Analysis Workshop

Go to

www.menti.com

Enter the code

3872 4589

Or use QR code

What Data Sources do you use and how do you combine them?.

Runway incursion

Cirium, ICAO, AvHerald, ASN

Eccairs

MOR, Audit results, SAFA results

Audit/Oversight Results

NM traffic data

ECCAIRS old version and E2

Runway incursion

Mentimeter

What Data Sources do you use and how do you combine them?.

Occurance reportsAudit reports

Eccairs dataExposure data (airport movements)

occurrece reports

ECCAIRS, Excel

Eccairs Aircraft RegisterOversight Results

ECCAIRS Aircraft Registered

E2, audit data, AIB data

Reporting systems, seminars, Eurocontrol articles

2

24

What Data Sources do you use and how do you combine them?.

Audit Reports

Accident Investigation Reports

E2 MOR & VOR + oversight data.

Excel, Power BI

Eccairs 2Audit results

MS Power BI

AIG report, quarterly reports from all operators/airports

ADREP reports, flight statistical data, USOAP reports. I combine them to calculate the rates.

What Data Sources do you use and how do you combine them?.

The main ECCAIRS2

Airspace infringement

Pilots involved in the occurrence

Runway Safety Team analysis

Statistic Office

Runway incursionOccurence reportsAudit reportsAdrep reports

Fdm and reportings

ENV data

What Data Sources do you use and how do you combine them?.

ADS-B datasources (Flightradar, e.g.)

Runway incursion

Number of Passenger by airport

MOR, Audit Reports, Voluntary Reports, AIR, Own Developed Occurence Report Base (2016. to 2024)

Flight Radar 24

Aeronautical information service website

Other

Process need to be monitored

Mentimeter

What Data Sources do you use and how do you combine them?.

Occurrnce or incident

An occurence or incident

Only lagging indicators

1

2

24

Mentimeter

What Systems or Tools do you use?

Excel

Excel

MS Power BI

Microsoft Fabric

Excel

Excel

Power BI

Excel, Power BI

2

12

What Systems or Tools do you use?

Excel

Excel

Excel

Exel

MS Power BI

Microsoft Fabric

Excel, Power BI, Tableau

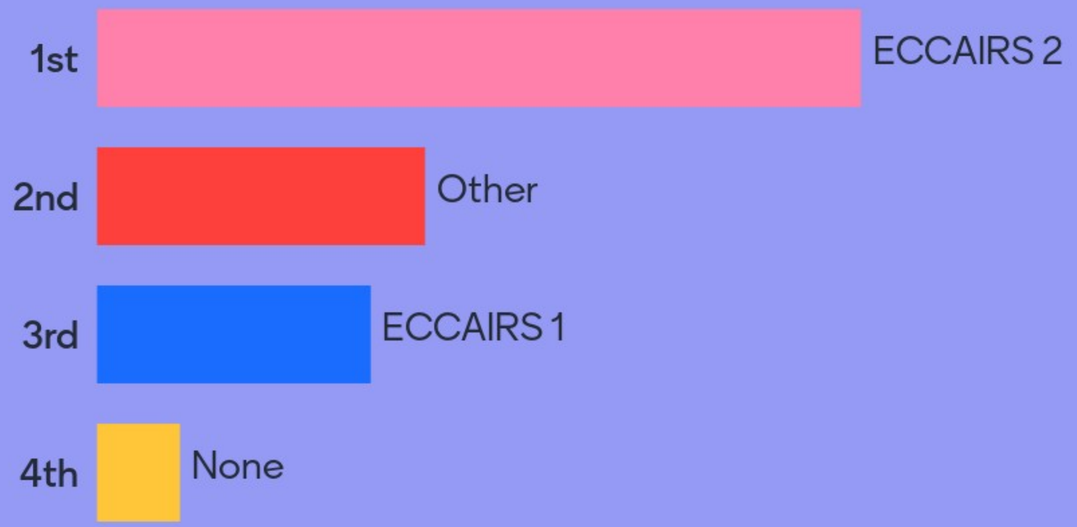
1st

2

12

Gathering Occurrence Data

What Occurrence Reporting SDCPS do you use?



Join the SPI Session

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When you hear SPIs, what do you think or feel?

51 responses

What are SPIs?

SPIs are a metric or quantitative means used to measure and monitor the progress made by a State or a service provider towards achieving a safety objective.

