2011 Winter Ops Conference

FDM

Presentation

Applied Informatics and Research Inc.

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Who we are ….. www.airinc.ca

What we produce –
Products (Software, Hardware)
Services (FDA/FDM/FOQA), Computing Assistance, Investigation Support
Statistical and Mathematical Support

We are focussed on adding value
To your FDM process and operation.

Experts in the field of Data Analysis Computer Science, we are Aviation Professionals with a background in Investigation, Mathematics, Computer Science, Flying Operations and Physics.

Today's FDM Presentation

- The objective of this presentation is as follows:
  - Provide an overview of the crash of Air Ontario flight 1363, which occurred at Dryden Ontario on March 10, 1989
  - Briefly discuss the Dryden Commission Report authored by The Honourable Virgil P. Moshansky
  - Evolution of FDM in Canada
  - FDM and Winter Operations Events

Icing Accidents

Year	Location	Aircraft	Cause
2004	St. Louis	Hansa	Engines
2004	Montrose	Challenger	Snow
2004	China	RJ	Frost
2002	Birmingham	Challenger	Frost
2001	Edinburgh	Shorts 360	Engine
2000	Moscow	Yak 40	Snow, stall
1993	Skopje	F 100	Not decided
1992	La Guardia	F 28	Ice, stall
1991	Stockholm	MD 80	Clear ice, engines
1991	Cleveland	DC 9	Ice, stall
1989	Seoul	F 28	Engine
1989	Dryden	F 28	Snow
1989	Kimpo, Korea	F 28	Engine
1988	Honshu, Japan	YS 11	Controls, aborted
1987	Denver	DC 9	Snow
1985	Philadelphia	DC 9	Ice
1985	Minsk	Tu 134	Engines
1985	Gander	DC 8	Snow

Table 1: A summary of serious accidents related to ground icing problems since 1985. Blue: executive and freight flights. Yellow: other airlines. Red: western airlines.

From an article by Canadian Forces authored by Alan White P.Eng

Period 1968-2004
22 accidents
750 lives lost

Air Ontario Flight 1363

F-28 of Air Ontario

Accident Synopsis

- March 10, 1989, at approximately 12:11 CST AO 1263 crashed approximately 962 metres off the end of runway 29 at Dryden
- Aircraft was a Fokker F-28 Mk 1000 with 65 passengers and a crew of 4 on board
- 21 passengers and 3 crew members died as a result of the crash and accompanying fire
- FDR and CVR were destroyed in the fire
- Canadian Aviation Safety Board with 21 investigators began the investigation

What Happened?

- Aircraft dispatched from YWG with unserviceable APU
- Routing YWG-YHD-YQT-YHD-YWG
- YHD (Dryden) was not normally a fuel stop and had no ability to start aircraft with unserviceable APU
- Outbound flights operated normally but running late due to weather

What Happened? Cont'd

- Flight 1363 (YQT-YHD) originally dispatched with sufficient fuel so no refueling required at YHD for the second leg however fuel was removed to accept 10 extra passengers from YQT-YHD (Note: Captain's decision to deplane passengers instead was overruled by Station Operations Control)
- Refueling at YHD required to keep one engine running due to unserviceable APU

What Happened? Cont'd

- Passengers remained on board during refueling which was at that time considered unsafe but not prohibited
- Snow had begun to fall
- Deicing was available but prohibited with either engine running
- Captain returned to aircraft for departure , passengers observed he did no walk around , asked about available deicing but did not request deicing

