Regional Runway Safety Seminar
ALAR for Small Operators

Harlan Simpkins

Customer Liaison Pilot, Q Series

BOMBARDIER

Forward-looking statements

FORWARD-LOOKING STATEMENTS

This presentation includes forward-looking statements, which may involve, but are not limited to: statements with respect to our objectives, guidance, targets, goals, priorities, markets and strategies, financial position, beliefs, prospects, plans, expectations, anticipations, estimates and intentions; general economic and business outlook, prospects and trends of an industry; expected growth in demand for products and services; product development, including projected design, characteristics, capacity or performance; expected or scheduled entry into service of products and services, orders, deliveries, testing, lead times, certifications and project execution in general; our competitive position; and the expected impact of the legislative and regulatory environment and legal proceedings on our business and operations. Forward-looking statements generally can be identified by the use of forward-looking terminology such as "may", "will", "expect", "intend", "anticipate", "plan", "foresee", "believe" , "continue" or "maintain", the negative of these terms, variations of them or similar terminology. By their nature, forward-looking statements require us to make assumptions and are subject to important known and unknown risks and uncertainties, which may cause our actual results in future periods to differ materially from forecasted results. While we consider our assumptions to be reasonable and appropriate based on information currently available, there is a risk that they may not be accurate. For additional information with respect to the assumptions underlying the forward-looking statements made in this presentation, refer to the respective Guidance and forward-looking statements sections in Overview, Bombardier Aerospace and Bombardier Transportation sections in the Management's Discussion and Analysis ("MD&A") in the Corporation's annual report for the fiscal year ended December 31, 2011.

Certain factors that could cause actual results to differ materially from those anticipated in the forward-looking statements include risks associated with general economic conditions, risks associated with our business environment (such as risks associated with the financial condition of the airline industry and major rail operators), operational risks (such as risks related to developing new products and services; doing business with partners; product performance warranty and casualty claim losses; regulatory and legal proceedings; to the environment; dependence on certain customers and suppliers; human resources; fixed-price commitments and production and project execution), financing risks (such as risks related to liquidity and access to capital markets, exposure to credit risk, certain restrictive debt covenants, financing support provided for the benefit of certain customers and reliance on government support) and market risks (such as risks related to foreign currency fluctuations, changing interest rates, decreases in residual value and increases in commodity prices). For more details, see the Risks and uncertainties section in Other. Readers are cautioned that the foregoing list of factors that may affect future growth, results and performance is not exhaustive and undue reliance should not be placed on forward-looking statements. The forward-looking statements set forth herein reflect our expectations as at the date of the Corporation's MD&A and are subject to change after such date. Unless otherwise required by applicable securities laws, we expressly disclaim any intention, and assume no obligation to update or revise any forward-looking statements, whether as a result of new information, future events or otherwise. The forward-looking statements contained in this presentation are expressly qualified by this cautionary statement.

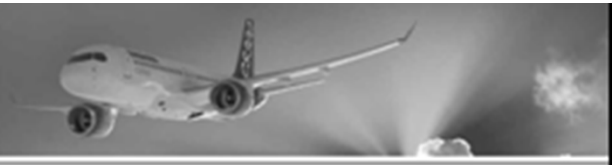
CAUTION REGARDING NON-GAAP EARNINGS MEASURES

This presentation is based on reported earnings in accordance with International Financial Reporting Standards ((IFRS) generally accepted accounting principles (GAAP)). It is also based on EBITDA and Free Cash Flow. These non-GAAP measures are directly derived from the Consolidated Financial Statements, but do not have a standardized meaning prescribed by IFRS; therefore, others using these terms may calculate them differently. Management believes that a significant number of the users of its MD&A analyze the Corporation's results based on these performance measures and that this presentation is consistent with industry practice.

