The role of aviation safety information in accident prevention

Harro Ranter / 15 October 2014

Contents

- How safe is aviation in this day and age?
- Aviation safety information and accident prevention
- Challenges in aviation safety information

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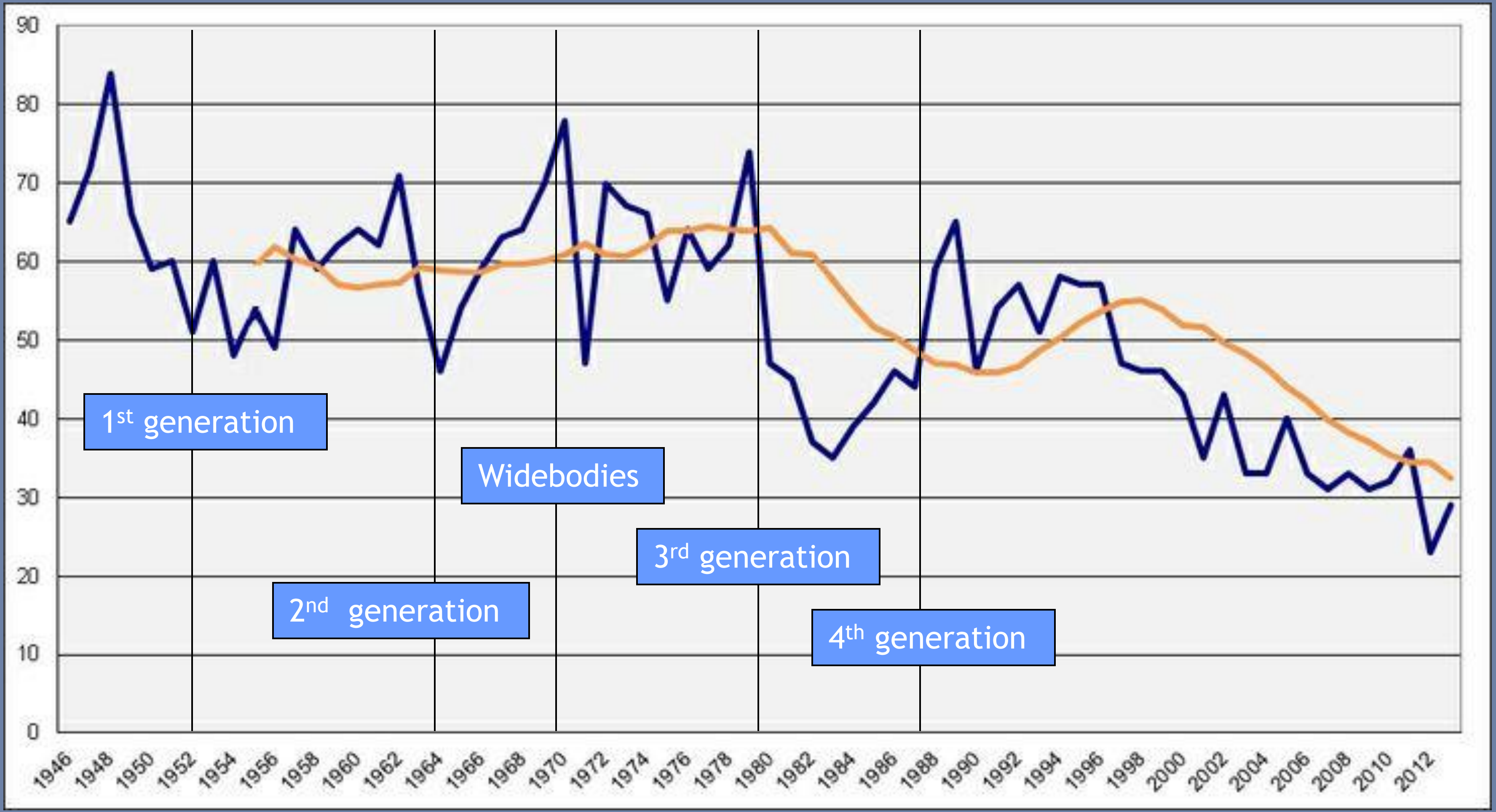
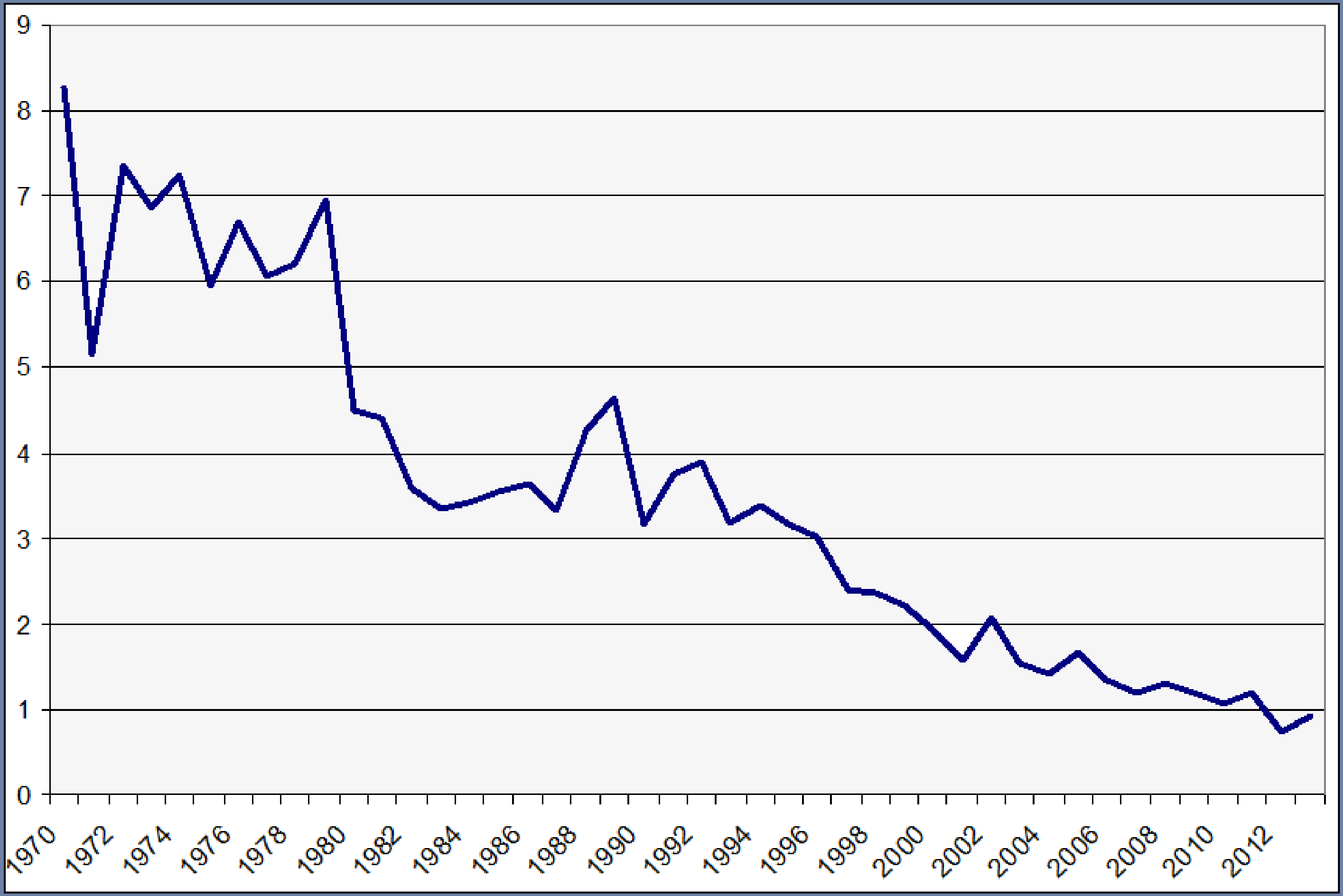
Aircraft accident prevention

Fatal airliner accidents and moving ten-year average



Aircraft accident prevention

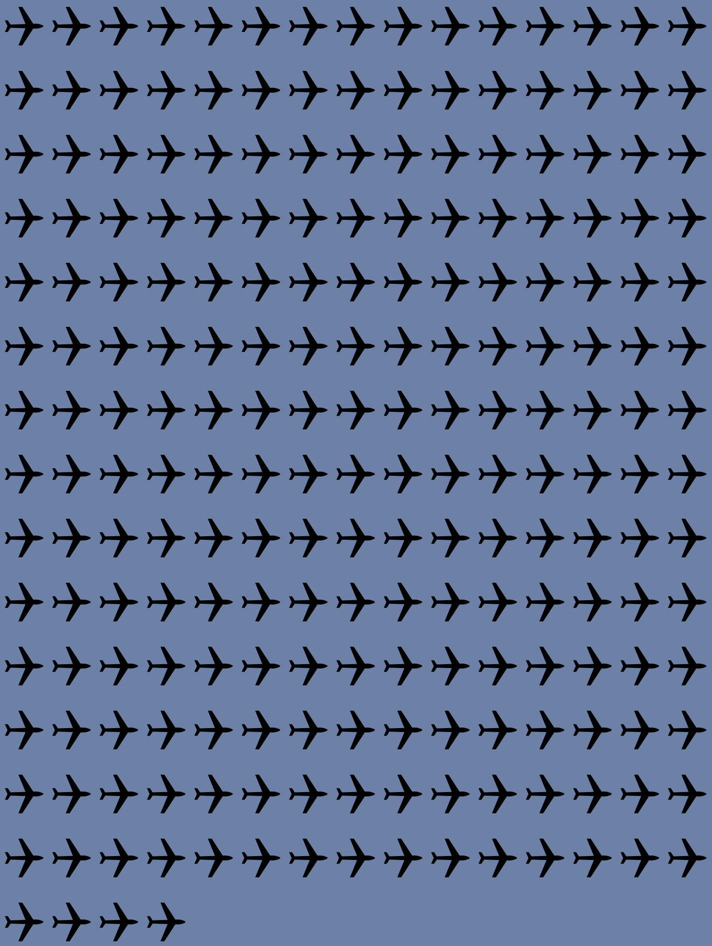
Fatal airliner accidents per 1,000,000 departures



