(8) CONOPS and OPSCON*: One example of integrating avian radar into airport operations

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For decades, radar technologies have been evaluated, validated, and utilized by researchers to determine how these systems can be employed to increase their awareness to the presence and the behaviors of flying birds. A critical locus of avian radar application is the airport where improved situational awareness, better hazard and threat analysis, and timely alerts to threats are elements of developing operational concepts (OpsCon). At airports radar data needs to be refined beyond what is typically useful in research, providing timely and meaningful information to airport personnel who have limited scientific training. At the Seattle Tacoma International Airport (SEA), avian radar evaluation and validation exercises began in 2007 utilizing FAA funding through the University of Illinois. In 2008, this technology helped the airport show that the SEA Netted/Lined Stormwater Pond BMP was effective at mitigating the facilities' attractiveness to hazardous waterfowl. Efforts to operationalize the avian radar at SEA began in 2008, just before the Miracle on the Hudson event which brought increased attention to the avian radar system at SEA. Unfortunately there exists a false perception that if pilots were made aware of birds that they could simply avoid hitting them. Under the OpsCon framework tailored to SEA's needs, radars have been deployed to support a Threat Viewer. The airfield is divided up into 10 regions where alerts are generated based on the detection of avian targets over short time intervals. Initially alerts were based on the number of bird tracks in an area. A revised alert now uses persistence over a set time period. . Today, when 2-12 "bird" tracks have persisted in region for more than 15% (>2.25 mins) of a running 15-minute period, the Airport Communication Center receives an auditory alert and notes the highlighted region from the ThreatViewer monitor. Following a dispatch from the ACC, the Airport Operations Specialist (AOS) drives to the area of concern searching for the threat, follows procedures to mitigate the threat, and later completes a form indicating what was observed and how/if the avian threat was abated following procedures identified in a separate group-specific Standard Operating Guideline (SOG). Analysis of AOS reporting indicate that the avian radar has been successful in increasing the awareness of bird threats to the AOSs and the response time to bird hazards has been decreased. Results also show that responder's ability to identify hazardous wildlife reported by the avian radar and to trust in new technology varies substantially by individual. Avian radar has increased our level of awareness to wildlife hazards on and near the airfield as well as the importance of reoccurring training programs that emphasize wildlife hazard management to airport operations personnel. Within NASA and the DOD, new technological system concepts are introduced within their respective organization using a Concept of Operations (ConOps) model, which is a single document that defines how new technologies will operate to achieve their various programmatic goals. In support of those overarching goals, group-specific Operational Concept (OpsCon) documents provide detail on the end-users objectives, under the direction of multiple Standard Operating Guideline (SOG) documents.

Osmek, S.D. and E.E. Herricks. 2015. CONOPS and OPSCON*: One example of integrating avian radar into airport operations. Proceedings of the North American Birdstrike Conference 15. 35 pages.

Concerned by the rising trend, Moran sent a letter to FAA Administrator Michael Huerta addressing the issue. Congressman Jim Moran (D-Va) told NBC Bay Area and with Congressman Joseph Crowley (D-NY),

Training times can be coordinated relative to bird activity

Quality of Data

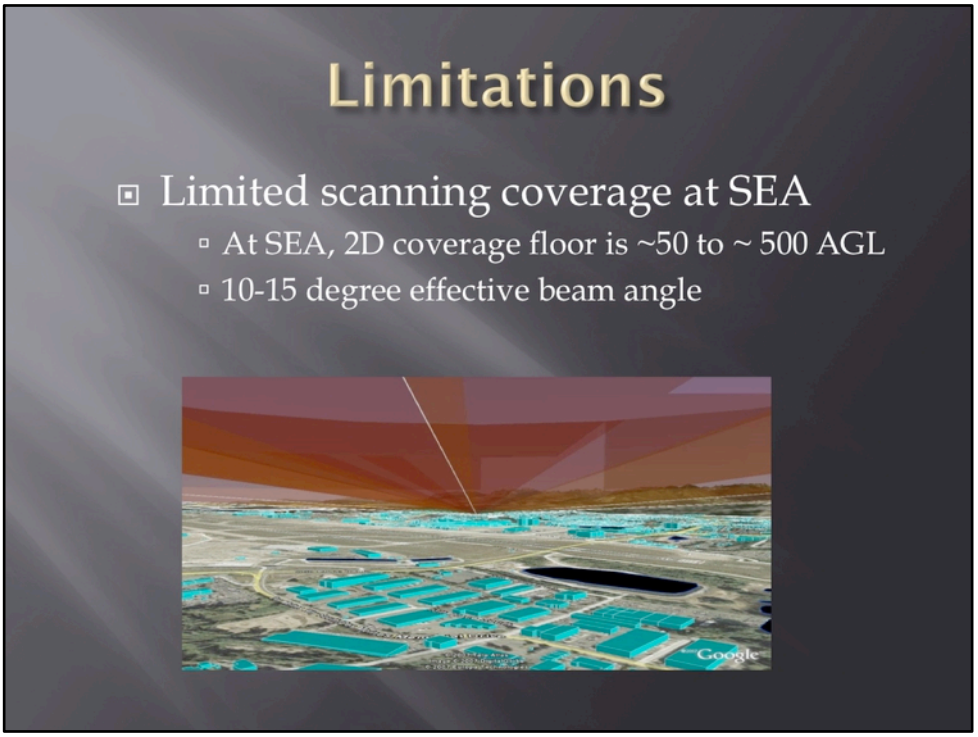
- How precise does target **location** data need to be?
  - Is 2D coverage of the approach/departure path enough for SEA?
- How close to "**Real-time**" do alerts need to be?
  - Consider
    - 250 knots aircraft covers >> a statute mile in 15s
    - Roughly the amount of time it takes for an [uncooperative] flock of birds to first be detected and tracked, but not necessarily in a predictable manner.
- Radar limitations | data refinement needed

Limitations & Workarounds

- Species not identified
  - Target reflectivity (RCS) does provide some indication of potential hazard
- 2010 FAA Radar AC
  - Standard Avian Target (SAT)
  - American crow
  - Ignoring Small flocks of small birds is the trade off at SEA
- Often too sensitive where it is scanning [x & s-band radars]
  - Rain clutter Insects, cottonwood seeds
  - Ground vehicle interference (2D)

Rain <= 0.1/hr
not an issue

Before I discuss how we used this tool for airport operations its important to discuss some radar limitations.



