so everybody would know where they are (Slide 12). On a quarterly basis we are now changing out these flyers so it is something new to look at, catch their eye, and hopefully they will not forget it sitting up there on the wall.

So the last thing is presentation two -- An evaluation of what I am calling Version 1 of AAG dashboard (Slide 13). I ignored Virgin Air because they came into the Alaska Air Group about halfway through or so in 2018. Some of the important things here are: Troy reached out to Seattle saying “hey we've seen a big increase in your number of strikes in September of 2018” (Slide 14). Where

they had 69 we showed 13 strikes. At the end of 2018 we started to dig deeper into our strikes and did a comparison. And I thought what was interesting is the AAG strike rate for Seattle was 25 strikes per 10,000 operations and they have about 47% of all the operations at Seattle. In my baseline rate for all airlines it was 2.5 so 10 times less. Of course they had many questions with this regard and find out why it was so different. Troy did a data dump for me and I got to say when Troy showed me the dashboard I was salivating, but when he actually agreed to give me the data in an Excel file I thought ‘oh my gosh I've been waiting for this for 19 years trying to get Airline data that could really tell us the story’, so it was a big deal for sure.

So how could the AAG and Seattle numbers be so different (Slide 15)? The first question I had was just that. The arrival airport gets the strike and that's just the way it is assigned and that is unless the strike location is known. Now it seems reasonable from the standpoint of the National Wildlife Strike Database because what is known there is 64% of the strikes are known to occur on approach or landing phases of flight. That also corresponds with Alaska Airlines and how they track other incidents. They always have the landing airport is the one that gets credit for it regardless of where it occurs unless they know exactly where it occurs then it does go to the other airport. So as a default; it is the landing airport, the arrival airport is the one that gets credit for it.

Double counting (Slide 16) - that was my first question. Certainly some of these had to be counted twice. Troy said ‘no’ because an impact area on the aircraft is wiped clean when looking for damage per the aircraft maintenance procedures. So that was not part of the story or the explanation as to why. Other answers to my questions where

‘yes’ a primary hub like Seattle could have more strikes discovered because typically there is more time spent there servicing aircraft (Slide 17). That maybe 10% or whatever it may be we don't have good numbers on that. So I said what about things like lightning strikes (Slide 18)? He said “oh yeah, striker, [inaudible], lightning, all those things are pulled out by the dashboard in advance. Now we are starting to reduce the amount of error that the dashboard is going to be showing us. Still the AAG strike rate for Seattle seemed too high (Slide 19). It was just very recently, a couple of weeks ago, Troy and I were talking about aircraft operations. We talked about this in the group before – 10,000, 100,000. Well look at this: airlines count one flight as one operation. Airports do it differently. We have a takeoff and landing as two operations. So right away the Alaska rate is twice as high as I would have calculated for myself even if I had exactly the same amount of data. So we have to be careful when we are talking about aircraft operations. What does that really mean? Is it the airline definition? Is it an airport definition? It makes no difference to me as long as we are really using apples to apples because right now those words are spelled exactly the same -- aircraft operations.

Results and Discussion (Slide 20). Sharing data had a positive effect on both the quality and number of strikes for both co-operators. So we compared all that 2018 strike data (Slide 21). We started off with 367 strikes at Seattle. Fifty of those were found to have occurred elsewhere based on the maintenance comments, or some were duplicates. An aircraft that strikes multiple birds has multiple records in the maintenance logs because there are different impact points. They wipe one area of the aircraft, it is another impact point. There is another reason why it could be inflated. That

left us left us with a total of 317 AAG strikes for further evaluation. We began to dive deeper and of the 317 strikes now (Slide 22), 56 (18%) were known had location data making them very likely to have occurred within 5 miles or less than 2500 feet of Seattle and that's how we count our strikes. If they did have approach on them, also landing gear, flaps impacted, so there were other things that made us believe that. But I can say with certainty that 16 (5%) of those definitely occurred within Seattle. There is no information to help us identify species ID from those records.

I don't know if I've said it, but the two damaging strikes were new to us - something that we hadn't known about before. You can look at the rate in green – that is with the AAG data compared to prior to having the AAG data (Slide 23). You notice that the rate jumps from 25 to 38 per 100,000 operations and damaging/adverse effect of course doubled. If you look at [inaudible] effects we actually went up from 3 up to 6 so that was unique for us because this was actually one of our lower rate years so we were feeling pretty good about that until I met Troy. If you extrapolate that, the 317 strikes and 64% of those if they were really ours, that's 170 strikes for Alaska Air Group alone. Extrapolate that airport wide, we have 360 strikes annually, meaning that could be another snarge sample a day for the Smithsonian.