Agenda

- Introduction
- Bombardier Commitment to Safety
- ALAR Toolkit Highlights and Comments
- Summary

Q Series Customer Liaison Pilot



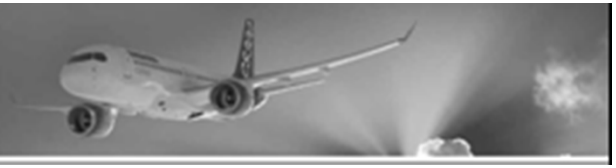
- Flight Operations Focal
- Technical Assistance and Response to Customer Queries
- Technical/Flight Manual Documentation
- Start up Supervision/Assistance

- Production Flight Testing
- Ferry/Delivery/Acceptance Flights
- Demonstration Flights

- Accident investigation

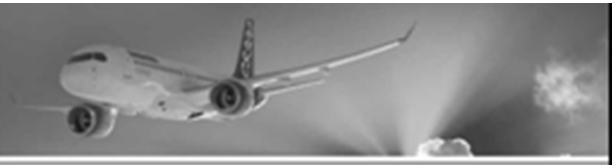
- Host of the Customer Flight Operations Steering Committee Meeting

Agenda



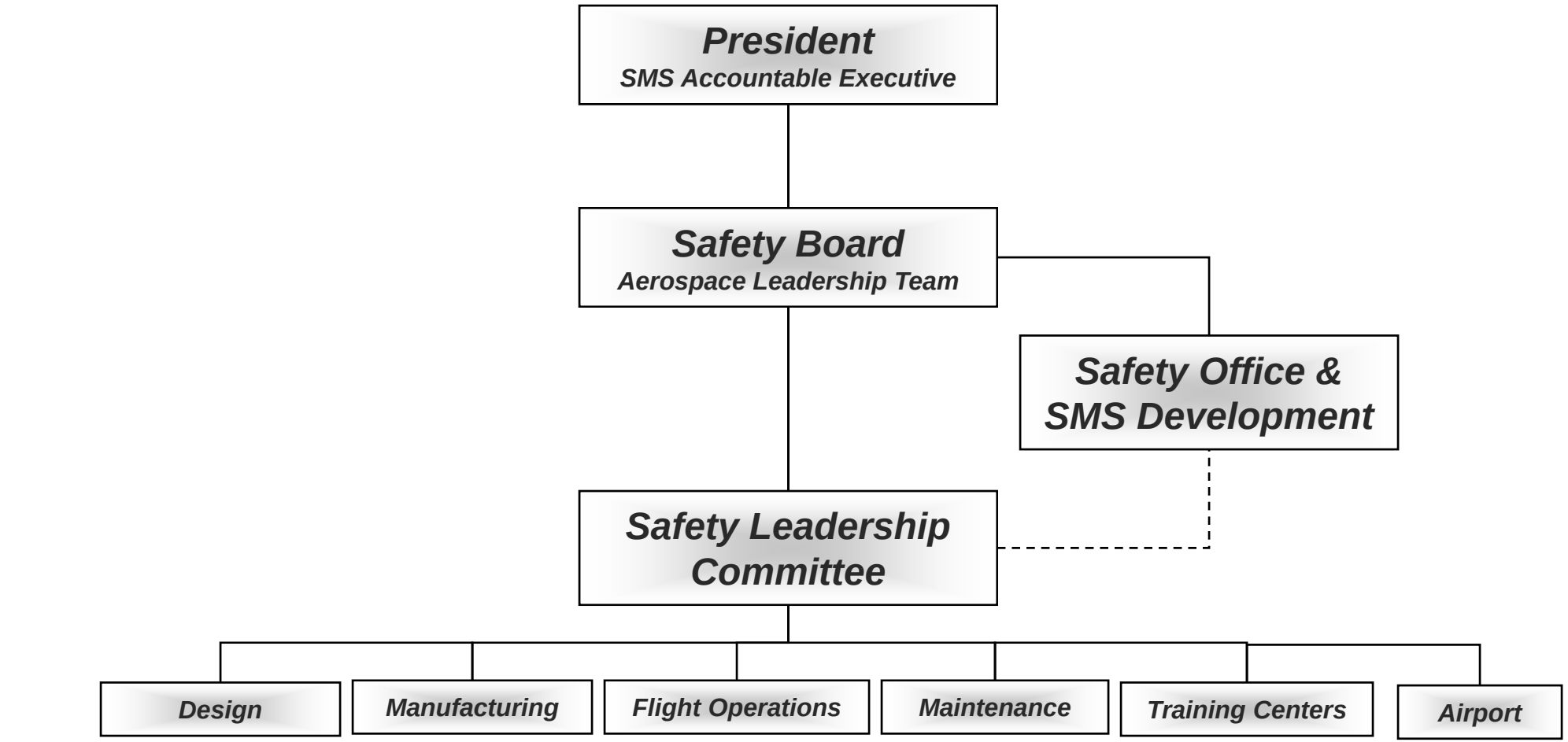
- Introduction
- **Bombardier Commitment to Safety**
- ALAR Toolkit Highlights and Commitments
- Summary

Bombardier Safety Mission



“Giving people peace of mind in our products, services and operations by striving for the highest standards of safety.”

