JUNEAU RIM PROGRAM
SAFETY RISK ASSESSMENT
APRIL 11, 2017
Agenda

- Background
- Design and Geometry Deficiencies
- Potential Mitigations
- SRA, SRM, and SMS
- 5-Step Process
- Next Steps
BACKGROUND
Runway Incursion Definitions

“Any occurrence at an aerodrome involving the incorrect presence of an aircraft vehicle or person on the protected area of a surface designated for the landing and take off of aircraft.”

(ICAO Doc 4444 - PANS-ATM)
# Runway Incursion Classifications

<table>
<thead>
<tr>
<th>Classification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Operational Incident</strong></td>
<td>a surface event attributed to ATC action or inaction.</td>
</tr>
<tr>
<td><strong>Pilot Deviation</strong></td>
<td>action of a pilot that violates any Federal Aviation Regulation</td>
</tr>
<tr>
<td><strong>Vehicle / Pedestrian Deviation (V/PD)</strong></td>
<td>any entry or movement on the movement area or safety area by a vehicle or pedestrian that has not been authorized by ATC.</td>
</tr>
</tbody>
</table>
Runway Incursion Categories

- **A** - Serious Incident – Actual Collision or Collision Narrowly Avoided

- **B** – Separation Decreases-Potential for Collision

- **C** – Ample Time and/or Distance to Avoid Collision

- **D** – Runway Incursion but No Immediate Safety Consequence
RIM Prevention Strategies
How SMS, SRM, and SRA work together

Safety Management System (SMS)
- The overall system. The FAA is implementing SMS internally as well as requiring airports to comply

Safety Risk Management (SRM)
- Identifying hazards, analyzing and assessing the risks, and mitigating them

Safety Risk Assessment (SRA)
- Conducted by a group of Subject Matter Experts
Describe System

- Describe the most important aspects of the system; make sure to establish boundaries or limits for analysis. Identify operational, procedural, organizational, environmental, and physical factors.

Identify Hazards

- Identify the inherent conditions associated with the defined system that have the potential to cause harm.

Analyze Risks

- Identify a credible worst case scenario as a possible outcome of each hazard, including the potential severity and likelihood of each hazard.

Assess Risks

- Assess the risk based on the Risk Matrix using the most accurate severity and likelihood definitions provided.

Mitigate Risks

- Identify steps for reducing the severity or likelihood. Assign who will be responsible for implementing those steps. Describe how mitigations will be monitored and documented.
Incidents at Juneau

50 Runway Incursions between 2004 – August 2016

- 18 related to construction activities

= 32 Runway Incursions Left to Analyze

- 4 Operational Incident
- 19 Pilot Deviations
- 9 Vehicle/Pedestrian Deviation
Runway Incursions by Category

- 4 Operational Incidents
- 19 Pilot Deviations
- 9 Vehicle / Pedestrian Deviations
Runway Incursions by Location

- TWY C – 6 Runway Incursions
- TWY D – 9 Runway Incursions
- TWY E – 3 Runway Incursions

TWY D 50%
TWY E 17%
TWY C 33%
*Six runway incursions are not depicted because the location was undetermined.
Design and Geometry
Deficiencies
Taxiway Design Deficiencies

**Taxiway C**
- Short taxi distance from ramp/apron to a runway.
- Wide expanses of taxi pavement along a runway.
- Direct taxiing access to runway from ramp.
- Not a 90 degree angle.
- Runway back-taxing operations.
Geocode 3

Wide Expanse of Pavement
Geocode 8

Direct Taxiing Access to Runway from the Ramp
Geocode 13

* Taxiway Intersects Runway at Other Than Right Angle*

- Acute angle taxiway alignment – non standard
- Perpendicular taxiway alignment (90°) – complies with standards
Geocode 14

✈️ Short Taxi Distance From Ramp to Runway

Length 455’ - Short taxi distance from ramp to runway
Taxiway C - Design Challenges

