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## Integrating Wildlife Hazard Management into a Safety Management System (SMS)

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Clifton, Wayne, "Integrating Wildlife Hazard Management into a Safety Management System (SMS)" (2011). *2011 Bird Strike North America Conference, Niagara Falls*. 6.  
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## 2011 BIRD STRIKE NORTH AMERICA CONFERENCE

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BIRD STRIKE COMMITTEE USA

# Integrating Wildlife Hazard Management into a Safety Management System (SMS)

Presented by: Wayne Clifton, ESIS, Inc.

Wednesday, September 14, 2011

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# Objectives for Today

**Goal: to provide an overview of the Risk Assessment process used to develop the wildlife risk assessment**

**Today's presentation will focus on:**

- ◆ What is Risk and Risk Assessment?
- ◆ What are our Risks and Controls?
- ◆ How do we do Risk Management?





# SMS - Risk Assessment / Management Process

## Safety Risk Management Process Steps:

Step 1- Describe the system – *Identify the safety significant activity;*

Step 2- Identify the hazards;

Step 3 - Determining the risk;

Step 4- Assess and analyzing the risk;

Step 5 -Treating the Risk

**Step 6 - Managing the Risk**

*“The manner in which SMS improves safety is by proactively managing risk.”* (JAA Safety Management System Manual)



# Risk Ratings

Risk Rating	Definition	Examples
L(Low)	Mitigation may not be necessary	Controls such as elimination, substitution, isolation and barriers are still preferable, but these hazards may rely more on warnings, training and other devices that may require operator intervention.
M (Moderate)	Mitigate on a priority basis	Controls such as elimination substitution and engineering controls are preferable. If reliance on warnings and training, these should be redundant to additional controls, or additional barriers, guards and other protective devices. <i>(monitor controls based on severity levels)</i>
H (High)	Mitigation is required	Use controls or multiples of controls (defense in depth), such as elimination, substitution or engineering controls like interlocking barrier guards, controls with built in redundancies, physical devices that do not require adjustment or operator intervention, or provide positive, ongoing indicators of operation. <i>(monitor controls)</i>

# Risk and Risk Factors

## Risk is the Product of Two Factors:

- ◆ Likelihood
- ◆ Severity



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# Risk Matrix

Severity Levels	Likelihood Levels				
	A Frequent	B Probable	C Remote	D Extremely Remote	E Improbable
5 Negligible	Low	Low	Low	Low	Low
4 Minor	Moderate	Moderate	Low	Low	Low
3 Major	High	High	Moderate	Low	Low
2 Hazardous	High	High	High	Moderate	Low
1 Catastrophic	High	High	High	High	High



# Severity Definitions Example

Criteria	Effect on <u>aircraft</u> and/or <u>operations</u>	Effect on <u>people</u>	Effect on airport <u>reputation</u> (corrective action response)	Damage to airport <u>assets</u>	Damage to Tenant <u>assets</u>
1	Negligible effect on aircraft or airport operations.	Inconvenience, Nuisance	One time impact, no lasting repercussion	Damage is less than \$5,000	Damage is less than \$5,000
2	Repairs to aircraft, vehicles or equipment can be done on-the-spot. Operational Delays to one flight	Physical discomfort, first aid	Loss of community reputation and/or airport only stakeholder involvement	Damage between \$5,001 and \$50,000	Damage between \$5,001 and \$50,000
3	Damaged aircraft, equipment or vehicles requiring them to be taken out of service for more than one day. Delays to a few flights. Shut down of runway.	Physical distress possibly including injuries	Loss of state/regional reputation and or multiple stakeholders and state agencies.	Damage between \$50,001 - \$1,000,000	Damage between \$50,001 - \$1,000,000
4	Extensive repairs or replacement of aircraft, equipment or vehicles. Delays to multiple flights and airlines. Shut down of more than one runway.	Severe Injury or Fatality	Loss of national reputation and or multiple stakeholders involvement, impact on operating certificate.	Damage between \$1,000,001 - \$10,000,000	Damage between \$1,000,001 - \$10,000,000
5	Alert 3, hull loss, or other event resulting in shut down of airport.	Multiple fatalities	Loss of international reputation.	Damage exceeds \$10,000,000	Damage exceeds \$10,000,000



