

IMPLEMENTING AND MONITORING EFFECTIVE RISK MITIGATIONS

Source of Mitigation Actions

● Rectangular Snip

<div><div></div><div>Rectangular Snip</div></div>							Frequency				
							Never happened in the industry	Happened in the industry	Happened in the company	Happened often in the industry	Happened often in the company
							Rare	Unlikely	Possible	Likely	Almost certain
People	Property Asset	Operations	Environment	Media	Reputation						
No health effect No injury	No damage	No missed trip	No impact	No media attention	No impact	Insignificant	Minimal	Minimal	Low	Low	Moderate
Minor health effect Minor injuries	No evident damage	Minor disruptions No missed trip	No impact	No media attention	No impact	Minor	Minimal	Low	Low	Moderate	High
Major health effect Major injuries	Local damage Technical Delay	Longer op. disruptions Financial loss	Some impact	Local media attention	Local impact Pax refuse a/c status	Moderate	Low	Low	Moderate	High	High
Disability Severe injuries	Major damages	Major op. disruption Missed trips	Major impact	National media attention	National impact Airline compromitation	Major	Low	Moderate	High	High	Extreme
Multiple fatalities Loss of lifes	Loss of aircraft	Removal of certificate of airline / aircraft	Extreme impact	International media attention	International impact Airline compromitation	Catastrophic	Moderate	High	High	Extreme	Extreme

Safety Department

Procedure for: Internal incident / event investigation

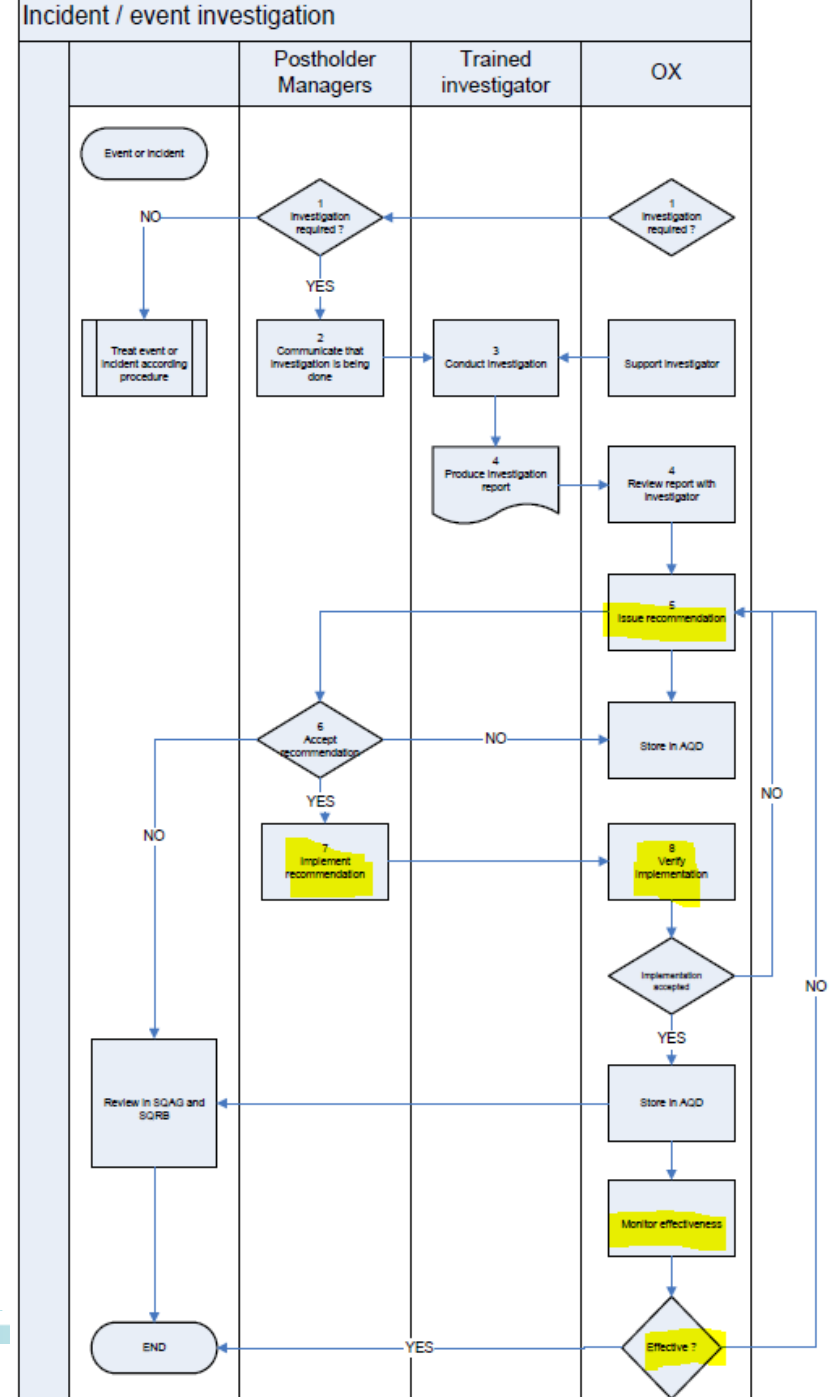
Identification number: FP P 20

ISSUE Nr 3

Effective date: March 2017

Writer(s) / Owner(s)	Review(s)	Verifier	Approver
T. WIEGANDT	Y. WACHTER	J-M MULLER	P. KREMER