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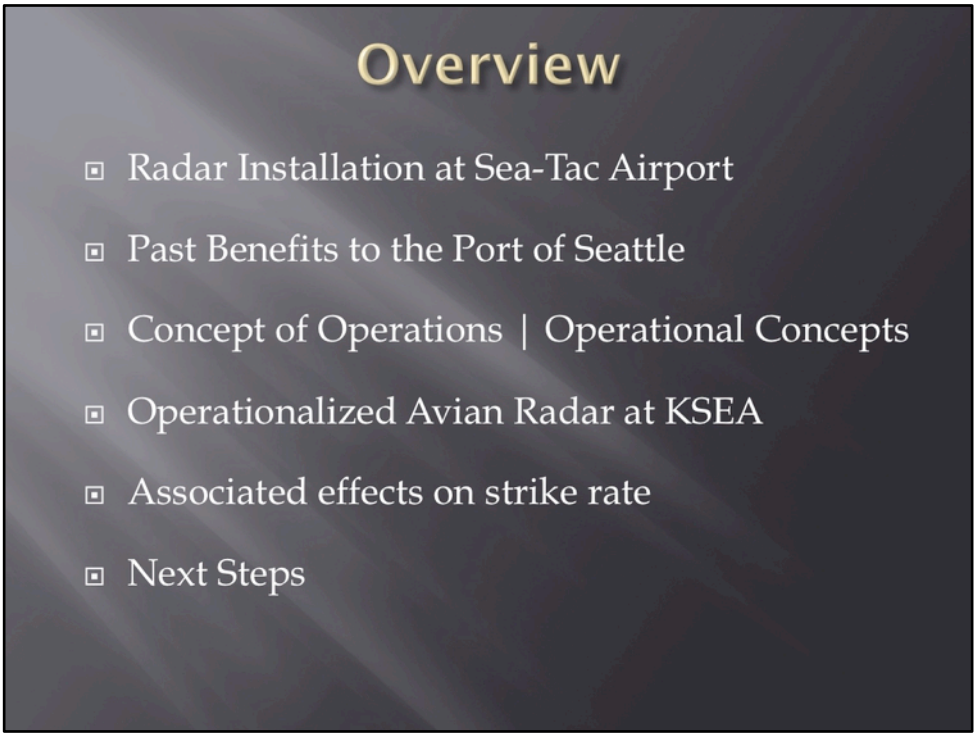

Overview
Radar Installation at Sea-Tac Airport
Past Benefits to the Port of Seattle
Concept of Operations | Operational Concepts
Operationalized Avian Radar at KSEA
Associated effects on strike rate
Next Steps

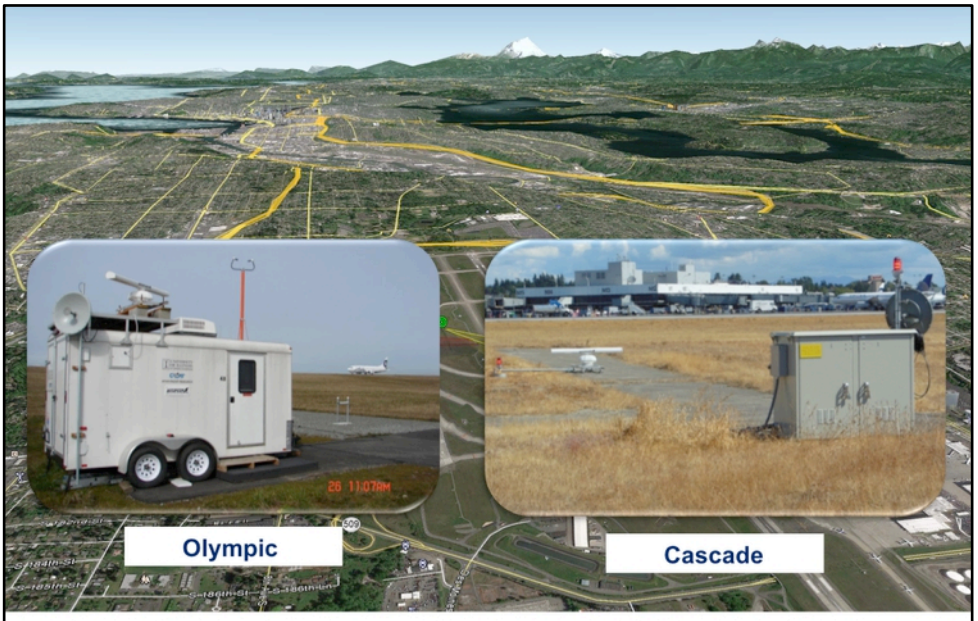
Overview…

Sea-Tac Airport Overview

< 2 miles from Puget Sound

Summary	
Airport type	Public
Owner/Operator	Port of Seattle
Serves	Seattle; Tacoma, Washington, US
Location	SeaTac, Washington, US
Hub for	• Alaska Airlines • Delta Air Lines • Horizon Air
Elevation AMSL	433 ft / 132 m