Senior Management Commitment

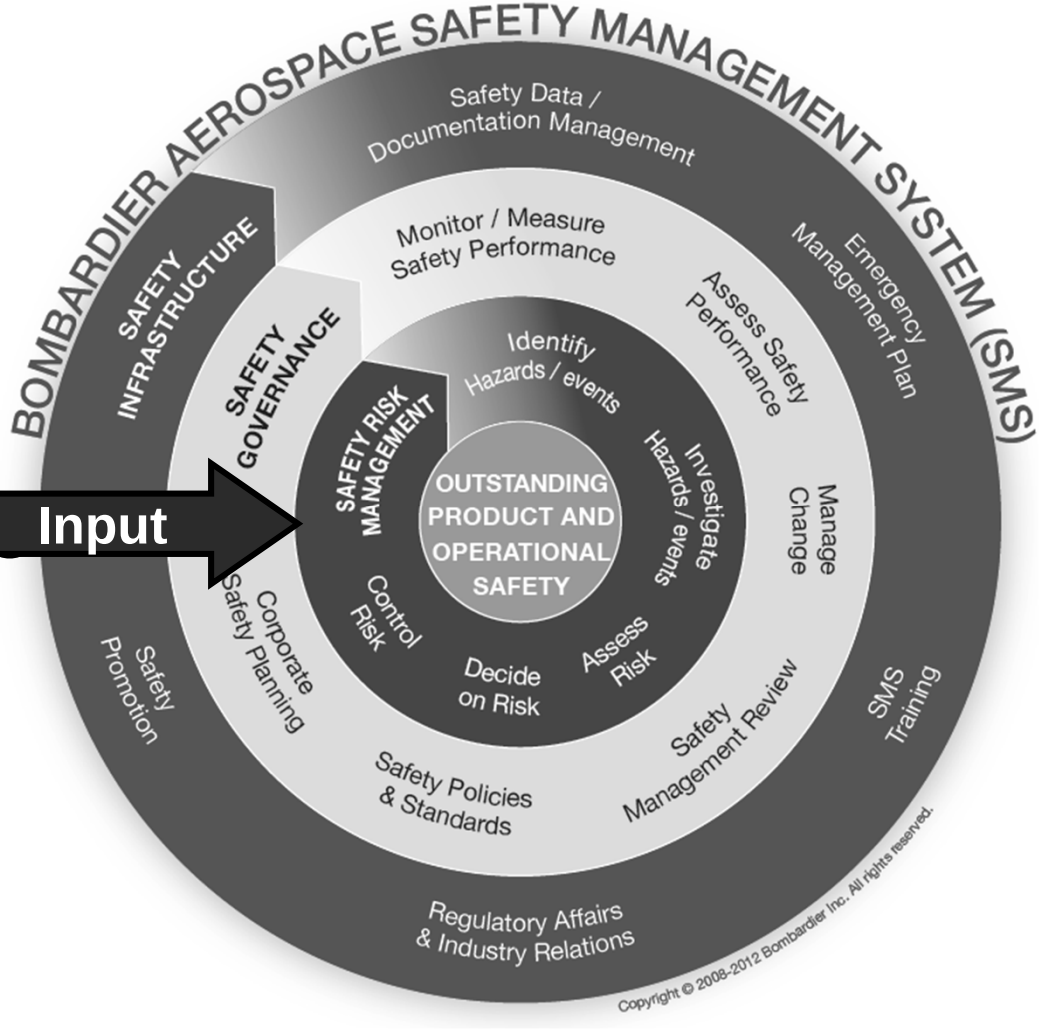


BOMBARDIER

Our Safety Management Model

- **Quality Errors**
- **Design Errors**
- **Maintenance Errors**
- **Procedural Infractions**
- **New Technology**
- **etc.**