22/02/2019



- OFDM
- Outside Investigations
- Safety Inspections
- Safety Audits
- Surveys
- Annual Safety Review
- Airline Safety Plan
- Industry Toolkits

- identify areas of operational risk and quantify current safety margins
- identify and quantify operational risks by highlighting occurrences of non-standard, unusual or unsafe circumstances
- use the FDM information on the frequency of such occurrences, combined with an estimation of the level of severity, to assess the safety risks and to determine which may become unacceptable if the discovered trend continues
- put in place appropriate procedures for remedial action once an unacceptable risk, either actually present or predicted by trending, has been identified
- confirm the effectiveness of any remedial action by continued monitoring

- Monthly Review
- Quarterly Review
 - Safety Board
- Annual Review
 - Safety Board and OFDM Safety Action Group
- OFDM Safety Action Group
 - Setting of Targets
 - Monitoring effectiveness of the action plans

Safety Department

External Investigation Follow-up sheet

March 2014-03-14

The following sheet is used to track the follow-up actions within Luxair of recommendations which have been issued in the scope of incident/accident investigations which have been performed by investigation bodies which are external to Luxair. It is not meant to be used for investigations in which Luxair aircraft were involved but for investigations which might have an effect on the risk within Luxair operations.

In case of investigation:

Investigation done by	Dutch Safety Board (DSB)
Investigation / Accident date	25 th February 2009
Report type	Preliminary <input type="checkbox"/> Final <input checked="" type="checkbox"/>
Report reference	
Aircraft type involved	E145 <input type="checkbox"/> DHC-8 <input type="checkbox"/> B737-700 <input type="checkbox"/> B737-800 <input checked="" type="checkbox"/> Other
Recommendations issued	Yes <input type="checkbox"/> No <input type="checkbox"/> 1. Proposed recommendation or action for Boeing tech/ops meeting: In respect to conclusion 'Not all certified Boeing 737 operating software versions for the auto throttle and flight control computers respond to an erroneous radio altimeter signal in the same way.' Inform pilots of responses of the software(s) installed on Luxair a/c. 2. Proposed recommendation or action for Boeing fleet chief. In respect to conclusion 'The information featured in the QRH regarding the use of the autopilot, the auto throttle and the need for trimming in the approach to stall recovery procedure is unclear and insufficient.' Note: Unsure if QRH used by Turkish airlines is Boeing standard or airline adapted.
Action by Luxair	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>

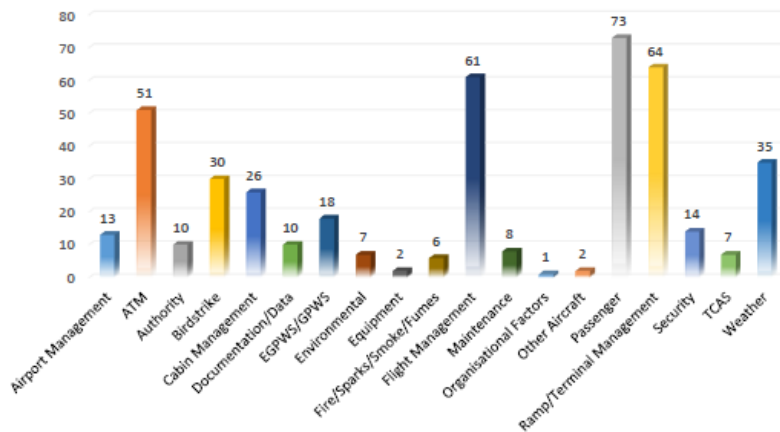
Follow-up by Luxair:

Actions taken	Description / Remarks
1	04/03/2009 Boeing MOM-09-0063-01B OF-B-M-270 memo issued to all B737 flight crew 04/03/2009. As of 13/03/2013 memo still available for flight crew reference. Memo contents - forwarded Boeing Multi Operator Message MOM-09-0063-01B
2	04/02/2013 Boeing SB 737-34-2395 Low range Radio Altimeter - Installation of the Antenna Gaskets Applicability. Applicable to Luxair a/c Reason: Installation of gaskets between low range radio altimeter antennas and the fuselage skin to reduce corrosion 1. Between antennas and fuselage skin 2. to antenna and cable connectors leading to damage to parts / reliability issues with RA signal. SB Luxair fleet incorporation as of 13/03/2013 ongoing.
3	22/11/2013 Boeing SB 737-22A1215 GE Auto throttle computer replacement This SB not distributed to Luxair. Technical Avionics dept. requested document. Boeing did not distribute to Luxair as SB not applicable to Luxair a/c. Note: This part was installed on LX-LGT. Luxair a/c -737YB 901, 902, & 903 and 738 YR386 & 387 (to come YR 388). See Paragraph 1A of document for applicable a/c. Reason: Single Unflagged/Valid erroneous RA output causing auto throttle to enter Landing Flare retard mode prematurely on approach (manual or single channel autopilot approach).
4	05/03/2014 EASA PAD Auto Flight Computer - Replacement References SB 737-22A1215 (see above). Applicability. Not applicable to Luxair a/c. Note: This part was installed on LX-LGT.
5	No documentation 'maintenance tips' released relating to RA - to help improve maintenance troubleshooting.
6	Technical engineering quarterly reliability reports / review (active since 2012) (AMOS APN 869, text search 'RR') have not flagged any trend monitoring reliability issue or single severe events relating to RA requiring follow up by technical avionics.
7	Checked with XL France for wet lease 2014 Their aircraft is not affected.

3.1.5 Flight Operations

3.1.5.1 Flight Safety Operational Events

FLIGHT SAFETY OPERATIONAL EVENT AT CATEGORY LEVEL 2016

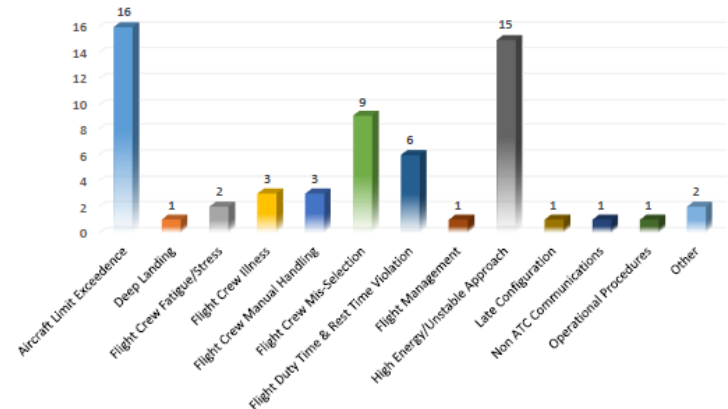


The top events are:

- Passenger
- Ramp/Terminal Management
- Flight Management
- ATM
- Weather

Flight Management

FLIGHT MANAGEMENT 2016



Aircraft Limit Exceedance

Like in 2015, these events include flap placard exceedances as well as maximum operating speed exceedances. Most of the time in the flap placard exceedance reports received, the speed was only a few knots over the allowed limit which was caused by external factors such as turbulence and heavy winds.

High Energy/Unstable Approaches

Only 4 reports out of the 15 received were because of an unstabilized approach. The rest of the reports were mainly because of a go-around event.

Flight Crew Mis-Selection

These events include flight crews forgetting to set-up flaps before take-off, choosing the wrong flap setting on landing and the cabin not properly pressurising. All events were uneventful and reported accordingly.

Airline Safety Plan

2017-2021



Executive summary

It is Luxair's fundamental belief that safety is a core business, personal value and a source of our competitive advantage. Our Safety Management Systems aims to continually improve the safety of Luxair. We are committed to developing, implementing, maintaining and constantly improving strategies and processes to ensure that all our aviation activities take place under a balanced allocation of organizational resources, aimed at achieving the highest level of safety performance.

The first edition of the Airline Safety Plan (ASP) fits into this concept of continuous improvement and is an integral part of the SMS activities. It covers the five-year period from 2017 to 2021 and is divided into three specific safety issue categories:

1. Systemic issues
2. Operational issues
3. Emerging issues

Each category contains several identified safety risk areas as well as high level actions to address those areas.