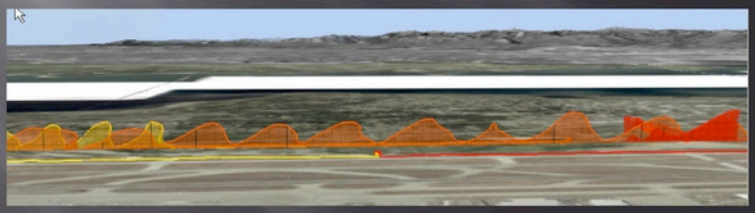
Port of Seattle | AIRPORT OPERATIONS Wildlife Hazard Mitigation & Conservation



- Two X-band avian radar systems 2007/2008
- Data archived for reprocessing

SeaTac 2008-09

- Unmanned Aerial Vehicle/radar comparisons
  - RC Helicopter
  - Balloons
  - Trained Falcons
- Observer Comparisons
  - Biologists abilities vary



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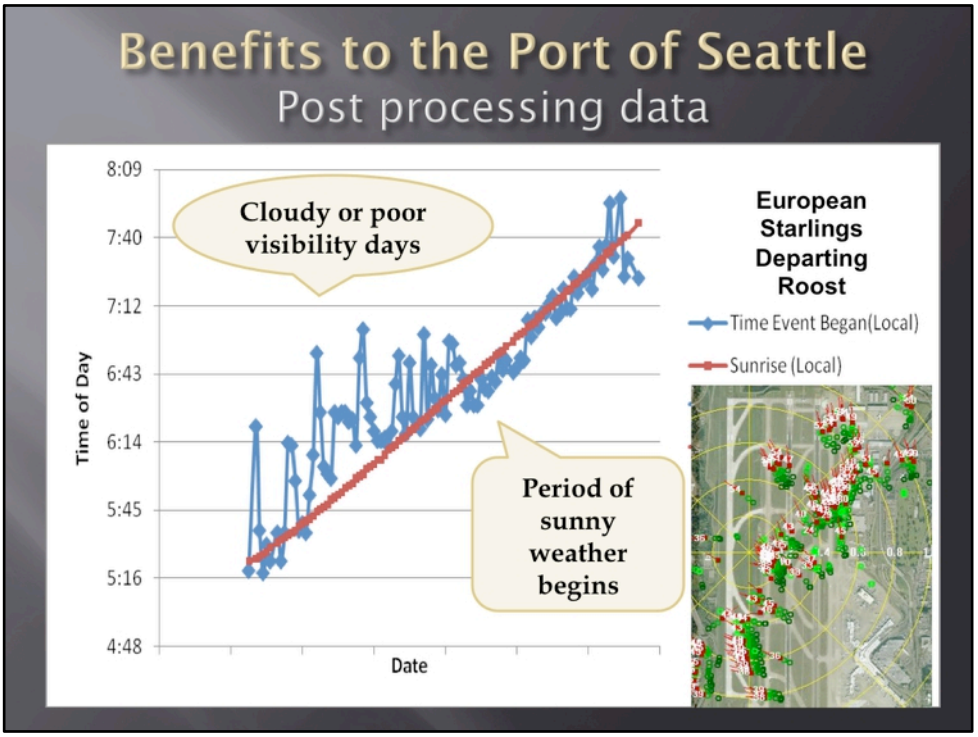


When the issue of real time is not important much information can be obtained

2009 Bird Strike Presentation
Use of avian radar to test an airport stormwater BMP
Lined/Netted Ponds
Vegetation Control/Bird Exclusion
13 10:07AM

Pond Study Methods

- Ponds were selected that were
  - An equal distance from the radar
  - In areas with little to no interfering clutter
  - Paired with habitat deemed acceptable to the FAA
- Fall 2008
  - 1,000 hrs. of data used when rain < 0.1"/hr

72 Hr burn for clutter determination

12

4 Pond Pairings with unattractive habitat

Control

Experimental

1 Pond Pairing with Open-Water Wetland (#5)

Control – Lora Lake

Experimental

4 POND PAIRINGS WITH UNATTRACTIVE HABITAT

RESULTS

Pair#	LOCATION	AVG (s)	STDEV	ALARMS (n)	T VALUE	CONF.	RESULT
1	TYEE Pond	9.56	8.32	280			
	TYEE-C	9.64	9.85	218	0.08	p<0.85	NULL
2	IWS3 Pond	10.04	9.52	344	1.25	0.85	NULL
4	NEPL Pond	4.75	2.19	28			Control
	NEPL-C (AMA)	6.15	3.41	32	2.1	0.975	Higher
	SDE4-C	9.86	32.59	43	0.166	p<0.85	NULL

