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*i*SMS Implementation at Air Canada

August 12th, 2008
Washington, DC

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Air Canada

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Agenda

- Background
- *i*SMS and *integrated*-AMS implementation
- Transport Canada SMS Components & Expectations
- Safety Information Management System (SafIMS)
- Air Canada Source Reference Material
- Ongoing iSMS / *integrated*-AMS activities

Background

Background

History

- **Pre-codeshare: “firefighting” and “making the operation work”**
- **1998/99: Founding member of Star Alliance:**
  - **code-share audits**
  - **focus on “implementation”**
  - **still few (if any) documented processes except for MNT.**
  - **some QA (internal audits) and QC (inspections)**
- **Nov 12, 2002: Pre-IOSA prep work and SMS.**
  - **IOSA Standards and Recommended Practices (and Guidance Material) used to determine gaps**
  - **CAA material either non-existent or useless**
  - **Project Team established**
  - **EVERTHING fell under the category of SMS**
- **Fall 2003: CAA bowed out of the ACA SMS Working Group**
- **April 1, 2004 Bankruptcy Protection**

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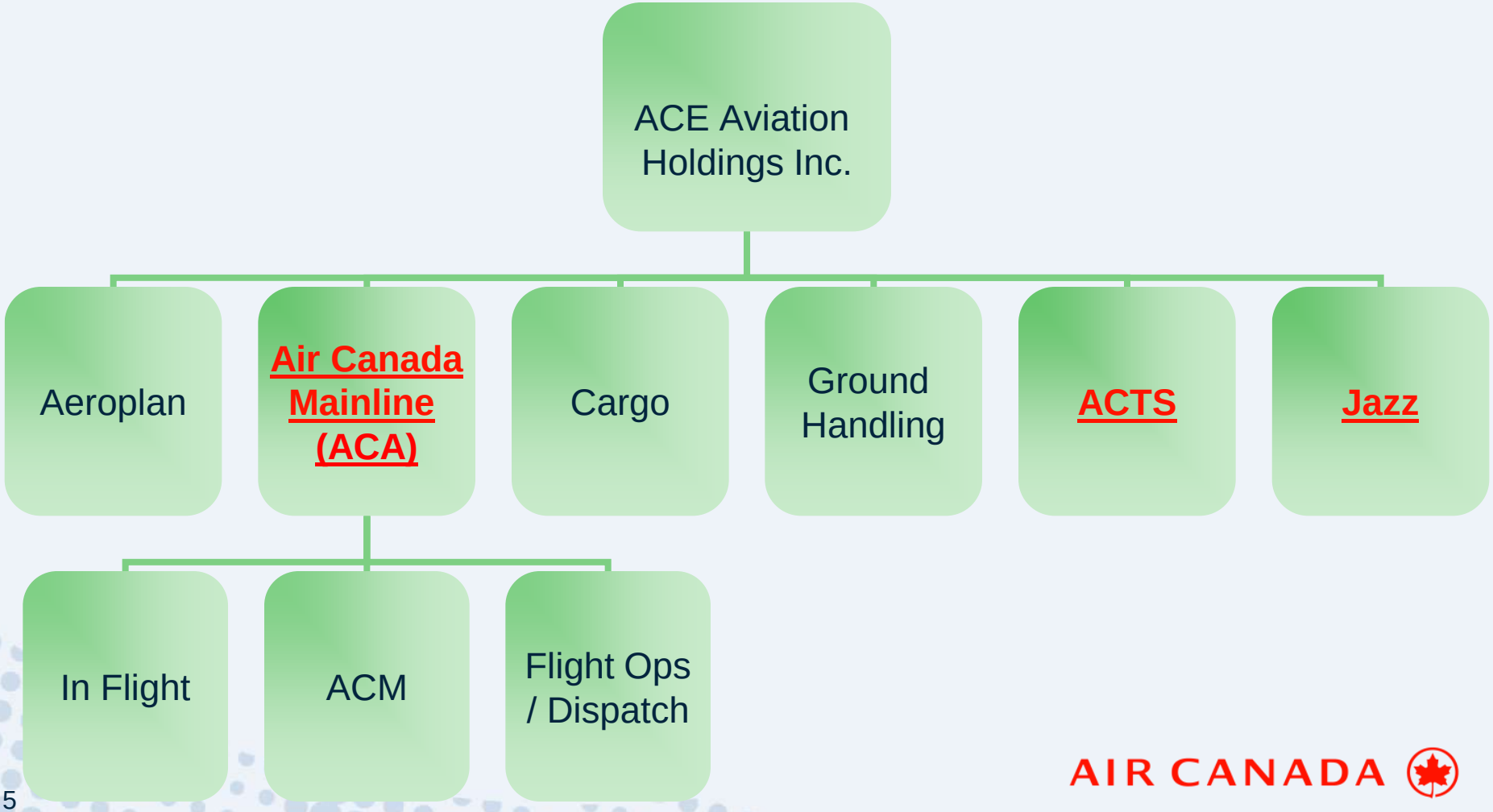
Background… cont.

In 2004 ACE was comprised of a number of legal entities, three of which are holders of Operations Certificates



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Background… cont.

History - cont

- **May 21, 2004: IOSA registration**
- **September 2005: First CAA SMS regulations published**
- **September 2006: SMS Project closed / Continuous Improvements**
- **Feb. 2007: first meaningful involvement of CAA in the review of the ACA SMS**
  - **Conflicting regulations (esp. Health & Safety vs. Flight Safety vs. Privacy)**
  - **Confused Civil Aviation Authority (the ACA SMS contained things outside of the Authority's scope, e.g., Security, Environment and Occupational Health and Safety)**
- **Sept 06: Phase 1 Validation (no changes)**
- **June 07: Phase 2 Validation (minor editorial changes)**
- **April 08: Phase 3 Validation (no changes)**
- **Oct 08: Phase 4 Validation (TBA)**

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Background: Conflicting vs. non-Conflicting Regulations

- **ICAO Standards and Recommended Practices**
- **US Department of Defense Quality and Safety Requirements**
- **Airline Alliance "Best Practices"**
- **Highly regulated and overlapping State jurisdictions**
  - **Civil Aviation Authority of our State**
  - **Civil Aviation Authorities of the States our airline operates into**
  - **Authority for Aviation Security**

  - **Occupational Safety & Health Authority Codes**
  - **Corporate Governance, SOX**
  - **Privacy Laws**
  - **Civil / Criminal Laws**
  - **Access to Information Legislation**
  - **Environmental Legislation**
  - **Municipal Codes (Building, Fire, etc.)**

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Background: Simplification and Clarification

- **ACA needed to overcome the CAA's issues and not lose any of the synergies, positive changes (and efficiencies gained)!**
- **Feb. – May 07: re-scoping of SMS under the umbrella of integrated-AMS in accordance with IATA Guidance Material**
  - **Not everything belongs in *i*SMS!**
    - **E.g., changes to key processes in Flight Operations (Flight Ops Management System) need not require CAA approval.**
    - **E.g., a change in security regs does not require an amendment to *i*SMS documentation**
  - **Foundation is QMS**
  - **Leverage "Modular" components of *i*SMS (SeMS, SUMS, ERM, Occupational Health & Safety Programs)**
- **April 2008: TC Phase 3 Validation (no changes required)**

*i*SMS and *integrated*-AMS Implementation

ACA SMS / *i*-AMS Project: Overview

- **The Safety Management System (SMS) project was officially launched at Air Canada November 12, 2002 to build upon existing safety systems throughout the organization**
- **IOSA-based (limited CAA guidance available)**
- **Dedicated Project Manger**
- **Executive Steering Committee**
- **Participation by all unions / associations and Business Unit representatives from all Operational Branches**
- **Commenced November 2002**
- **Project Office wound down in September 2006**
- **Migration to *integrated*-AMS with *i*SMS as a component in February 2007**

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What is an *i*-AMS

- **A "system of management systems"**
- **Scope is the entire airline**

Operational Systems

- **Flight Operations**
- **Cabin**
- **Maintenance**
- **Dispatch**
- **Ground Handling**
- **Cargo**

Support Systems*

- **Personnel**
- **Supplier**
- **Financial**
- **Marketing**
- **Communications**
- **Legal**

***AND includes Management Systems that also "touch" everyone, i.e.,**
Safety (*i*SMS), Quality, Supplier, Security, Enterprise Risk, Environmental, Corporate Governance, Occupational Safety & Health Programs, and Safety Information Management (SafIMS)

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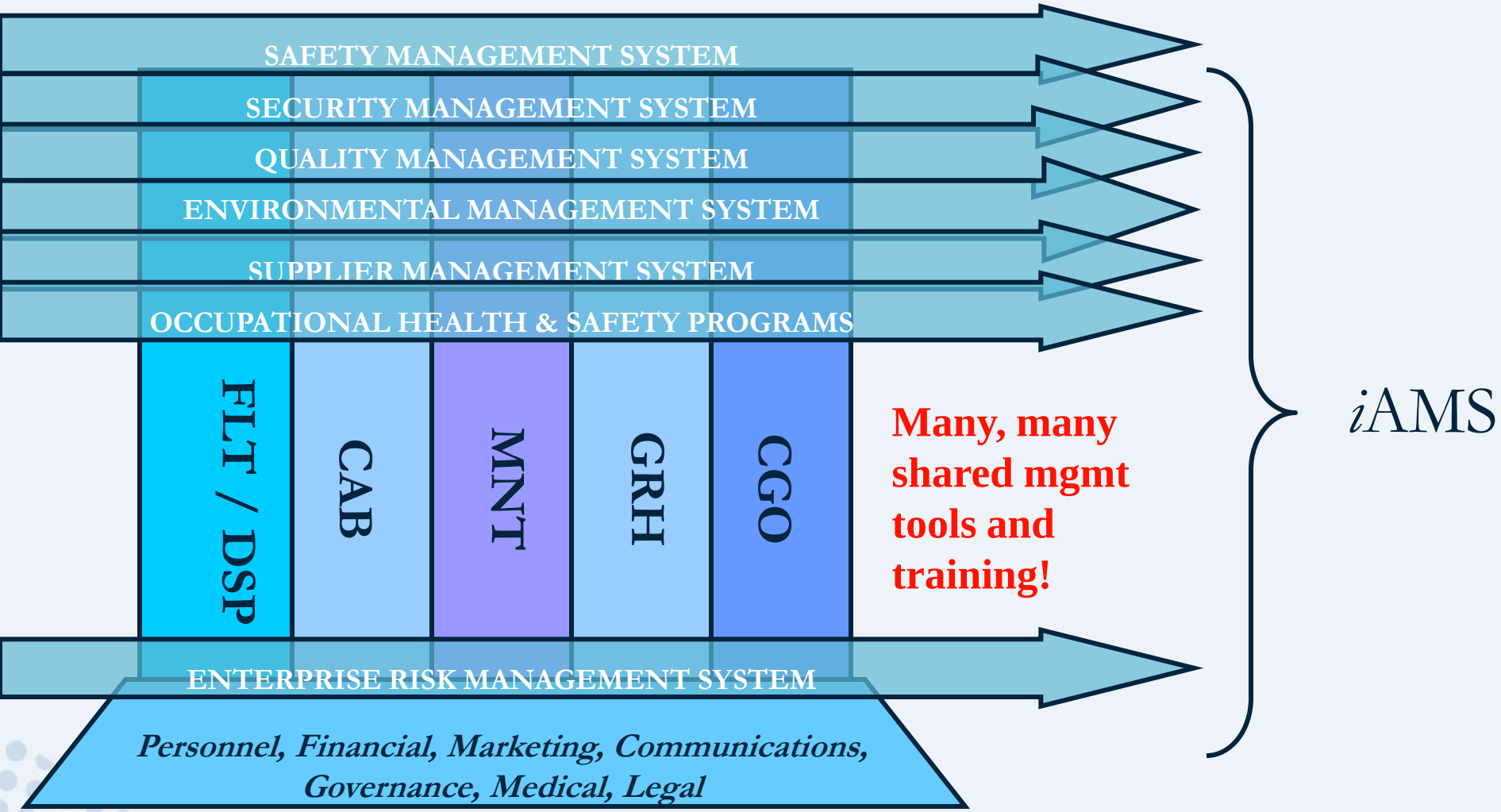
The Air Canada integrated-AMS: Conceptual Diagram



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What is a SMS?