# Likelihood Definitions Example

Quantitative (occurrence)				
A	B	C	D	E
Improbable	Extremely Remote	Remote	Probable	Frequent
<i>(&lt;1x/100yrs.)</i>	<i>(1x/10-100yrs.)</i>	<i>(1x/1-10yrs.)</i>	<i>(1x/month)</i>	<i>(1<sup>+</sup>x/week)</i>
Qualitative (exposure)				
Performed by only a few people	Performed by staff or a single entity	Performed by some departments and tenants, one or two subcontractor personnel	Performed by most departments/Tenants, Limited contractors	Performed by airport, by tenants, vendors, and contractors
Seldom performed	Performed a few times a year	Performed less than 1X/wk	Performed a few times a week	Performed at least every day





# Cause and Effect

**Hazard:** Any real or potential condition that can cause injury, illness, or death to people; damage to or loss of a system, equipment, or property; or damage to the environment.

**Cause:** Events that lead to or result in a hazard or hazardous condition

**Effect:** Outcome or harm of a hazard for a given system state





“Worst CREDIBLE Outcome”

**POSSIBLE**

**Vs**

**CREDIBLE**





## Step 2: Hazard Categories

### Hazard Sources Are Broad; Some Not Obvious:

- A. **Energy/Forces/Pressurization/Vibration:** *What forces are present that can contribute to accidents? Jet blast? Jetbridge tires under pressure? Electrical hazards (shock, fire, static, power loss to critical safety equipment/airfield lighting)?*
- B. **Mechanical:** *Can one strike an object or be stricken by a moving object? Vehicles/construction equipment? Being caught in, on, or between (Baggage handling equipment)?*
- C. **Structural:** *What results from failure of the structure? Runway/taxiway/ramp? Buildings?*
- D. **Substances:** *What chemical or substances pose a threat? Fueling? Toxic substances?*
- E. **Surroundings/Physical Layout/Geographic Limitations:** *Always consider airfield dynamic movements as accident potentials; aircraft taxing/takeoff/landings. Geographic limitations affect airfield design, safety areas, approach and landings, wildlife habitat.*
- F. **Environmental :** *Wildlife is an example of environmental facto. Others include weather factors contribute to hazards? Winter events? Fog? Noise? Rain? Wind, etc.?*





## Cause

This is the actual event that needs to be controlled.

For example, for Wildlife, a partial list can include:

- Deer on the runway;
- Lake near safety area that attracts birds;
- Dead armadillo left on taxiway.



# Hierarchy of Controls

## Hierarchy of Controls:

Elimination is most effective;  
PPE is least



**Table .1.3 Control Selection**

Controls	Examples
<b>Elimination (including Frequency)</b>	Eliminate the need to replace lighting as often (like LED Runway lights) Preclude human interaction (Perimeter road to avoid crossing active taxiways) Eliminate pinch point (increase clearance) Automated materials handling (forklifts, scissors lifts) Eliminate tool or process (like automated generator-set).
<b>Substitution</b>	Replace with less hazardous compound Replace items; reduce steps (Solar-powered barricade flashers) Reduce time on Site
<b>Engineering</b>	Project planning Planning airfield geometry Fencing, Platforms & guardrails – Terminals & Parking Lift tables, conveyors, tool balancers SMGCS (Surface Movement Ground Control Systems)
<b>Warnings</b>	Signs, Backup alarms, Beepers, Horns, Labels
<b>Administrative</b>	Work procedures, safety inspections <b>Training</b> Worker rotation (Especially during winter operations) Radio communications
<b>Personal Protective Equipment (PPE)</b>	Reflective vests Ear protection, gloves, respirators Safety glasses, face shields Safety harnesses and lanyards Protective Clothing