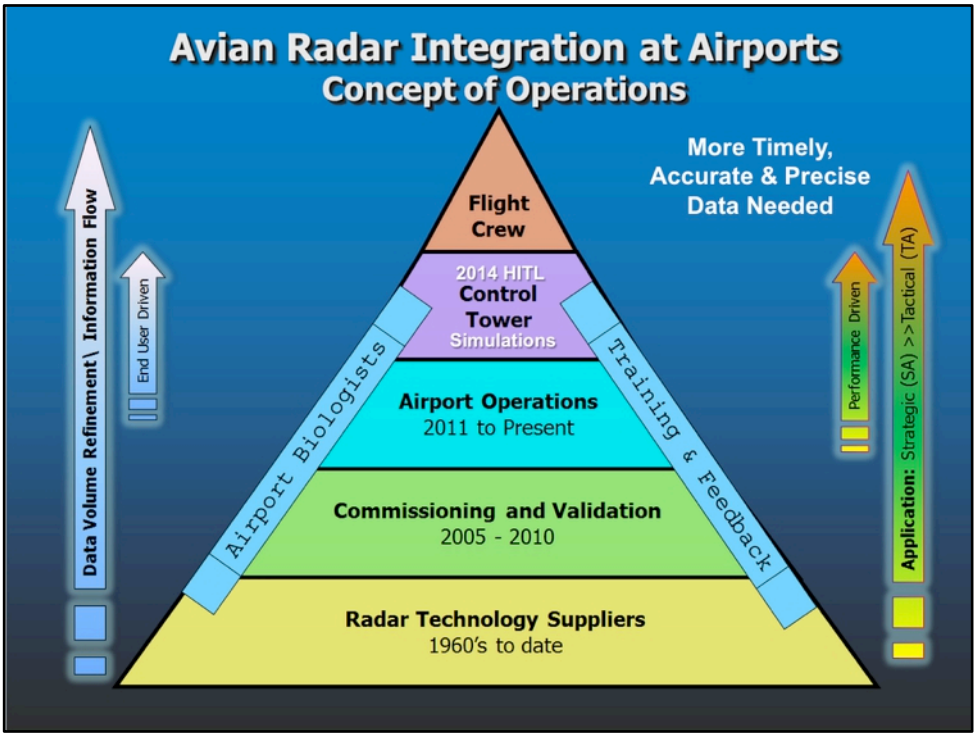
POND PAIRING WITH AN OPEN-WATER WETLAND

RESULTS

Pair #	LOCATION	AVG (s)	STDEV	ALARMS (n)	T VALUE	CONF.	RESULT
5	SDN1 Pond	4.6	2.35	41			Control
	SDN1-C (Lora Lk)	6.1	3.41	126	3.4	0.9995	Higher

Pond Study Conclusion

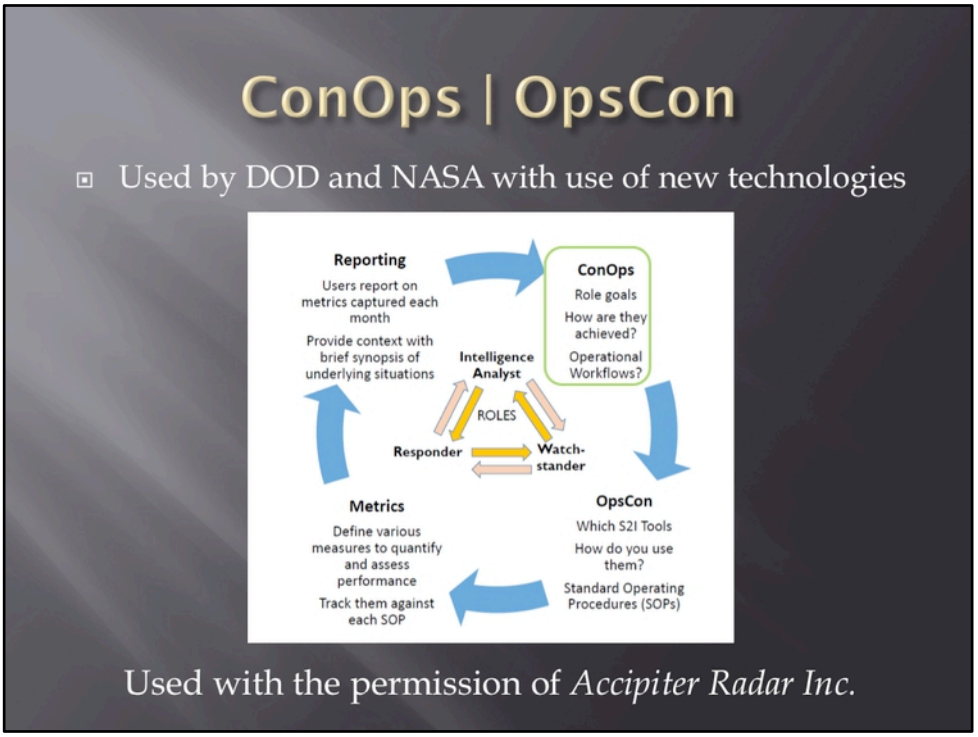
- **BMP Validation** – The netted/lined pond BMP appeared to be at least as effective as other unattractive areas.
  - Saved the Port of Seattle >> $6 million
    - Did not install floating covers or balls
- **Radar Validation** – The radar confirmed what we knew: Lora Lake is a wildlife attractant.
  - Lora Lake will be filled in 2017



Data needs to be refined beyond what is typically useful in research, providing timely and meaningful information to airport personnel with wildlife and many other responsibilities.