- **A Safety Management System (SMS) is a structured, quality-oriented system that allows:**
  - **Managers and employees throughout the corporation to**
    - **report (hazards, occurrences and audit findings);**
    - **detect and manage risks associated with those reports;**
    - **take action to eliminate systemic errors and non-conformities (corrective or preventive actions) before they result in an incident or accident (A/C "in operation");**
    - **and control the processes and tasks associated with the above activities to ensure that they are performed satisfactorily with continuous improvement**
  - **Data sources include :**
    - **Reactive (incidents, audit findings)**
    - **Proactive (hazard reports, surveys, risk assessments, audit observations, risk assessments or program management/6-Sigma/mgmt checklists)**
    - **Predictive (e.g. FDA, LOSA, AQP)**
- **Scope is "Safety of Flight" hazards and occurrences and includes QA and Emergency Response per CARs**
- **FLT, DSP, MNT and CAB Branches only per CARs**

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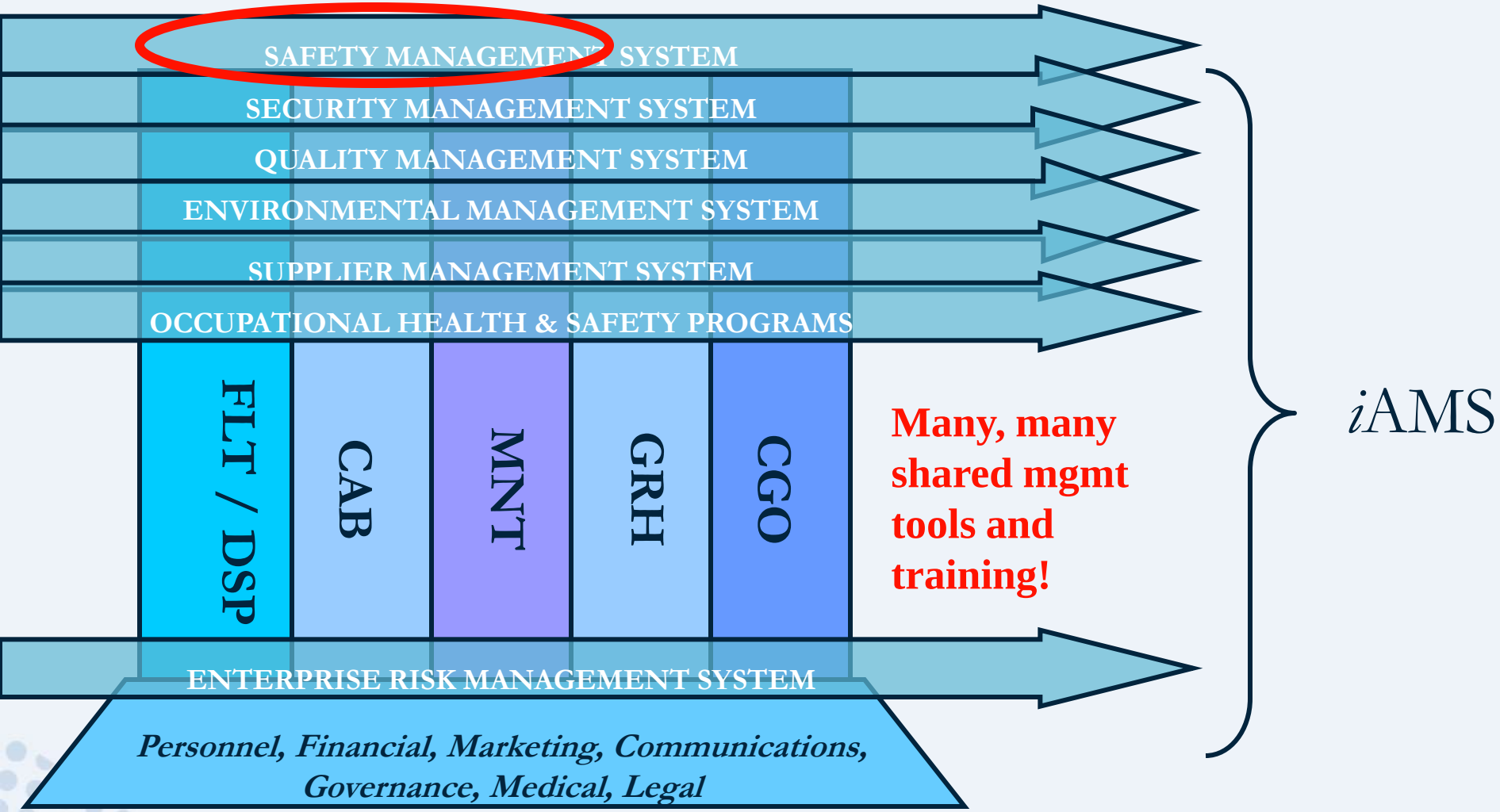
The Air Canada integrated-AMS: Conceptual Diagram



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What is an *i*-AMS? Why Bother? What can be gained?

- **Quality Management System (QMS): THE FOUNDATION**
  - » Tools: Auditing, Risk Model, Classification Model, Training
- **Supplier Management System (SuMS)**
  - » Tools: Auditing, Risk Model, Classification Model, Training
- **Safety Management System (SMS)**
  - » Tools: Safety Reports, Risk Model, Classification Model, Investigations, Training, FDA
- **Occupational Health & Safety Programs**
  - » Tools: Safety Reports, Risk Model, Classification Model, Investigations, Training
- **Security Management System (SEMS)**
  - » Tools: Security Reports, Auditing, Risk Model, Classification Model, Investigations, Training
- **Environmental Management System (EMS)**
  - » Tools: Environmental Reports, Auditing, Investigations, Training
- **Enterprise Risk Management Systems (ERM)**
  - » Tools: Workshops, Risk Model, Training, Risk Management Plans

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ACA *i*-AMS ~ Defining the Boundaries and Scope of the various Management Systems

- **The Air Canada *integrated* AMS is now comprised of:**
  - **QMS (foundation of integrated-AMS): Based on IOSA and ISO 9001-2000 / ISO 19011:**
    - **Plan, Do, Check, Act**
    - **Train, Communicate, Management Review**
    - **Document, Implement, Control, Measure, Analyze (KPIs)**
  - **SMS: Based on IOSA and CAA (Transport Canada) regulations**
  - **Environmental Management System: Based on ISO 14001**
  - **Security Management System: Based on IOSA, IATA Security Manual, ICAO, Canadian and US Security Regulations**
  - **Occupational Health & Safety Programs: Based on Canada Labour Code**
  - **AND Branch-specific Management Systems (FLT, MNT, CAB, GRH, CGO, DSP, SEC)**

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Integrated AMS Implementation

- **Manuals (Corporate and Branch)**
  - » ***Integrated* Airline Management System Manual**
  - » **Security Manual**
  - » **Environmental Manual**
  - » **Occupational Safety & Health Manual**
  - » **Emergency Response Manual**
  - » **Branch Quality Manuals**
    - > **FOQM: Flight Ops Quality Manual**
    - > **Cargo Quality Manual**
    - > **Ground Handling Quality Manual**
    - > **Cabin Services Quality Manual**
    - > **Maintenance Control Manual - amended to include *i*SMS / *i*AMS references**
- **Job Competencies developed for all managers**
- **Standardized Safety Reporting Process implemented (both proactive – hazards and reactive – occurrences) via legacy (paper and various dbase) systems and electronic**

Integrated AMS Implementation – cont.

- **Intuitive Risk Assessment Model (IRAM) adopted and implemented via EtQ Reliance**
- **Human Factors Analysis and Classification System (HFACS) Root Cause Analysis / Causal Factors Model adopted and implemented via EtQ Reliance**
- **Standardized Audit Process implemented (EtQ Reliance)**
- **Standardized Documentation Control implemented (EtQ Reliance)**
- **Corporate Policies leveraged across all Business Units:**
  - **Safety Policy**
  - **Safety Reporting Policy (Non-punitive)**
  - **Quality Policy**
  - **Environmental Policy**
  - **Security Policy**

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Integrated AMS Implementation – cont.

- ***i*AMS Training provided:**
  - » **Quality Auditor Training**
  - » **Investigator Training**
  - » ***i*SMS Awareness Training**
- **3rd tier / code share audits and operational reviews (Domestic and International) to IOSA ORG and relevant technical standards**
- **External Contracts include language re: safety, security, quality, documentation and training requirements**
- **Safety / Quality Managers in all Operational Business Units / Branches ~ Security, ACM, ACTS, Jazz, International, In Flight, Cargo, ACGHS, Flight Ops**
- **Corporate Safety and Quality Oversight ~ Internal Quality Audits, External Quality Audits and Quality Services, OSH, Flight Safety and the development of a Corporate Biennial Audit Program**

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Integrated AMS Implementation – cont.

- **Branch internal audit programs**
- **Flight Data Analysis**
- **Safety Pulse Surveys**
- **Safety Assessments**
- **Steering Committees (IRAM, HFACS, Safety Information Management)**
- **Standardized Corporate Goals and Objectives rolled out annually**
  - » **Safety, Quality, Occupational Health & Safety and Environmental Objectives tailored to meet the needs of each Business Unit**
  - » **Development of Key Performance Indicators in each Business Unit**
  - » **Performance Management / Measurement Process for the review of all management staff includes iAMS measures**

Integrated AMS Implementation – cont.

- **Hazard Register and Safety Risk Profile (work in progress within SafIMS)**
- **Organizational Risk and Project Management (work in progress within SafIMS)**
- **Enterprise Risk Management (work in progress): NOT within scope of *i*SMS!**
- **Review and Reformat of Management Reviews: IB-SRT, Branch and Corporate Safety Board and introduction of the Annual Ops Review:**
  - » **Prepared and presented by each Operating Business Unit Executive with the assistance from Corporate Safety and Environment if requested (data, analysis, etc.)**
  - » **In line with the philosophy of *i*AMS and IOSA by placing the responsibility for safety of flight, quality, security, environment, and occupational safety & health within the business unit**

Transport Canada SMS Components & Expectations

Transport Canada SMS Components & Elements

Table A - SMS Assessment Protocol Framework	
Component	**Element**
0. Safety Management System	
1. Safety Management Plan	1.1 Safety Policy
	1.2 Non-Punitive Safety Reporting Policy
	1.3 Roles, Responsibilities & Employee Involvement
	1.4 Communication
	1.5 Safety Planning, Objectives and Goals
	1.6 Performance Measurement
	1.7 Management Review
2. Documentation	2.1 Identification and Maintenance of Applicable Regulations
	2.2 SMS Documentation
	2.3 Records Management
3. Safety Oversight	3.1 Reactive Processes
	3.2 Proactive Processes
	3.3 Investigation and Analysis
	3.4 Risk Management
4. Training	4.1 Training, Awareness and Competence
5. Quality Assurance	5.1 Operational Quality Assurance
6. Emergency Preparedness	6.1 Emergency Preparedness and Response

Phased-In Approach

- Phase I: “Plan”
- Phase II: “Reactive”
- Phase III: “Proactive”
- Phase IV: “QA and Emerg. Prep.”