2013 – at 1973 accident rate

6446 fatalities

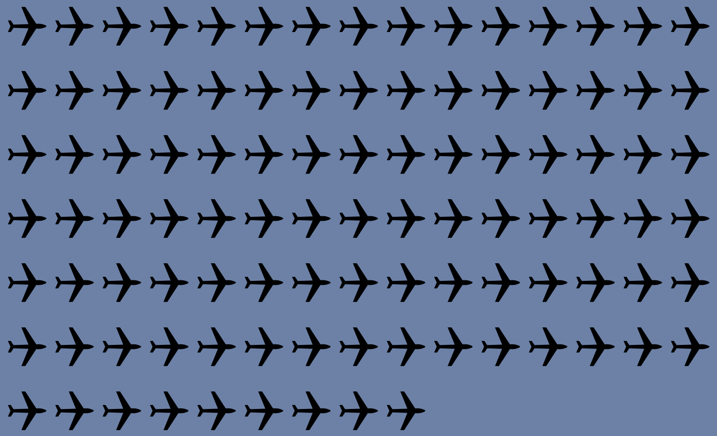
214 accidents



2013 – at 1993 accident rate

2225 fatalities

99 accidents



2013

265 fatalities

29 accidents

✈✈✈✈✈✈✈✈✈✈✈✈✈✈✈
✈✈✈✈✈✈✈✈✈✈✈✈✈✈

16 Passenger

8 Cargo

4 Ferry

1 Training

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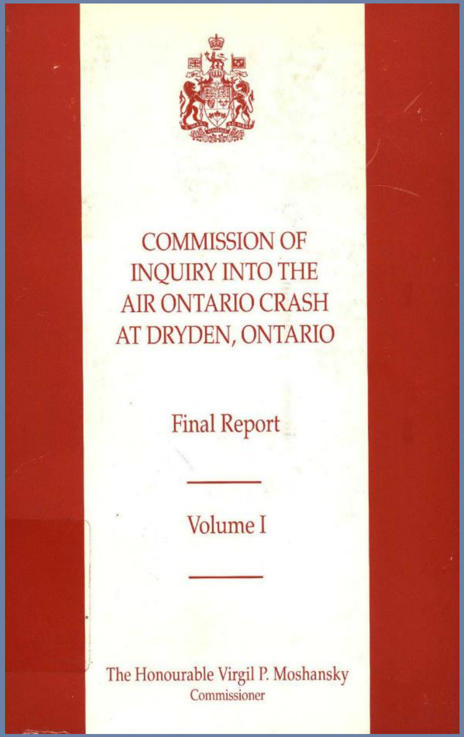
Safety information

March 1989

- Fokker F-28
- Dryden, Ontario, Canada
- 24 dead



COMMISSION OF INQUIRY INTO THE AIR ONTARIO CRASH AT DRYDEN, ONTARIO

Final Report

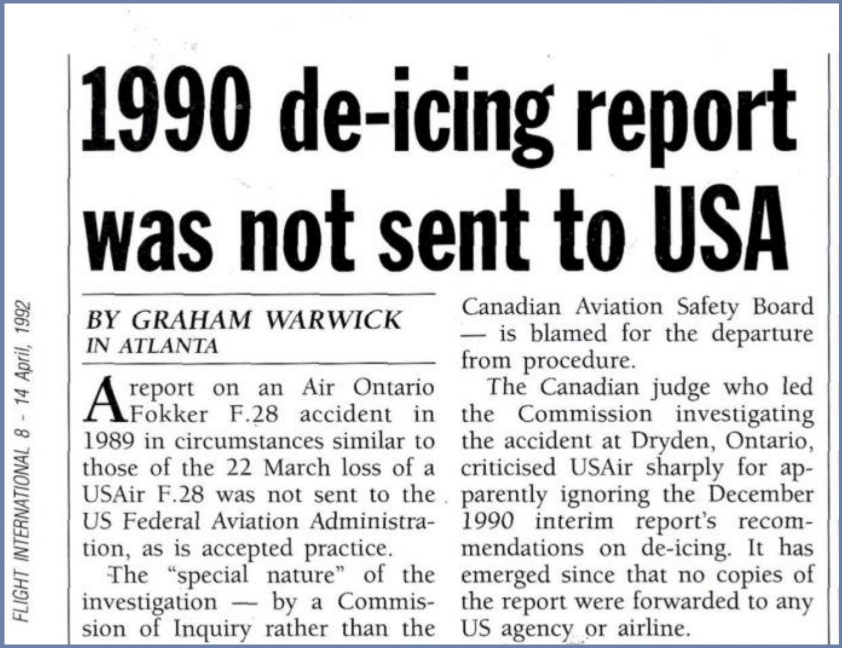
Volume I

The Honourable Virgil P. Moshansky
Commissioner

Safety information

March 1992

- Fokker F-28
- New York-La Guardia
- 27 dead



FLIGHT INTERNATIONAL 8 - 14 April, 1992

1990 de-icing report was not sent to USA

BY GRAHAM WARWICK IN ATLANTA

A report on an Air Ontario Fokker F.28 accident in 1989 in circumstances similar to those of the 22 March loss of a USAir F.28 was not sent to the US Federal Aviation Administration, as is accepted practice.

The "special nature" of the investigation — by a Commission of Inquiry rather than the Canadian Aviation Safety Board — is blamed for the departure from procedure.

The Canadian judge who led the Commission investigating the accident at Dryden, Ontario, criticised USAir sharply for apparently ignoring the December 1990 interim report's recommendations on de-icing. It has emerged since that no copies of the report were forwarded to any US agency or airline.

Safety information

Accident

Accident. An occurrence associated with the operation of an aircraft which takes place between the time any person boards the aircraft with the intention of flight until such time as all such persons have disembarked, in which:

a) a person is fatally or seriously injured as a result of:

— being in the aircraft, or
— direct contact with any part of the aircraft, including parts which have become detached from the aircraft, or
— direct exposure to jet blast,

except when the injuries are from natural causes, self-inflicted or inflicted by other persons, or when the injuries are to stowaways hiding outside the areas normally available to the passengers and crew; or

b) the aircraft sustains damage or structural failure which:

— adversely affects the structural strength, performance or flight characteristics of the aircraft, and
— would normally require major repair or replacement of the affected component,

except for engine failure or damage, when the damage is limited to the engine, its cowlings or accessories; or for damage limited to propellers, wing tips, antennas, tires, brakes, fairings, small dents or puncture holes in the aircraft skin; or

c) the aircraft is missing or is completely inaccessible.

Incident

Incident. An occurrence, other than an accident, associated with the operation of an aircraft which affects or could affect the safety of operation.

Note.— The types of incidents which are of main interest to the International Civil Aviation Organization for accident prevention studies are listed in the Accident/Incident Reporting Manual *(Doc 9156).*

Occurrences

Incident reporting systems

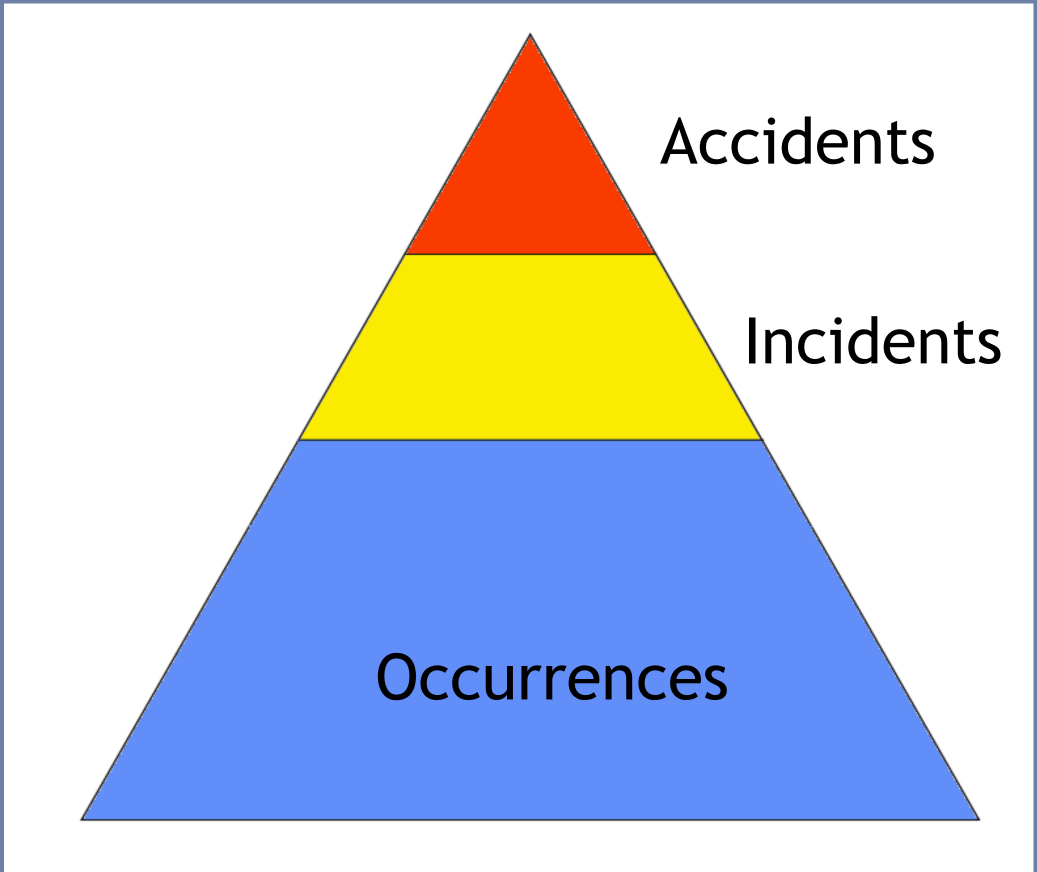
8.1 A State shall establish a mandatory incident reporting system to facilitate collection of information on actual or potential safety deficiencies.