The following issues have been selected as top strategic safety priorities to be addressed:

- | | |
|---------------------------------|------------------------------|
| • Human factors: | Fatigue |
| • Fire, smoke and fumes: | Fumes on the Q400 |
| • Systemic issues: | Cybersecurity |
| • Human factors: | Pilot monitoring |
| • Systemic issues: | Enhancement of communication |

Airline Safety Plan Process

DAC-L annual review

TOP 10 SAFETY ISSUES			Potential accident outcome					
	Safety issue	Accident Severity	CFIT	LOC-I	MAC	GCOL	RWY-EXC	Injury or damage in flight Injury or damage on ground
1	Risk of MAC	Catastrophic			X			
2	Cargo moving/shifting during flight	Catastrophic		X				X
3	W&B issues due to wrong loading	Catastrophic		X			X	
4	Runway incursion by aircraft	Catastrophic				X		X
5	Technical - pressurisation system	Catastrophic	X	X				X
6	Technical - malfunction of automatic flight management	Catastrophic	X					X
7	Technical - hydraulic system	Catastrophic		X			X	X
8	Aircraft deviation from ATC instruction	Catastrophic			X	X		
9	Technical - de-icing system	Catastrophic		X				
10	Unstabilised approach	Major					X	X

X: the safety issue can lead to the potential accident outcome

Note: the following cases have been excluded:

- safety issues linked to a "minor" accident severity
- safety issues with less than 3 related occurrences

CFIT Controlled flight into terrain
LOC-I Loss of control in flight
MAC Mid-air collision
GCOL Collision on ground
RWY-EXC Runway excursion

DURG
E

on civile

aw 2016

iation Luxembourg (DAC) is to maintain or improve
ial and international regulations.

v is to summarise and analyse the current situation

ences, the year 2016 is a transition year due to the
ion on occurrence reporting¹. The new regulation
ry to report while also promoting voluntary reporting.
gement Systems (SMS) of operators of the aviation
heir own reports. In addition to the initial notification,
assification, risk assessment and follow-up actions
rators usually have more detailed information than
ment may differ from those applied by DAC in the
on of 2016 data to the previous years is difficult. The
re change for the national occurrence database
ated the analysis of the data.

¹ REGULATION (EU) No 376/2014 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 3 April 2014 on the reporting, analysis and follow-up of occurrences in civil aviation, amending Regulation (EU) No 996/2010 of the European Parliament and of the Council and repealing Directive 2003/42/EC of the European Parliament and of the Council and Commission Regulations (EC) No 1321/2007 and (EC) No 1330/2007

Airline Safety Plan Process



CAT Aeroplane CAG

7th Meeting

21-22 February, 2018

Air Safety Group



Minutes of the Air Safety Group (ASG)
Tuesday 15 March 2017

Hosted by European Aviation Safety Agency in Cologne, Germany

Chair: Pascal Kremer, Luxair

Attendees

Per Christensen, Danish Air Transport
Alain Corbel, HOP!
Déborah Vintner, ATR
Alistair Scott, BAE Systems (Regional Aircraft)
Dominic Perrin, Titan Airways
Jussi Laaksonen, Nordic Regional Airlines
Andrei Tanase, Blue Air
Bjorn Johansen, Widerøe
Görl Berg, Widerøe
Eduard Ciofu, EASA

Ewout Hiltermann, KLM Cityhopper
Erki Teras, Nordica
Karin Forsell, Braathens Regional Airlines
Pieter Grosskamp, To70
Chris Holliday, Energy Aviation Services
João Loureiro, PGA - Portugal Airlines
Miguel Correia, PGA - Portugal Airlines
Christopher Mason, ERA
Nick Mower, ERA

1. Welcome

The Chair of the Air Safety Group, Pascal Kremer (Luxair), welcomed everyone to the meeting.

2. Tour de table

Everyone introduced themselves by way of a tour-de-table.

3. Minutes and actions from last meeting

The minutes were agreed to be an accurate account of the last meeting and were approved.

There were three action items from the previous meeting:

- Drafting of a new STAR 022 covering 'Drugs and Alcohol Testing'
- Revision to STAR 010 'Flight Data Monitoring'
- Publication of guidance material for ERA Members regarding Peer Support Groups

4. Safety Targeted Awareness Reports (STARs)

One of the Germanwings Task Force six recommendations was for airlines to mandate random drugs and alcohol testing, although there was little regulatory guidance on what this should encompass. During the last meeting of the Safety Group in November 2016, it was agreed that a new STAR should be published providing guidance on the subject.

Draft STAR #022, 'Drugs and Alcohol Testing', was distributed to the Safety Group members prior to the meeting for perusal and comment. There were some constructive comments for additional information to be included, and the STAR will be modified accordingly. (Action: CM)

The Germanwings Task Force also recommended that operators should provide a Peer Support Programme for Flight Crew. This was discussed within the meeting and it was agreed that a new STAR covering Peer Support will be drafted for presentation at the next Safety Group meeting.