Strikes that were undocumented by AAG, I thought, was pretty interesting too (Slide 24). The Port knew of eight new strikes that AAG did not have. They were showing up on our FOD detection system so we know exactly what aircraft it is, when they leave. There was no carcass there before and all of a sudden, boom, there is a bird on the ground so we go out there and pick it up and

it is assigned to AAG. So there were some that even Alaska Airlines did not have.

The dashboard is great for quickly obtaining data (Strike 25). I think my Seattle bubble maybe a little bit higher than it really is, but we have a lot of operations there. I am more concerned about the colour changes and the trends over time. I think it is just a brilliant indexing tool. I know Troy, he might share with you later, has a story about one airport that I guess lost its biologist a couple of weeks prior. He contacted them because their rate was going up only to find out that that in fact was what happened - their wildlife team had changed. So it is sensitive. We have a huge opportunity right now in front of us. Thank you again, Troy, for providing your data as you did (Slide 26). It was very generous and I think it is a paradigm-shifting moment. It is pretty cool that you are able to come forward and with that, American Airlines is starting to talk about their strike data, Southwest and hopefully others as well.



Slide 1



Slide 2



Slide 3

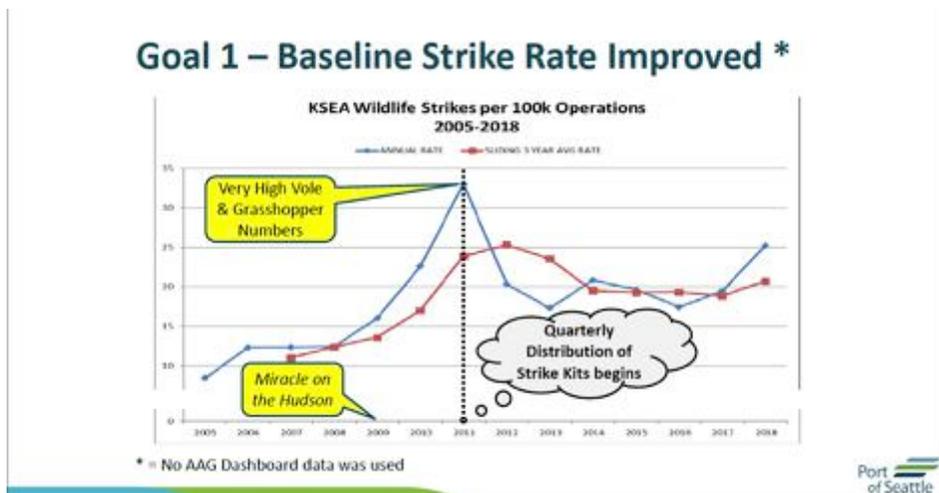
Goals Were Simple

1. Improve airport's baseline strike rate by creating consistency in the "ask"
2. Improve species identification rate by collecting more snarge
3. Improve reporting rates for all airlines