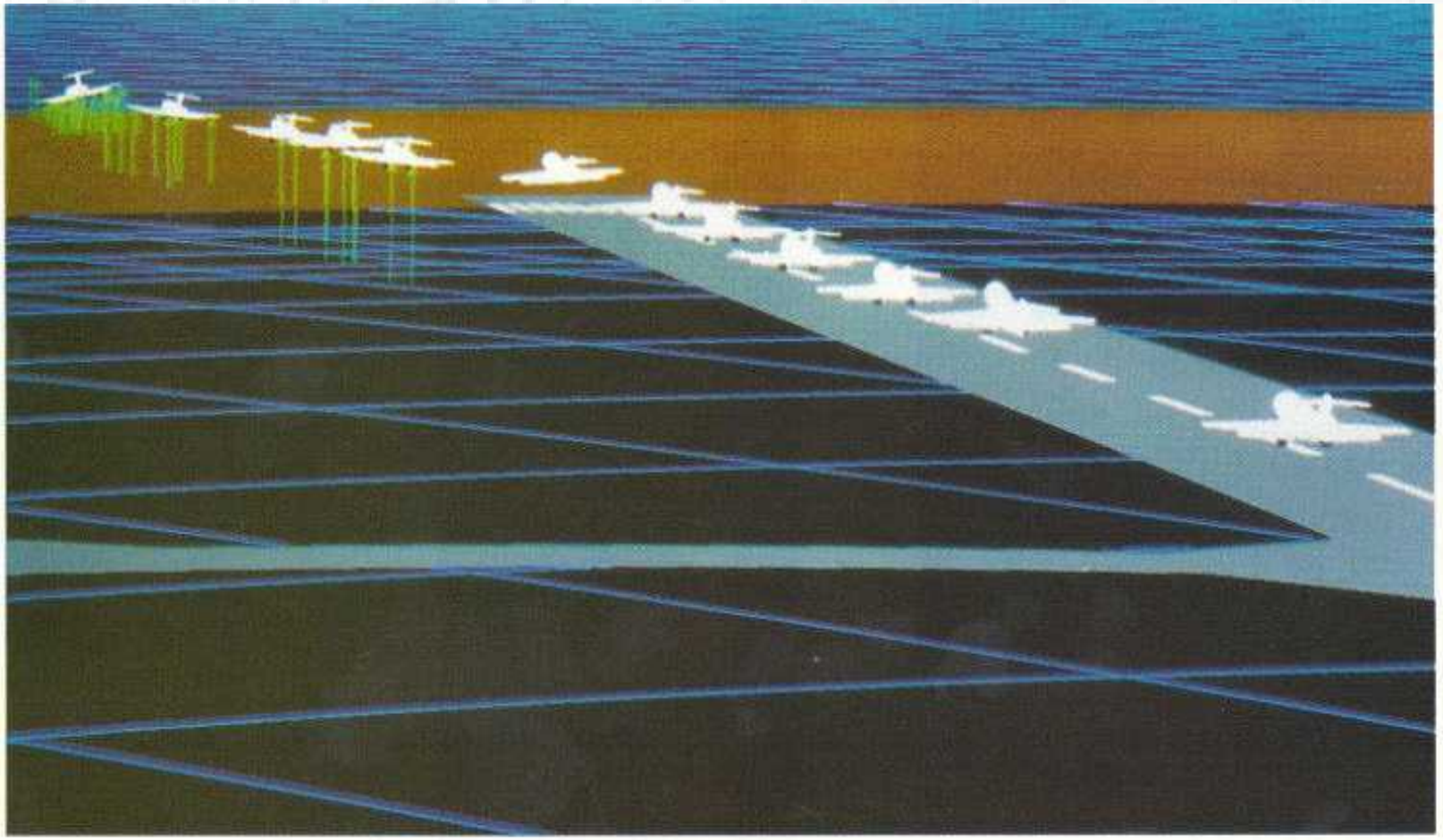
What Happened? Cont'd

- Snow was falling heavily now as aircraft departed terminal
- Wings were observed to be covered with depths varying from one-eighth to one-quarter of an inch at that time
- At least one-half inch of wet layered snow on wings at take off
- As aircraft began takeoff run snow turned to dull grayish opaque ice on wings

What Happened Cont'd

- Aircraft rotated at approximately 3500 feet, lifted off slightly, began to shudder, settled back onto the runway
- Aircraft rotated again at approximately the 5700 ft mark of the 6000 ft runway
- Prior to take off there was between one-quarter and one-half inch of slush on the runway
- Aircraft flew briefly, cleared end of runway approximately 15 ft above the ground and crashed

Accident Path



Accident Path Cont'd

Investigation to Commission of Inquiry?

- On March 29th investigation suspended and Commission of Inquiry was established under The Honourable Virgil Moshansky
- This incident followed hard on the heels of the Arrow Air crash at Gander which killed 256 US US Service Personnel and aircraft crew. The inquiry into the Gander crash was widely criticized as having been mishandled, and the investigating agency, the Canadian Aviation Safety Board (CASB) was subsequently scrapped.

Accident Synopsis cont'd

- Mandate as from Final Report *" I interpret the terms of reference to provide a broad mandate to inquire not only into the Air Ontario crash but also into any derivative matters which affect aviation safety, with respect to which I am directed to make such recommendations as I may deem appropriate. The Commission may, from time to time, enlarge, consolidate, delete, and/or modify any of the said areas of inquiry as the evidence unfolds."*

The Result

- His inquiry ultimately lasted three years and produced a 1,712-page report in four volumes (including technical appendices), with extensive recommendations. It was effectively a damning indictment of many aspects of Canadian aviation at that time, and the recommendations provided the foundation for a major overhaul of Canada's aviation safety system. In addition, the findings regarding ice build-up on wings led to a better technical understanding of this phenomenon, and enabled Canada to become a world leader in preventive measures.