They are defined by ICAO as a data-based safety parameter, used for monitoring and assessing safety performance.

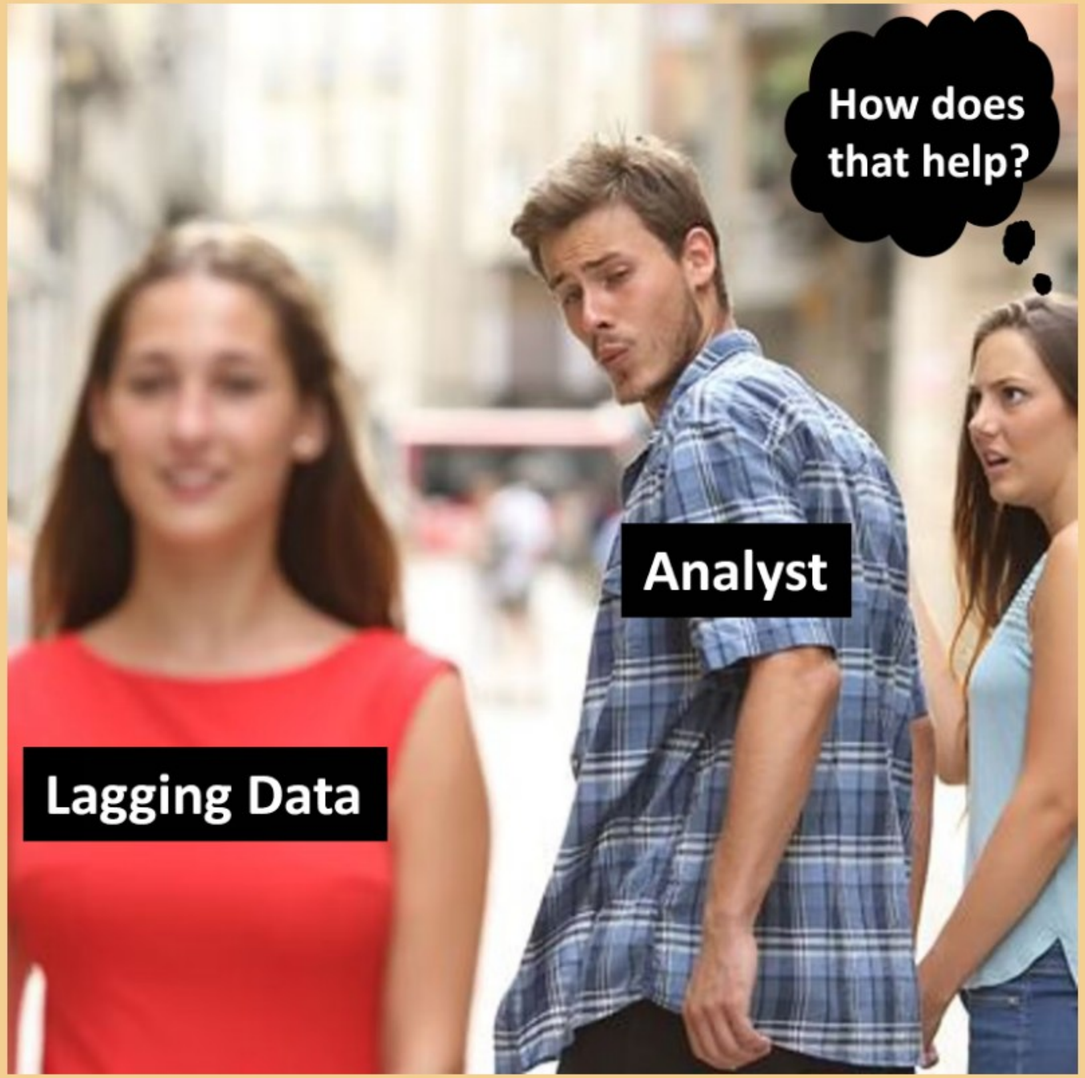
Effective SPIs measure, monitor and trigger action when necessary, reviewing organisational and operational attributes that contribute to safety management activities.

Successful and effective measuring of safety performance uses a combination of leading and lagging indicators.

What is a Lagging Indicator?

Lagging indicators measure events which have already occurred and are based on safety-related events.