FAA AC120-92, IATA and ICAO Guidance Material “similar”

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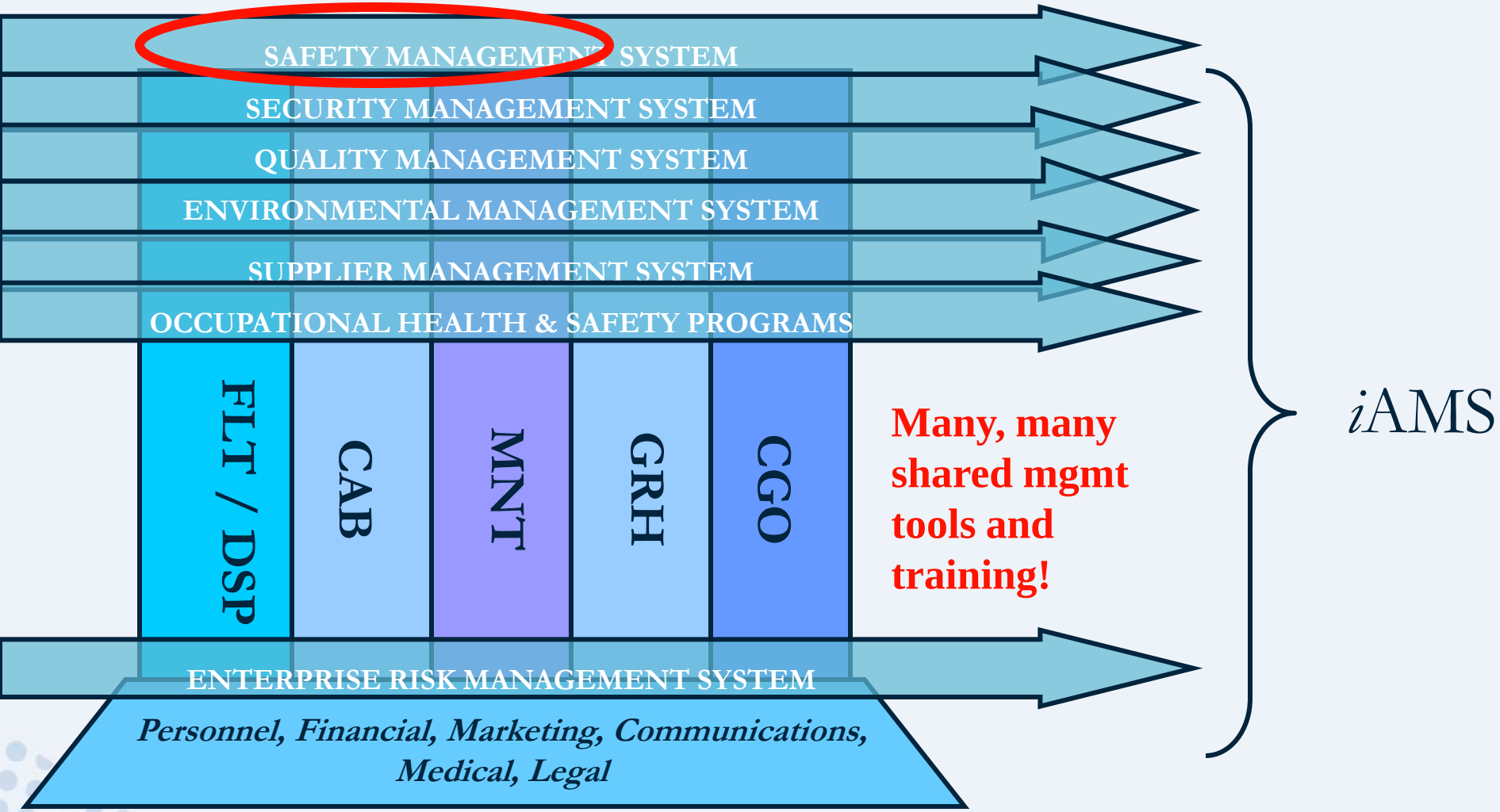
TC Elements and Expectations: ACA issues

- **Assessment components, elements and expectations viewed by TC as guidance material (and therefore not subject to a consultative process), but**
  - **These are the questions used during the interviews and during records / documentation reviews**
- **Numerical rating (1 – 5 scale), but**
  - **No Qualification Standard (or equivalent)**
  - **No inter-rater reliability**
  - **No consideration of impact of "scoring" on industry or government (access to information laws)**
- **Subjective language used: e.g., "clear commitment," "followed and understood," "made aware," "widely understood" etc.**
  - **Opportunity to define terms that are measurable**

TC Elements and Expectations: ACA issues

- **Recent unexplained editorial (and some substantive) changes to previously validated Phase 2 and 3 expectations create the impression of "a moving target."**
- **Ongoing discussion about what SMS "should" and "should not" cover: e.g.,**
  - **Simulator serviceability**
  - **Aircraft defect logs**
  - **Injuries under OSH jurisdiction**
  - **Fire evacuation plans**
  - **Building maintenance**
  - **Management Systems outside of the scope of SMS**

The Air Canada integrated-AMS: Conceptual Diagram



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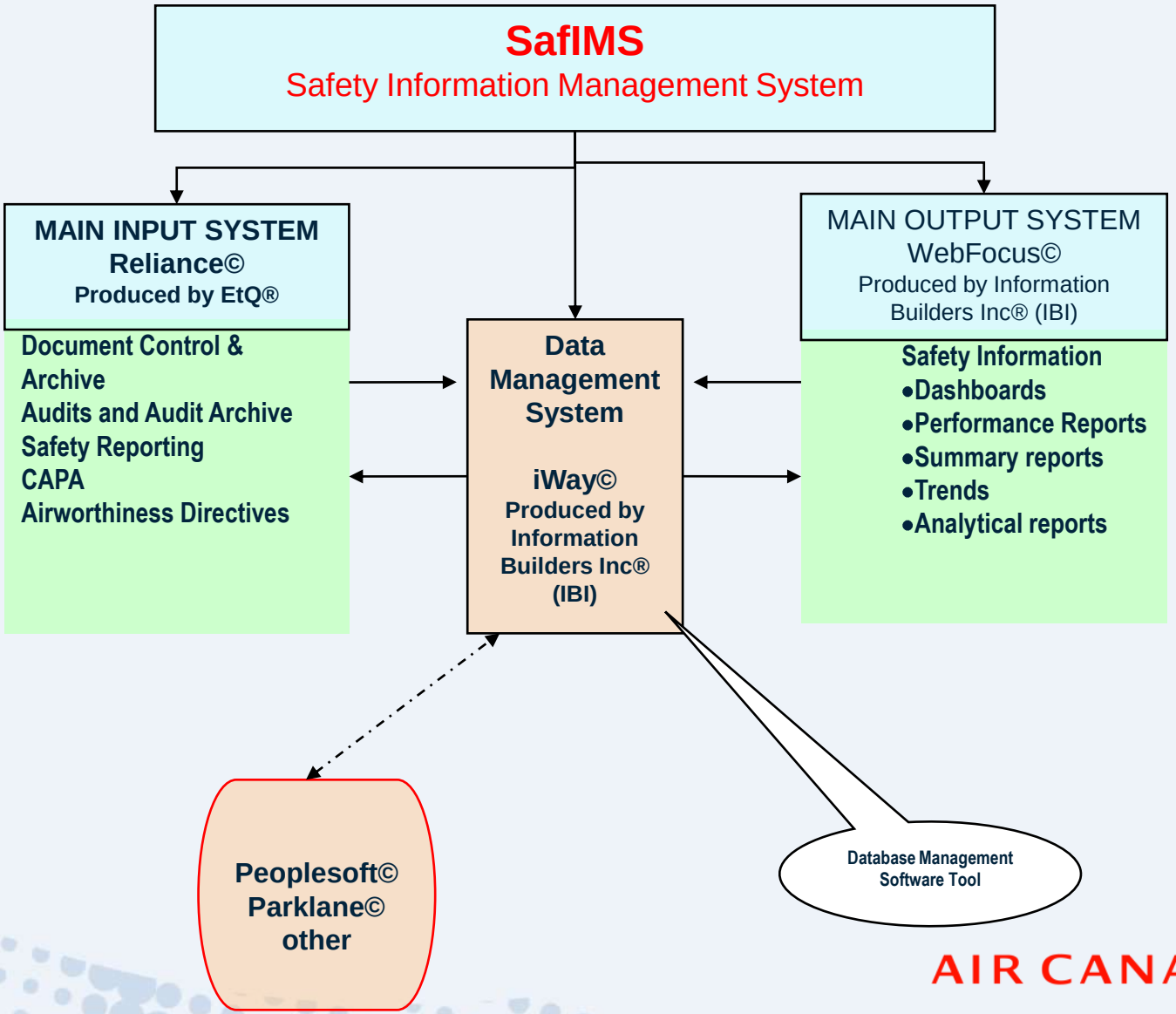
Safety Information Management System (SafIMS)

The ACA *i*-AMS Software Solution: Overview



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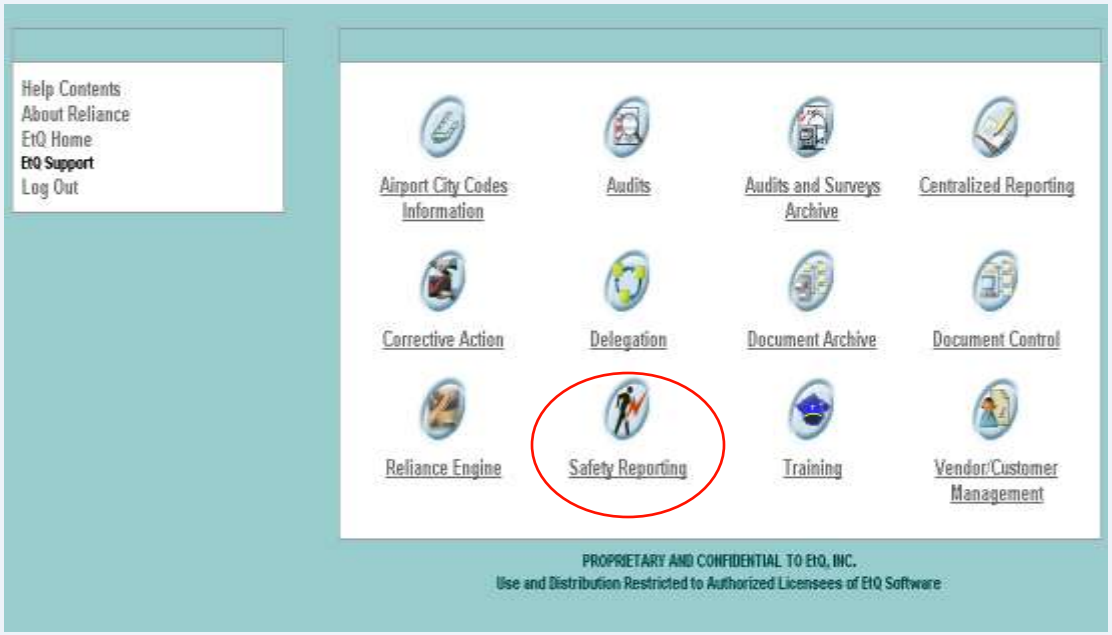
Integrated AMS Implementation – cont.
EtQ Reliance

- **Document Management and Control**
  - » **Automates documentation notification, review and approval processes including TC approval**
  - » **Provides a central repository for archived documents**
- **Audit and Quality Assurance**
  - » **Tracks Audit Findings / Observation and Corrective Action Plans**
  - » **Trends and analyses collected data using Risk Assessment Model (IRAM) and root cause analysis/causal factors model (HFACS)**
- **Safety Reporting**
  - » **Provides a single, reliable and effective mode for reporting events that impact different Branches and Business Units**
  - » **Also uses intuitive Risk Assessment Model (IRAM) and root cause analysis/causal factors model (HFACS)**

iSMS @ Air Canada



- **EtQ Reliance is the primary source of all iSMS records, such as safety reports, audit documents, corrective action documents, and documentation control**
- **Other records to support operational requirements are maintained within each respective branch as required (i.e. Operational and training records are maintained by ACM, IFS, Flt Ops, Dispatch)**
- **BASIS legacy system for Flight Ops Safety data; however safety data is now being entered into Reliance**