8.2 **Recommendation.—** *A State should establish a voluntary incident reporting system to facilitate the collection of information that may not be captured by a mandatory incident reporting system.*

8.3 A voluntary incident reporting system shall be non-punitive and afford protection to the sources of the information.

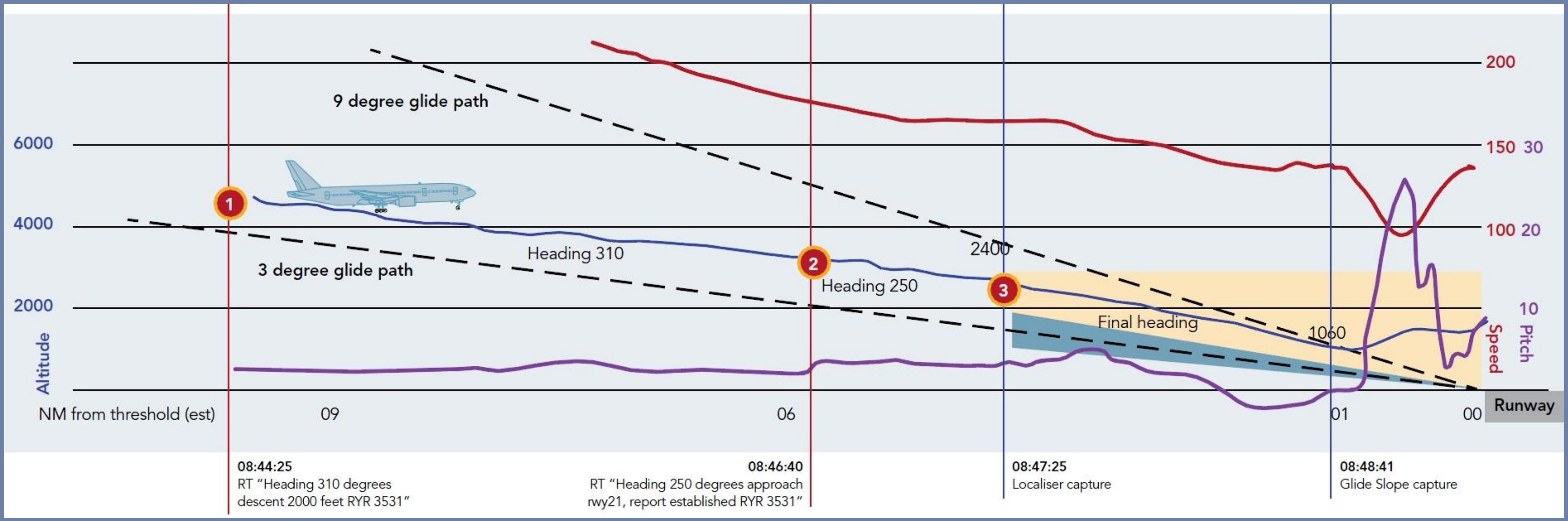
ICAO Annex 13

Safety information

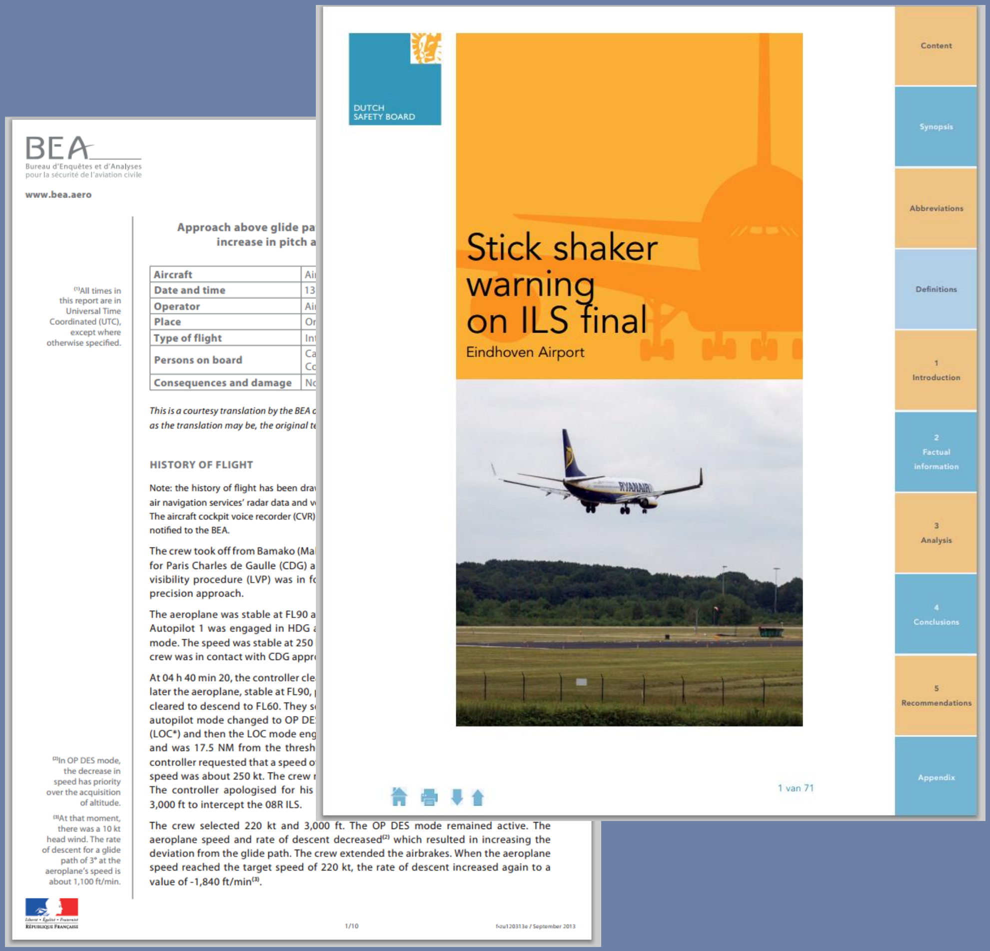


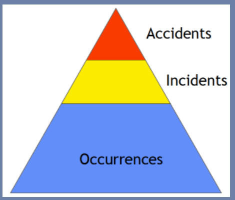
Heinrich Pyramid

False glideslope report



False glideslope report



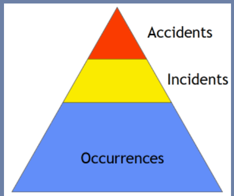


False glideslope report

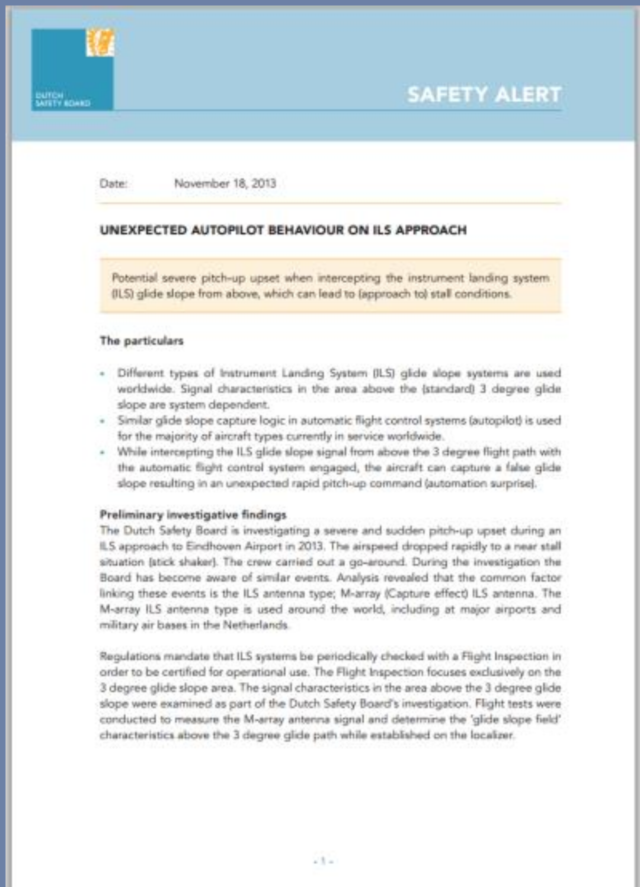
A narrative search was performed on the ASRS database with the key words: 'False Glide Slope', 'False Glideslope' and 'False GS'. The result was 57 occurrences related to False Glide slopes. These occurrences were analysed further.