The key data source for lagging indicators are occurrence reports. These include accidents, serious incidents, incidents, and contributing factors

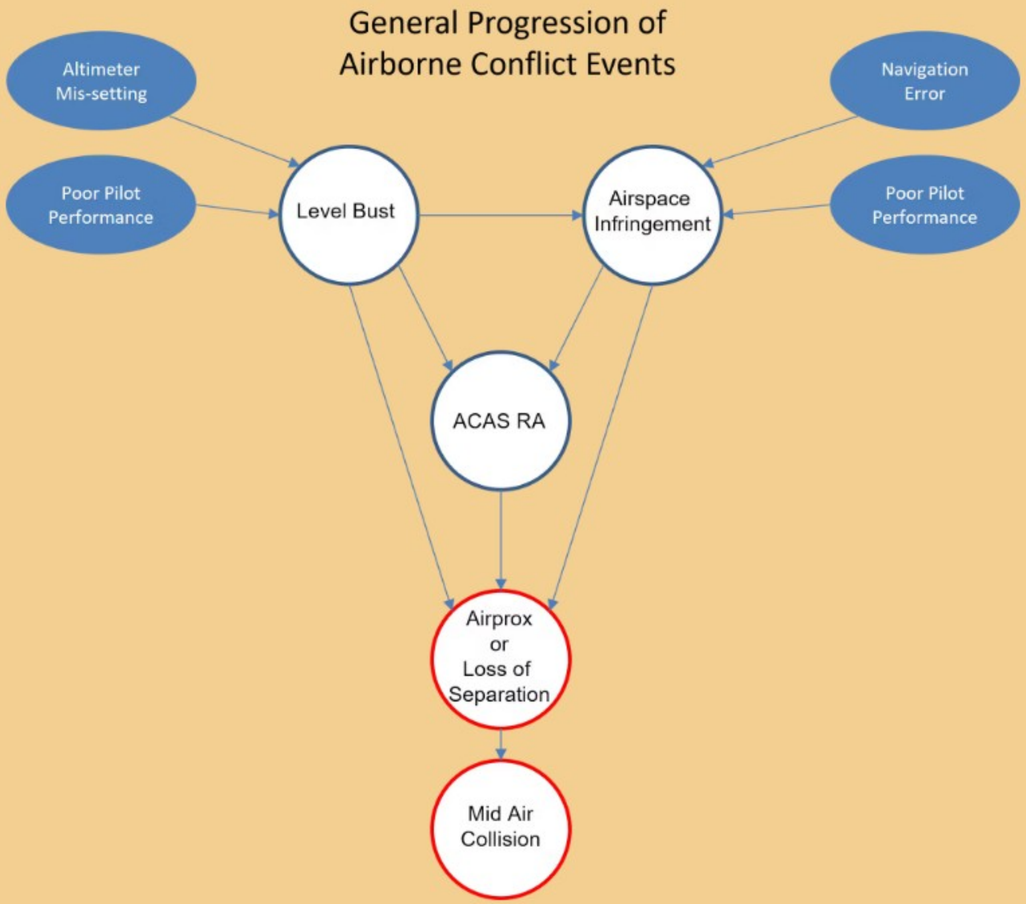


Precursor Events

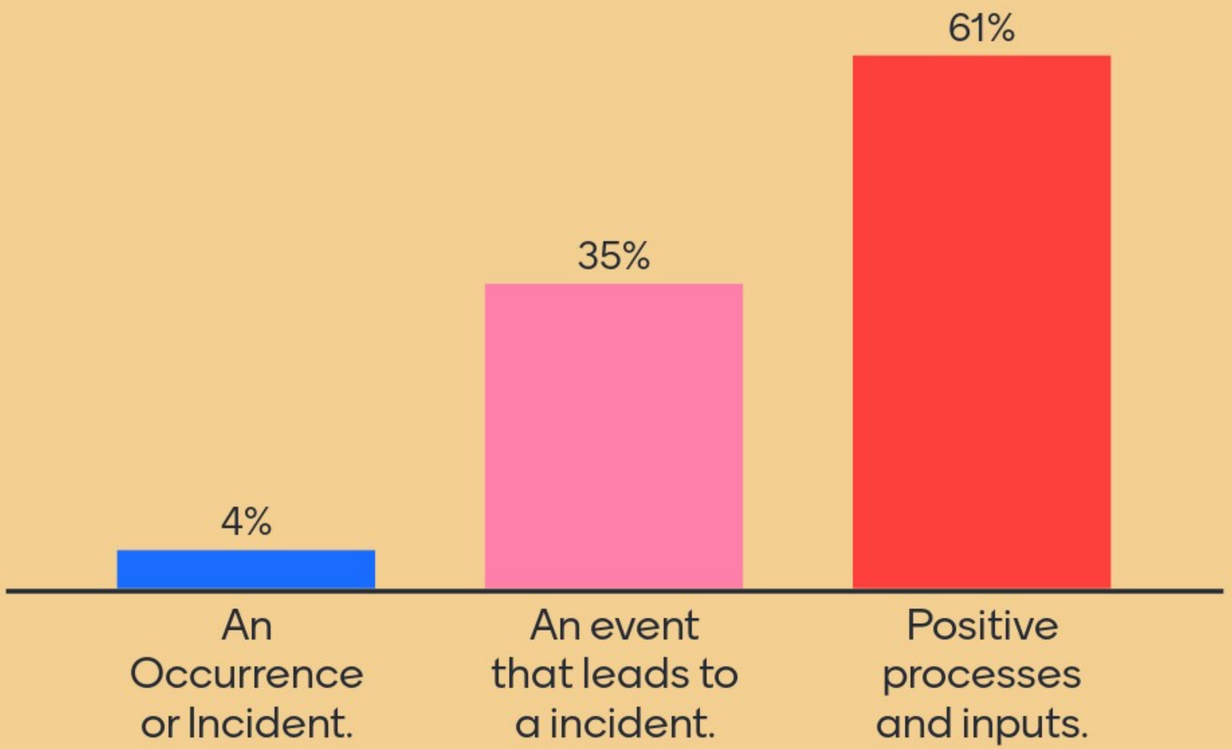
These metrics can be considered as a subset of Lagging