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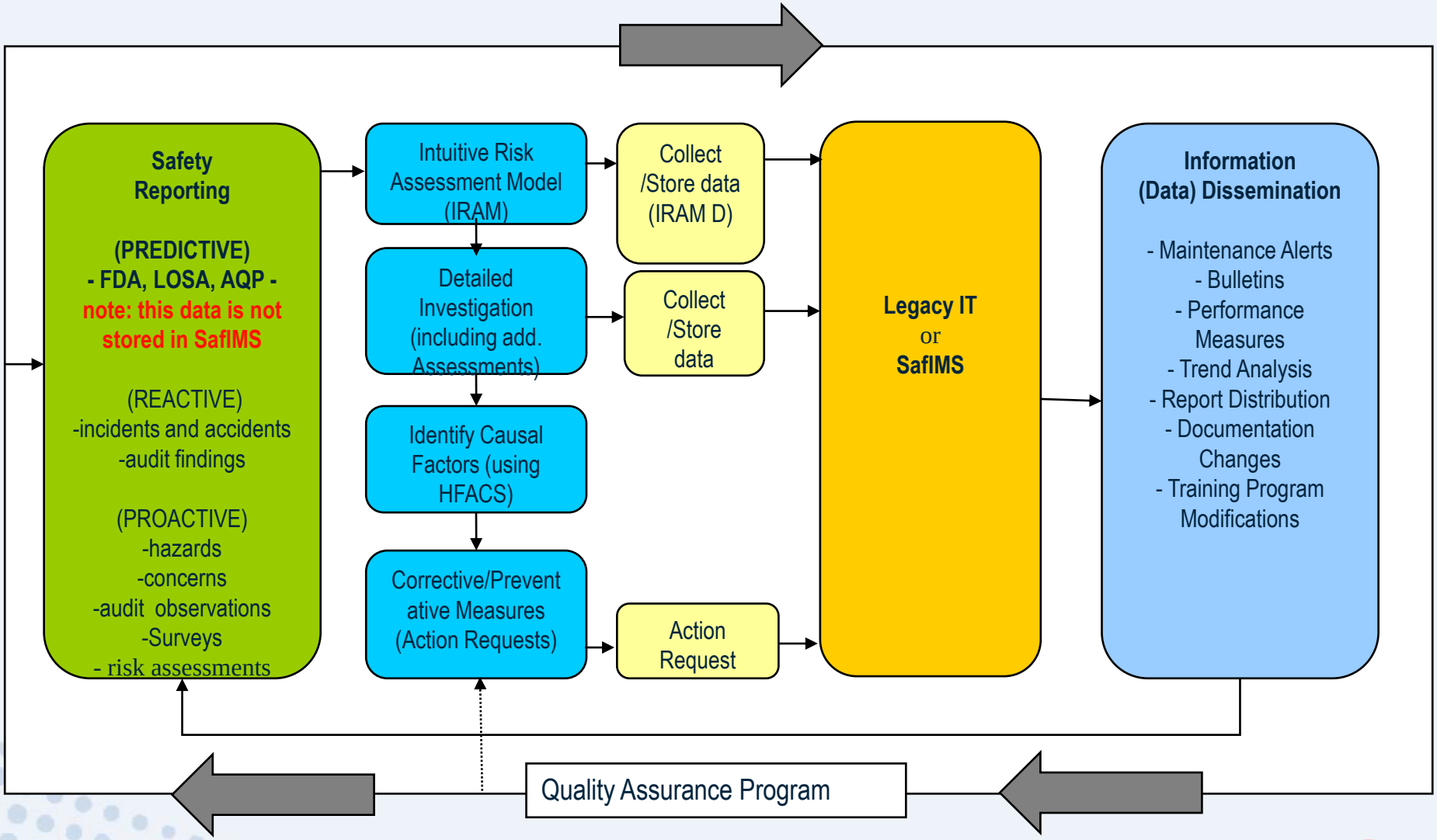
*i*SMS Data (inputs)

- Data Types
  - » **Predictive: FDA, LOSA (under development), AQP**
  - » **Proactive: Hazard reports/ Safety Concerns, Audit Observations and Noteworthy Programs, Surveys, Risk Assessments, Safety Assessments, Organizational Risk Management and Program Management / 6-Sigma / Management Checklists**
  - » **Reactive: Incident/accident reports, audit findings**
- Ongoing monitoring of the health of the *i*SMS through Quality Audits and Management Reviews

*i*SMS Data Management and QA Processes (Hazard Registry and Safety Risk Profile)



*i*SMS Data Analysis (Hazard or Occurrence)

- **Acknowledge receipt of report**
- **Risk Assess (IRAM) to prioritize**
- **Investigate**
  - » **Categorize (HFACS root cause analysis/causal factors)**
  - » **Develop Corrective / Preventive Action Plans and strategies**
  - » **Implement recommendations (corrective or preventive actions)**
- **Communicate results to employee(s) (if applicable) / Modify procedures, training, equipment, etc. as applicable**
- **Monitor for ongoing effectiveness**
- **Ongoing Management oversight and review of “significant risk” issues via Corporate and Branch Management Review processes and the QA program**

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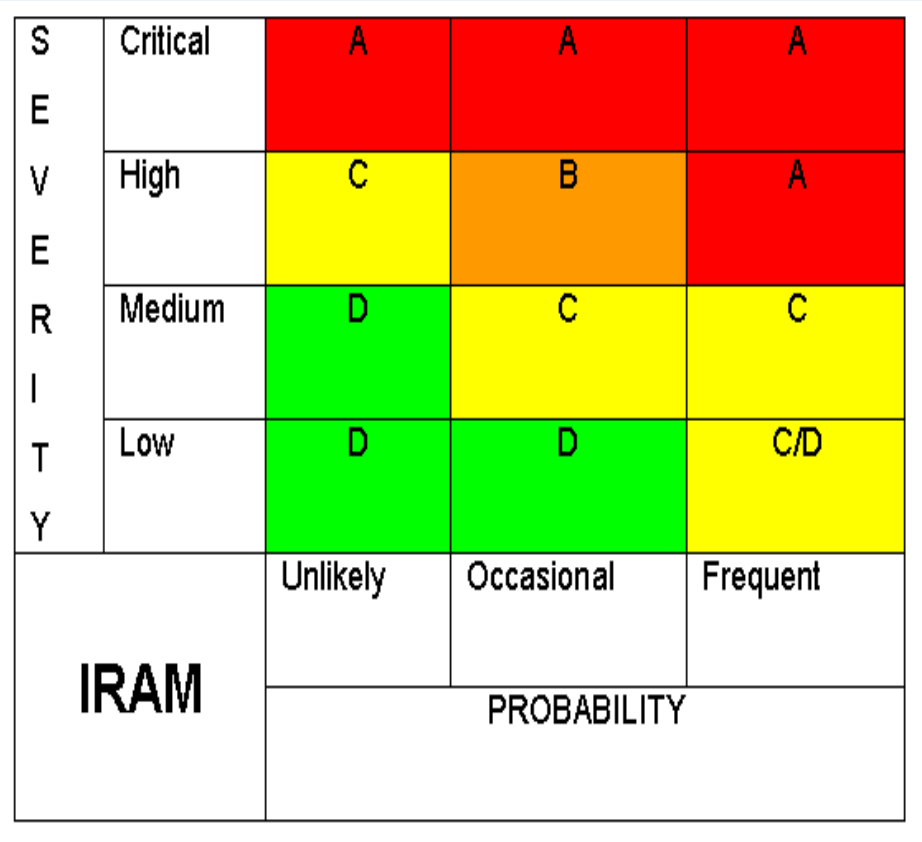
Risk Assessment

- **Air Canada has developed an intuitive Risk Assessment Matrix**
- **Provides guidance words to front-line staff to make quick assessments without statistics**
- **User chooses:**
  - » **Probability of occurrence**
  - » **Severity of outcome**
- **The matrix provides a direction letter A ➔D**
- **Centralized Risk Model - for hazards, occurrences, audit findings and vendor management - is key to the ACA integrated-AMS (and SMS)**

Integrated AMS Implementation – cont.
EtQ Reliance



- **Intuitive Risk Assessment Model (IRAM)**
- **Used in Safety and Audit modules**
- **AC defines a level of tolerable risk as that in which a condition is allowed to exist without taking action beyond recording, monitoring and trend analyzing the condition**
- **Examples of this level of tolerability are conditions that fall within Direction D of IRAM**

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Guidance Words

- **Exist for the following possible hazard / incident outcomes:**
  - **Injury**
  - **Illness**
  - **Aircraft damage**
  - **Equipment / facility damage**
  - **Safety of flight**
  - **Environmental**
  - **Regulatory**
  - **Security**
  - **Organizational (relates to audit findings re: Documentation / Implementation / Control)**
  - **Vendor Management**

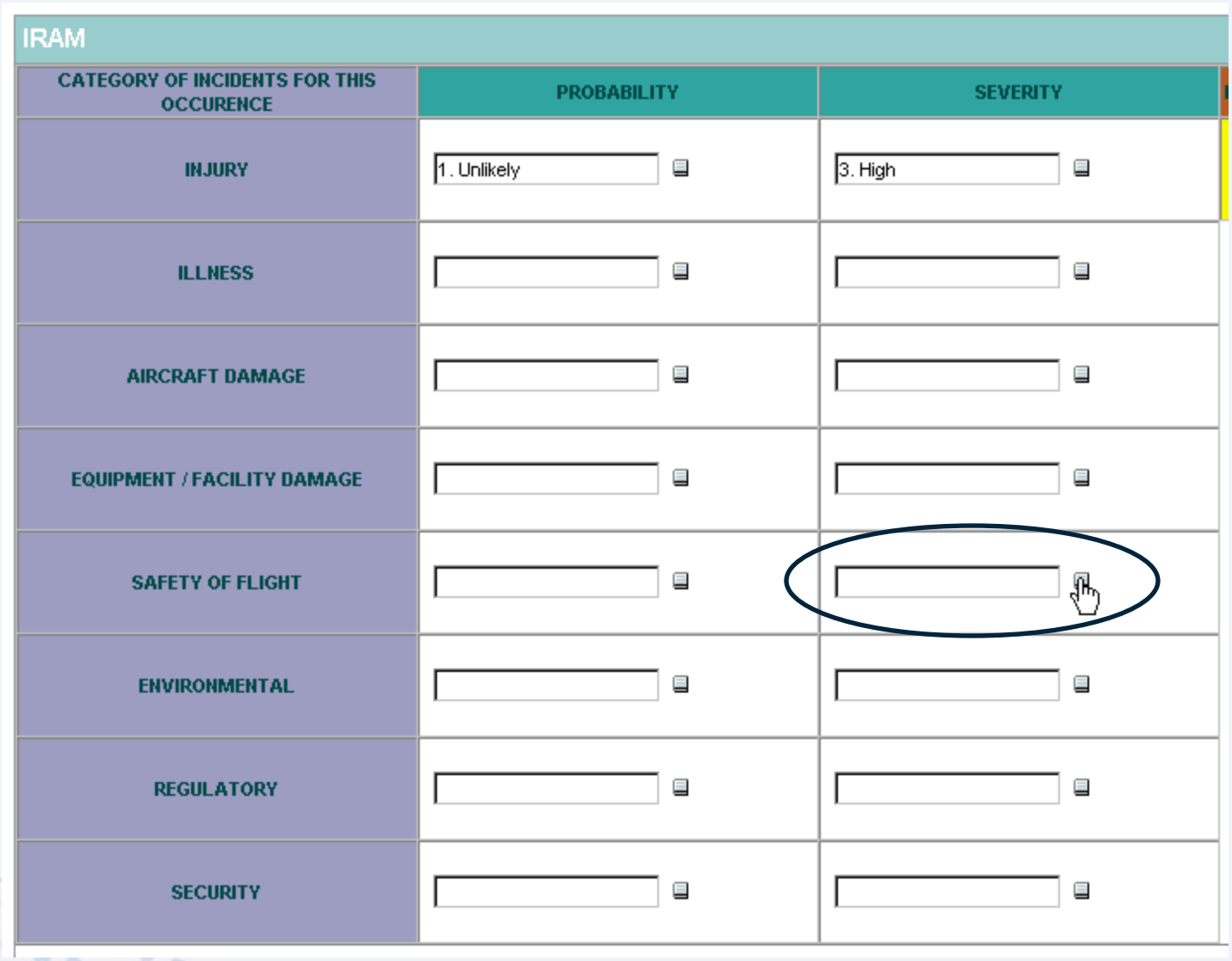
Sample Guidance Words for Safety of Flight

- **Low;**
  - » **activation of a safety system or safety procedure with correct crew response**
  - » **an avoidance maneuver that is deemed not to have been required**
  - » **loss of single primary system with redundant system available.**
  - » **smoke, smell, or fire/spark that was brief, identifiable, and extinguished**
- **Medium;**
  - » **activation of a safety system or safety procedure followed by an incorrect crew response, which however did not result in an increased safety threat**
  - » **an avoidance maneuver that is deemed to have been required**
  - » **loss of multiple primary systems with redundant systems available**
  - » **an un-commanded flight control input that is easily counter controlled.**
  - » **smoke, smell, or fire that was prolonged and identifiable, but contained or extinguished.**
- **High;**
  - » **activation of a safety system or safety procedure with incorrect response which did result in an increased safety threat**
  - » **an avoidance maneuver that is deemed to have been aggressive or prolonged**
  - » **loss of a primary system with no redundant system available**
  - » **an un-commanded flight control input that is difficult to counter control**
  - » **smoke, smell, or fire that was prolonged and not identifiable, or not contained, or not extinguishable.**
- **Critical;**
  - » **hull loss**

Risk Assessment – The Challenge

- How to make all the guidance words available via the software?

