Project 12: Airport SMS Software Analysis

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The Team

• FAA
  – Lauren Vitagliano, Technical Monitor
  – Keri Lyons, Sponsor

• The Ohio State University
  – Seth Young, Project Lead
  – Shawn Pruchnicki, Management Support

• Southern Illinois University
  – Mike Robertson, Technical Lead
  – Bryan Harrison, Research Support
Executive Summary

Purpose
• Understand the software used by airports to manage their SMS

Goal
• Provide the FAA with guidance towards recommending SMS software for airports, including minimum functionality standards

Software Analysis
• Reviewed commercially available SMS software products

Survey
• Accessed the airport community to see how they’re using SMS software
Research Design

Part I
• Literature review and background

Part II
• Review of commercially available SMS software products

Part III
• Survey of airports that have some level of knowledge of SMS and have used some sort of software to manage their SMS
Part I – SMS Background

Safety Management Systems

• High-Risk Industries
  – Nuclear, maritime, petroleum, rail

• New Era in Aviation Safety
  – 1900 – 1970s = Technical Era
  – 1970s – min-1990s = Human Factors Era
  – Mid-1990s – Today = Organizational Era
<table>
<thead>
<tr>
<th>Year</th>
<th>Project Type</th>
<th>Participants</th>
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<tr>
<td>2007</td>
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<td>2008</td>
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<td>2011</td>
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<tr>
<td>2014</td>
<td>Robertson, Harrison, Ruiz</td>
<td>42</td>
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</table>
Identify SMS Software

- Basic Internet search for software related to Safety Management Systems
- 31 different software systems were identified
- 16 of the 31 software systems provided a demonstration or trial
  - 13 airport-specific
  - 3 for general industry
Methodology

- Identify the basic functionalities of the software

The Four SMS Components

Safety Policy
Establishes senior management's commitment to continually improve safety; defines the methods, processes, and organizational structure needed to meet safety goals.

Safety Assurance
Evaluates the continued effectiveness of implemented risk control strategies; supports the identification of new hazards.

Safety Risk Management
Determines the need for, and adequacy of, new or revised risk controls based on the assessment of acceptable risk.

Safety Promotion
Includes training, communication, and other actions to create a positive safety culture within all levels of the workforce.
ICAO SMM

- Provided a basis from which we created the list of software functionalities
# Software Evaluation

## 37 Software Attributes Identified

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<thead>
<tr>
<th>Administrative</th>
<th>Policy and Objectives</th>
<th>Safety Risk Management</th>
<th>Safety Assurance</th>
<th>Safety Promotion</th>
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<tr>
<td>Web-Based</td>
<td>SMS Manual Builder</td>
<td>Mandatory Hazard Reports</td>
<td>Audits</td>
<td>Communication with 3rd Parties</td>
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<td>Voluntary Hazard Reporting</td>
<td>Trend Analysis</td>
<td>Communication</td>
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<td>Confidential Hazard Reporting</td>
<td>Trend Analysis: Trend Analysis: Mapping with GIS</td>
<td>Training Modules</td>
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<td>Software Design Based on ICAO/FAA</td>
<td>Customizable Surveys</td>
<td>Customizable Form</td>
<td>Training Assessment Tools</td>
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<td>Hazard Mitigation Tracking</td>
<td>Integration with a Learning Management System</td>
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<td>Customizable Risk Matrix</td>
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<td>Hazard Report Feedback to Original Reporter</td>
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</table>
Administrative Capabilities

- Public Access: 6 (Aviation Specific) / 0 (Non-Aviation)
- Off-Line Access: 5 (Aviation Specific) / 2 (Non-Aviation)
- Mobile Applications: 9 (Aviation Specific) / 1 (Non-Aviation)
- Web-Based: 10 (Aviation Specific) / 2 (Non-Aviation)
- Data Backup: 10 (Aviation Specific) / 2 (Non-Aviation)
- Technical Support: 10 (Aviation Specific) / 3 (Non-Aviation)
- Individual Login: 10 (Aviation Specific) / 3 (Non-Aviation)
- Data Export: 10 (Aviation Specific) / 3 (Non-Aviation)