Indicators that do not manifest themselves in accidents or serious incidents.

They can occur as an incident themselves or as a condition or factor leading to a more serious incident.

They indicate less severe system failures.



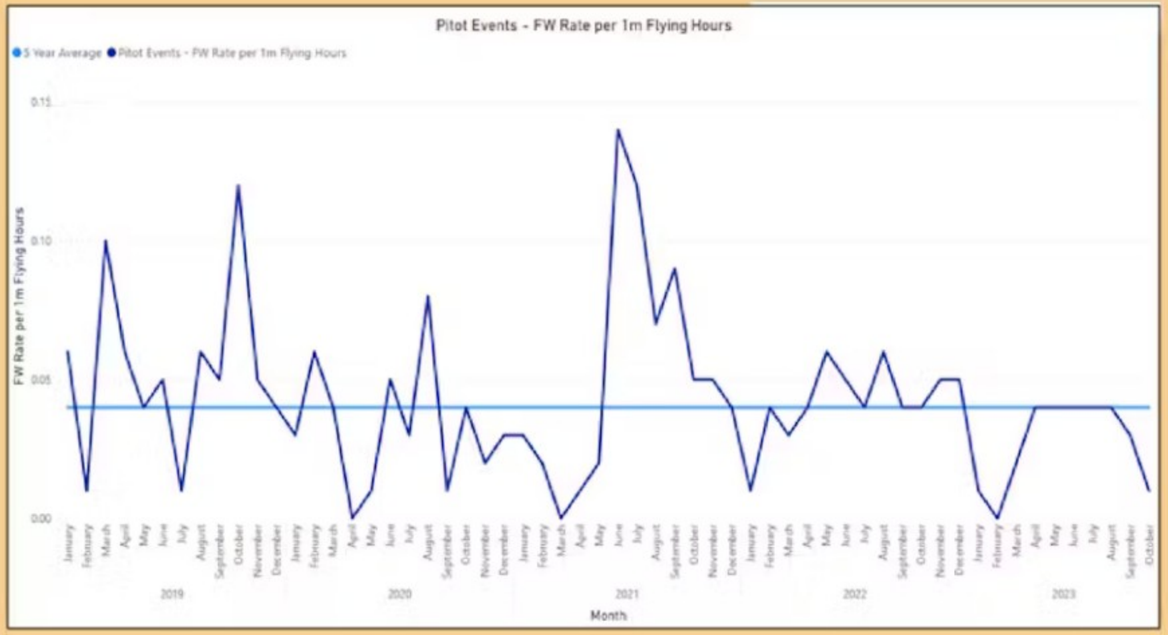
What is a Leading Indicator?