Anton Koros, FAA

Advanced Operational Concepts Division ANG-C43



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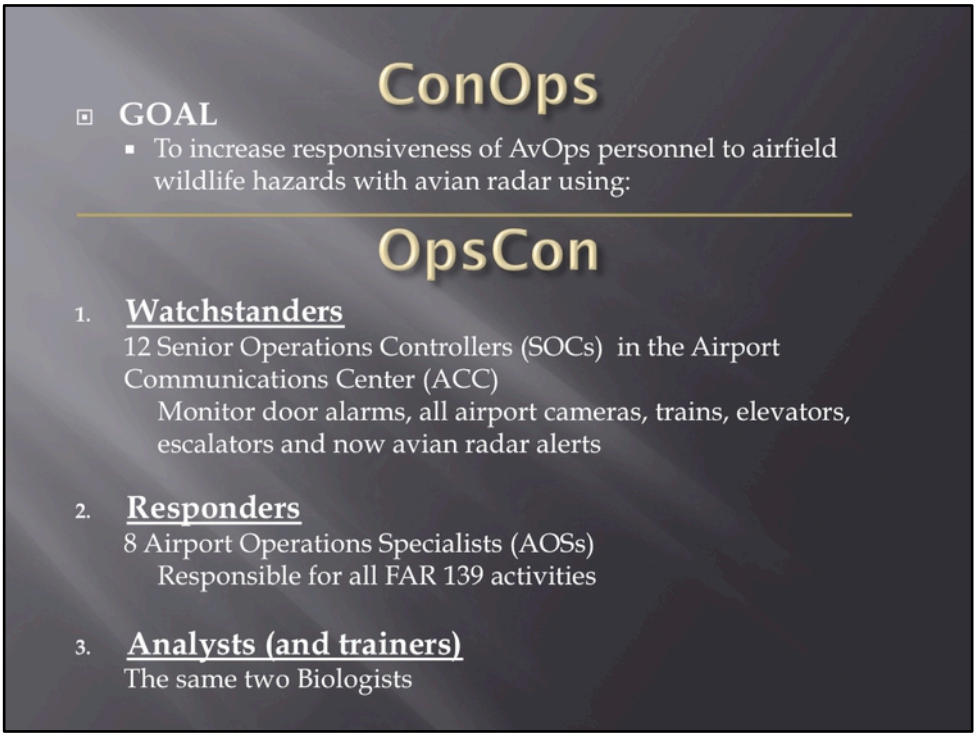

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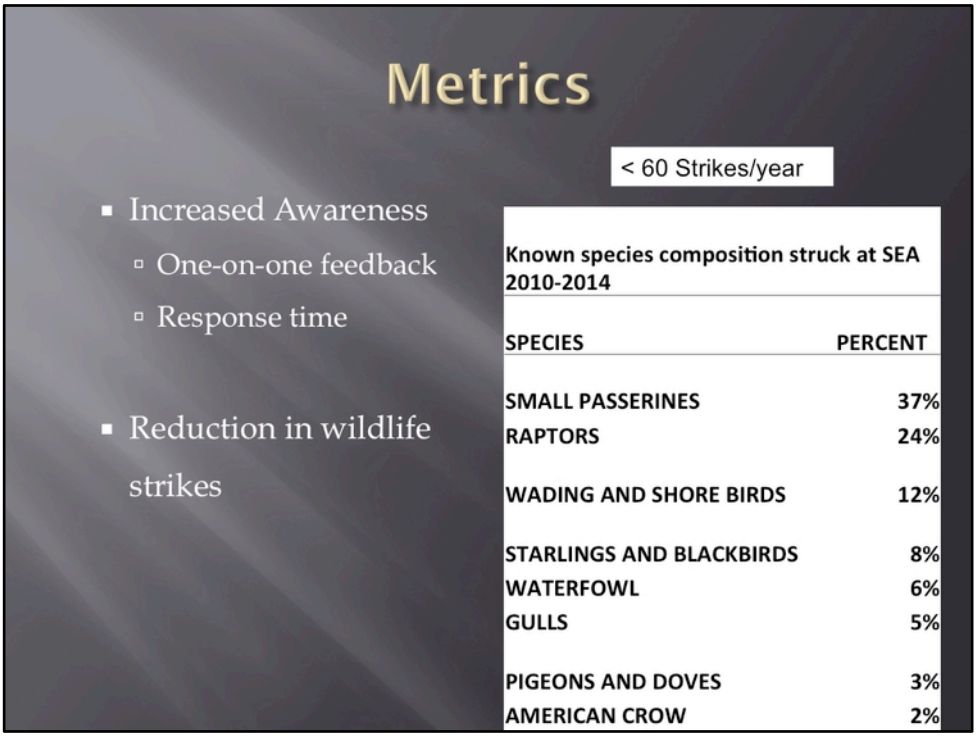