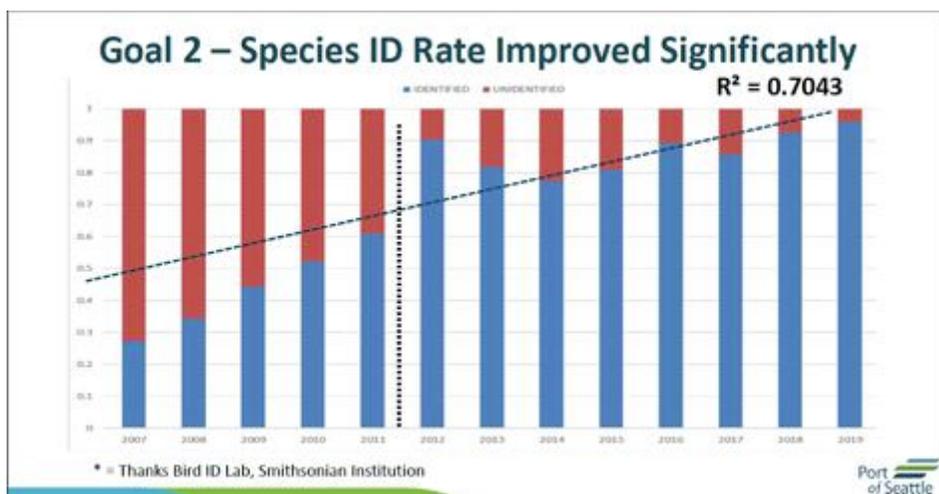




Slide 4



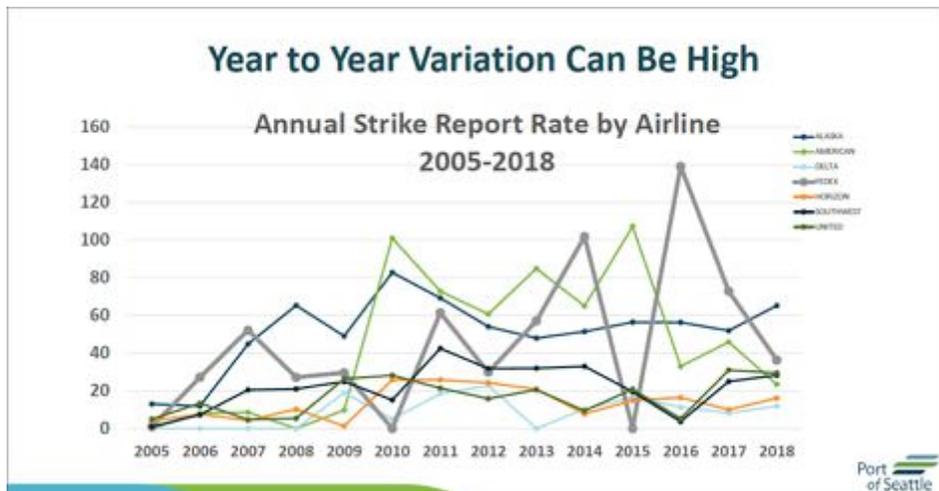
Slide 5



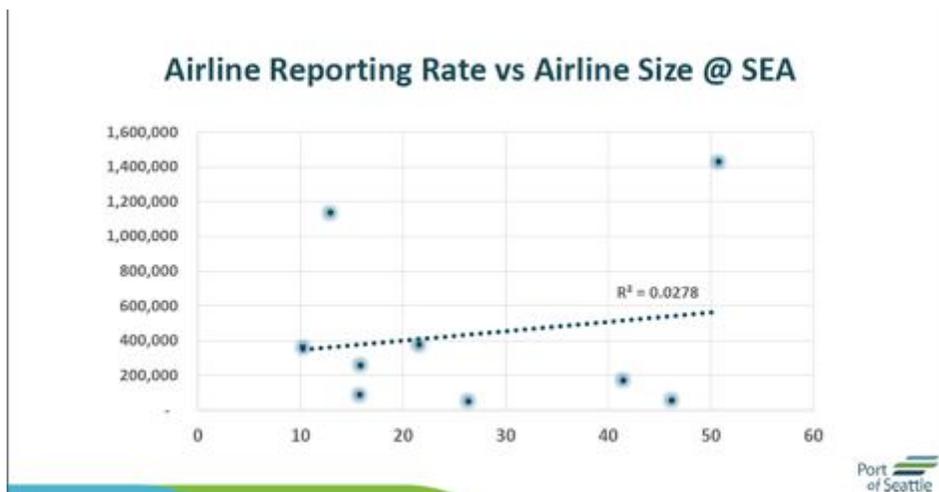
Slide 6



Slide 7



Slide 8



Slide 9

Benefits of Providing Strike Reporting Kits

- **Pros**
 - Overall increase in:
 - Baseline rate became more consistent
 - More snarge collected & species ID'd
 - Significant improvement in reporting
 - Hard to quantify but data quality improved
 - Kits are inexpensive \$1 each





Slide 10

Strike Reporting Kits Can't Fix Everything

- **Cons**
 - Individual airline reporting rates remained dissimilar
 - Between years and even within an air group
 - Airline “size” no influence on reporting rate
 - Kits alone get lost in drawers or repurposed
 - Receive less than 20% back
 - 2018 Port recently provided kit “holders”
 - More improvement still





Slide 11

Have you seen me?

I can cause serious damage!



Common name
Bald Eagle

Scientific name
Haliaeetus leucocephalus

Length 38 inches
Wingspan 80 inches
Weight 14 pounds

Protected under both the International Migratory Bird Treaty Act (1916) and US Bald and Gold Eagle Protection Act (1940), this species population is increasing in Washington and the Pacific NW.

$E = \frac{1}{2}mv^2$

A 400 mph (v) aircraft hitting a 14 lb. (m) bird creates a 39 ton strike impact force (E).

Think about it!
That's the energy required to lift a soccer ball weighing 78,000 lbs.



Have you seen me?

I can cause serious damage!



Common name
Glaucous-winged Gull

Scientific name
Larus glaucopterus

Length 25 inches
Wingspan 52 inches
Weight 2.5 pounds

Protected under the International Migratory Bird Treaty Act of 1916, some species of gulls are scavengers and are attracted to garbage.