Phases – Risk Assessment



IRAM

CATEGORY OF INCIDENTS FOR THIS OCCURENCE	PROBABILITY	SEVERITY
INJURY	1. Unlikely	3. High
ILLNESS		
AIRCRAFT DAMAGE		
EQUIPMENT / FACILITY DAMAGE		
SAFETY OF FLIGHT		
ENVIRONMENTAL		
REGULATORY		
SECURITY		

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Risk Assessment - Example

AIRCRAFT DAMAGE	2. Occasional	3. High	B
EQUIPMENT / FACILITY DAMAGE			
SAFETY OF FLIGHT			
ENVIRONMENTAL	1. Unlikely	2. Medium	D
REGULATORY			
SECURITY			

OVERALL SAFETY REPORT IRAM RATING:	B	Action / Investigation: Medium level investigation: requires a safety callout; usually requires Branch resources and coordination; a qualified investigator is assigned; approx. 14 - 30 days; usually internal to Air Canada; may require further Risk Assessment; ususally results in corrective actions. Report Type: Class II. Report Composition: Icludes a Branch Executive Summary; Foraml Investigative Report format; approx. 2 - 15 pages; may include Annexes.

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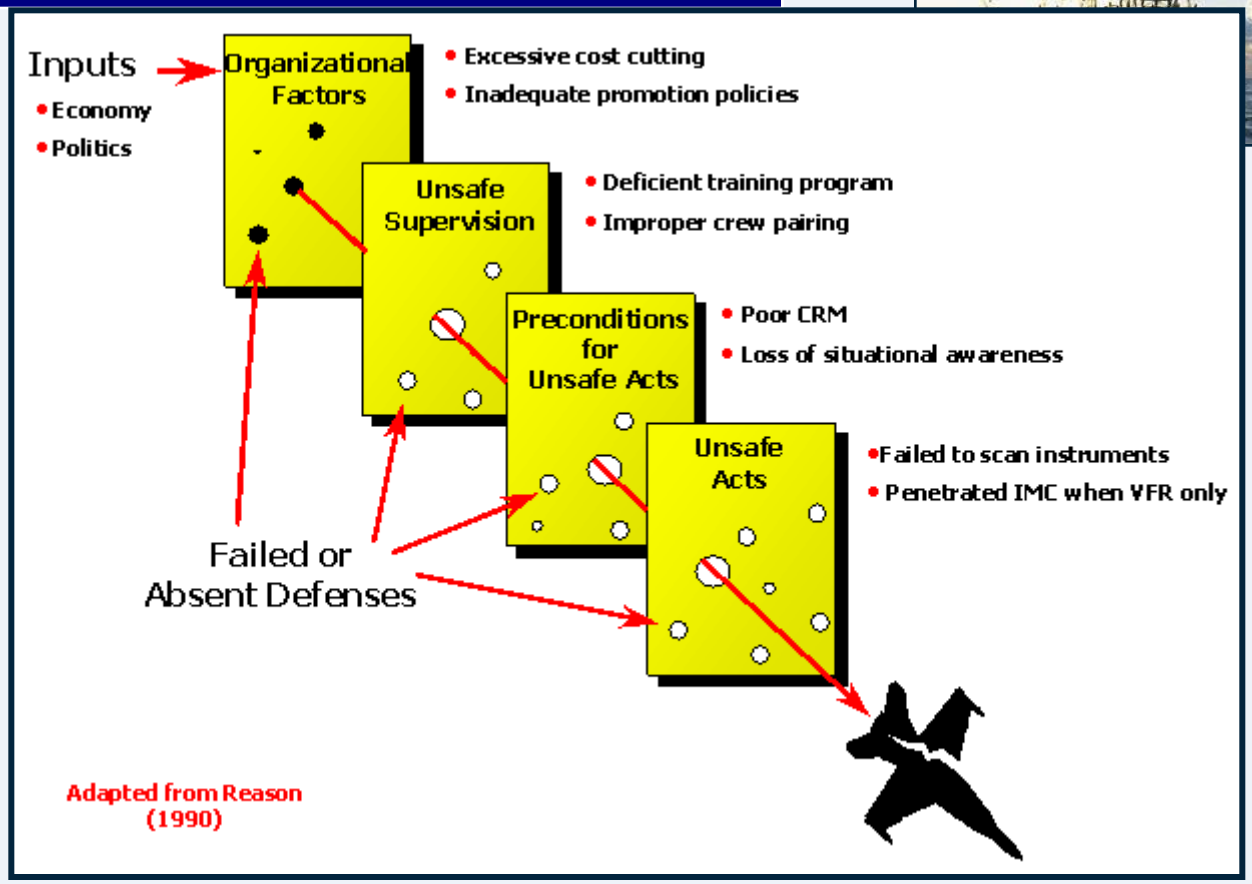
Phases – Investigation and Recommendation

- **Investigate: Supervisor or trained investigator performs investigation:**
  - » **Executive Summary of Occurrence**
  - » **Factual Information of Occurrence**
  - » **Analysis of Occurrence**
  - » **Findings**
  - » **Recommendations (Corrective and Preventative Actions)**
- **Categorizes the incident various ways**
  - » **Immediate Effect (e.g., altitude deviation, engine shutdown)**
  - » **Phase of Operations (e.g., FLT – cruise, GRH – a/c servicing, MNT – repair)**
  - » **Occurrence Classification (e.g., FLT – fuel valve, MNT – installation)**
  - » **Operational Effect (e.g., air turn back, delay, cancellation)**
  - » **HFACS – a centralized classification model, based on HF - for hazards, occurrences, audit findings and vendor management - is key to the ACA integrated-AMS (and SMS)**

HFACS®

Human Factors Analysis and Classification System



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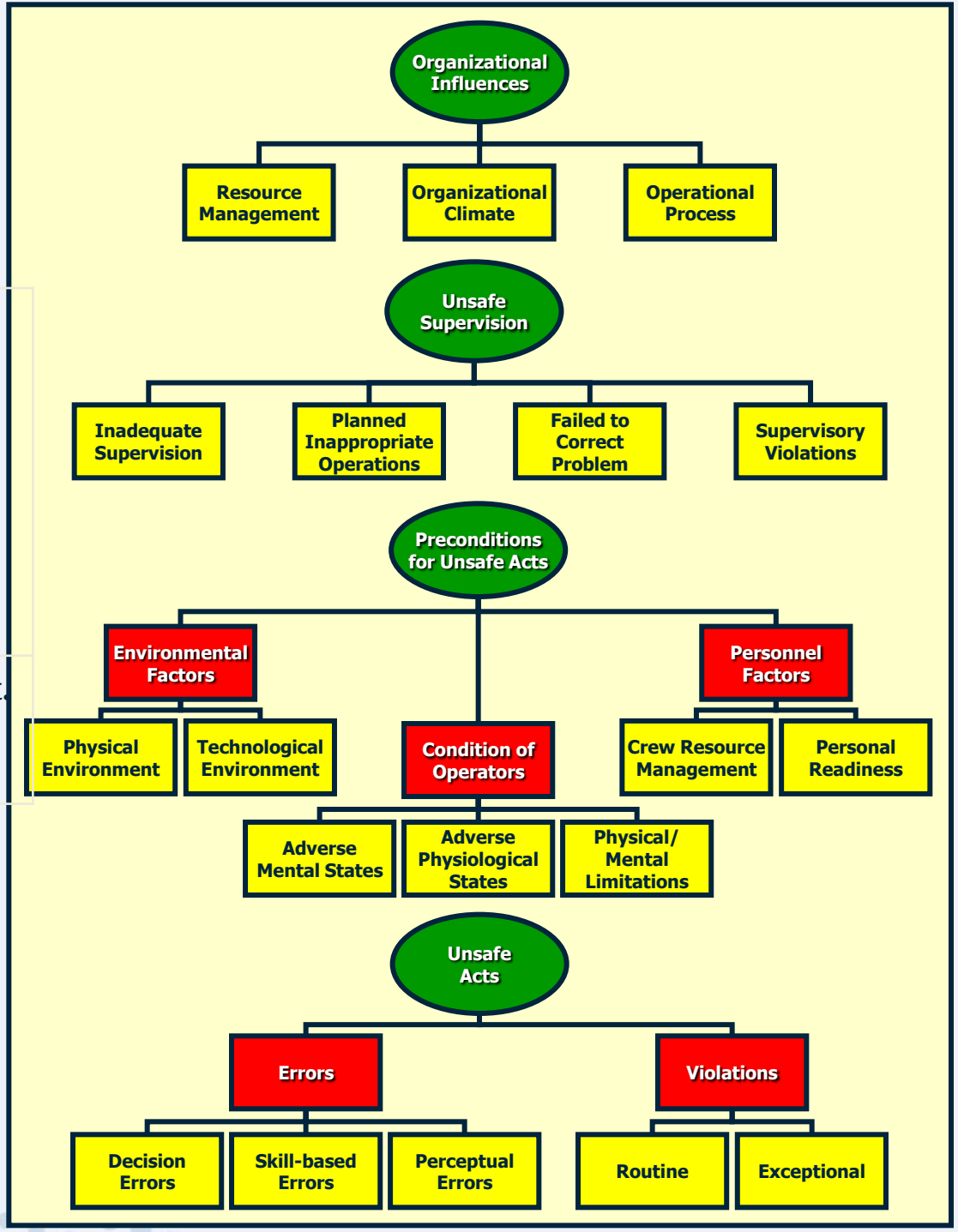
HFACS®
Human Factors Analysis and Classification System