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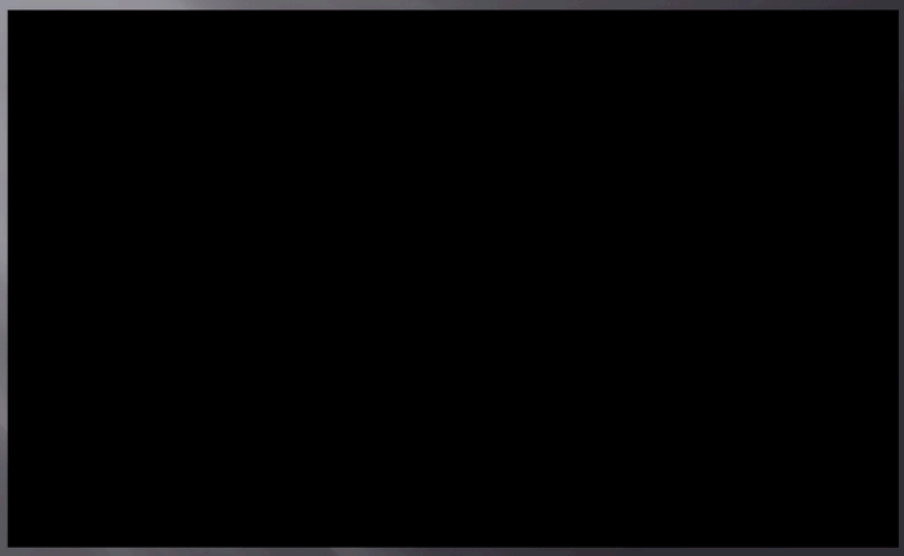
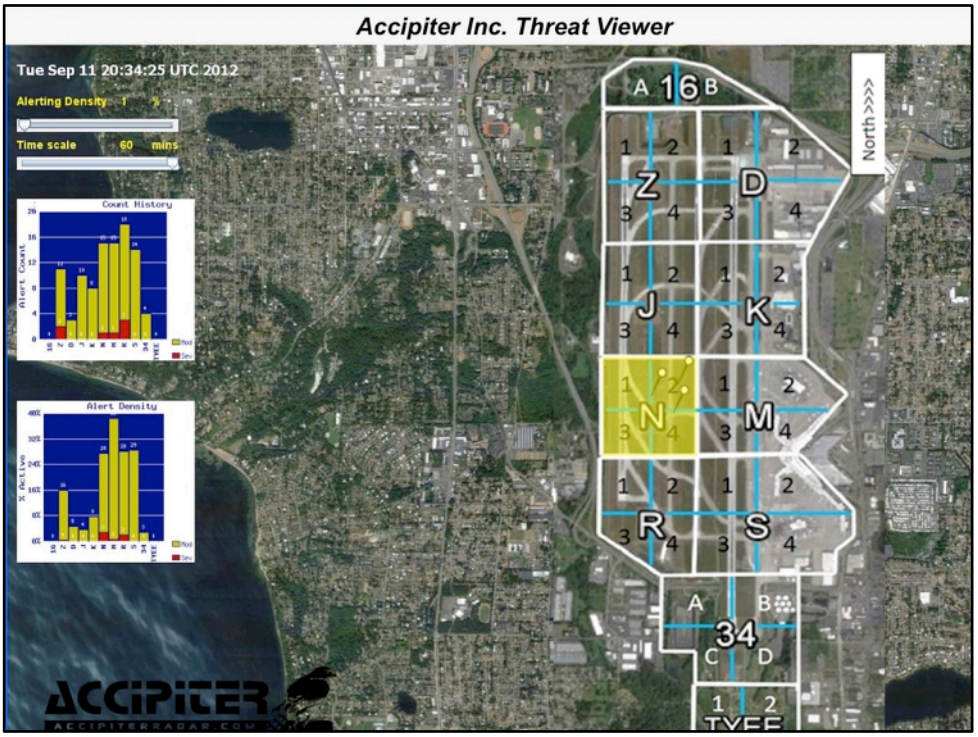
2014 Avian Radar Update (YouTube)




Accipiter Inc. Threat Viewer
Tue Sep 11 20:34:25 UTC 2012
Alerting Density 1 %
Time scale 60 mins
Count History
Alert Count
Alert Density
% Active
North >>>>
A 16 B
Z
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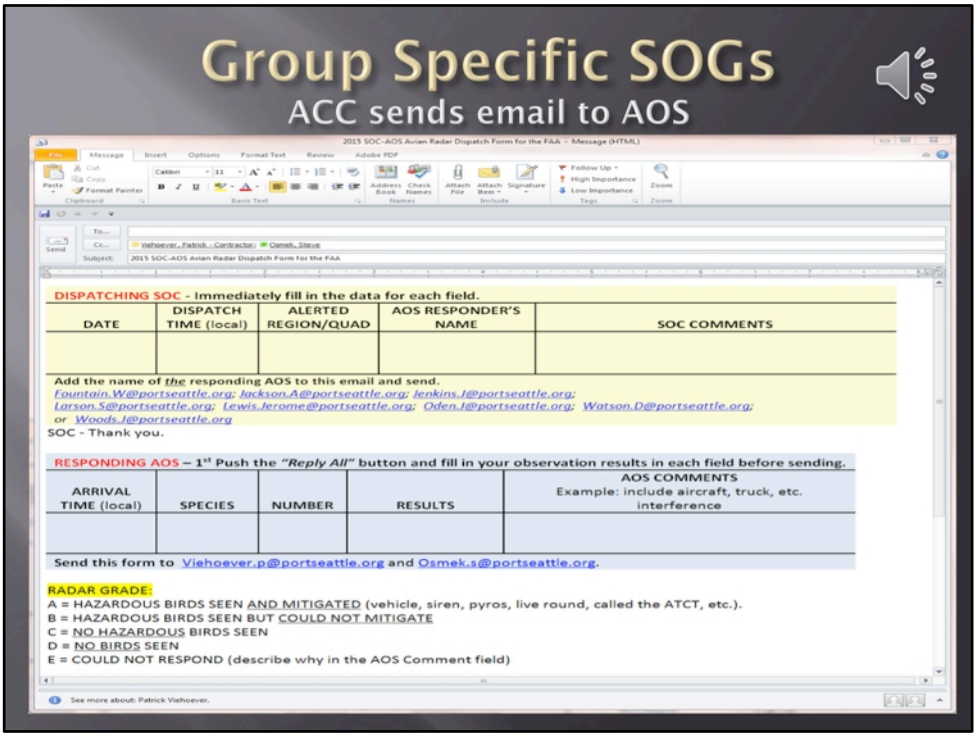
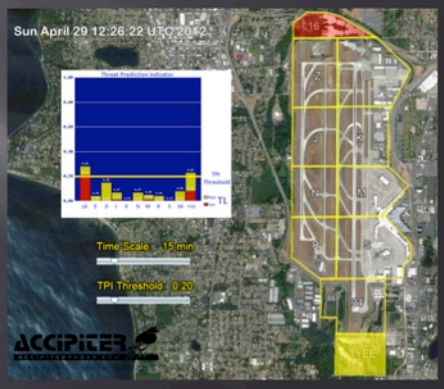


. Results also show that responder's ability to identify hazardous wildlife reported by the avian radar and to trust in new technology varies substantially by individual.