# Risk Reduction Options

**Elimination**

**Substitution**

**Automation**

**Engineering Controls**

**Better tools**

**Early warning**

**Training**

**Rotation**

Only controls that can affect  
Severity





# Risk Mitigation Options

**We need to implement effective and appropriate risk mitigation plans to mitigate or eliminate hazards**

- ◆ Control (using your Hierarchy of Effectiveness and Defense in Depth)
- ◆ Management Systems (Organizational Controls)
- ◆ Avoidance
- ◆ Transfer
- ◆ Assumption

**Risk control** is the option most often used and preferred







# Objectives for Today

Goal: to prepare the team to complete a Risk Assessment

Today's presentation will focus on:

- ◆ What is Risk and a Risk Assessment
- ◆ What does the existing data tell us
- ◆ What are Risks and Controls
- ◆ How do we do Risk Management



# Step 1: ID System State/ Tasks or Activities

*Let's look at the Risk Assessment*

Step 1: Identify your System State/ Tasks / Activities	
Department	System State/ Tasks/Activities

**What are the “System States” or what are the hazards that impact the operations?**



# SRA: Step 2 - ID Hazards

Step 2: Identify your Hazards and Threats				
Hazard Category (What could go wrong)	Hazard Aspect (Types)	Cause	Effect / Scenario / outcome	Part 139 Task Applicability

*Let's look at the  
Risk Assessment*



# SRA: Steps 3 and 4

Step 3: Identify your Controls		Controls: Refer to Part 139 if Applicable (place an "X" if a control exists.)			Description of Controls	Step 4: Determine Risk Factors and Evaluate Risk		
Preferred Controls		Less Effective Controls				Residual Severity	Residual Probability	Residual Risk Total
Controls: Elimination/Substitution	Controls: Engineering	Controls: Warnings	Controls: Administrative/procedures/training	Controls: Personal Protective Equipment (PPE)				

*Let's look at the Risk Assessment*





# Objectives for Today

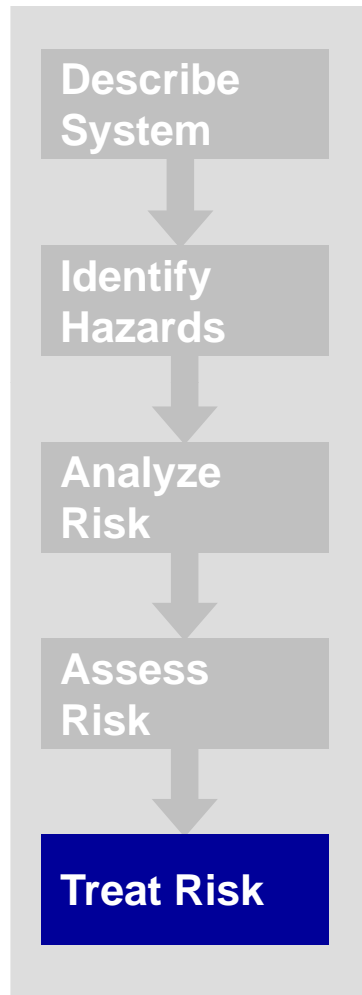
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## Step 5: Treat Risk



### Effectively treating risk involves

- ◆ Identifying feasible mitigation options
- ◆ Selecting best balanced response
- ◆ Developing risk treatment plans
- ◆ Implementing and verifying
- ◆ Monitoring the effectiveness of the mitigation



# Step 5: Mitigation

## Corrective Action and Implementation

Problem	Corrective Action	Owners	Due Date	Completion Date/ Status
	Task 1: Total perimeter fencing for construction area.			
	Task #2: Sweeping truck routes twice per day to control FOD?			
	Task #3: Monitor use of escorts for construction vehicles?			