Legend:
- Aviation Specific
- Non-Aviation
SMS Implementation and Policy Capabilities

- Implementation Plan: 1 (Aviation Specific), 0 (Non-Aviation)
- Gap Analysis Tool: 2 (Aviation Specific), 0 (Non-Aviation)
- SMS Manual Builder: 3 (Aviation Specific), 0 (Non-Aviation)
- Software Design Based on ICAO/FAA: 8 (Aviation Specific), 3 (Non-Aviation)
- Document Upload: 10 (Aviation Specific), 3 (Non-Aviation)
Airport SMS Software Evaluation

Risk Management Capabilities

- Hazard Report Feedback to Original Reporter: 8 Aviation Specific, 1 Non-Aviation
- Customizable Risk Matrix: 10 Aviation Specific
- Risk Mitigation Planning: 10 Aviation Specific, 1 Non-Aviation
- Risk Assessment: 10 Aviation Specific, 1 Non-Aviation
- Customizable Surveys: 9 Aviation Specific, 2 Non-Aviation
- Confidential Hazard Reporting: 10 Aviation Specific, 1 Non-Aviation
- Voluntary Hazard Reporting: 10 Aviation Specific, 1 Non-Aviation
- Incident Assignment: 10 Aviation Specific, 2 Non-Aviation
- Email Notification to Safety Manager: 9 Aviation Specific, 3 Non-Aviation
- Mandatory Hazard Reports: 10 Aviation Specific, 2 Non-Aviation
Safety Assurance Capabilities

- Trend Analysis: Mapping with GIS
  - Aviation Specific: 2
  - Non-Aviation: 1

- Hazard Mitigation Tracking
  - Aviation Specific: 10
  - Non-Aviation: 1

- Incident/Accident Investigations
  - Aviation Specific: 10
  - Non-Aviation: 2

- Audits
  - Aviation Specific: 10
  - Non-Aviation: 2

- Customizable form
  - Aviation Specific: 10
  - Non-Aviation: 3

- Trend Analysis
  - Aviation Specific: 10
  - Non-Aviation: 3

Legend:
- Aviation Specific
- Non-Aviation
Airport SMS Software Evaluation

Safety Promotion Capabilities

Integration with a Learning Management System: 2 (Aviation Specific), 0 (Non-Aviation)

Training Modules: 4 (Aviation Specific), 1 (Non-Aviation)

Training Assessment Tools: 5 (Aviation Specific), 2 (Non-Aviation)

Communication with 3rd Parties: 7 (Aviation Specific), 2 (Non-Aviation)

Dashboard: 8 (Aviation Specific), 2 (Non-Aviation)

Must Read Alerts: 9 (Aviation Specific), 2 (Non-Aviation)

Training Tracking for all Personnel: 8 (Aviation Specific), 3 (Non-Aviation)

Internal Email Communication: 10 (Aviation Specific), 3 (Non-Aviation)
• Developed a survey to be distributed to 45 domestic civil airports

• Survey Purpose
  – Gauge the safety culture and Safety Management System implementation at airports
Survey Results

- **Survey Content**
  - SMS Software Programs

- **Capabilities and Features**

- **User Satisfaction**

- **What works and what does not?**
Responding airports - Mostly small/medium hubs (NPIAS classification) or Class I (14 CFR Part 139).

Several airports continue to develop and implement SMS programs, while others have ceased implementation for now.
• Most airports had their softwares installed on a local network server, which was accessible from multiple computers on their network.
• Out of the 6 airports paying higher upfront costs, some were paying for in-house built software, while others paid for software products installed by vendors.
• Airports paying less upfront costs instead paid monthly subscription costs.
• About 9 airports said that SMS software was limited to only certain users.
### Administrative Capabilities

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<td>Technical Support</td>
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<td>Individual Login</td>
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<tr>
<td>Data Export</td>
<td>10</td>
<td>3</td>
</tr>
</tbody>
</table>