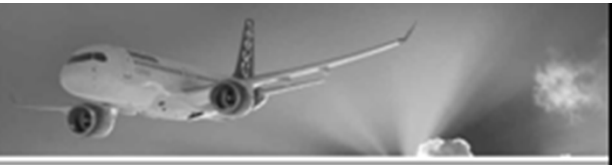
Input



Safety Standdown: Pioneering Man-Machine Interface

- **Promotes knowledge-based training along with personal discipline and responsibility as essential elements of aviation professionalism and safety.**
- **Free of charge, open to all aviation professionals and is not aircraft or manufacturer specific.**
- **Recognized by Federal Aviation Administration and National Transportation Safety Board.**
- **Supported by National Business Aviation Association and safety organizations in other regions.**
- **Safety Standdown was awarded the FSF Business Aviation Meritorious Service Award in 2011**

Safety Standdown Objectives

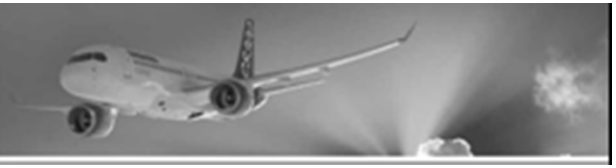


- **Safety Standdown provides global operators with resources to make personal changes for safer aviation.**

- **Knowledge sources are available through website, seminars, Leading Edge programs and a community of subject matter experts.**

- **Our long-term goal is to foster a world-wide community of Aviation Professionals who strive to set the bar higher than minimal regulations and instill a culture of proactive accountability within their companies and communities.**

Safety Standdown Programs



Website – www.safetystanddown.com

Knowledge Center – Posts from Experts
Share – Join discussions and share stories
Eugene Cernan Safety Award nominations
Seminars – Updates on upcoming seminars
Newsroom – library of safety articles

Seminars

Asia – March 26, 2012
Latin America – August 13 – 14, 2012
USA – October 8 – 11, 2012

Leading Edge 2.0 ~ *Safety Standdown Delivered*

Available to new Bombardier operators
Elements:
Human Error SMS Kit ~ Convergent Performance
Fatigue Management ~ Alertness Solutions
Upset Recovery Training ~ APS Training Solutions

Eugene Cernan Safety Award

Recognizing individual contribution to aviation safety.
Nominee exhibits Safety Standdown framing principals.
Winner is selected by the Advisory Council.

Advisory Council

12 Aviation Industry Leaders / Experts
Provides advice, recommendations and suggestions for the ***content*** and ***direction.***
Assist in creating and supporting the future goals.

BOMBARDIER

Industry Initiatives

- **Bombardier Aerospace actively engaged**
  - ICCAIA SMS WG with ICAO & the ICG to optimize standards and practices for Annexes 6,8
  - FAA SMS Aviation Rulemaking Committee
  - FAA SMS Pilot Project
    - BBD Service Centers in Tucson, West Virginia
  - Several industry safety initiatives
    - ECAST, FAST, AIA/GAMA, JSAT, JSIT
  - IATA Safety Working Group
  - NBAA Safety Committee
  - Flight Safety Foundation

Agenda

- Introduction
- Bombardier Commitment to Safety
- ALAR Toolkit Highlights and Commitments
- Summary

ALAR is a global issue…

Industry Perspective – TSB Watch List

AVIATION

PROBLEM

There is ongoing risk that aircraft may collide with vehicles or other aircraft on the ground at Canadian airports.

SOLUTION

Improved procedures and the adoption of enhanced collision warning systems are required at Canada's airports.

PROBLEM

Fatalities continue to occur when planes collide with land and water while under crew control.

SOLUTION

Wider use of technology is needed to help pilots assess their proximity to terrain.