- Wide Expanse of Pavement
- Direct Taxiing Access to Runway from Ramp
- Taxiway Intersects Runway at other than Right Angle
- Short Taxi Distance from Ramp to Runway
Potential Mitigations
- Apron is very congested during peak periods (queuing of departing aircraft).
- Location of facilities (helicopters, hardstand, terminal) contribute to apron congestion.
- Taxiway C is a high priority during snow events.
- 2-way traffic happens every day
- Small aircraft exit Runway 8/26 and conduct intersection takeoffs at Taxiway C
Potential Mitigations

Non-Construction Mitigation
» New Training Programs
» New Communication Protocol
» Revised Operational Procedures

Construction Mitigation
» Signs, Lighting, Markings,
» Taxiway Nomenclature
» Taxiway Geometry

Exhibit Produced By: RS&H, 2016
Potential Mitigation Non-Construction

✈ Air Traffic Controllers
   » Encourage use of correct terminology and proper voice cadence.

✈ Pilots
   » Maintaining a sterile cockpit during taxiing, departing, and preparing for arrival.

✈ Airport Personnel
   » Promote the use of effective communication and encourage educational seminars for operating on an airfield.

Source: wiki.media.org, 2016
Potential Mitigation Construction

Airfield Design Standards
- Surface Painted Signs
- Lighting Enhancements
- Taxiway Nomenclature
- Taxiway Geometry

Master Plan Solutions
- Taxiway E, D, and C

Source: 20/20 HeinSite, 2016
Master Plan Solutions for Taxiway C

Exhibits prepared by URS Corporation.

Alternative 1 – Do-Nothing

Alternative 2 – Realign Ramp Connection

Alternative 3 – Realign Runway Connection

Alternative 4 – Mark as Dual Taxiway

Alternative 5 – Close Taxiway
Apron is very congested during peak periods (queuing of departing aircraft).

Location of facilities (helicopters, hardstand, terminal) contribute to apron congestion.

Taxiway C is a high priority during snow events.

2-way traffic happens everyday

Small aircraft exit Runway 8/26 and conduct intersection takeoffs at Taxiway C
Considerations for Taxiway C

- Current geometry established though decades of airfield enhancements
- No such thing as perfectly safe
- Balancing safety, operational efficiency and capacity is essential
- Safety Risk Assessment is a key tool in striking that balance
- More than just the RIs, geometry and dimensional standards are vital to this solution
- Three options were developed as a potential solution for Taxiway C

Exhibit Produced By: RS&H, 2016
Option 3 – Preferred Solution

- Meets current airfield design standards.
- Optimizes the configuration based on the aircraft fleet.
- Improved ATCT flexibility and airfield efficiency.
- Increase situational awareness and aircraft performance
SRA, SRM, and SMS
How SMS, SRM, and SRA work together

**Policy**
- Policy statement
- Roles and responsibilities
- Metrics
- Organizational processes

**Assurance**
- Continuous improvement
- Reporting system
- Performance monitoring
- Self-assessment and audit

**Risk Management**
- Hazard identification
- Safety Assessments
- Safety investigations
- Documentation

**Promotion**
- Training
- Communications
- Safety culture
- Media / branding
Identify Hazards

Analyze Risks

Assess Risks

Mitigate Risks

Describe System

Describe the most important aspects of the system; make sure to establish boundaries or limits for analysis. Identify operational, procedural, organizational, environmental, and physical factors.

Identify the inherent conditions associated with the defined system that have the potential to cause harm.

Identify a credible worst case scenario as a possible outcome of each hazard, including the potential severity and likelihood of each hazard.

Assess the risk based on the Risk Matrix using the most accurate severity and likelihood definitions provided.