Commission Highlights

- Public Hearings lasted 20 months; 166 witnesses, 1343 exhibits mostly documents many containing hundreds of pages
- The Report is a synthesis of the 168 volumes of transcripts totaling 34,000 pages and of the contents of the documentary exhibits totaling more than 177,000 pages
- The Commission disclosed numerous safety related deficiencies and failings within the carrier, the industry in general and the regulatory domain of Transport Canada
- There were 193 recommendations, far reaching, impacting all aspects of the Canadian Aviation System in accordance with the Commission mandate

Flight Data Monitoring in Canada

Recommendation 167:

"It is recommended that Transport Canada actively participate and participate in the research and development necessary to establish safety effectiveness measurement systems that will lead to the efficient use of resources in assuring safety. Cooperation with the United States Federal Aviation administration and other international groups should be encouraged and resourced to obtain the maximum and most expedient benefits from such programs"

Following the Commission of Inquiry, a Dryden Commission Implementation Project (DCIP)was established within Transport Canada to oversee the feasibility of implementing the recommendations

DCIP Initiatives

- March 1994, Workshop on Aviation Safety Effectiveness Measurement Systems was held to address Recommendation 167
- Attendees included 24 international experts, air carriers, industry groups and government
- Under Flight Operational Quality Assurance:
  - *Research how best to use digital flight data recorder information-for CEO's in particular, but also for other purposes, including training, evaluation of regulations, etc.*
  - *Conduct a flight operational quality assurance (FOQA) demonstration/project*
  - *At this time Air Canada was the only air carrier in North America with a FOQA program using software from the Flight Data Company in the UK*

DCIP Initiatives Cont'd

- Subsequently in the intervening years up until 2005 over $2,000,000 reportedly invested in the program from both government and industry
- The work includes three main activities:
- promotion of voluntary Flight Data Monitoring Programs (FDMPs) with Canadian air carriers
- development of an international Flight Recorder Configuration Standard (FRCS) now Arinc 647A-1 Flight Recorder Electronic Documentation (FRED) Standard
- promotion of the sharing of aviation safety information by participating in the Global Aviation Information Network (GAIN) program

DCIP Initiatives Cont'd

- Transportation Development Centre (TDC) conducted FDMP activities beginning in October 1995, with the following results:
- FDMPs are now widely accepted in the Canadian aviation industry as one of the best available tools for improving aviation safety , they are in fact a cornerstone of an SMS program providing quantifiable data for safety performance measurement.
- many managers including some finance people in the Canadian aviation industry are now aware of the costs, benefits, and methods of FDMPs
- most Canadian carriers recognize that FDMPs are cost-effective
- From and Operators perspective Air Canada, WestJet, First Air, and Air Transat have initiated FDMPs, Jazz has recently selected an FDMP.
- There are other operational groups that have adopted FDMP, Helicopter operations being an example.
- Transport Canada has issued a policy statement and is reviewing legislation with respect to the data security and safety regulation issues related to FDMPs

We are off to a great start !

DCIP Initiatives Cont'd

Where are we now ?

- As of October 2011, there is no formal specifically regulated FDM program requirement mandate in Canada or for Operators flying into Canadian Airspace

- Major airlines have their own FDM programs but
  - No formal means of sharing data
  - No standard definitions for events and measurements
  - No standard for what type of events or percentage of fleet coverage in order to gain meaningful statistical information
  - No specific protection of the data
  - Unable to use Quick Access Recorder Data to dispatch aircraft and diagnose system issues even though QAR wireless data transmission is fully functional, limited to DFDR data only …
  - No central point of contact within Transport Canada (TC)

DCIP Initiatives Cont'd

What are the next steps ?

- ICAO and Transport Canada (TC) promote FDM as a proactive element of a SMS system without TC formal protocol or standards.
- There is a need to have Transport Canada assume a leadership role and formalize the process and address some of the outstanding FDM issues.
- At least the establishment of a FDM working group to discuss these issues.
- Provide protection to the data
- Allow the use of QAR data as a reliable source for alternative purposes

FDM Winter Events

- As for Dryden an FDM program would not have prevented the accident
- It is possible to create “Winter Events” but requires a comprehensive number of parameters and algorithms
- The capture of weather into the database is required
- Creative minds to develop events (Working Group Initiative?)
- We have come a long way in developing events which are basically “all-Season”
- Finally, data is supreme, in the Dryden accident the flight data recorder had 9 parameters.

The End

Thank You