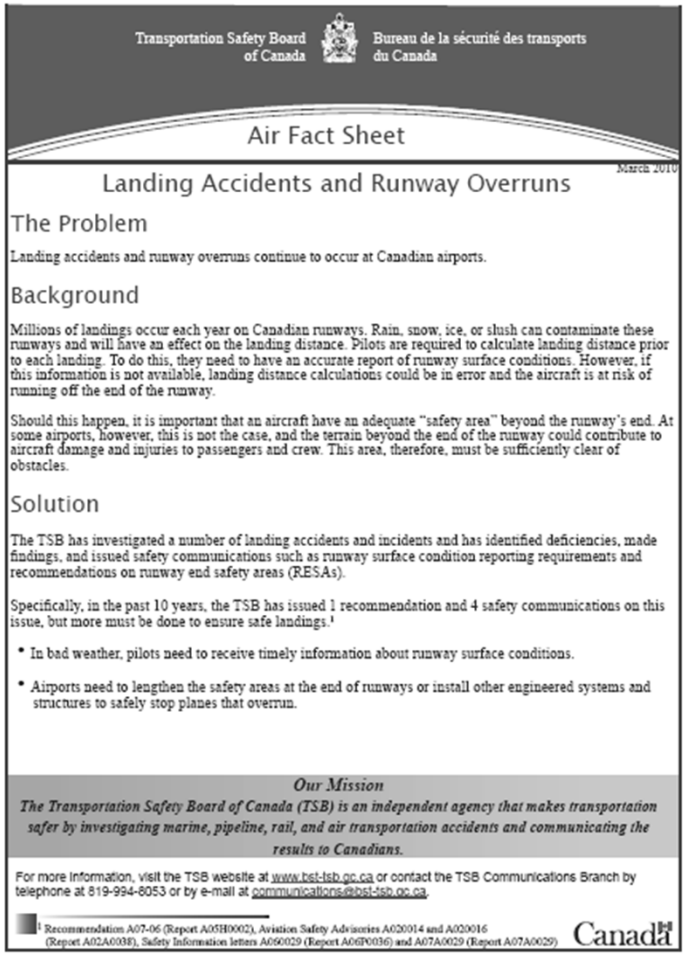
PROBLEM

Landing accidents and runway overruns continue to occur at Canadian airports.

SOLUTION

In bad weather, pilots need to receive timely information about runway surface conditions.

Airports need to lengthen the safety areas at the end of runways or install other engineered systems and structures to safely stop planes that overrun.



Transportation Safety Board of Canada | Bureau de la sécurité des transports du Canada

Air Fact Sheet

March 2010

Landing Accidents and Runway Overruns

The Problem

Landing accidents and runway overruns continue to occur at Canadian airports.

Background

Millions of landings occur each year on Canadian runways. Rain, snow, ice, or slush can contaminate these runways and will have an effect on the landing distance. Pilots are required to calculate landing distance prior to each landing. To do this, they need to have an accurate report of runway surface conditions. However, if this information is not available, landing distance calculations could be in error and the aircraft is at risk of running off the end of the runway.

Should this happen, it is important that an aircraft have an adequate "safety area" beyond the runway's end. At some airports, however, this is not the case, and the terrain beyond the end of the runway could contribute to aircraft damage and injuries to passengers and crew. This area, therefore, must be sufficiently clear of obstacles.

Solution

The TSB has investigated a number of landing accidents and incidents and has identified deficiencies, made findings, and issued safety communications such as runway surface condition reporting requirements and recommendations on runway end safety areas (RESAs).

Specifically, in the past 10 years, the TSB has issued 1 recommendation and 4 safety communications on this issue, but more must be done to ensure safe landings.[1]

- In bad weather, pilots need to receive timely information about runway surface conditions.
- Airports need to lengthen the safety areas at the end of runways or install other engineered systems and structures to safely stop planes that overrun.

Our Mission

The Transportation Safety Board of Canada (TSB) is an independent agency that makes transportation safer by investigating marine, pipeline, rail, and air transportation accidents and communicating the results to Canadians.

For more information, visit the TSB website at www.bst-tsb.gc.ca or contact the TSB Communications Branch by telephone at 819-994-8053 or by e-mail at communications@bst-tsb.gc.ca.

[1] Recommendation A07-06 (Report A05H0002), Aviation Safety Advisories A020014 and A020016 (Report A02A0038), Safety Information letters A060029 (Report A06P0036) and A07A0029 (Report A07A0029)

Canada

BOMBARDIER

Industry Perspective – NTSB Most Wanted List

MOST WANTED LIST

Addressing Human Fatigue

General Aviation Safety

Safety Management Systems

Runway Safety

Bus Occupant Safety

Pilot & Air Traffic Controller Professionalism

Recorders

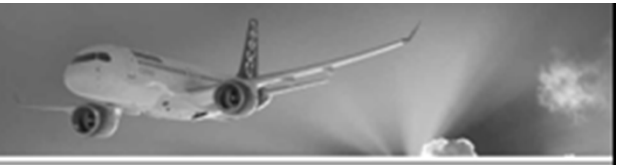
Teen Driver Safety

Addressing Alcohol-Impaired Driving

Motorcycle Safety

Industry Perspective – EASA Documents

1.1 Operating Philosophy



- **Standard Operating Procedures (SOP)**
  - Must be developed for each individual operation