Example ASRS report number 1054754
Boeing 737-300, 20 December 2012, altitude 3,000 feet

This event occurred during approach to Runway 28L. The ceiling was approximately 1,500 ft MSL, requiring ATC vectors to the approach. There was other traffic in the area and we were vectored to final behind them. ATC had slowed us to 150 KIAS, which, in our type of aircraft, requires landing gear down, and flaps 15. This is a high amount of drag to have, especially in level flight. I was the pilot flying. I was given an intercept heading to join the localizer, and cleared for the approach. The autopilot was engaged, and I armed the VOR/LOC mode. It was clear that the localizer was going to capture at about the same time as the Glide Slope was intercepted. As soon as the FMA changed VOR/LOC to green (captured), I selected the approach function, and the Glide Slope indication went to green (captured) almost immediately. The Glide Slope indicator then trended downward, showing that we were getting high on the desired path. The autopilot, instead of pitching down to follow the Glide



False glideslope report



DUTCH SAFETY BOARD

SAFETY ALERT

Date: November 18, 2013

UNEXPECTED AUTOPILOT BEHAVIOUR ON ILS APPROACH

Potential severe pitch-up upset when intercepting the instrument landing system (ILS) glide slope from above, which can lead to (approach to) stall conditions.

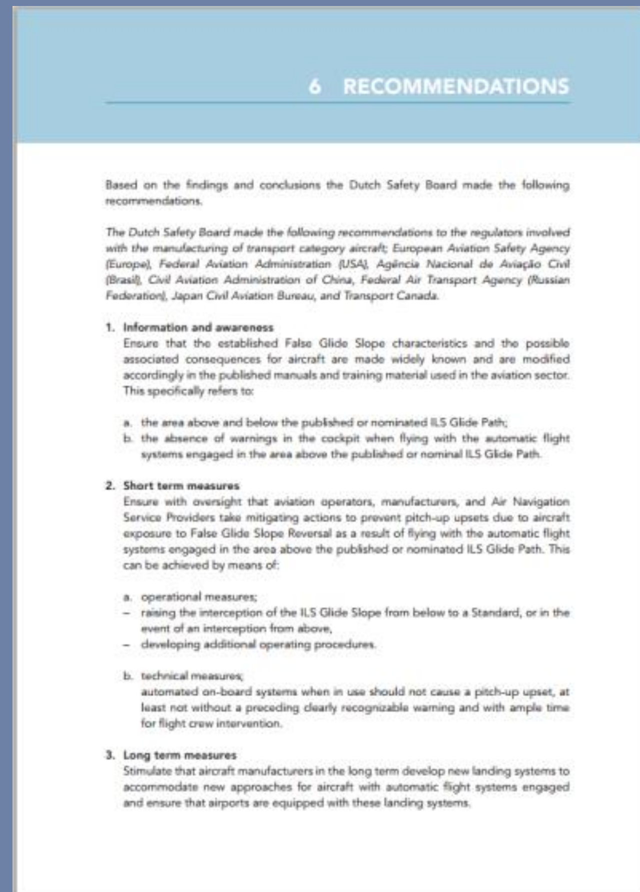
The particulars

- Different types of Instrument Landing System (ILS) glide slope systems are used worldwide. Signal characteristics in the area above the (standard) 3 degree glide slope are system dependent.
- Similar glide slope capture logic in automatic flight control systems (autopilot) is used for the majority of aircraft types currently in service worldwide.
- While intercepting the ILS glide slope signal from above the 3 degree flight path with the automatic flight control system engaged, the aircraft can capture a false glide slope resulting in an unexpected rapid pitch-up command (automation surprise).

Preliminary investigative findings
The Dutch Safety Board is investigating a severe and sudden pitch-up upset during an ILS approach to Eindhoven Airport in 2013. The airspeed dropped rapidly to a near stall situation (stick shaker). The crew carried out a go-around. During the investigation the Board has become aware of similar events. Analysis revealed that the common factor linking these events is the ILS antenna type; M-array (Capture effect) ILS antenna. The M-array ILS antenna type is used around the world, including at major airports and military air bases in the Netherlands.

Regulations mandate that ILS systems be periodically checked with a Flight Inspection in order to be certified for operational use. The Flight Inspection focuses exclusively on the 3 degree glide slope area. The signal characteristics in the area above the 3 degree glide slope were examined as part of the Dutch Safety Board's investigation. Flight tests were conducted to measure the M-array antenna signal and determine the 'glide slope field' characteristics above the 3 degree glide path while established on the localizer.

- 1 -



6 RECOMMENDATIONS

Based on the findings and conclusions the Dutch Safety Board made the following recommendations.

The Dutch Safety Board made the following recommendations to the regulators involved with the manufacturing of transport category aircraft; European Aviation Safety Agency (Europe), Federal Aviation Administration (USA), Agência Nacional de Aviação Civil (Brasil), Civil Aviation Administration of China, Federal Air Transport Agency (Russian Federation), Japan Civil Aviation Bureau, and Transport Canada.

1. **Information and awareness**
   Ensure that the established False Glide Slope characteristics and the possible associated consequences for aircraft are made widely known and are modified accordingly in the published manuals and training material used in the aviation sector. This specifically refers to:

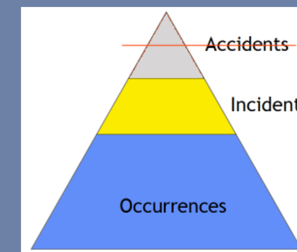
   a. the area above and below the published or nominated ILS Glide Path;
   b. the absence of warnings in the cockpit when flying with the automatic flight systems engaged in the area above the published or nominal ILS Glide Path.

2. **Short term measures**
   Ensure with oversight that aviation operators, manufacturers, and Air Navigation Service Providers take mitigating actions to prevent pitch-up upsets due to aircraft exposure to False Glide Slope Reversal as a result of flying with the automatic flight systems engaged in the area above the published or nominated ILS Glide Path. This can be achieved by means of:

   a. operational measures;
   – raising the interception of the ILS Glide Slope from below to a Standard, or in the event of an interception from above,
   – developing additional operating procedures.

   b. technical measures;
   automated on-board systems when in use should not cause a pitch-up upset, at least not without a preceding clearly recognizable warning and with ample time for flight crew intervention.

3. **Long term measures**
   Stimulate that aircraft manufacturers in the long term develop new landing systems to accommodate new approaches for aircraft with automatic flight systems engaged and ensure that airports are equipped with these landing systems.