(Action: CM)

Park House, 127 Guildford Road, LIGHTWATER, Surrey GU18 5RA, UK

Airline Safety Plan Process

Strategic Safety Priorities

The Airline Safety Plan consists of three specific safety issue categories. Each category contains several identified safety risk areas as well as high level actions to address those areas. The safety issue categories as well as the safety risk areas are shown in the table below:

Safety issue category	Safety risk area
Systemic issues	<ul style="list-style-type: none"> Safety Management System Contracted activities Cybersecurity Coordination of work processes
Operational issues	<ul style="list-style-type: none"> Loss of control inflight Mid-air collisions Conflict zones Fire, smoke and fumes Cabin safety Human factors
Emerging issues	<ul style="list-style-type: none"> Avionics integration and pilot training New technologies

The following issues have been selected as top strategic safety priorities to be addressed:

- **Human factors:** Fatigue
- **Fire, smoke and fumes:** Fumes on the Q400
- **Systemic issues:** Cybersecurity
- **Human factors:** Pilot monitoring
- **Systemic issues:** Enhancement of communication


Operational Issues

LOC 3 2017	Use of automation	Flight ops	Policy 2018
<p>Objective:</p> <p>Modern aircraft are increasingly reliant on automation for safe and efficient operation. However, automation also has the potential to cause significant incidents when misunderstood or mishandled. Furthermore, automation may result in an aircraft developing an undesirable state from which it is difficult or impossible to recover using traditional hand flying techniques.</p> <p>Review/enhance the policy on use of automation.</p>			
LOC 4 2017	Go-around execution	Safety	Analysis 2017
<p>Objective:</p> <p>A go-around is normally performed for safety reasons but the go-around manoeuvre itself, and subsequent flight management, will introduce new risks. At the initiation of any go around <u>workload</u> is significantly increased so that pilots are likely to be functioning much nearer to their <u>mental capacity</u> than during the approach phase.</p> <p>Analyse go-around execution using FDM data.</p>			
LOC 5 2017	Go-around training	Safety	Training program 2018
<p>Objective:</p> <p>Go-around training is an important factor in the assurance of proper go-around execution. Legal requirements often only ask for go-arounds during training to be performed at minima or with inoperative engines. The training should however reflect different risk execution scenarios.</p> <p>Review/enhance go-around training program.</p>			

Aircraft Operator

Ref	Flight Phase	Recommendations	Owner	Status	Company document reference	Comments
3.4.1	GENERAL	Aircraft operators are encouraged to participate in safety information sharing networks to facilitate the free exchange of relevant information on actual and potential safety deficiencies.	Aircraft Operator	Implemented	SMS manual Ch. 4.12 FP-P-04 SIE and monthly reports	
3.4.2	GENERAL	The aircraft operator should include and monitor aircraft parameters related to potential runway excursions in their Flight Data Monitoring (FDM) program.	Aircraft Operator	Implemented	SMS manual	All parameters related to unstabilized approaches are monitored.
3.4.3	GENERAL	The aircraft operator should include runway excursion prevention in their training program. This training should be done using realistic scenarios.	Aircraft Operator	Implemented	QM-D Training Manual 2.13.4 400 Year 3 covered in ALAR (approach and landing accident reduction) SMS manual 4.6 Dissemination of safety data and feedback SFRP courses FP-P-12 SFRP Events Printout	
3.4.4	GENERAL	The aircraft operator should consider equipping their aircraft fleet with technical solutions to prevent runway excursions.	Aircraft Operator	Partially implemented	QM-B	Use of HGS is highly recommended. LNAV/VNAV for non-precision approaches. RAAS (Boeing only)
3.4.5	GENERAL	The aircraft operator should consider equipping their aircraft fleet with data-link systems (e.g. ACARS) to allow flight crews to obtain the latest weather (D-ATIS) without one pilot leaving the active frequency.	Aircraft Operator	Partially implemented	QM-B	Only 737 is equipped
3.4.6	GENERAL	The aircraft operator should report to the ANSP if approach procedures or ATC practices at an airport prevent flight crew from complying with the published approach procedures and their stabilised approach criteria.	Aircraft Operator	Implemented	QM-A 11.3.4 SFRP training EVAIR	Meetings with ANA on request
3.4.7	GENERAL	The aircraft operator should ensure the importance of a stabilised approach and compliance with final approach procedures is included in briefing for flight crews. The commander should not accept requests from ATC to perform non-standard manoeuvres when they	Aircraft Operator	Implemented	QM-A 8.3.26 600 + 800 SFRP	

Once the risk is determined then the tolerability has to be assessed. This is done through the table below:

	Risk tolerability	ALARP	Action to be taken
Minimal	Risk is acceptable as it currently stands		No action required
Low	Risk is acceptable		Task might be reviewed to further reduce the risk
Moderate	Risk is acceptable based on mitigation		Incorporate risk controls or monitor risk controls
High	Risk needs management review before proceeding		Incorporate risk controls Task may only proceed with management approval
Extreme	Risk is unacceptable		Task may not proceed under the given conditions

Final responsibility and accountability for all safety risks lies with the Accountable Manager. He has the overall accountability to decide whether safety risks within Luxair are tolerable or not.