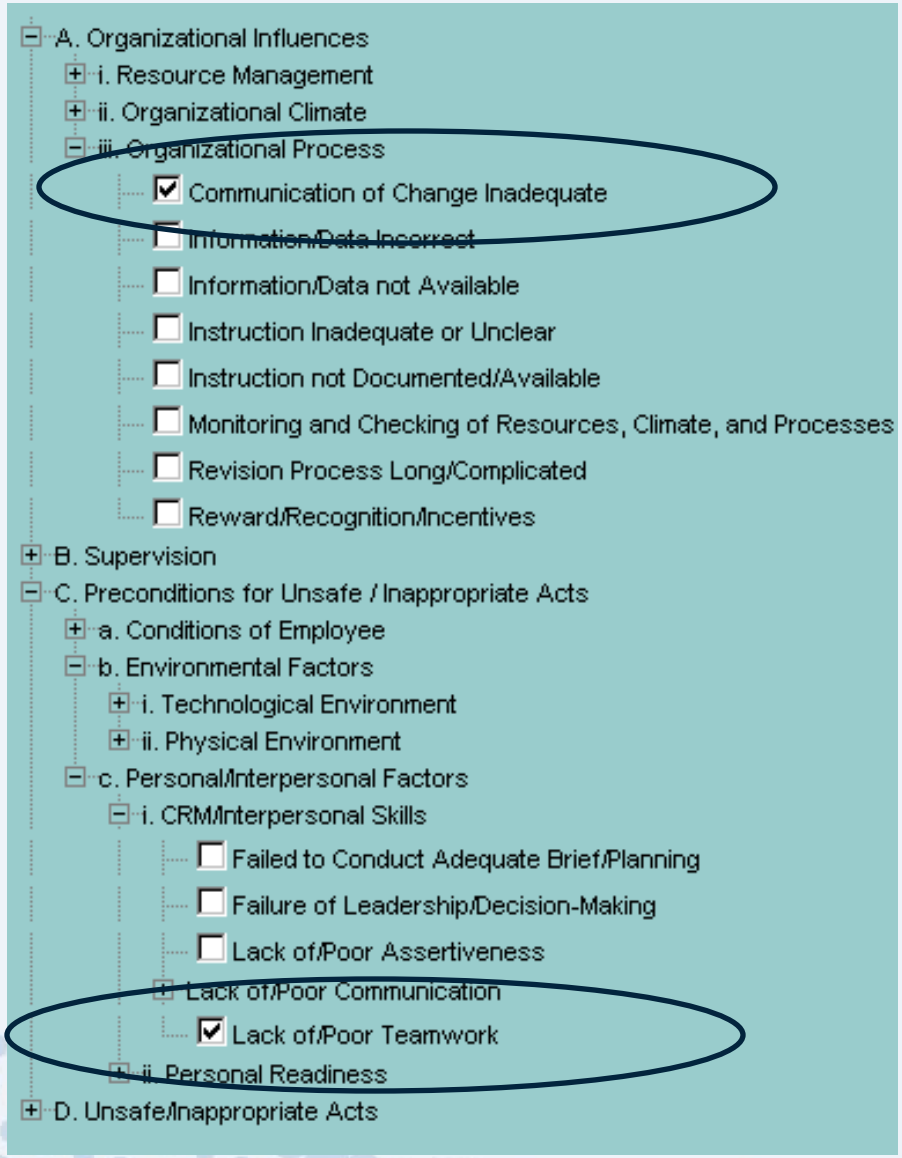
Dr. Scott Shappell, FAA Civil Aerospace Medical Institute, Oklahoma City, OK 73126, +1 405-954-4082, scott.shappell@faa.gov

Dr. Douglas A. Weigmann, Aviation Research Laboratory, University of Illinois, Savoy, IL 61874

http://www.hf.faa.gov/Portal/ShowProduct.aspx?ProductID=54



Human Factors Accident Classification System (HFACS) Implementation



- User can choose as many as needed

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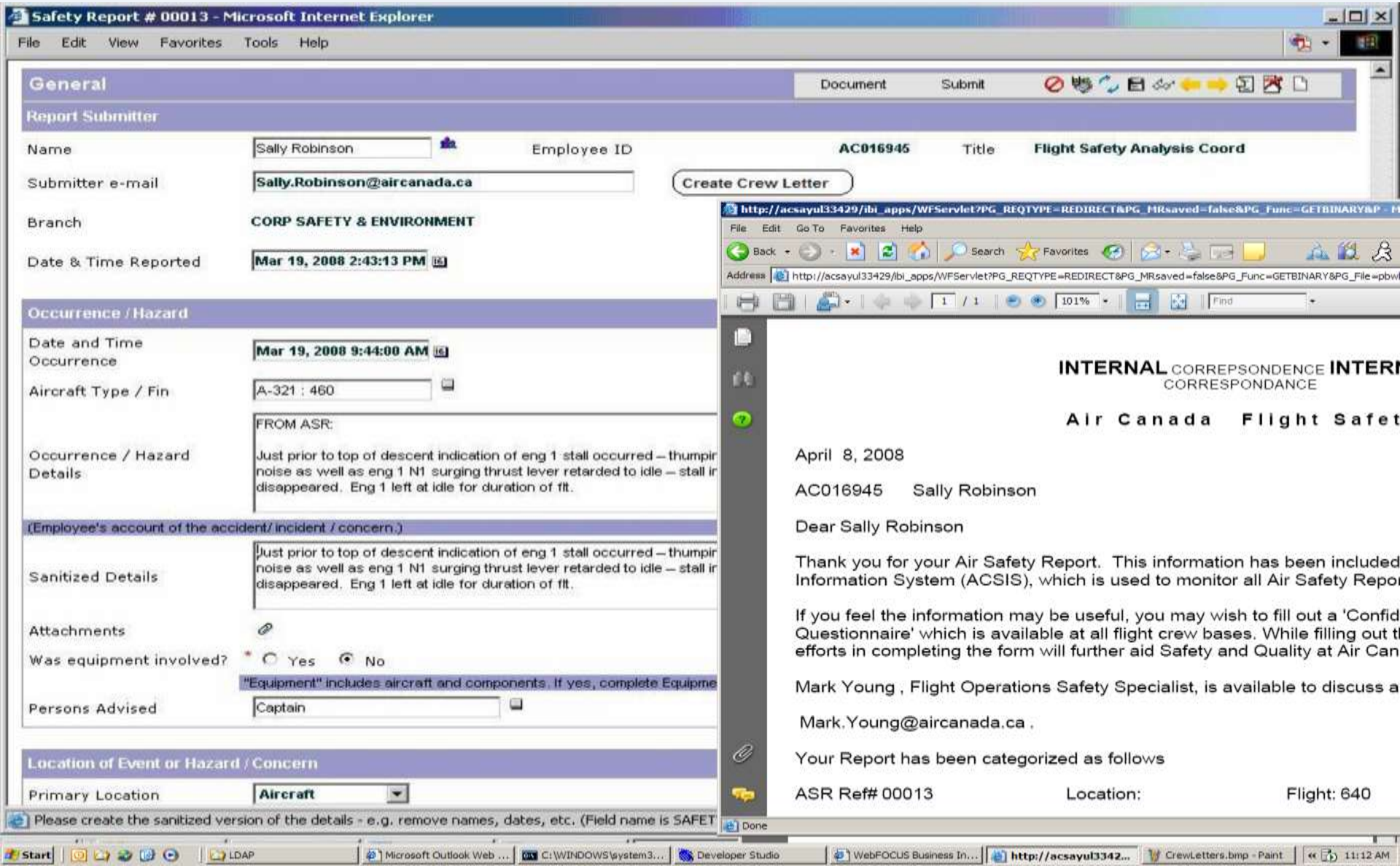
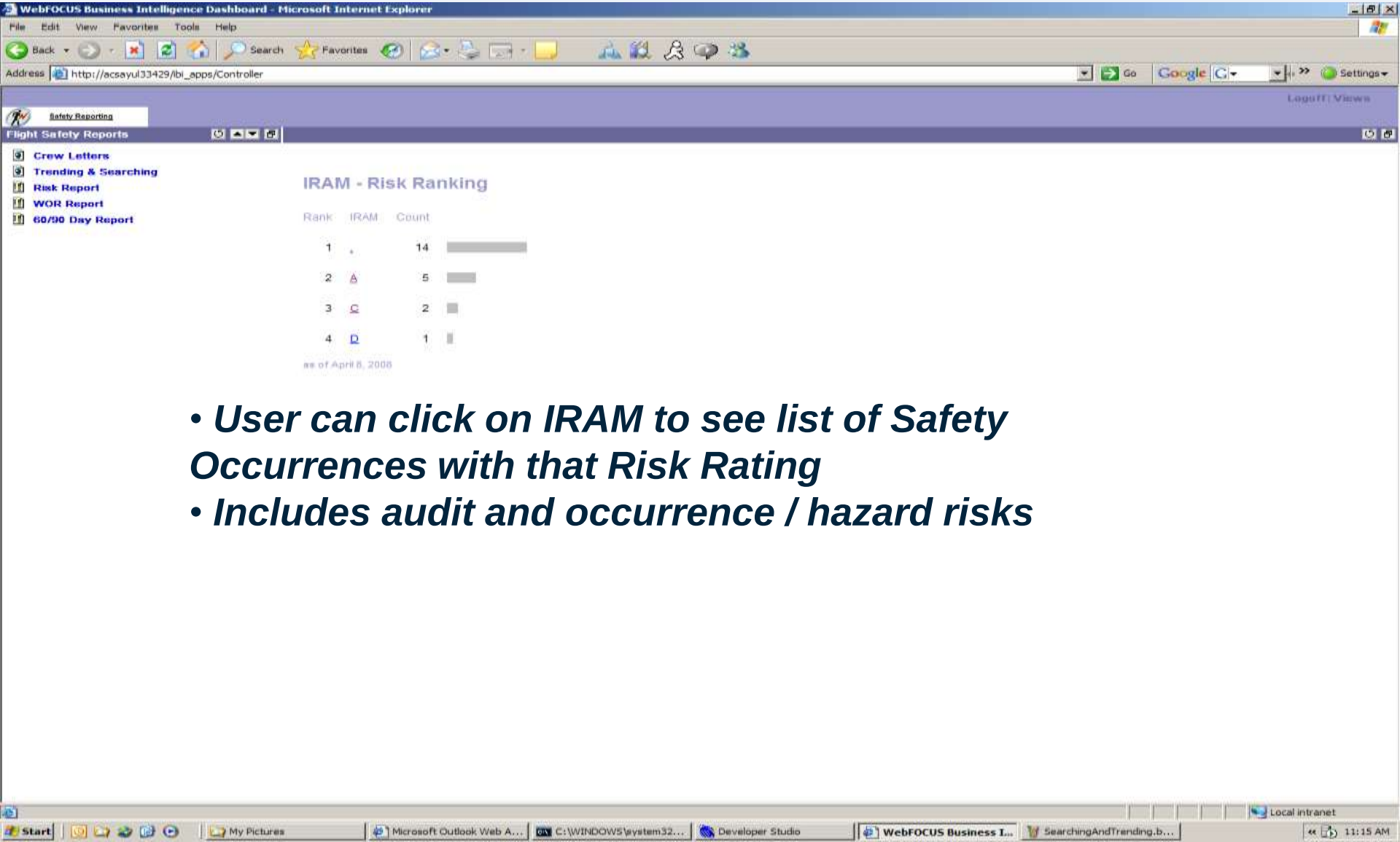
SafIMS Safety Module Outputs

Acknowledgement Letter (example)