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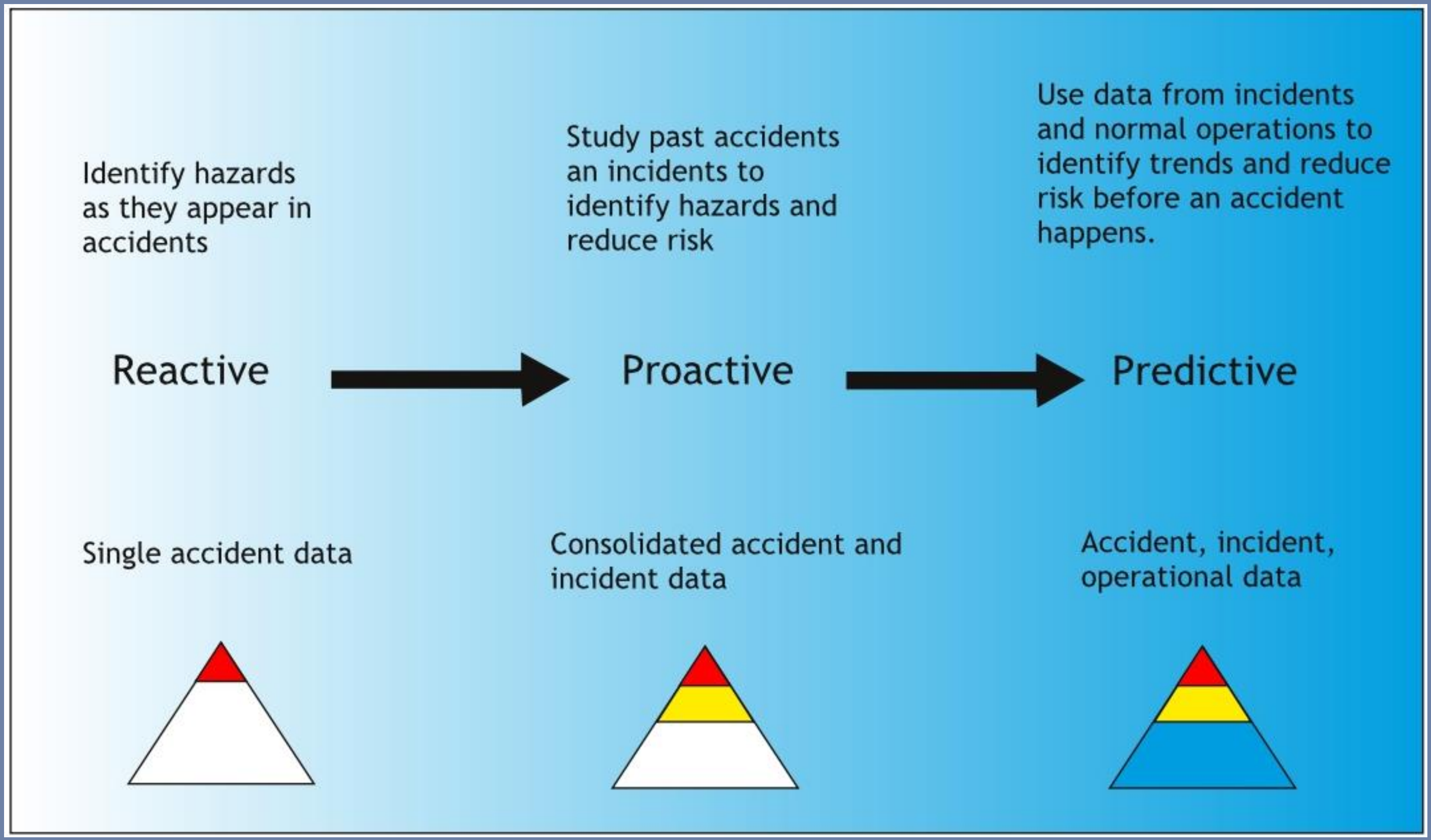
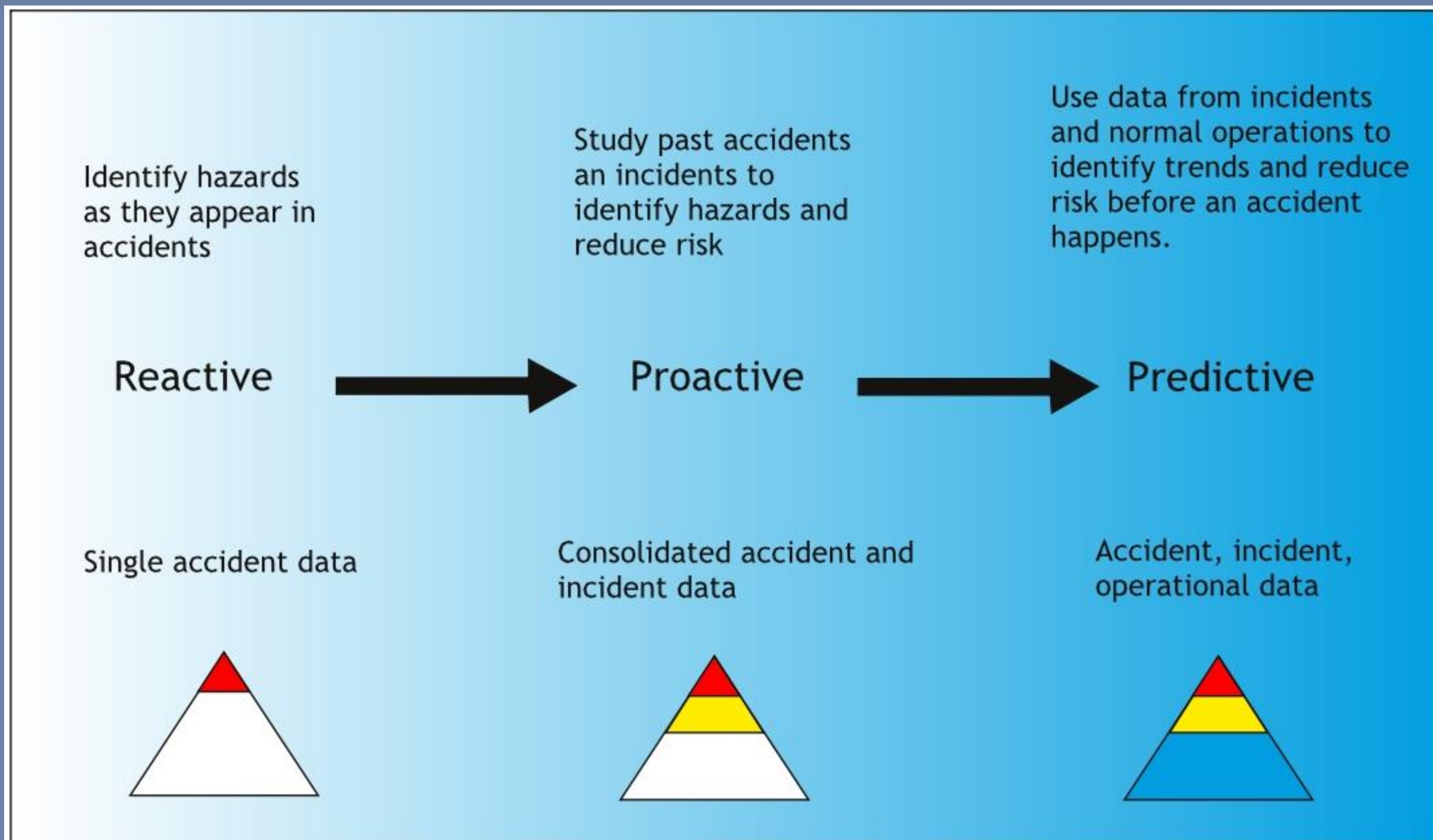
Challenges



Spectrum of Safety model (adapted) from J. Burin, FSF

Challenge 1 – use of data available



database
ker F-28

Challenge 2 – data entry

Quality of data entry

8 found

8 records meet your search criteria.
A docket of supporting materials may exist for factual and probable cause reports. Please contact Records Management Division. Dockets are not available for preliminary reports.

Accident Database & Synopses   Download XML   Download Delimited Text

Current Synopsis	PDF Report(s) (Published)	Event Date	Location	Make/Model	Regist. Number	NTSB No.	Event Severity	Type of Air Carrier Operation and Carrier Name (Doing Business As)
Foreign		1/9/2003	Chachapoyas, Peru	Fokker F-28 MK 1000		FTW03RA083	Fatal(46)	
Probable Cause	Factual (04/29/2004) Probable Cause (06/30/2004)	3/6/2002	Dallas, TX	Fokker F-28 MK-100	N1425A	FTW02LA088	Nonfatal	
Probable Cause	Factual (11/25/1998) Probable Cause (07/02/1999)	5/13/1998	FT. WAYNE, IN	Fokker F-28 MK100	N1400H	CHI98LA154	Nonfatal	(DBA: AMERICAN AIRLINES)
Probable Cause	Factual (04/06/1995) Probable Cause (05/16/1995)	11/23/1994	EVANSVILLE, IN	FOKKER F-28-4000	N479AU	CHI95IA045	Incident	
Probable Cause	Factual Probable Cause (08/26/1994)	1/26/1993	DETROIT, MI	FOKKER F-28 MK 1000	N452US	CHI93IA078	Incident	USAIR (DBA: USAIR)
Probable Cause	Factual Probable Cause (09/05/1991)	8/19/1989	VERO BEACH, FL	FOKKER F-28 MK4000	N489US	MIA89LA228	Nonfatal	USAIR (DBA: USAIR)
Probable Cause	Factual Probable Cause (07/10/1989)	10/3/1987	BALTIMORE, MD	FOKKER F-28-MK-1000	N288N	BFO88IA001	Incident	
Probable Cause	Factual (02/06/1995) Probable Cause (02/06/1995)	10/24/1985	FLUSHING, NY	FOKKER F-28	N510	NYC86IA019A	Incident	EMPIRE AIRLINES,INC.

NOTES:
- On Jan. 8, 2001, dynamic access to the accident data repository was implemented. Static files are no longer available.
- On Oct. 2, 2001, minor cases which do not fall under the definition of "accident" or "incident" were removed from the database; these entries were previously identified with "SA" in the accident number.
- On Sept. 18, 2002, data from 1962-1982 were added to the aviation accident information. The format and type of data contained in the earlier briefs may differ from later reports.

** - Do not use these fields as selection parameters if your date range includes pre-1982 dates, as they did not exist prior to 1982 and their use may falsely limit the data returned.

Aviation Page | Switch to Monthly Lists

NTSB online database
Search: Fokker F-28

Challenge 2 – data entry

Quality of data entry

41 found

41 records meet your search criteria.
A docket of supporting materials may exist for factual and probable cause reports. Please contact Records Management Division. Dockets are not available for preliminary reports.

Accident Database & Synopses   Download XML   Download Delimited Text

Current Synopsis	PDF Report(s) (Published)	Event Date	Location	Make/Model	Regist. Number	NTSB No.	Event Severity	Type of Air Carrier Operation and Carrier Name (Doing Business As)
Foreign		7/1/2010	Warsaw, Poland	FOKKER F28		ENG11WA010	Incident	
Foreign		5/4/2010	Bogota, Colombia	Fokker F28		DCA10WA058	Incident	
Foreign		9/22/2008	Quito, Ecuador	Fokker F28-4000		MIA08WA200	Nonfatal	
Probable Cause	Factual (11/18/2004) Probable Cause (01/24/2005)	9/4/2003	Flushing, NY	Fokker F.28 Mk 0100	N1450A	NYC03FA190	Nonfatal	
Foreign		1/17/2003	Quito, Ecuador	Fokker F28		FTW03RA085	Nonfatal	
Foreign		1/9/2003	Chachapoyas, Peru	Fokker F-28 MK 1000		FTW03RA083	Fatal(46)	
Probable Cause	Factual (07/30/2003) Probable Cause (09/30/2003)	9/5/2002	Minneapolis, MN	Fokker 100	N1473K	CHI02IA270	Incident	
Probable Cause	Factual (04/29/2004) Probable Cause (06/30/2004)	3/6/2002	Dallas, TX	Fokker F-28 MK-100	N1425A	FTW02LA088	Nonfatal	
Probable Cause	Factual (06/12/2003) Probable Cause (08/26/2003)	10/3/2001	DFW Airport, TX	Fokker F28 Mk 0100	N1448A	FTW02FA003	Nonfatal	
Foreign		9/15/2001	Belo Horizonte, Brazil	Fokker F28 Mk 100		ENG01RA010	Incident	
Foreign		7/16/2001	TULCAN, Ecuador	Fokker F28		WAS01RA016	Nonfatal	
Probable Cause	Factual (08/19/2003) Probable Cause (11/25/2003)	5/23/2001	DFW Airport, TX	Fokker F28 Mk 0100	N1419D	FTW01FA127	Nonfatal	
Probable Cause	Factual (10/16/2001) Probable Cause (11/01/2001)	3/6/2001	Montreal, Canada	Fokker F28 MK 0100	N1426A	CHI01IA102	Incident	
Probable Cause	Factual (09/04/2001) Probable Cause [illegible]	2/6/2001	Boston, MA	Fokker F28 MK 0100	N1457B	NYC01LA077	Nonfatal	

NTSB online database
Search: Fokker 28

Challenge 3 – taxonomies vs mapping

Do we need a common taxonomy or a common mapping?