    Example:

    England versus Greece

ALAR TOOL KIT:

Standard Operating Procedures Template

1.3 Golden Rules

- **Basic assumptions have to be challenged**
- **Assumed level of knowledge or airmanship differs greatly around the world**
- **Training / Documentation (checklists) has to be adjusted for the varying levels of experience**
- **Multi-Crew Pilot Licence programs and their effects**

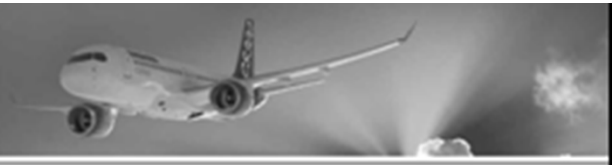
1.5 Normal Checklists

- **Examples:**
  - Challenge/Response
  - Jump in, stay in
  - Flows
  - Silent
  - Memory

- **Types:**

  Paper, mechanical, wearable, EFB, Integrated, electronic, audible

1.5 Checklists



Checklist Expert:

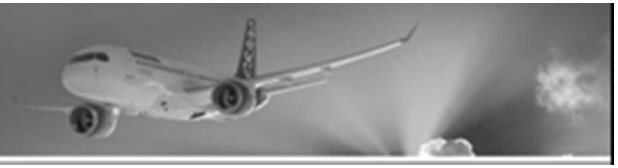
Dr. Barbara Burian, Ph.D

Human Systems Integration Division

NASA Ames Research Center

Bombardier Checklist Initiatives

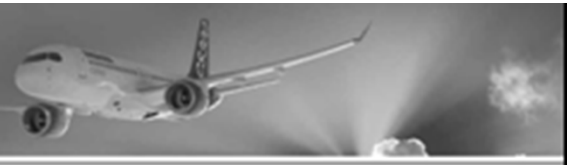
2.2 Crew Resource Management



- **Cultural Sensitivities**

- **Steep Gradients**
  - Captain versus First Officer

2.3 Pilot-Controller Communication



- **Language Barriers**

  "Climb to 3,000 ft"

  = Climb 23,000 ft?

- **Better way to state or readback the clearance:**
  - "Climb, maintain …"

- **Language Barrier Example:**
  - Ferry Flights in conjunction with training / supervision

2.4 Interruptions / Distractions

- **Building lines of defense**
  - Head's Up versus Head's Down
    - Effectively Communicating where you are!
  - Providing Rules of Automation below 10,000 ft
    - Engaged versus manual
    - Pilot Flying does not do all the work!
    - Sharing of duties.

5.1 Approach Hazards Overview

FSF ALAR Briefing Note
5.1 — Approach Hazards Overview

Few air transport accidents occur on calm sunny days; risk increases during flight over hilly terrain, with reduced visibility, adverse winds, contaminated runways and limited approach aids.

Statistical Data

The Flight Safety Foundation Approach-and-landing Accident Reduction Task Force, in an analysis of 76 approach-and-landing accidents and serious incidents, including controlled-flight-into-terrain (CFIT) accidents, worldwide in 1984 through 1997,[1] found that:

- Fifty-three percent of the accidents and incidents occurred during nonprecision instrument approaches or visual approaches (42 percent of the visual approaches were conducted where an instrument landing system [ILS] approach was available);
- Fifty percent occurred where no radar service was available;
- Sixty-seven percent of the CFIT accidents occurred in hilly terrain or mountainous terrain;
- Fifty-nine percent of the accidents and incidents occurred in instrument meteorological conditions (IMC);
- Fifty percent occurred in precipitation (snow, rain);
- Fifty-three percent occurred in darkness or twilight;
- Thirty-three percent involved adverse wind conditions (i.e., strong crosswinds, tail winds or wind shear);
- Twenty-one percent involved flight crew diso
  or visual illusions;
- Twenty-nine percent involved nonfitment of
  safety equipment (e.g., ground-proximity
  system [GPWS] or radio altimeter);
- Eighteen percent involved runway conditions (e.
  contaminated by standing water, slush, snow or
- Twenty-one percent involved inadequate gro
  (e.g., navigation aids, approach/runway lights
  approach-slope guidance).