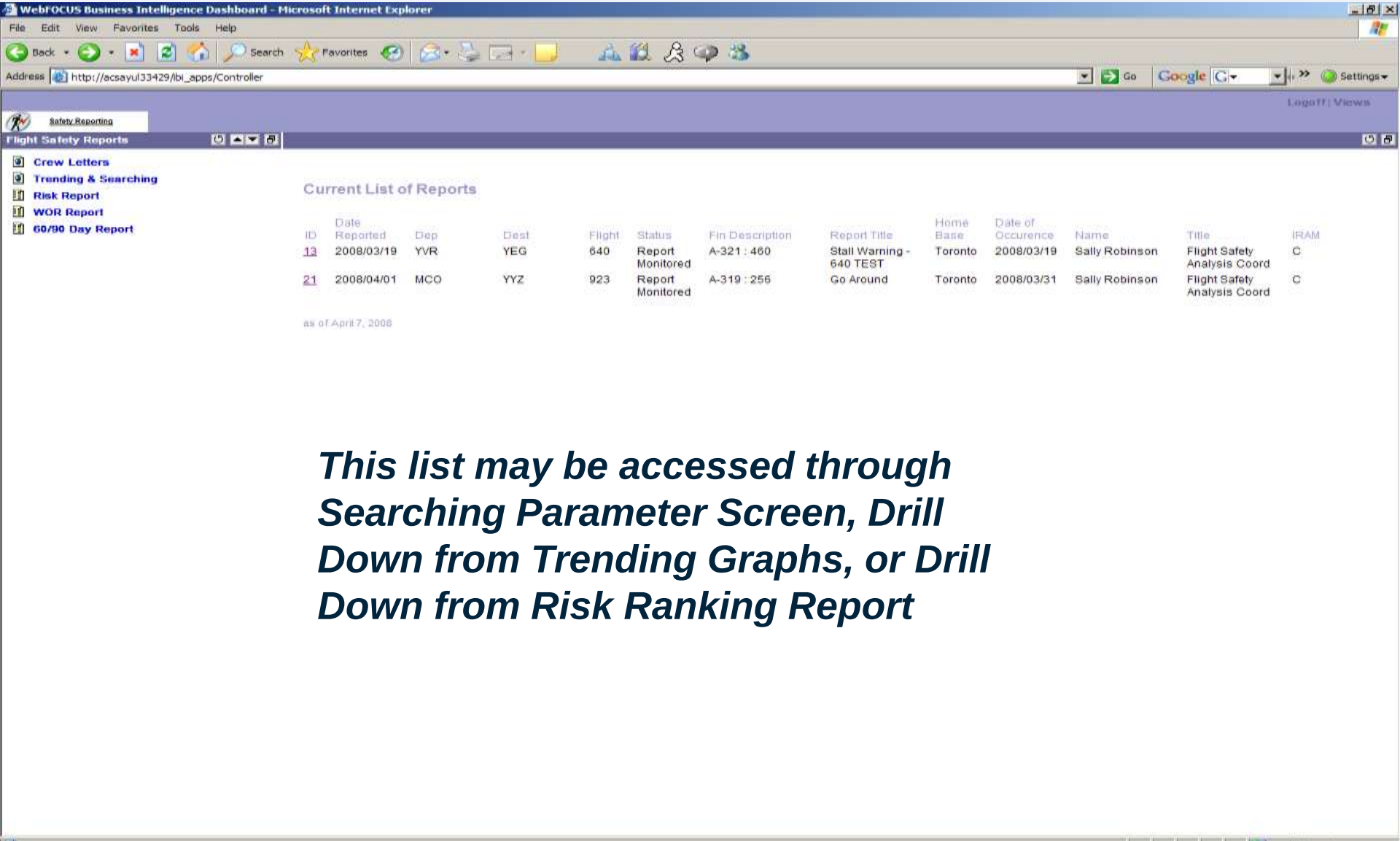


Risk Ranking Report (example)



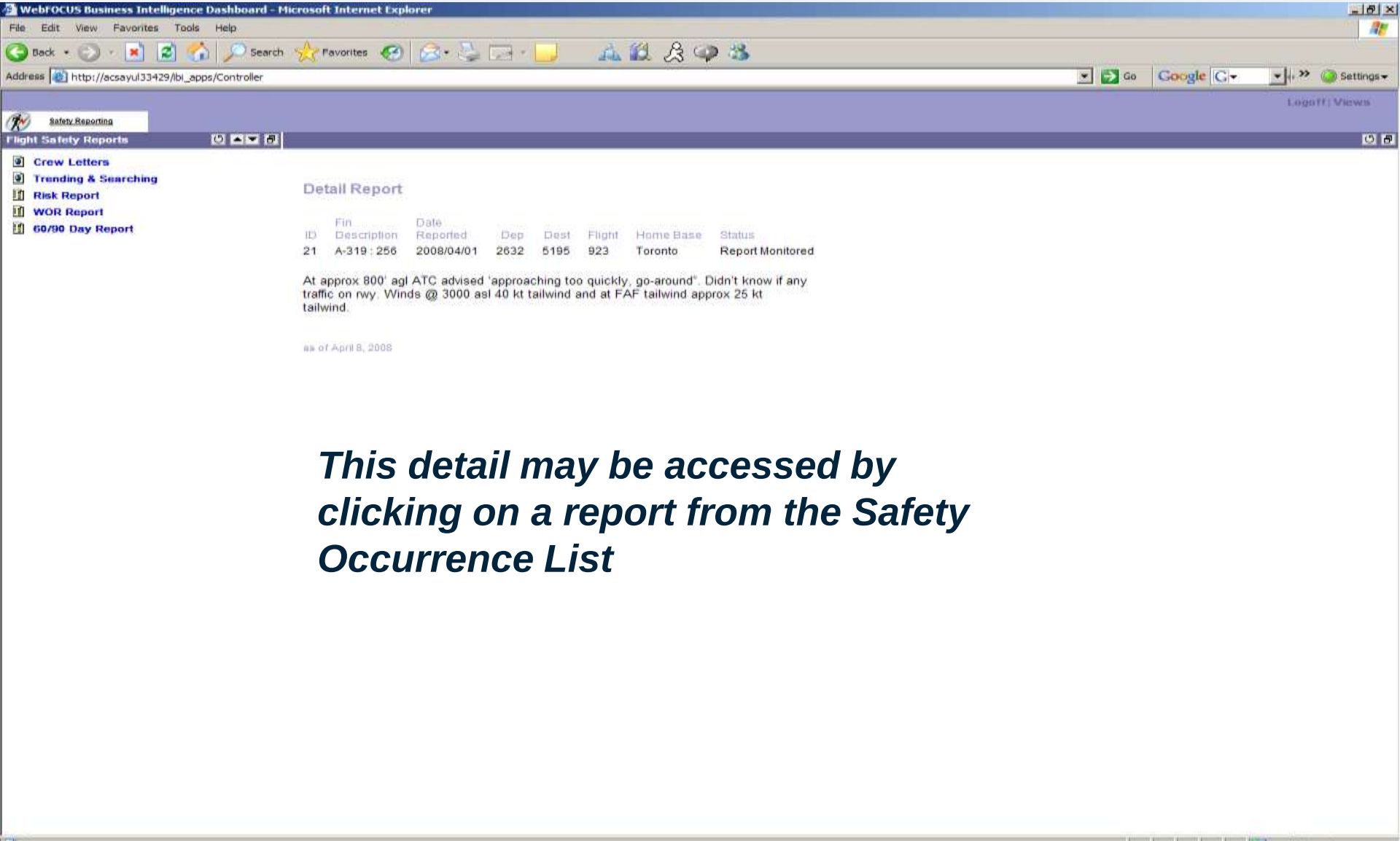
- ***User can click on IRAM to see list of Safety Occurrences with that Risk Rating***
- ***Includes audit and occurrence / hazard risks***

Safety Occurrence/Hazard List (example)



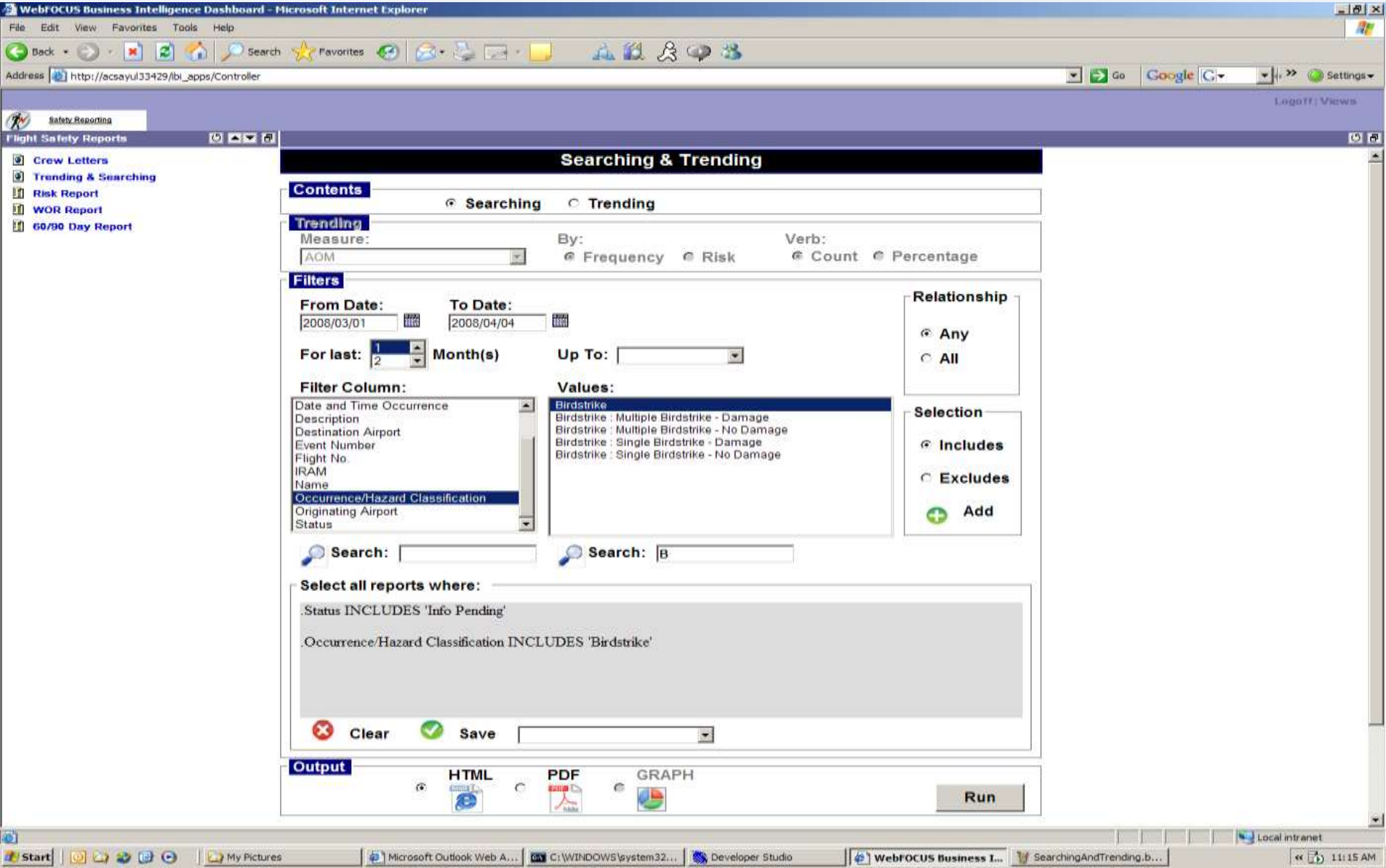
This list may be accessed through Searching Parameter Screen, Drill Down from Trending Graphs, or Drill Down from Risk Ranking Report

Drill Down to Safety Occurrence/Hazard Detail from Safety Occurrence List (example)