ECCAIRS 4	Aviation Operations	Data Definition Standard

1000000 Commercial Air Transport — **Commercial Air Transport**

Commercial air transport operation. An aircraft operation involving the transport of passengers, cargo or mail for remuneration or hire. Annex 6 Part 1, Chapter 1.

1010000 Scheduled air service — **Scheduled revenue ops**

Scheduled air service: an air service open to use by the general public and operated according to a published timetable or with such a regular frequency that it constitutes an easily recognizable systematic series of flights which are open to direct booking by members of the public.ICAO DOC 9626.

1010100 Scheduled international — **International**

International air service: A flight with one or both terminals in the territory of a State, other than the State in which the carrier has its principal place of business.

1010101 Scheduled international passenger flight — **Passenger**

A flight carrying one or more revenue passengers. Note: this includes flights which carry, in addition to passengers mail or cargo.

1010102 scheduled international cargo flight — **Cargo**

This is to be used for all-freight services only. Cargo includes freight, unaccompanied baggage and mail.

1010200 scheduled domestic — **Domestic**

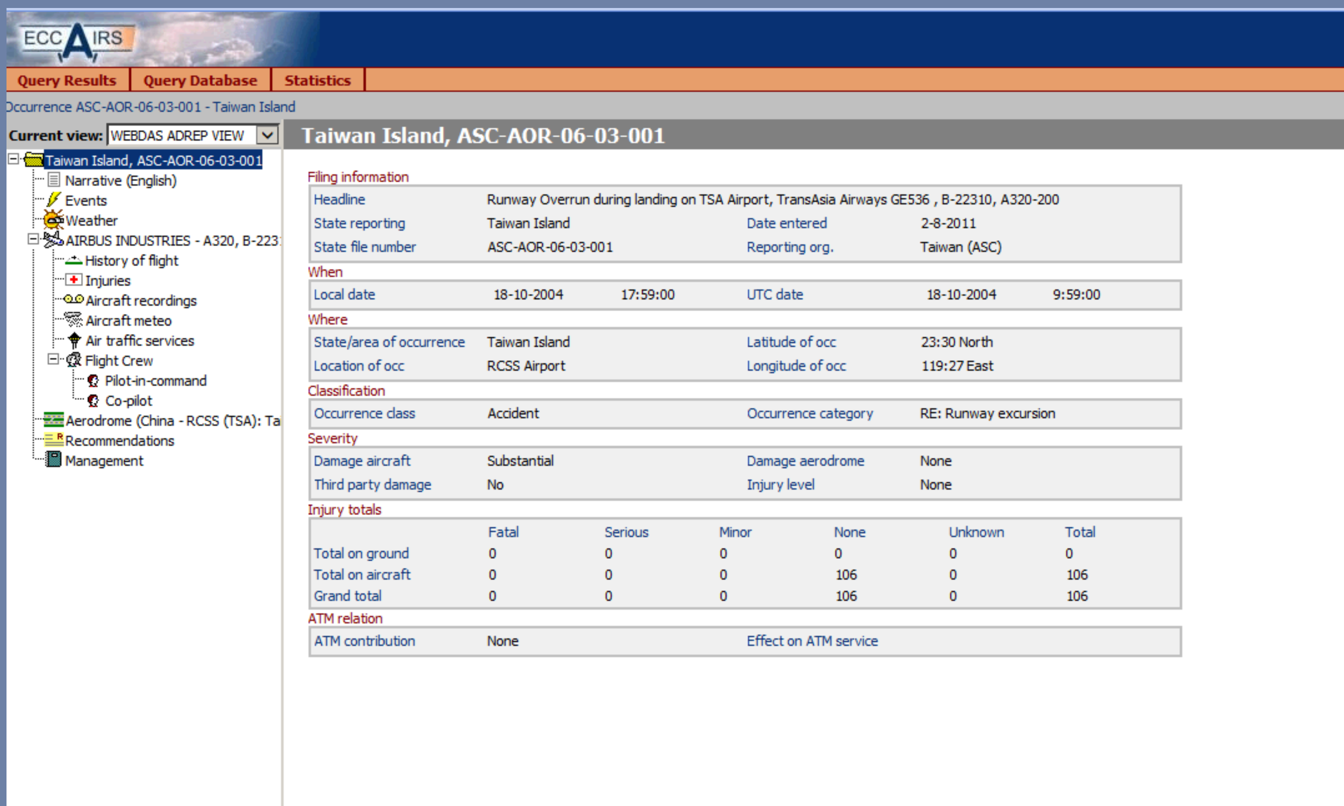
A flight not classifiable as international. Domestic flight include flights flown between point within the domestic boundaries of an air carrier whose principal place of business is in that State. Flights between a State and territories belonging to it, as well as any flights between two such territories are also classified as "domestic". This applies even though a flight may cross international waters or over the territory of another State.

1010201 scheduled domestic passenger — **Passenger**

A scheduled flight carrying one or more revenue passengers. Note: The flight may also carry mal or cargo.

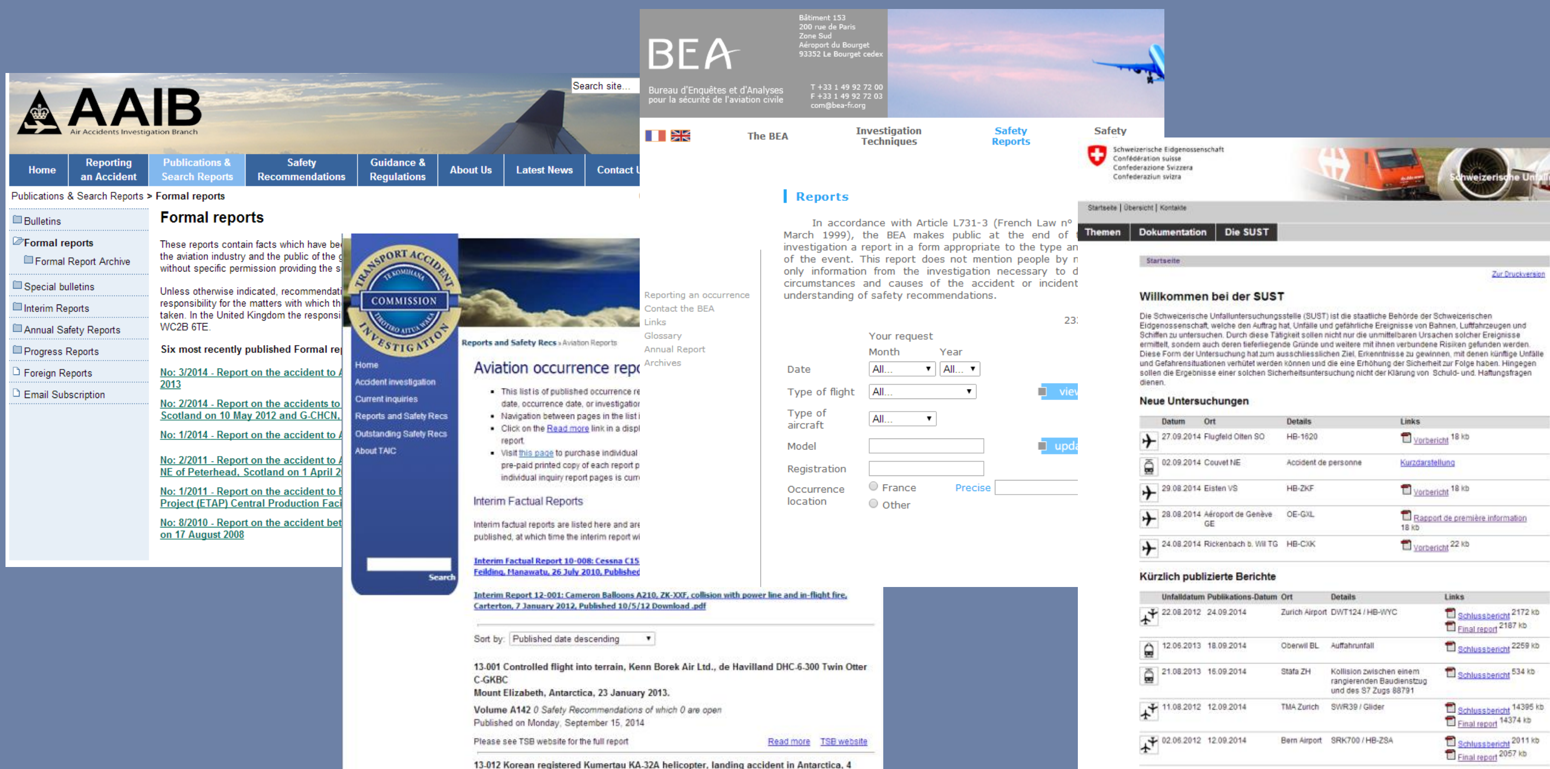
Challenge 3 – human vs system

Systems & taxonomies have to adapt to their users, not the other way around



Challenge 4 – formal reports

No easily accessible/searchable repository of formal investigation reports



Aviation safety information

Challenge 4 – formal reports

Not all formal reports in an ICAO language

Sažetak Završnog izvješća CESSNA CITATION BRAVO C550B, ZL BRAČ, 15. srpnja 2010.

