Safety Data Collection and Processing Systems in Aviation (SDCPS) The case of Zambia.

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Presentation Content

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Presentation Objective

- To provide an overview of the Safety Data Collection and Processing System (SDCPs) for Zambia, highlighting key developments, current status, and future aspirations.

Introduction

- Zambia's Safety Data Collection and Processing System (SDCPS) enhances safety data management across sectors, ensuring robust governance, evidence-based, and data-driven decision making.

- The establishment of Zambia’s SDCPS commenced after the transformation of the Department of DCA into the Civil Aviation Authority in 2015 and has made steady strides since then.

Authority

As per Annex 19, Section 5, Subsection 5.1.1, SDCPS encompasses systems, databases, and schemes for processing, reporting, and exchanging safety information, including:

- Accident and incident investigation records
- Mandatory incident reporting systems
- Voluntary incident reporting systems
- Self-disclosure reporting systems

Authority

The Safety Management Systems Manual (SMS) 4th Edition of 2018 encourages organizations to implement Safety Data Collection and Processing Systems (SDCPS) to ensure compliance and enhance safety.

Key aspects include:

- Data Collection
- Analysis
- Data Protection
- Reporting
- Integration

Authority

- The Zambia Civil Aviation Requirements (ZCARs) Part 15, Revision 2 of 2021, authorizes the implementation of Safety Data Collection and Processing Systems (SDCPS) to enhance aviation safety.

Background (Where we have come from)

- The Civil Aviation Authority (CAA) was ***established by Act No. 7 of 2012***, in 2015 as an autonomous Aviation Regulator. This was in line with international best practice and to enable the creation of an effective safety oversight authority (CAA) in Zambia.
- **ZCARS Introduced**: Established Regulations under Act No. 7 of 2012 to domesticate Annex 19 requirements.
- **TGMs Developed**: Standardized procedures and guidance for safety data submission.
- **Safety Data Systems Order issued**: Mandated internal instructions for collecting, storing, and analyzing aviation safety data in Zambia.

Data Collection

And so many more

Data Processing

- Consideration is made to the collected data in relation to safety data processing, including: data quality, aggregation, fusion, and filtering.

Data Quality

Data Quality relates to data that is clean and fit for purpose. It involves the following aspects;

- Cleanliness
- Relevance
- Timeliness
- Accuracy and Correctness

Aggregation of Safety Data and Safety Information

- Data Aggregation is when safety data and safety information is gathered and stored in the organization's SDCPS and expressed in a summary form for analysis.