Avian Radar – Operationalized
First few months

AVG SCORE (VALID RESPONSES ONLY)

# OF "A's"	1	
# OF "B's"	43	
# OF "C's"	1	
# OF "D's"	8	n=53
# OF "E's"	3	

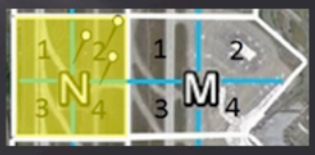


A = HAZ WILDLIFE MITIGATED
B = HAZ WILDLIFE OBSERVED
C = ONLY NON-PRIORITY SPECIES OBSERVED
D = NO WILDLIFE OBSERVED
E = COULD NOT RESPOND BUT DATA SUBMITTED PROPERLY

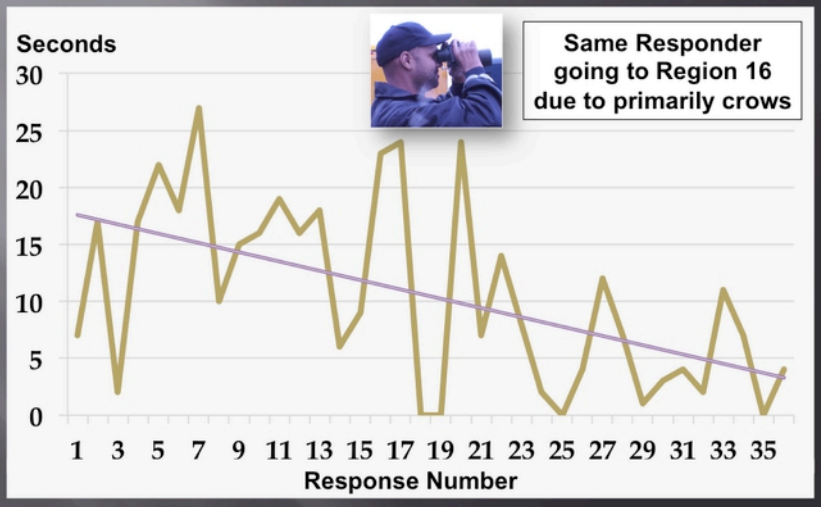
Erosion of Confidence

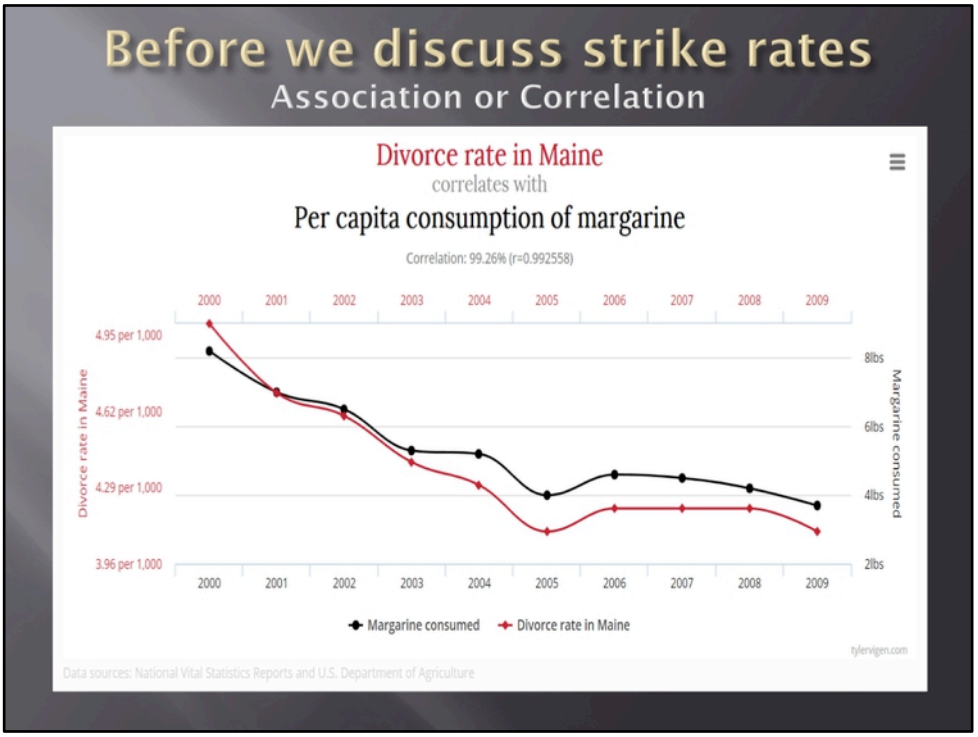
Extreme Differences Among Observers and Overtime

- Ability to detect birds
- Prioritizing
  - Ambulance Escort
  - Radar Response
- Adherence to protocol
  - Not
    - Going to the subregion
    - Scanning adjacent regions
    - Searching the ground
- Retraining is important!!!