OSNOVNI PODACI

Zrakoplov

Vlasnik	PA Beograd, Srbija	
Operator	PA Beograd, Srbija	
Model zrakoplova	Proizvođač:	CESSNA – USA
	Tip i model:	CESSNA 550 B
	Serijski broj:	550-1049
Država i registracija	Srbija	
	Registracija:	YU-BSG
Mjesto događaja	Zračna luka Brač	
Datum događaja	15.07.2010.	

KRATKI SADRŽAJ

Zrakoplov YU-BSG poletio je dana 15. srpnja 2010. godine u 16:06 sa luke Tirana, Albanija za Zračnu luku Brač, Hrvatska. Posada je dobila odobrenje od k leta za slijetanje na Zračnu luku Brač. Staza u upotrebi bila je 04. Zrakoplov je dc uzletno-sletnu stazu u 16:44. Nakon dodira s podlogom, piloti su prvo uključili ko motorom nakon čega su pritiskom na papučice za kočenje pokušali zaustaviti zrakoplov zakašnjelog kočenja došlo je do izlijetanja zrakoplova s uzletno-sletne staze, pro ograde, prelaska preko zaštitnog pojasa i pada na kamenje i makiju na dubinu od metara. Od posljedica udara zrakoplova u kamenje došlo je do zapaljenja zrakoplova. zrakoplova brzom reakcijom zaustavila je dovode goriva i isključila napajanje na gl prekidaču, a u međuvremenu je domaćica zrakoplova pripremila putnike za evak Putnici i posada uspješno su, bez povreda, napustili zrakoplov i udaljili se na pro udaljenost. Brzom intervencijom vatrogasne postrojbe Zračne luke Brač ugašen je p zrakoplovu.

1.1. PRIPREMA ZA LET I POVIJEST LETA

1.1.1. Općenito

Djelomična rekonstrukcija prilaza i izlijetanja zrakoplova YU-BSG s u sletne staze napravljena je na temelju izjava pilota, kontrolora leta, očitanih z Bilježitelja parametara leta, Bilježitelja razgovora i očevidaca.

AZI Stranica 3

REDEGØRELSE

HCLJ510-000668	Havari		
Luftfartøj:	DHC-6 Twin Otter	Registrering:	OY-POF
Motorer:	2 – PT6A-27	Flyvning:	Charter, VFR
Besætning:	2 – ingen tilskadekomne	Passagerer:	Ingen
Sted:	73 24N 24 30W	Dato og tidspunkt:	29.7.2009 kl. 1200 U

Havarikommissionen for Civil Luftfart og Jernbane (HCLJ) fik meddelelse om havariet fra operatø 29.7.2009 kl. 1700 UTC.

Flyvningens historie

Havariet indtraf i forbindelse med en VFR fragtflyvning fra Mestersvig (BGMV) til position 73 2 30W. Piloterne havde tidligere på dagen fløjet den samme rute (BGMV – 73 24N 24 30W – BG

Ved ankomst til det valgte landingsområde valgte piloterne at lave en lav overflyvning for at bed vindforholdene. Det var piloternes vurdering, at vindretningen var skiftende med en vindstyrke p knob.

Umiddelbart for baneenden var det piloternes oplevelse, at luftfartøjet blev udsat for en uventet rettet vindstrømning (downdraft), hvilket medførte, at det højre hovedhjul fik kontakt med jorden f tiltænkte landingsbane. Luftfartøjet kom i luften igen, og ved den efterfølgende sætning tippede lufti over mod højre, hvor et flaphængsel på højre vinge fik kontakt med jorden med skader på højre kræ og flap til følge.

Havariet indtraf i dagslys og under visuelle meteorologiske vejrforhold (VMC).

מדינת ישראל
משרד התחבורה והבטיחות בדרכים
חקירת תאונות ותקריות אוויר

דוח חקירה בטיחותית
(דוח סופי)

תיק תקרית חמורה מס' 100-14

תקציר האירוע

ביום ראשון, בתאריך 10.8.2014, בשעה 16:18 (זמן מקומי), המריא מטוס OTJ874 על מסלול 08 בנתב"ג, עם 2 טייסים, 4 דיילים ו - 169 נוסעים. לאחר ההמראה ותוך כדי הטיפוס, בהיות המטוס דרומית מזרחית לנקודת NIREL, בגובה של 6,000 רגל מעפ"י, הצוות הבחין בעליית הטמפרטורה של צינור הפליטה (EGT, Exhaust Gas Temperature) במנוע מס' 1 (שמאל) מעל 800 מעלות. במקביל, על פי דיווח צוות הקבינה, נשמע רעש חזק, רעידות, בחלקו האחורי של המטוס והורגשו רעידות חזקות בקבינה.

הטייס טיפל מידית בתקלה, מספר שניות מקבלת החיווי וכיבה את מנוע שמאל. הטמפרטורה ירדה ולא התקבל חיווי של אש במנוע. הצוות הודיע למגדל על הכשל מנוע בדיווח: "We have one engine failure Ben Gurion Departure OTJ874".

פקח הגישה בבן גוריון החל מיד בפינוי המרחב, לצורך נחיתת OTJ874, ולשם כך הפנה מספר כלי טיס ממסלולם. הדיווח הראשוני הובן במגדל כדיווח על כשל בשני המנועים, ולכן הוכרז על "מצב חירום 3" והחלו הכנות בשדה לנחיתת חירום, לרבות הזעקת כוחות כיבוי והצלה. לאחר כעשרים שניות שונתה ההכרזה ל – "מצב חירום 2".

צוות הטיסה שידר בתחילה שכוונתו לנחות על מסלול 08, הופנה לנחיתה בגישת ILS למסלול 21 ובסופו של תהליך הוצע לו ע"י המגדל והוא נחת על מסלול 26. המטוס נחת בשלום, בשעה 16:35 (זמן מקומי).

המטוס נשוא התקרית

3 משרד החוקר הראשי – חקירת תאונות ותקריות אוויר

Challenge 5 – level of investigation

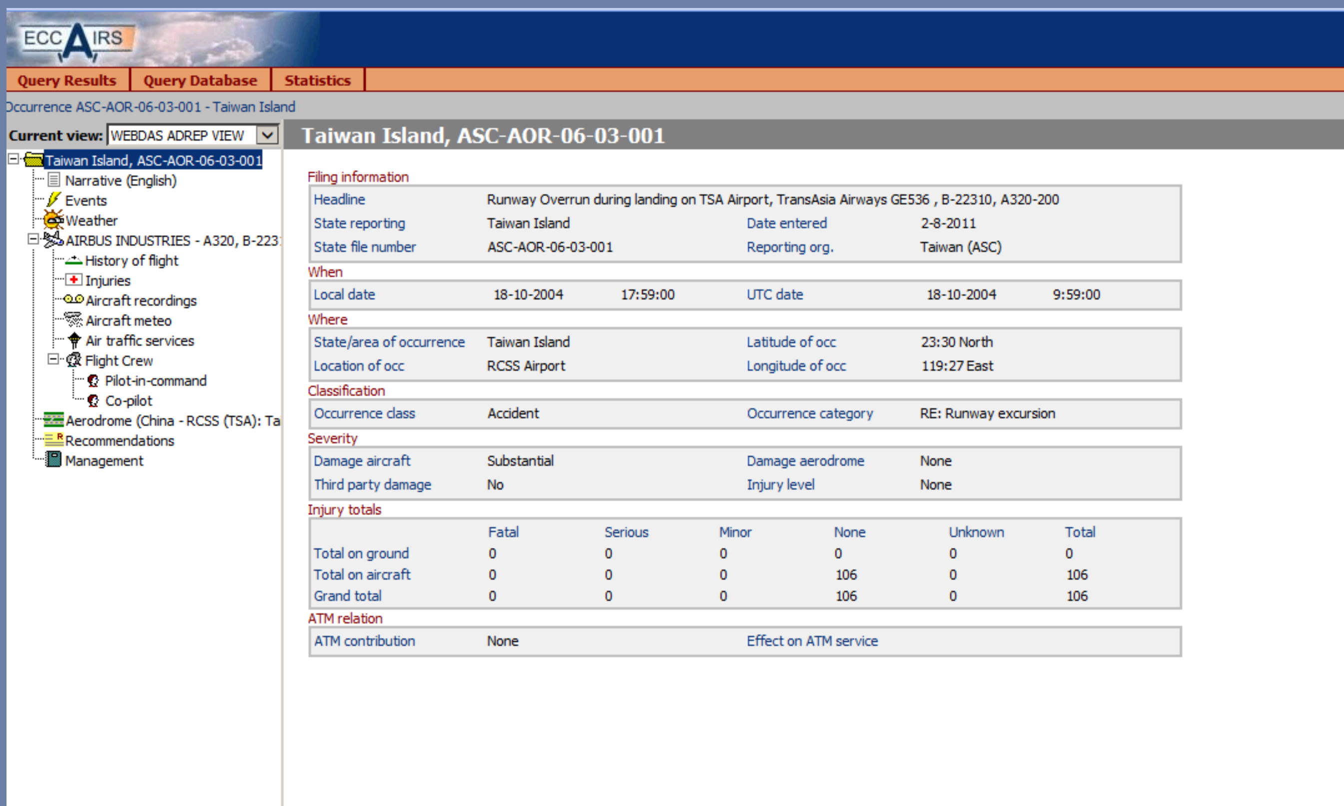
Funding and available manpower determine number of investigations

Recommendation 3

4.43 The committee recommends that the ATSB move away from its current approach of forecasting the probability of future events and focus on the analysis of factors which allowed the accident under investigation to occur. This would enable the industry to identify, assess and implement lessons relevant to their own operations.