Data Fusion

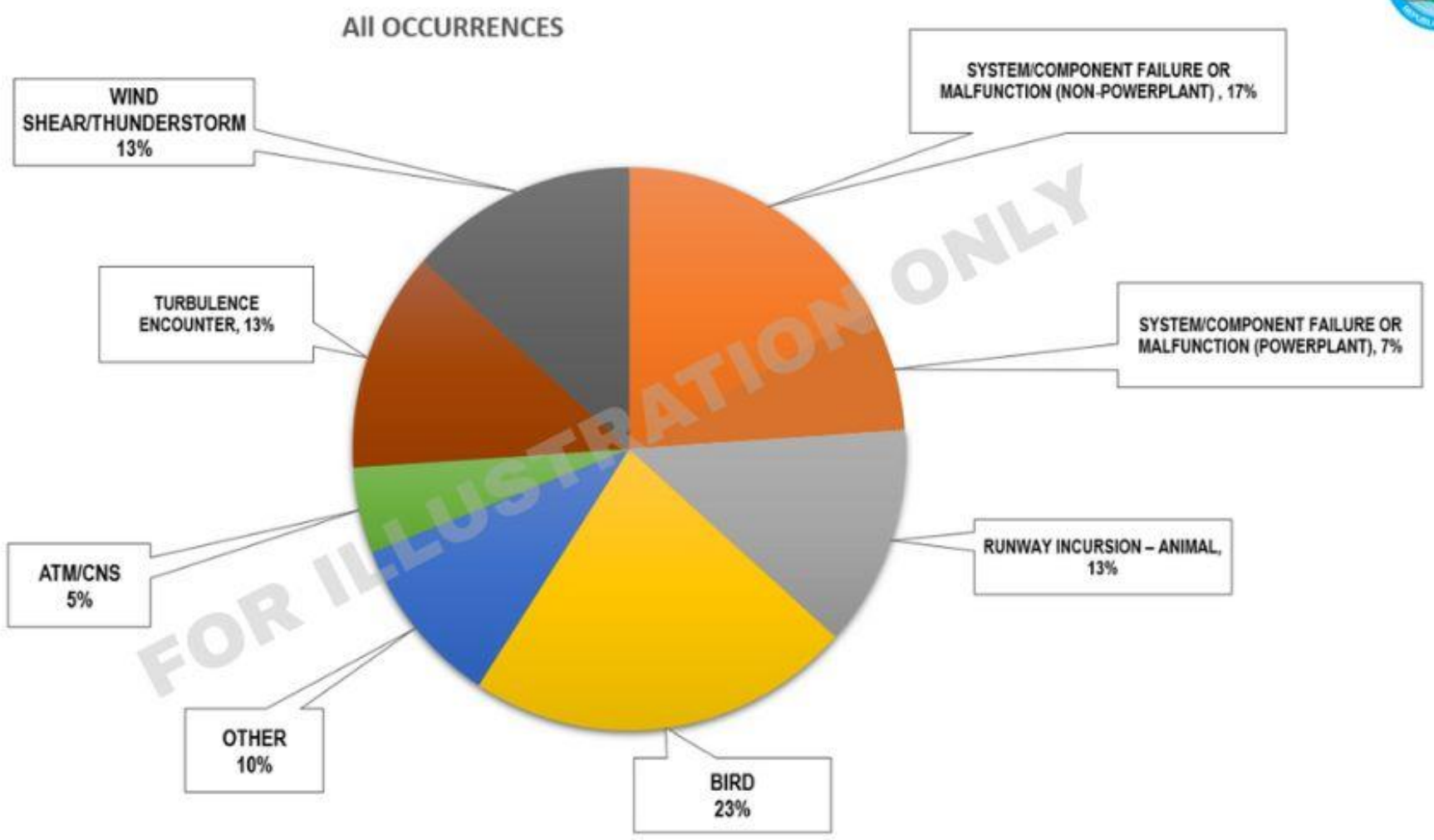
- Data fusion is the process of merging multiple safety data sets to produce more coherent, linked and useful safety data than that provided by any individual set of safety data.

Filtering of Safety Data and Safety Information

- Safety data filtering refers to a wide range of strategies or solutions for refining safety data sets.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	SERIAL NO.	DATE OF OCCURRENCE	DATE REPORTED	AIRCRAFT TYPE	AIRCRAFT (INVOLVED) REGISTRATION	OPERATOR CATEGORY	OPERATOR	LOCAL/FOREIN	LOCATION	OCCURRENCE GROUP	CATEGORY OF OCCURRENCE	DESCRIPTION	INFORMATION SOURCE	INFORMATION RECEIPTIENT	INVESTIGATORS
3	2	4-May-23	5-May-23	BE 55	9J-XXX	Commercial	Local	Commercial	OTHER	AIRCRAFT	SYSTEM/COMPONENT FAILURE OR MALFUNCTION (NON-POWERPLANT)	9J-XXX Expereienced left main landing gear tyre burst on landing. No damage to the aircraft.			
5	4	7-May-23		C206	9J-XXX	Commercial		Local	KKIA	AIRCRAFT	SYSTEM/COMPONENT FAILURE OR MALFUNCTION (NON-POWERPLANT)	On 7th at 0704 UTC, 9JXXX after landing, reported having a flat tyre RFS were called and assisted. The aircraft taxied to the hangars safely.	ZACL		
6	5	8-May-23		C401	9J-XXX	Commercial		Local	KKIA	AIRCRAFT	SYSTEM/COMPONENT FAILURE OR MALFUNCTION (NON-POWERPLANT)	On the 8th at 07.41 UTC, 9JXXX while taxiing for circuits and landing, returned to the hangars at taxiway A1 due to technical problem.	ZACL		