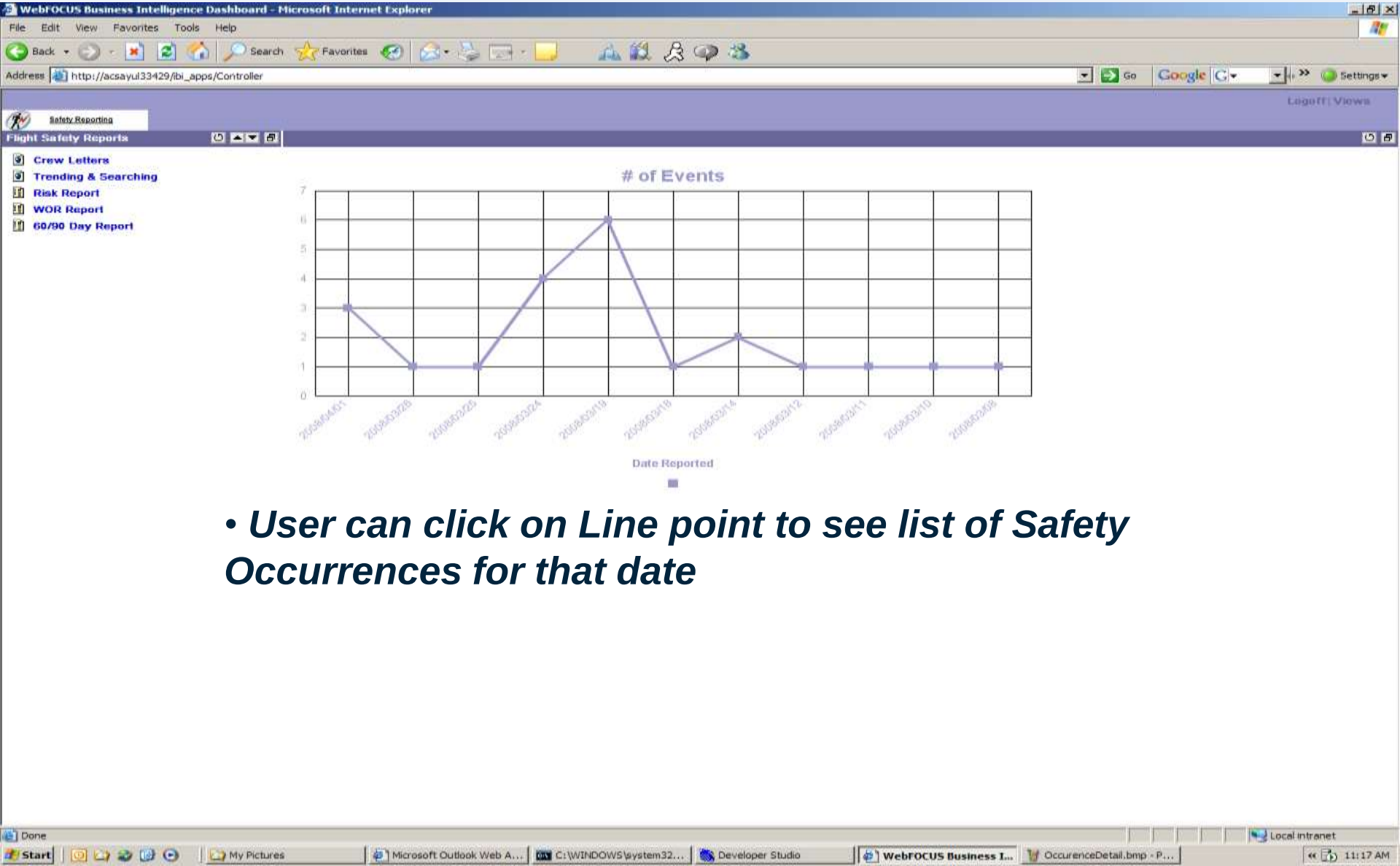


This detail may be accessed by clicking on a report from the Safety Occurrence List

Searching/Trending Parameter Screen

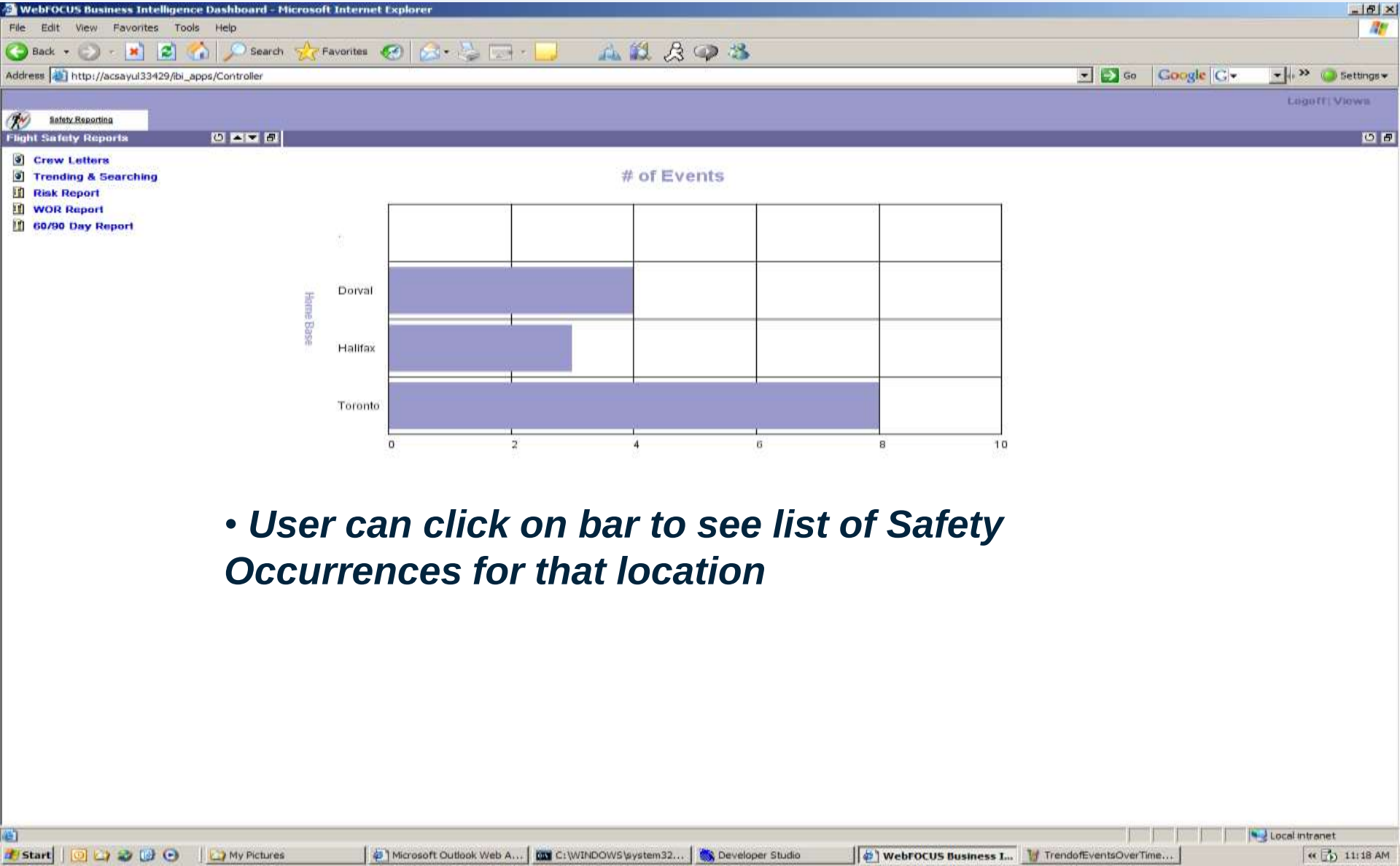


Trending Line Graph – # of Events over time (example)



- ***User can click on Line point to see list of Safety Occurrences for that date***

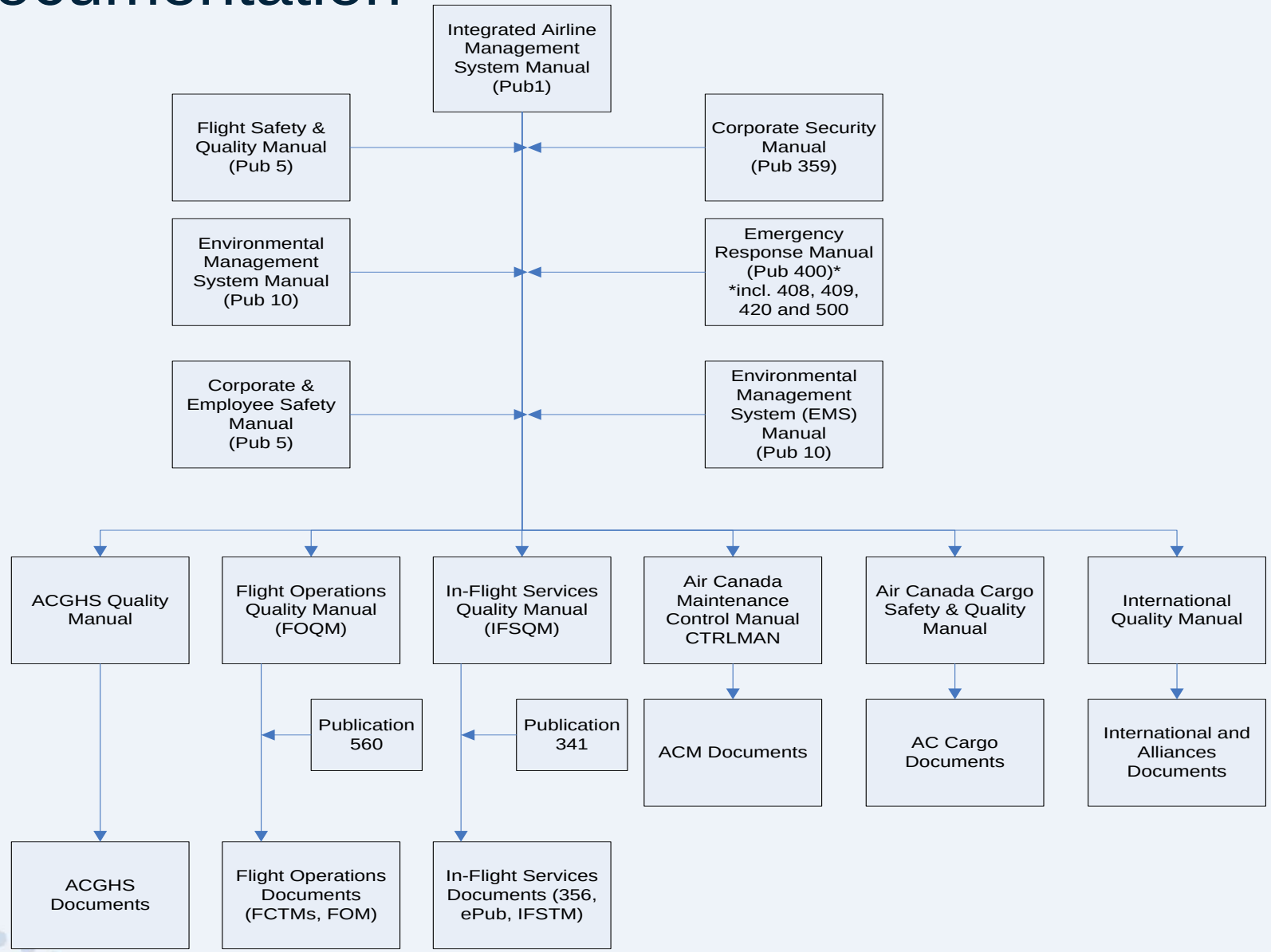
Trending Simple Bar Graph – Events by Location (example)



- ***User can click on bar to see list of Safety Occurrences for that location***

Air Canada Source Reference Material

Documentation



Ongoing *i*SMS / *integrated*-AMS Activities

Integrated AMS Implementation: Ongoing Activities (Branches and Corporate)

- **EtQ Reliance enhancements (incl. reporting tools)**
- **Leverage EtQ into other areas of the airline (e.g., MTC, CRE, HR)**
- **Ensuring the ongoing delivery of *i*AMS training and dissemination of awareness material to management and employees (initial and recurrent)**
- **Ensuring the ongoing evaluation of the effectiveness of Continuous Improvement Cycle (ISO - plan, do, check, act)**
- **Discuss integrated AMS issues and trending of emerging issues**
  - » **Local management forums and committees including Branch, Business Unit and Corporate Safety Boards**
  - » **Utilization of real time safety & quality data to make educated business decisions**

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Integrated AMS Implementation: Ongoing Activities (Branches and Corporate) – cont.

- **Conduct training**
- **Ensure awareness and information sharing**
- **Provide feedback to employees who submit safety reports**
- **Promotion of Safety and Safety Reporting Policies**
- **Participation in industry and regulatory forums to ensure conformity with emerging industry standards, norms and best practices**
- **Conducting Organizational Risk Assessments on, or assign Project Management to critical initiatives**
- **Using integrated AMS data as an input to Enterprise Risk Management (ERM)**
- **Implementation of "Just Culture" process**

End results: what has IOSA and i-AMS done for ACA?

- ✓ **Efficiency / Productivity Gains**
  - ✓ **Common IT Solution**
    - ✓ **Standardized processes**
    - ✓ **Common Risk Model**
    - ✓ **Common Taxonomy**
  - ✓ **Leverage existing training delivery methods**
  - ✓ **Leverage existing communications vehicles**
  - ✓ **Pooling of Resources (auditors, investigators)**
- ✓ **Business Units have ownership of their piece of the Management Systems**
- ✓ **IOSA ISARP Conformity**
  - ✓ **Renewal (#2)**
- ✓ **Compliance with CAA regulations and ongoing validations (only very minor editorial changes to date)**
- ✓ **Conformity with TC SMS Expectations and FAA AC120-92**
- ✓ **Conformity with ICAO SARPs and Guidance Material**

Thank you very much!