The Nominated Persons are responsible for the evaluation and to accept or reject safety risks within their specific area of operation.

Safety risks which may have an impact on several different departments are reviewed during the SQRB.

Since hazards can be identified through many various means the following gives guidelines on how the hazards data is used within Luxair:

Reporting

All safety reports received by the Safety Department are risk assessed after reception. This is a reactive assessment since the actual outcome of the event/incident is risk assessed. Maintenance reports are risk assessed by the maintenance department.

All risks with a severity of moderate or higher have to be reported to the Safety Manager who will then inform the respective Nominated Person. The acceptance of the risk resides with the Nominated Person and

Frequency					
	Never happened in the industry	Happened in the industry	Happened in the company	Happened often in the industry	Happened often in the company
	Rare	Unlikely	Possible	Likely	Almost certain
Insignificant	Minimal	Minimal	Low	Low	Moderate
Minor	Minimal	Low	Low	Moderate	High
Moderate	Low	Low	Moderate	High	High
Major	Low	Moderate	High	High	Extreme
Catastrophic	Moderate	High	High	Extreme	Extreme

Target Setting, Safety Performance Monitoring

Cabin													
Safety Performance Indicator	N°	Data source	Objectives	N°	Performance								
					1	2	3	4	5	6	7	8	9
					Qtr 1			Qtr 2			Qtr 3		
Number of occurrence reports received		AQD	Maintain the reporting rate										
Lead time for reaction to recommendations. Maximum 1 month.		AQD	Maintain timely reaction to recommendations										
Presence of nominated person/head of department or deputy during SQAG/SQRB		Meeting minutes											
Number of changes for which a formal change management has been performed			All changes which may have an effect on safety should be analysed be it only with the first page of our document										
Identify contracted activities which perform safety relevant tasks and document													
Number of risk cases done			Complete the risk cases below plus 3 others according occurrences during the year.										

Risk cases to be done	Status
Handling of hand luggage (together with ground)	
Handling of special request (e.g. oxygen generators, wheelchairs, PRM and CRD seats together with ground)	
Handling of medical sickness of crew (e.g. communication with health and safety together with flight ops)	
Pushback with passengers not seated	
Operation in severe weather (together with flight ops and OCC)	
Own alcohol on board	