	N	O	P	Q	R	S	T	U	V	W
1	INFORMATION RECEIPTIENT	INVESTIGATORS	STATUS	CASUAL FACTORS (TECHNICAL, TRAINING (PILOT/ATC/ENGINEER), PROCEDURAL DEVIATION, FATIGUE, WORKLOAD PEAK, WEATHER)	PROBABLE CAUSE	CONSEQUENCE	IMPACT	LIKELIHOOD	INHERENT RISK RATING	ROOT CAUSE
3										
5										
6										


All OCCURRENCES
WIND SHEAR/THUNDERSTORM 13%
SYSTEM/COMPONENT FAILURE OR MALFUNCTION (NON-POWERPLANT) , 17%
TURBULENCE ENCOUNTER, 13%
SYSTEM/COMPONENT FAILURE OR MALFUNCTION (POWERPLANT), 7%
ATM/CNS 5%
RUNWAY INCURSION – ANIMAL, 13%
OTHER 10%
BIRD 23%
FOR ILLUSTRATION ONLY

Data Analysis

- Data is analyzed for the purposes of adding value, making such data useful.
- Such analysis includes Aviation Safety Risk Analysis.
- Aviation Safety Risk Analysis is the process of evaluating safety hazards, determining the likelihood (probability) and severity of associated outcomes, and identifying effective mitigation strategies to manage or reduce those risks.

Safety Risk Probability Table

Table 1. Safety risk probability table

Likelihood	*Meaning*	*Value*
Frequent	Likely to occur many times (has occurred frequently)	5
Occasional	Likely to occur sometimes (has occurred infrequently)	4
Remote	Unlikely to occur, but possible (has occurred rarely)	3
Improbable	Very unlikely to occur (not known to have occurred)	2
Extremely improbable	Almost inconceivable that the event will occur	1

Safety Risk Severity Table

Table 2. Example safety risk severity table

Severity	*Meaning*	*Value*
Catastrophic	• Aircraft / equipment destroyed • Multiple deaths	A
Hazardous	• A large reduction in safety margins, physical distress or a workload such that operational personnel cannot be relied upon to perform their tasks accurately or completely • Serious injury • Major equipment damage	B
Major	• A significant reduction in safety margins, a reduction in the ability of operational personnel to cope with adverse operating conditions as a result of an increase in workload or as a result of conditions impairing their efficiency • Serious incident • Injury to persons	C
Minor	• Nuisance • Operating limitations • Use of emergency procedures • Minor incident	D
Negligible	• Few consequences	E

Risk Matrix

Table 3. Example safety risk matrix

Safety Risk		*Severity*				
Probability		*Catastrophic A*	*Hazardous B*	*Major C*	*Minor D*	*Negligible E*
Frequent	5	5A	5B	5C	5D	5E
Occasional	4	4A	4B	4C	4D	4E
Remote	3	3A	3B	3C	3D	3E
Improbable	2	2A	2B	2C	2D	2E
Extremely improbable	1	1A	1B	1C	1D	1E