### Reported Capability Necessity by Percent

- **Public Access**: 60% Must have, 30% Nice to have, 10% Not desired
- **Off-Line Access**: 50% Must have, 40% Nice to have, 10% Not desired
- **Mobile Applications**: 90% Must have, 5% Nice to have, 5% Not desired
- **Web-Based**: 100% Must have, 0% Nice to have, 0% Not desired
- **Data Backup**: 100% Must have, 0% Nice to have, 0% Not desired
- **Technical Support**: 100% Must have, 0% Nice to have, 0% Not desired
- **Individual Login**: 100% Must have, 0% Nice to have, 0% Not desired
- **Data Export**: 100% Must have, 0% Nice to have, 0% Not desired
SMS Implementation and Policy Capabilities

- Implementation Plan: 10
- Gap Analysis Tool: 2
- SMS Manual Builder: 3
- Software Design Based on ICAO/FAA: 8
- Document Upload: 10

Reported Capability Necessity by Percent

- Implementation Plan
- Gap Analysis Tool
- SMS Manual Builder
- Software Design Based on ICAO/FAA
- Document Upload

- Must have
- Nice to have
- Not desired

Aviation Specific vs. Non-Aviation
## Risk Management Capabilities

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<tr>
<th>Capability</th>
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<tr>
<td>Hazard Report Feedback to Original Reporter</td>
<td>8</td>
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<tr>
<td>Customizable Risk Matrix</td>
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<tr>
<td>Mandatory Hazard Reports</td>
<td>10</td>
<td>2</td>
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</tbody>
</table>

## Reported Capability Necessity by Percent

- **Hazard Report Feedback to Original Reporter**
  - Must have: 80%
  - Nice to have: 20%
- **Customizable Risk Matrix**
  - Must have: 100%
  - Nice to have: 0%
- **Risk Mitigation Planning**
  - Must have: 80%
  - Nice to have: 20%
- **Risk Assessment**
  - Must have: 100%
  - Nice to have: 0%
- **Customizable Surveys**
  - Must have: 80%
  - Nice to have: 10%
  - Not desired: 10%
- **Confidential Hazard Reporting**
  - Must have: 90%
  - Nice to have: 10%
- **Voluntary Hazard Reporting**
  - Must have: 100%
  - Nice to have: 0%
- **Incident Assignment**
  - Must have: 90%
  - Nice to have: 10%
- **Email Notification to Safety Manager**
  - Must have: 80%
  - Nice to have: 20%
- **Mandatory Hazard Reports**
  - Must have: 100%
  - Nice to have: 0%
### Safety Assurance Capabilities

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<tr>
<td>Trend Analysis</td>
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</table>

### Reported Capability Necessity by Percent

#### Trend Analysis: Mapping with GIS
- Must have: 40%
- Nice to have: 60%
- Not desired: 0%

#### Hazard Mitigation Tracking
- Must have: 80%
- Nice to have: 20%
- Not desired: 0%

#### Incident/Accident Investigations
- Must have: 60%
- Nice to have: 40%
- Not desired: 0%

#### Audits
- Must have: 80%
- Nice to have: 20%
- Not desired: 0%

#### Customizable form
- Must have: 80%
- Nice to have: 20%
- Not desired: 0%

#### Trend Analysis
- Must have: 70%
- Nice to have: 30%
- Not desired: 0%
Safety Promotion Capabilities

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Reported Capability Necessity by Percent

- **Integration with a Learning Management System**
  - Must have: 80%
  - Nice to have: 20%
  - Not desired: 0%
- **Training Modules**
  - Must have: 80%
  - Nice to have: 20%
  - Not desired: 0%
- **Training Assessment Tools**
  - Must have: 80%
  - Nice to have: 20%
  - Not desired: 0%
- **Communication with 3rd Parties**
  - Must have: 80%
  - Nice to have: 20%
  - Not desired: 0%
- **Dashboard**
  - Must have: 80%
  - Nice to have: 20%
  - Not desired: 0%
- **Must Read Alerts**
  - Must have: 80%
  - Nice to have: 20%
  - Not desired: 0%
- **Training Tracking for all Personnel**
  - Must have: 80%
  - Nice to have: 20%
  - Not desired: 0%
- **Internal Email Communication**
  - Must have: 80%
  - Nice to have: 20%
  - Not desired: 0%
Thank you! Questions?