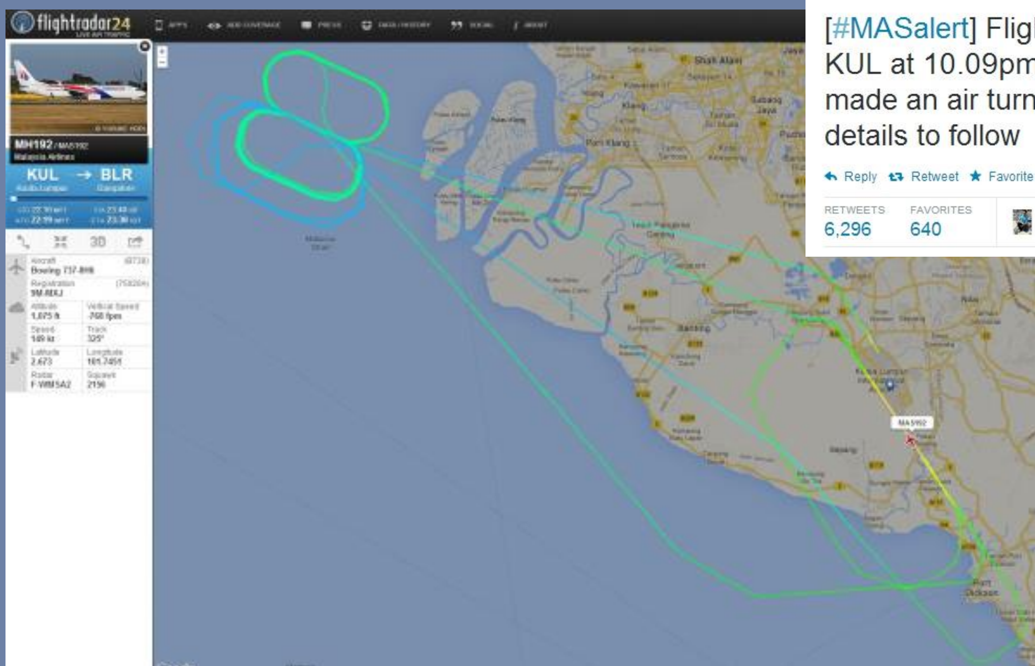
Challenge 6 – transparency

Availability of accident information for research



Challenge 7 – timeliness

Media and public demand immediate incident information



Challenge 8 – safety oversight

Investigation

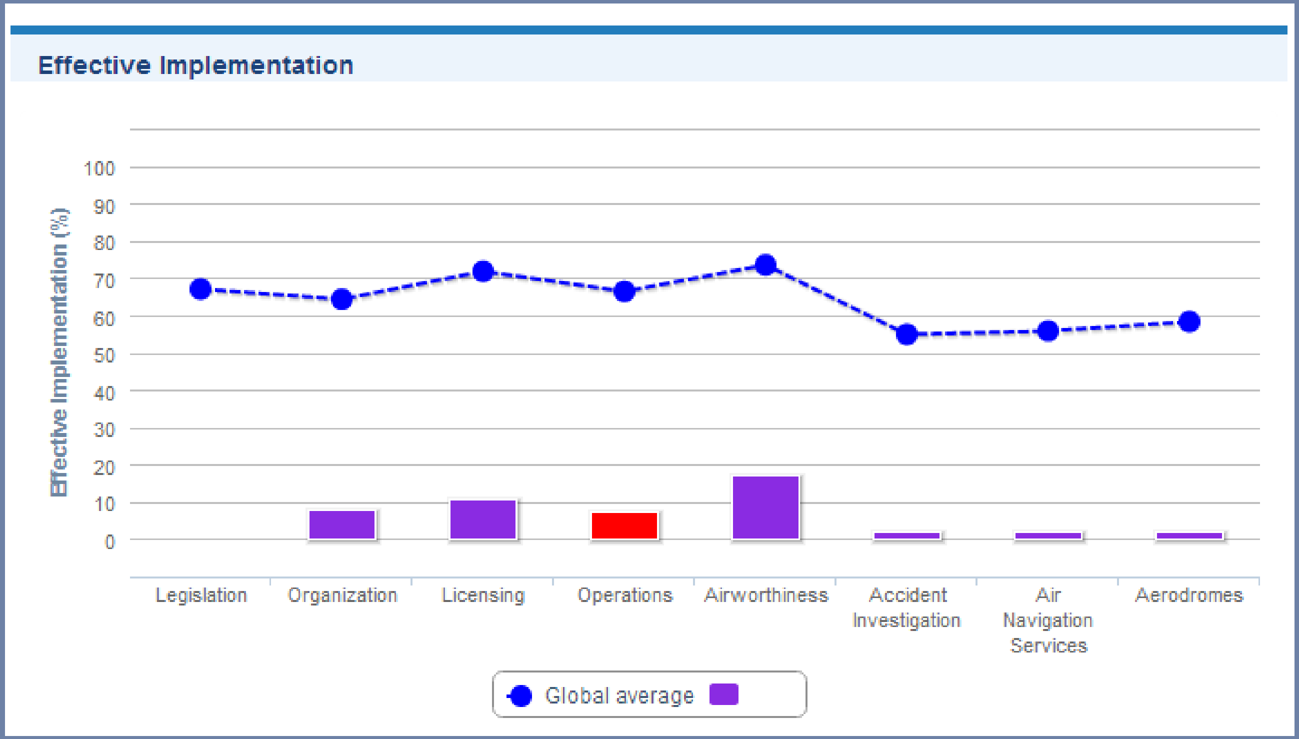
Interim Safety Recommendations

Final report with Conclusion & Recommendations

- (Emergency) Airworthiness Directives
- Changes in regulations
- Service Bulletins

Challenge 8 – safety oversight

How sharing accident and incident information results in a.o. AD's and effectiveness also depends on country's EI.



Challenge 9 – Safety Recommendations

Safety recommendations of previous investigations regarding safety information

Consequently, the BEA recommends that:

- **EASA improve the feedback process by making mandatory the operational and human factors analysis of in-service events in order to improve procedures and the content of training programmes; [Recommendation FRAN-2012-052]**

and specifically,

- **that the DGAC take steps aimed at improving the relevance and the quality of incident reports written by flight crews and their distribution, in particular to manufacturers. [Recommendation FRAN-2012-053]**

AF447 report

Thank you

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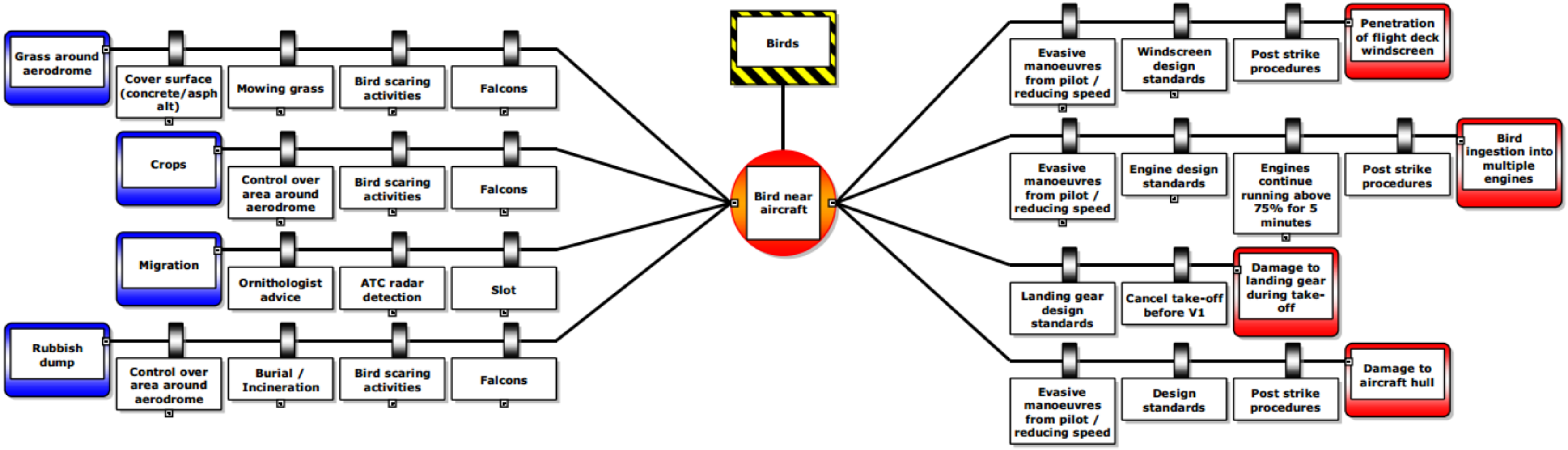
Visualisation missing airliners

Aircraft accident prevention

2013 – accident locations

Challenges



Bird Strike Bowtie from
CGE Risk Management Solutions