Identify steps for reducing the severity or likelihood. Assign who will be responsible for implementing those steps. Describe how mitigations will be monitored and documented.
<table>
<thead>
<tr>
<th>(1) Hazard ID</th>
<th>(2) Hazard Description</th>
<th>(3) Cause(s)</th>
<th>(4) System State</th>
<th>(5) Existing Controls</th>
<th>(6) Justification / Supporting Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>XYZ-1</td>
<td>Condition, real or potential; can cause injury, illness, etc. Prerequisite for an accident or incident</td>
<td>Events that result in a hazard or failure.</td>
<td>Conditions, characterized by quantities or qualities, in which a system can exist; worst credible</td>
<td>Mitigations that exist to prevent or reduce hazard occurrence or mitigate its effect</td>
<td>Explanation and additional detailing of Existing Controls</td>
</tr>
</tbody>
</table>
## Hazard Assessment Worksheet

<p>| | | | | | | | |</p>
<table>
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<tr>
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</tr>
<tr>
<td>Potential outcome or harm of the hazard if it occurs in the defined system state</td>
<td>Resultant matrix determination</td>
<td>Particular effect of the identified hazard producing the worst credible outcome (likelihood is not considered)</td>
<td>Resultant matrix determination</td>
<td>Expression of how often a particular effect is expected to occur given existing controls and requirements (severity must be considered first)</td>
<td>Risk matrix ranking based on severity and likelihood of a hazard when it is first identified and assessed</td>
<td>Stated mitigation for this hazard</td>
<td>Who has the responsibility to implement the mitigation</td>
</tr>
</tbody>
</table>
Describe the System

Identify Hazards

Analyze Risks

Assess Risks

Mitigate Risks

Describe the most important aspects of the system; make sure to establish boundaries or limits for analysis. Identify operational, procedural, organizational, environmental, and physical factors.
Step 2 – Identify Hazards

Describe System

Identify Hazards

Identify the inherent conditions associated with the defined system that have the potential to cause harm.

Analyze Risks

Assess Risks

Mitigate Risks
Step 3 – Analyze Risks

**Risk**: Composite of predicted severity and likelihood of outcome.
### Severity and Likelihood Definitions

#### Table C-1: Severity Definitions

<table>
<thead>
<tr>
<th>Severity Level</th>
<th>Minimal (5)</th>
<th>Minor (4)</th>
<th>Major (3)</th>
<th>Hazardous (2)</th>
<th>Catastrophic (1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negligible safety effect</td>
<td>Physical discomfort to persons</td>
<td>Physical distress or injuries to persons</td>
<td>Substantial damage to aircraft/vehicle</td>
<td>Multiple serious injuries; fatal injury to a relatively small number of persons (one or two); or a hull loss without fatalities</td>
<td>Multiple fatalities (or fatality to all on board) usually with the loss of aircraft/vehicle</td>
</tr>
</tbody>
</table>

*Excludes vehicles, crew, and participants of commercial space flight.*

#### Table C-2: Likelihood Definitions

<table>
<thead>
<tr>
<th>Likelihood</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequent A</td>
<td>Expected to occur routinely</td>
</tr>
<tr>
<td>Probable B</td>
<td>Expected to occur often</td>
</tr>
<tr>
<td>Remote C</td>
<td>Expected to occur infrequently</td>
</tr>
<tr>
<td>Extremely Remote D</td>
<td>Expected to occur rarely</td>
</tr>
<tr>
<td>Extremely Improbable E</td>
<td>So unlikely that it is not expected to occur, but it is not impossible</td>
</tr>
</tbody>
</table>
Step 4 – Assess Risks

Describe System
Identify Hazards
Analyze Risks
Assess Risks
Mitigate Risks

Assess the risk based on the Risk Matrix using the most accurate severity and likelihood definitions provided.
### Risk Matrix

<table>
<thead>
<tr>
<th>Severity</th>
<th>Minimal 5</th>
<th>Minor 4</th>
<th>Major 3</th>
<th>Hazardous 2</th>
<th>Catastrophic 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Likelihood</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Frequent A</td>
<td>Green</td>
<td>Yellow</td>
<td>Yellow</td>
<td>Red</td>
<td>Red</td>
</tr>
<tr>
<td>Expected to occur routinely</td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
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* Unacceptable with Single Point and / or Common Cause Failures

* Unacceptable with Single Point and / or Common Cause Failures
Step 5 – Mitigate the Risks

Describe System

Identify Hazards

Analyze Risks

Assess Risks

Mitigate Risks

Identify steps for reducing the severity or likelihood. Assign who will be responsible for implementing those steps. Describe how mitigations will be monitored and documented.