# SRA: Step 5

## Corrective Actions

Corrective Actions	Corrective Action (CA) Assigned to (by Department)
--------------------	--

*Let's look at the  
Risk Assessment*





# Step 6: Risk Management and Risk Reduction

Step 6 Risk Management and Risk Reduction					
<b>Critical Control</b> (Y if Residual Severity is Catastrophic or Serious, or if Residual Risk is High)	<b>Describe the Critical Control?</b> (add to inspection, testing or observation)	<b>Critical Control Owner</b> (by Title)	<b>Control Category</b> (based on Corrective Action)	<b>Hierarchy/Defense in Depth Met</b> (If No, then add additional controls via CAs is Step 5)	<b>Risk Reduction Target</b>

## Risk Management:

Conformance to using or following Critical Controls

Ensuring Preferred Controls or Defense in Depth is in place

## Risk Reduction = Continuous Improvement:

**Establishing Goals to add better/more controls based on your Risk Priorities**

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# Step 6: Identify Critical Controls

Residual Severity	Residual Probability	Residual Risk Total	Critical Control	Describe the Critical Control? (add to inspection, testing or observation)	Critical Control Owner (by Title)
M	L	M	N	Enclosure of electrical junctions.	Maint
C	L	H	Y	Training	Security
S	L	H	Y	Flight Path. Clearance areas.	Tower

If Residual Severity is

- ◆ S=Serious or
- ◆ C=Catastrophic

If Residual Risk is

- ◆ High

Then Control is “Critical”

(Other Controls may be Critical, based on Assessor’s judgment)



Assign Critical Control Owners

Require “Failure Rate Metrics” from them periodically

Validate through inspections and observations

Hold them accountable for maintenance & long-term controls

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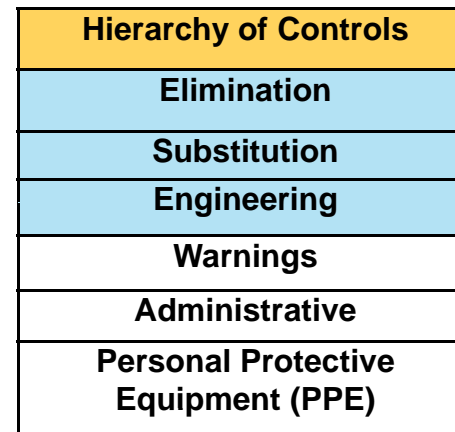
# Control Selection – Preferred Controls and Defense in Depth

## If The Preferred Controls

- Elimination,
- Substitution or
- Engineering

**are not feasible, or the risk is high, then additional and multiple controls (Defense in Depth) should be identified to control the Risk!**

**For example: (See next page)**



Preferred Controls



# Hierarchy/Defense in Depth Control Verification

Scenario (outcome)	Description of Controls	Residual Risk Total	Critical Control (Y if Residual Severity is Catastrophic or Serious, or if Residual Risk is High)	Describe the Critical Control? (add to inspection, testing or observation)	Critical Control Owner (by Title)	Control Category (based on Corrective Action)	Hierarchy/Defense in Depth Met (If No, then add additional controls via CAs in Step 5)	Risk Reduction Target
Vehicle striking and damaging an airplane.	Training, licensure, markings, control tower observations.	High	Y	Training	Security	Warning/Administrative	N	Y/N

“High” Residual Risk

Training is a “Less Effective” control

Additional Controls are expected (H/DiD not Met)

Either Identify better/more controls or set this Action as part of your Annual SMS Goal Setting

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# Risk Reduction

Safety Management System and Risk Management philosophy both include the concept of:

- **Continuous Improvement**

This means ongoing efforts should continually be looking for opportunities to improve or *REDUCE RISKS*.

Set targets for risk reduction, either by developing

- Corrective Actions for additional controls and or
- SMS Goals to investigate, fund etc. additional controls