$E = \frac{1}{2}mv^2$

A 400 mph (v) aircraft hitting a 2.5 lb. (m) bird creates a 7 ton strike impact force (E).

Think about it!
That's the energy required to lift a soccer ball weighing 14,000 lbs.



Changing
Out
Hazardous
Species
Fact
Sheets
Each
Quarter




Slide 12

B. An Evaluation of “Version 1.0” AAG Dashboard Data

Using 2018 Data Only

Virgin Air Was New to AAG & Not Included



Slide 13

Alaska Air Group Contacted Port of Seattle

- October 2018 - AAG contacted SEA noticing a pronounced increase in wildlife strikes
 - AAG recorded 69 strikes in September whereas SEA recorded 13 strikes
- The end of 2018 we dug deeper
 - AAG’s rate for SEA ~25 strikes/10,000 ops (47% of all SEA ops)
 - SEA’s baseline rate for ALL airlines = ~2.5 strikes/10,000 ops
- I had many questions regarding AAG’s Dashboard; Reviewed 2018 data
 - AAG = 367 strikes @ SEA (~5 times more strikes) vs SEA’s 80 strikes for AAG



Slide 14

How Could AAG & SEA Numbers Be So Different?

- First question: How is a strike assigned to an airport?
 - The arrival airport gets it, unless strike location is known
 - Seems reasonable - National Wildlife Strike Database found more strikes (64%) occur during the approach/landing phases of flight rather than other flight phases
 - Consistent with how AAG maintenance (MX) logs record other kinds of incidents



Slide 15

Double Counting?

- Could a bird strike inspected today be counted again by MX at another airport later?
 - No, the impact area on an aircraft is wiped clean when looking for damage per aircraft maintenance procedures.



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Slide 16

Other Answers to Questions

- Yes, a primary hub like SEA, could have more strikes discovered there because typically more time is spent there servicing aircraft.

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Slide 17

Other Answers to Questions

- Yes, the dashboard is designed to catch/omit maintenance records with the words like “lightning”, “striker”, ...



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Slide 18

Still the AAG Strike Rate for SEA Seemed Too High

- AAG & Port - Recently learned one reason why:
 - Airlines and airports count an “aircraft operation” differently:
 - Airlines: 1 Flight = 1 Operation
 - Airports: 1 Take-off + 1 Landing = 2 Operations

Take away – Can’t assume aircraft operations are counted the same way



Slide 19

Results & Discussion

Sharing data had a positive effect on the quality and number of strikes for both cooperators



Slide 20

Comparison of All SEA 2018 Strike Data From AGG

- AAG initially assigned 367 strikes to SEA
 - 50 (13.6%) were found to have occurred elsewhere based on maintenance log comments
 - Some were duplicates - an aircraft that strikes multiple birds has multiple records in the maintenance logs
- A total of 317 AAG strikes remained for further evaluation.



Slide 21

Diving Deeper

- Of the 317 AAG strikes initially assigned to SEA, 56 (18%) had location data making them likely to have occurred within 5-miles and 2,500' AGL of SEA ("approach", landing gear or flaps impacted, etc.).
 - 2 of those were damaging and were previously unknown
- Of the 56 probable strikes, 16 (5%) definitely occurred at SEA because location information was excellent.
- There was no information to help with species ID from the records



Slide 22

AAG's Impact to Port's 2018 baseline

YEAR	OPERATIONS*	ALL REPORTED UNK & SEA STRIKES	KSEA STRIKES	KSEA STRIKE RATE/100K	DAMAGING/ADVERSE EFFECT
2018	432,190	206	109	25	2
2018 w AAG	432,190	523 (317)	165 (56)	38	4 (2)

* = One take off and one landing equals 2 movements

- Results above are with 18% of AAG strikes w/ geographic location
- If all had location: 317 x 64% (approach/landing%) = ~170
- Extrapolated airport wide (AAG is 47%) ~ 360 strikes annually



Slide 23

Strikes Undocumented in the AAG Database

- Port also had 8 new AAG strikes that were detected by the Port's center-runway FOD detection system



Slide 24

Summary of AAG Database Findings

- Dashboard is a great start for quickly obtaining strike data
- Gave SEA a better understanding of an expected strike rate
- Index – Dashboard appears to be sensitive to changes in strike rate
- We now have a huge opportunity and challenge collecting snarge samples



Slide 25

Thank You Alaska Air Group - A Turning Point

- Access to airline maintenance (MX) data has:
 - Already helped increase resources for SEA



Slide 26