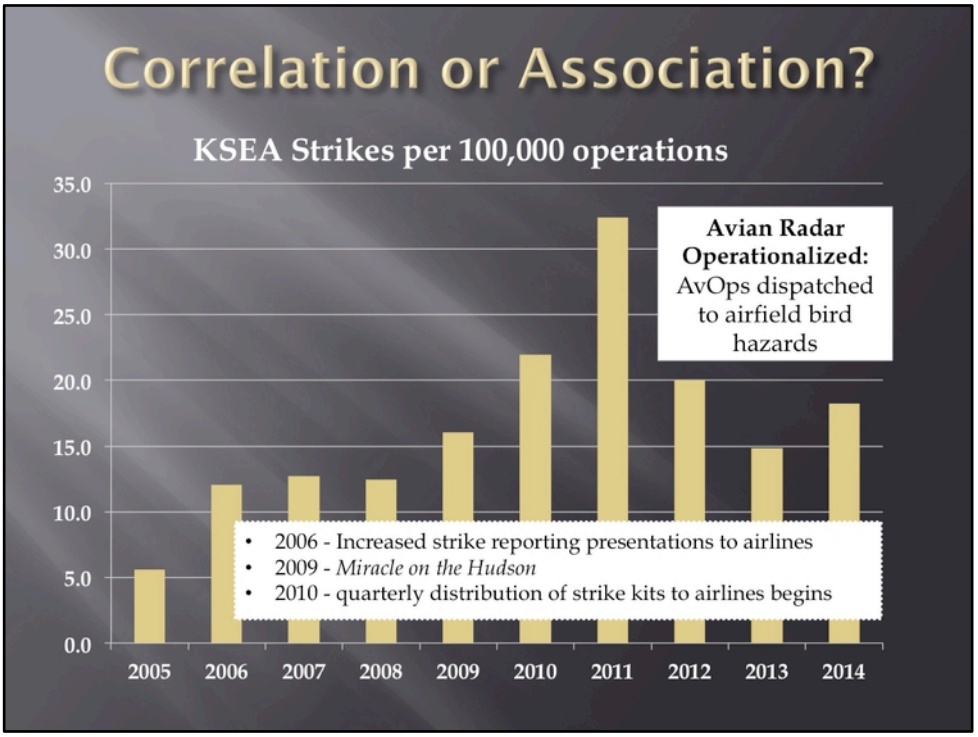


Declining Response Time Trend





Congressman Jim Moran (D-Va) and Congressman Joseph Crowley (D-NY)



Congressman Jim Moran (D-Va) and Congressman Joseph Crowley (D-NY)

Potential Next Steps for SEA

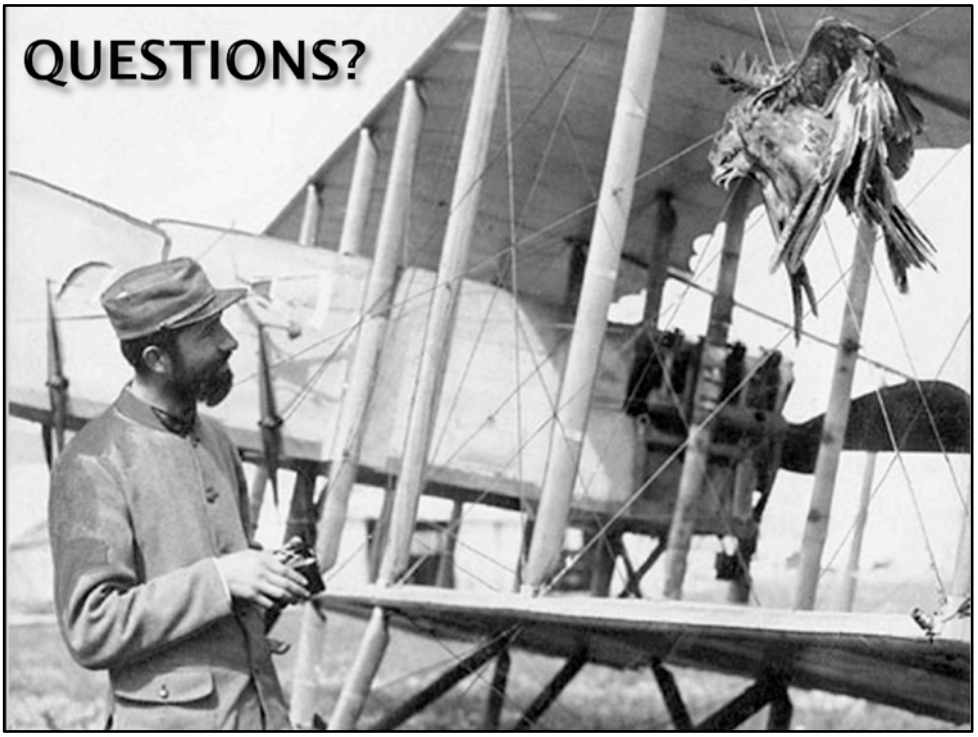
- 3D radar Capabilities
  - Enhanced filtering
  - Near miss data analysis
    - More numerous than strike data and can be used for heat mapping
  - Provide information on birds landing
- Analyze archived data

Aircraft scaring starlings on take off

Lessons Learned

- Common Beliefs
  1. An avian radar will replace a biologist or other employees
  2. Avian radar detects all birds on and near the airfield
  3. Avian radar reduces the need for wildlife removal
  4. Avian radar is plug and play technology

- Port's Experience
  1. More time was needed for training, respond to alerts and investigate information
  2. Avian radar detects [moving] targets well where it can effectively scan…stationary birds are more difficult
  3. Say what??
     Long-term, however, it can identify and reduce attractants.
  4. Sea-Tac is a changing environments making 3D radar extremely important


QUESTIONS?

BASH Viewer - Accipiter Radar Technologies Inc. © 2009-2010
Mon Nov 15 16:48:26 UTC 2010
Riverton-Boulevard-Park
Burien
SeaTac
Normandy Park
Second Iteration
Avian Radar
BASH Viewer
Criteria Used to Trigger an Alert
1. Number of Tracks = 5
2. Birds Flying Towards Area of Concern
3. Radar Cross Section (RCS) – Mass
4. Duration (5-15 Seconds)