Awareness Program

A company awareness program on approach-and
hazards should emphasize the following elements th
good crew decisions:

- Use the FSF *Approach-and-landing Risk Aware*
  (page 84) to heighten crew awareness of the
  hazards to the approach;
- Use the FSF *Approach-and-landing Risk R*
  Guide (page 86);
- Anticipate by asking, "What if?" and prepare;
- Adhere to standard operating procedures (SO
- Prepare options, such as:
  - Request a precision approach into the wind
  - Select an approach gate[2] for a stabilized a
    (Table 1, page 82);

FLIGHT SAFETY FOUNDATION • FLIGHT SAFETY DIGEST • AUGUST–NOVEMBER 2000

- Fifty-three percent of the accidents and incidents occurred during nonprecision instrument approaches or visual approaches (42 percent of the visual approaches were conducted where an instrument landing system [ILS] approach was available);
- Fifty percent occurred where no radar service was available;
- Sixty-seven percent of the CFIT accidents occurred in hilly terrain or mountainous terrain;
- Fifty-nine percent of the accidents and incidents occurred in instrument meteorological conditions (IMC);
- Fifty percent occurred in precipitation (snow, rain);
- Fifty-three percent occurred in darkness or twilight;
- Thirty-three percent involved adverse wind conditions (i.e., strong crosswinds, tail winds or wind shear);

5.1 Approach Hazards:

No radar, hill, twilight, crosswind, ground aids

BOMBARDIER

5.1 Approach Hazards:

No automation (hand flown), wet runway

BOMBARDIER

5.1 Approach Hazards

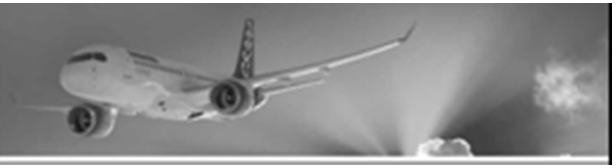
Gravel runway, ground aids

5.1 Approach Hazards

Unique airport environments

BOMBARDIER

5.1 Approach Hazards Overview



- **Excellent tools included in the Toolkit:**
  - Approach-and-landing Risk Awareness Tool
  - Approach-and-landing Risk Reduction Guide

5.3 Visual Illusions

- **Environmental conditions:**
  - Precipitation
    - Lightning, mist, heavy rain
  - Smoke, haze, sand

- **Physical conditions:**
  - Wide, long runway
  - Narrow, short runway

6.1 Being Prepared to Go-Around
6.2 Manual Go-Around

7.1 Stabilized Approach

- **Uncontrolled Airports**
  - Get down first
- **Deceleration techniques**
  - Rapid configuration changes short final
- **Use of Autopilot / Shadowing the controls**
  - Inadvertent disconnect

8.1 Runway Excursions and Runway Overruns

8.1 Runway Excursions and Runway Overruns

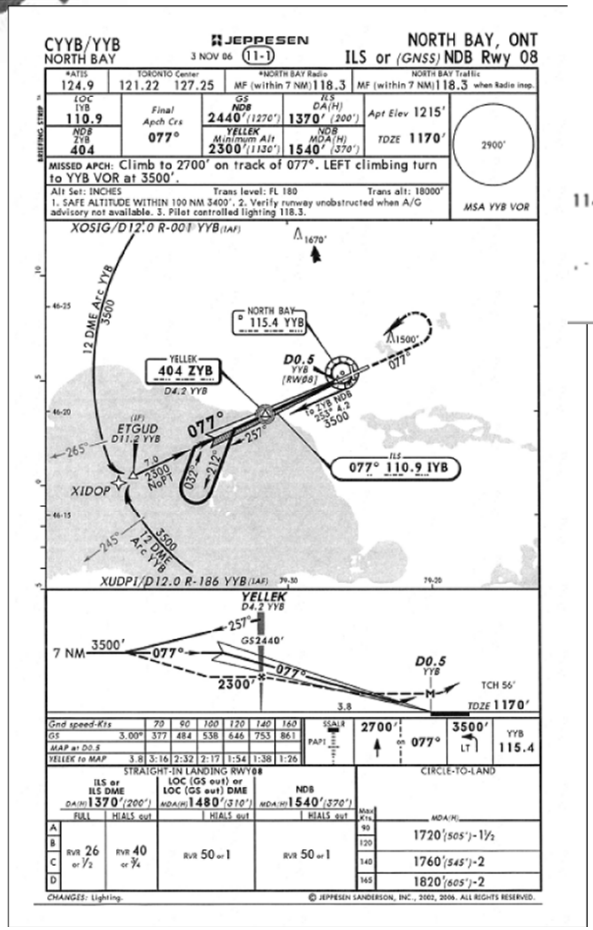
- **The aircraft departed Toronto/Lester B. Pearson International Airport under instrument flight rules for a regularly scheduled flight to North Bay, Ontario.**