Action Plan

Table 4. Example of safety risk tolerability

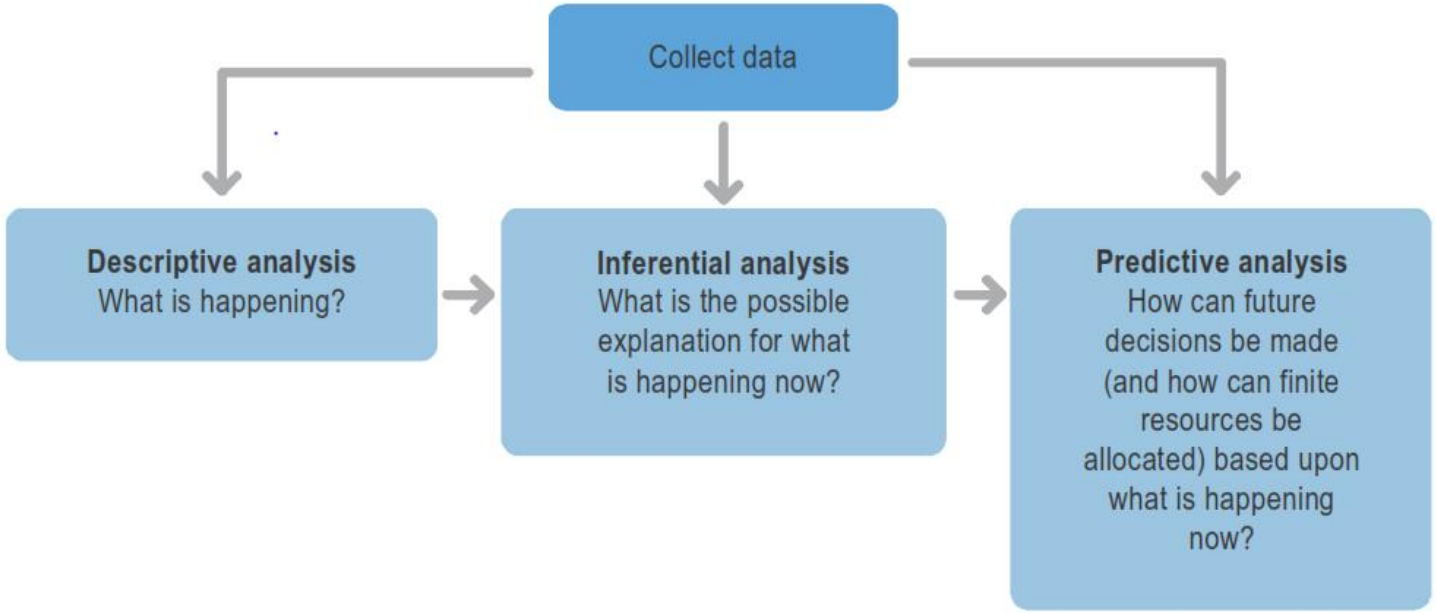
Safety Risk Index Range	*Safety Risk Description*	*Recommended Action*
5A, 5B, 5C, 4A, 4B, 3A	INTOLERABLE	Take immediate action to mitigate the risk or stop the activity. Perform priority safety risk mitigation to ensure additional or enhanced preventative controls are in place to bring down the safety risk index to tolerable.
5D, 5E, 4C, 4D, 4E, 3B, 3C, 3D, 2A, 2B, 2C, 1A	TOLERABLE	Can be tolerated based on the safety risk mitigation. It may require management decision to accept the risk.
3E, 2D, 2E, 1B, 1C, 1D, 1E	ACCEPTABLE	Acceptable as is. No further safety risk mitigation required.

Real World Example

	A	B	C	D	E	F	G	H
1	VARIABLE	RISK FACTOR	NUMBER OF OCCURENCES	PERCENTAGE OF OCCURRENCE	SEVERITY	NUMERICAL SEVERITY VALUE	LIKELIHOOD	INHERENT RISK RATING
2	SYSTEM/COMPONENT FAILURE OR MALFUNCTION (NON-POWERPLANT)	R6	24	17%	D	3	4	4D
3	SYSTEM/COMPONENT FAILURE OR MALFUNCTION (POWERPLANT)	R12	10	7%	B	2	4	4B
4	RUNWAY INCURSION – ANIMAL	R21	18	13%	A	1	4	4A
5	BIRD	R22	32	23%	B	2	5	5B
6	OTHER	R14	14	10%	D	4	2	2D
7	ATM/CNS	R23	7	5%	B	2	3	3B
8	TURBULENCE ENCOUNTER	R29	18	13%	D	4	4	4D
9	WIND SHEAR/THUNDERSTORM	R19	19	13%	D	4	3	3D
10	Total		142	100%				

Heat Map

Data-Driven Decision Making



Mitigation Forums

- The Internal Aviation Safety Committee – comprising inspectorate and other relevant experts (within the CAA).
- The National Aviation Safety Committee – A high state-level committee comprising representatives of institutions relevant to the enhancement and maintenance of safety.

Looking Ahead

- Enhancing the taxonomy
- Simplifying data reporting by making it digital and real-time automated
- Deploy ECCAIRS system to enhance occurrence reporting to ICAO
- Enhancing Data Protection and Data Governance.

Conclusion

- SDCP is an evolving system considering where we have come from, where we are now, and where we are going.
- Zambia's SDCPS, aligned with ICAO Annex 19, enhances aviation safety through robust data collection, analysis, and reporting. Evolving from manual systems to digital solutions like ECCAIRS and Safety Management Oversight Systems (SOMS).