Change Management - Preliminary Safety Assessment

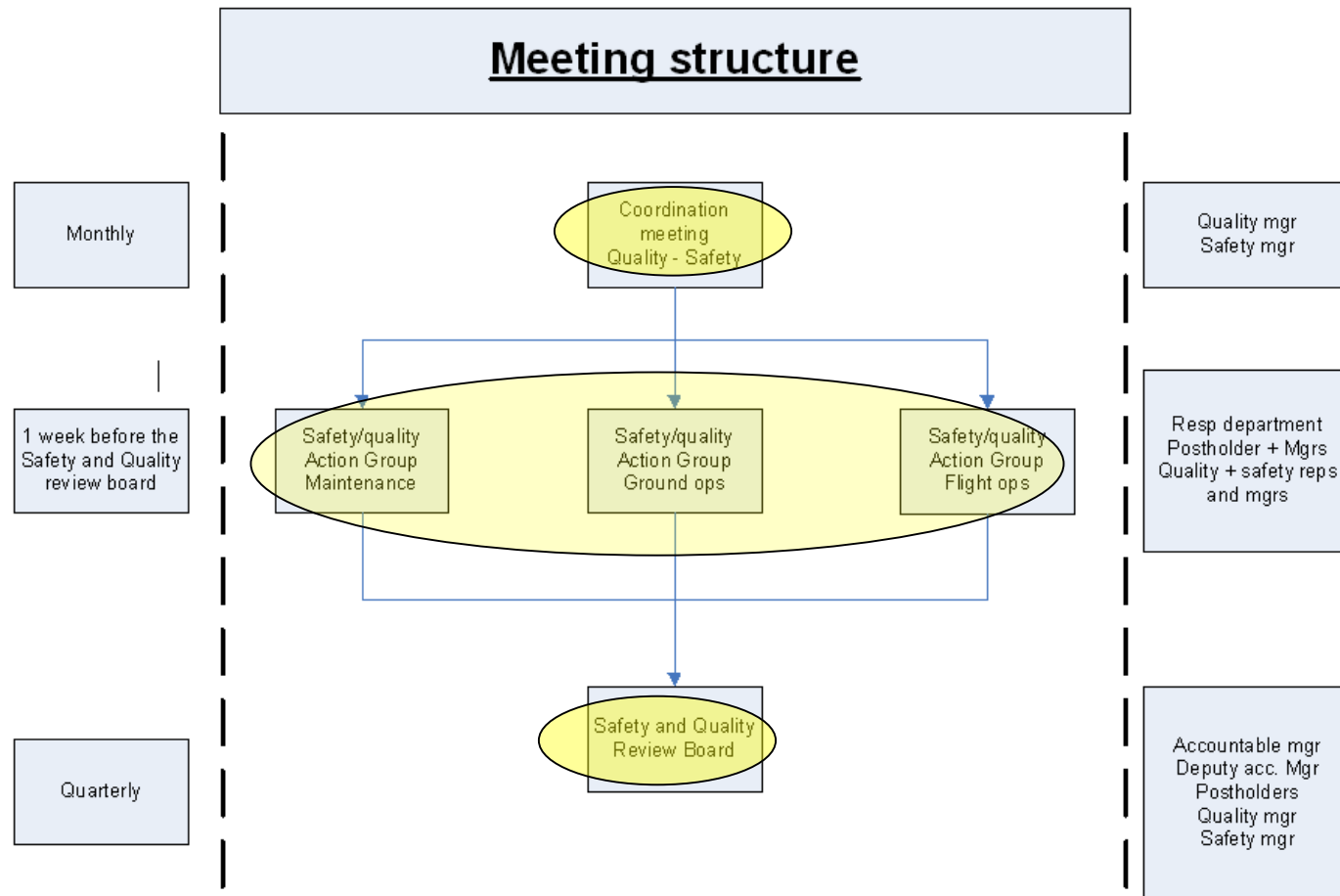
Change Management

1 Type of operation or activity	2 Generic hazard		3 Specific components of the hazard	
<input type="text"/> If other, Specify <input type="text"/>	<input type="text"/>		<input type="text"/>	
4 Hazard related consequence	<input type="text"/>			
5 Existing defenses to control safety risk, associated safety risk index and safety risk tolerability	1 <input type="text"/> 2 <input type="text"/> 3 <input type="text"/> 4 <input type="text"/> 5 <input type="text"/>	Probability: <input type="text"/> Severity: <input type="text"/> Risk index: <input type="text"/> Safety risk tolerability: <input type="text"/>		
6 Further actions to reduce the safety risks, associated safety risk index and safety risk tolerability	1 <input type="text"/> 2 <input type="text"/> 3 <input type="text"/> 4 <input type="text"/> 5 <input type="text"/>	Probability: <input type="text"/> Severity: <input type="text"/> Risk index: <input type="text"/> Safety risk tolerability: <input type="text"/>		
7 Time limit for implementation of further actions, person responsible and follow-up	Time limit 1 <input type="text"/> 2 <input type="text"/> 3 <input type="text"/> 4 <input type="text"/> 5 <input type="text"/>	Person responsible 1 <input type="text"/> 2 <input type="text"/> 3 <input type="text"/> 4 <input type="text"/> 5 <input type="text"/>		
8 Remarks, risk acceptance and person who accepted the risk	Remarks <input type="text"/>	Risk accepted <input type="checkbox"/> Yes <input type="checkbox"/> No	Person who accepted the risk <input type="text"/>	Signature <input type="text"/>

- Recommendations
 - Investigations
- Preventive actions
 - Risk Management
 - Change Management
- Corrective actions
 - Safety Audits and Safety Inspections