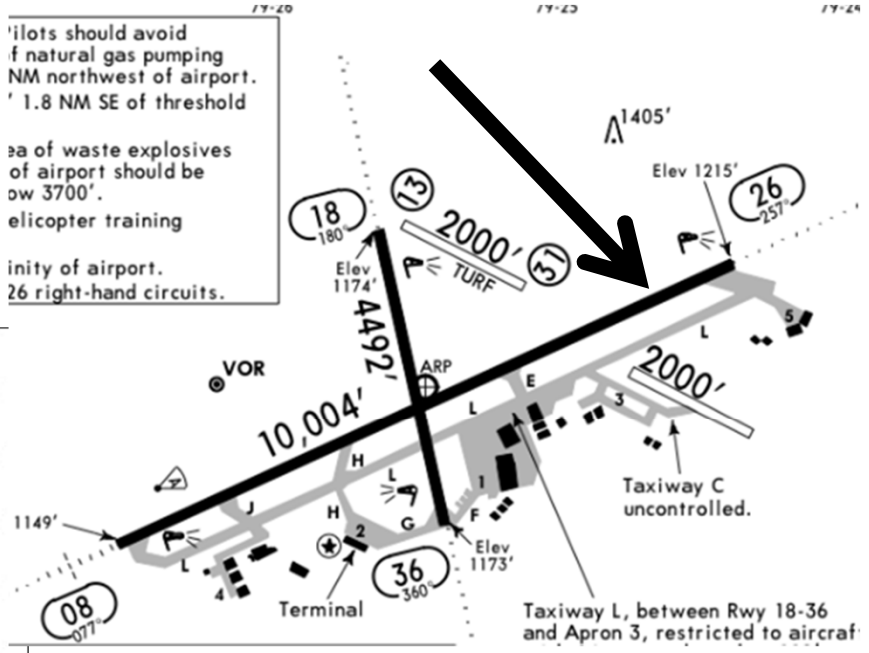
- **The flight crew planned a stabilized constant descent angle non-precision approach to Runway 08 at the North Bay Airport.**

- **The aircraft touched down approximately 8,900 feet past the threshold of Runway 08, which is 10,000 feet in length, and overran the end.**

- **The aircraft came to rest approximately 260 feet past the end of the runway in two to three feet of snow. There were no injuries and the aircraft sustained minor damage.**

North Bay, Canada





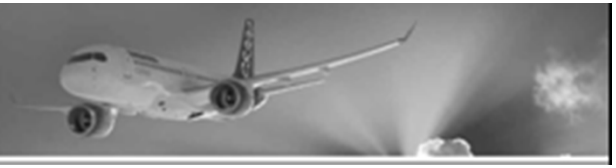
BOMBARDIER

8.1 Runway Excursions and Runway Overruns

Elba, Italy

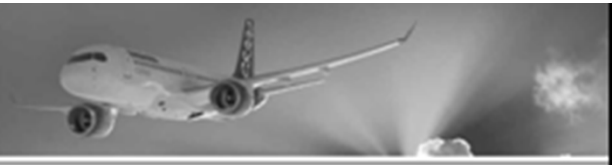
- **http://www.youtube.com/watch?v=i3KkRaZAS74&feature=player_detailpage#t=97s**

Agenda



- Introduction
- Bombardier Commitment to Safety
- ALAR Toolkit Highlights and Commitments
- Summary

Summary



- **Bombardier is committed to safety, internally and externally.**
- **ALAR toolkit is an excellent resource.**
- **Thank you!**

Questions / Comments ?

Harlan Simpkins
Q Series Customer Liaison Pilot
Telephone: 1 416 375 4278
Mobile: 1 416 939 0045
harlan.simpkins@aero.bombardier.com