- Meeting structure ensures and monitors implementation

Monitoring of the implementation



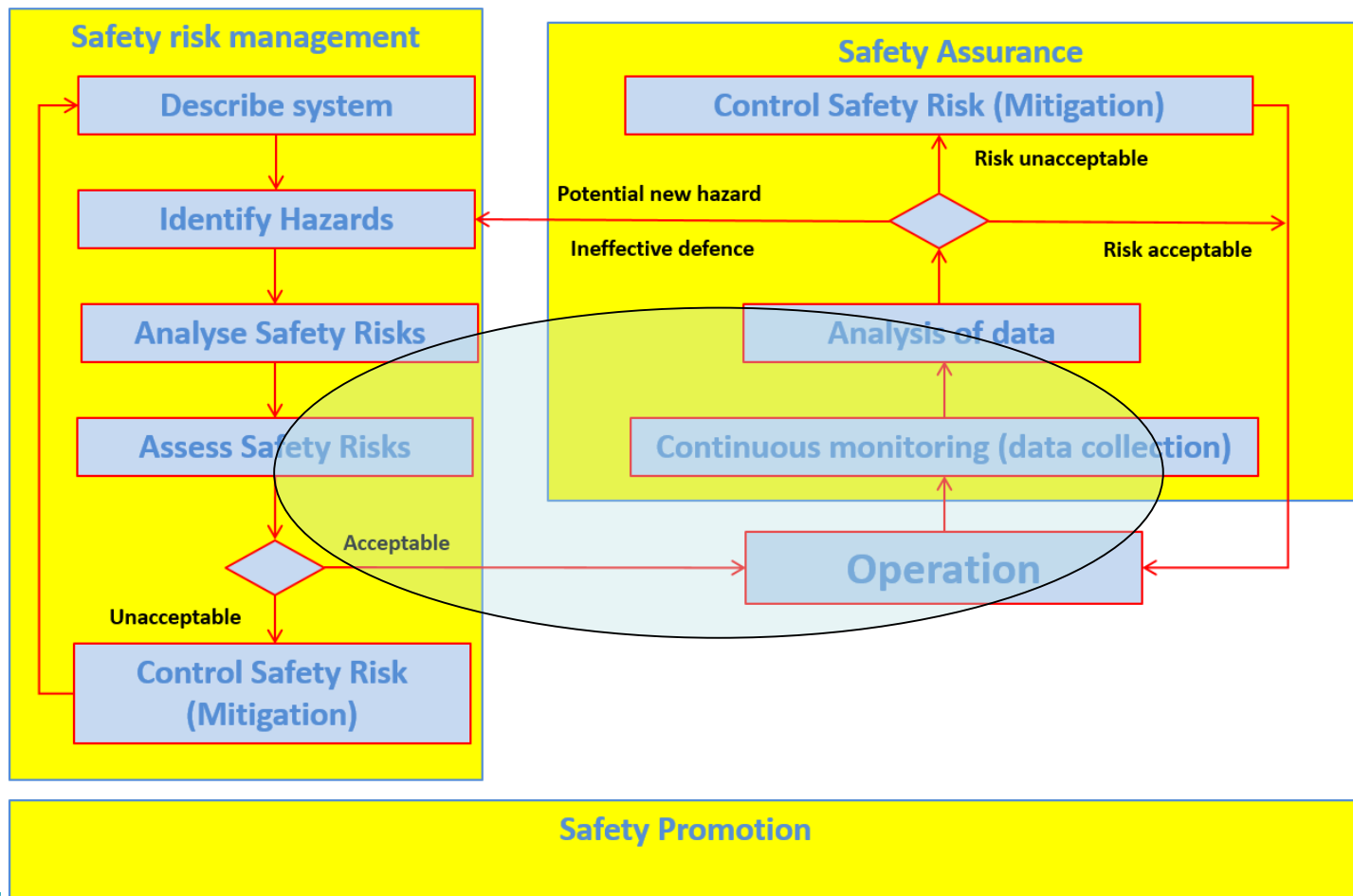
Annual review of mitigation actions

Review of Mitigation Actions 2017

Reference	Finding	Action	Status	Implementation	Remark	Last Review					
A286-17	Review of flight data out of office hours	Provide Safety department with the means to review flight data in a timely manner out of hours (support for maintenance control)	Effective	Implemented		14.03.2018					
A287-17	Structural e-mail alert with flight data extract attached	Change management to be done to cover this process on use of BAFDA between Safety and Luxair Technics. Check with BAFDA software provider FDP. Review presented options with Luxair Technics department with consideration to current 'OFDM Memorandum of Understanding' agreement between Luxair representative and Comité Mixte and regulation (EU) 965/2012 ORA.AOC.130 covering use of Flight Data Monitoring for airworthiness requirements	Unknown	In progress	Change management done. Coordination meeting for procedure adaptation to come. Waiting for test drive to be installed in Technics for trial phase	14.03.2018					
A288-17	Journal file e-mail alert	Change Management to be done to cover this process on use of BAFDA between Safety and Luxair Technics. Check with BAFDA software provider FDP. Review presented options with Luxair Technics department with consideration to current 'OFDM Memorandum of Understanding' agreement between Luxair representative and Comité Mixte and regulation (EU) 965/2012 ORA.AOC.130 covering use of Flight Data Monitoring for airworthiness requirements	Unknown	In progress	Change management done. Coordination meeting for procedure adaptation to come. Waiting for test drive to be installed in Technics for trial phase	14.03.2018					
A289-17	AMM	Request Bombardier review ATR72-600 50-06 to be compliant with our setup. Alternatively develop an internal process to coordinate our EFB	Unknown	In progress	Under discussion	14.03.2018					
A290-17	Crew judgement vs presented G value	Consideration to flight crews on the importance of torque application and not pitch to reduce rate of descent. Also that a rapid increase in pitch just prior touchdown may in fact	Unknown	Rejected	Communication will	14.03.2018					

Closing the loop

Safety policy and objectives



The words "THANK YOU" in a large, bold, blue, sans-serif font, centered against a background of a bright blue sky with scattered white clouds. A horizontal bar with a red and blue gradient is visible at the top of the image.

THANK YOU