What is a Leading Indicator?

It is a measurement of processes and inputs being implemented to improve or maintain safety.

These are also known as “activity or process SPIs” as they monitor and measure conditions that have the potential to lead to or contribute to a specific outcome aimed at maintaining or improving safety.



What makes a good SPI?

This is a chart, a graph; you can infer trends but how do changes direct activity?

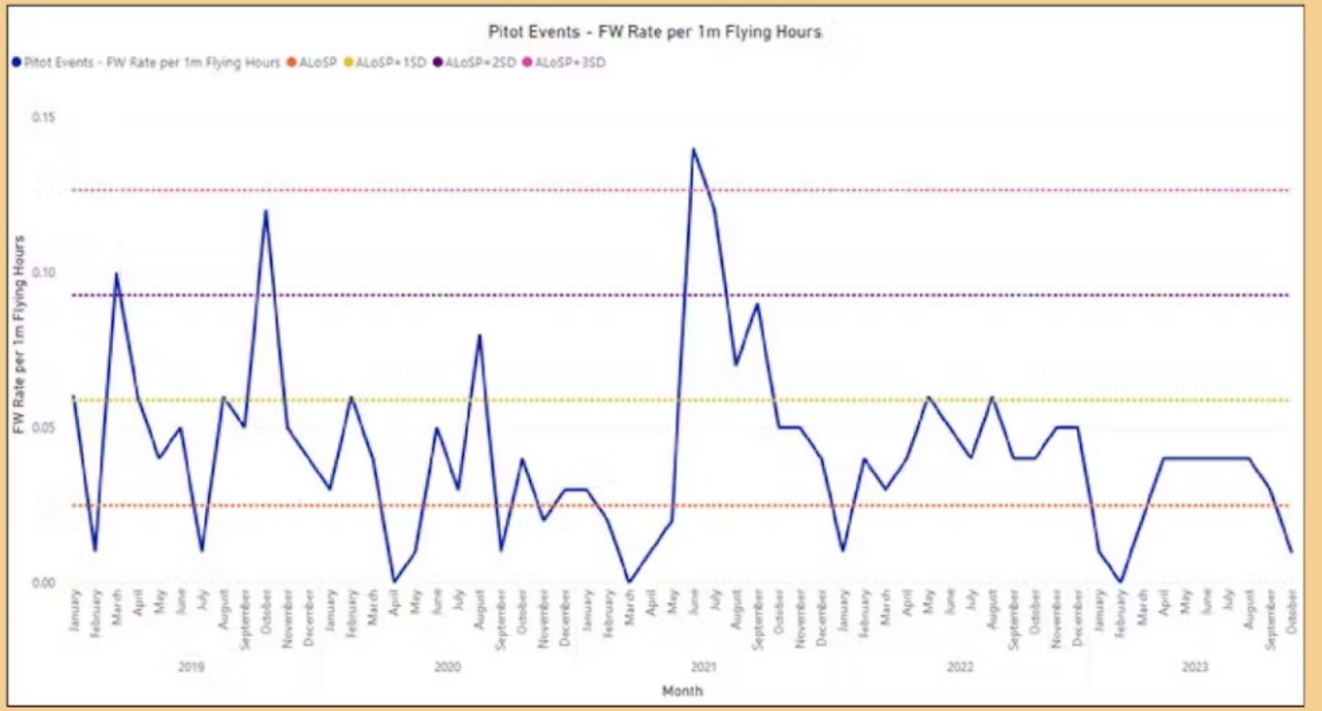
How do we make sense of what the chart is telling us?

When looking at measures which best represents a set of data, defining which type of average is used is important. In terms of averages used with Standard Deviation, this refers to the mean. The mean is the calculation of all the data values divided by the number of values in the dataset.

What makes a good SPI?

With the addition of Standard Deviations and an agreed Acceptable Level of Safety Performance (ALoSP), with activities triggered by breaches of the monitoring lines, this now becomes an SPI.

SPIs should have positive and negative Standard Deviations assigned, this enables the monitoring of fluctuations, the effectiveness of mitigations and potentially the rescoring of Risks.



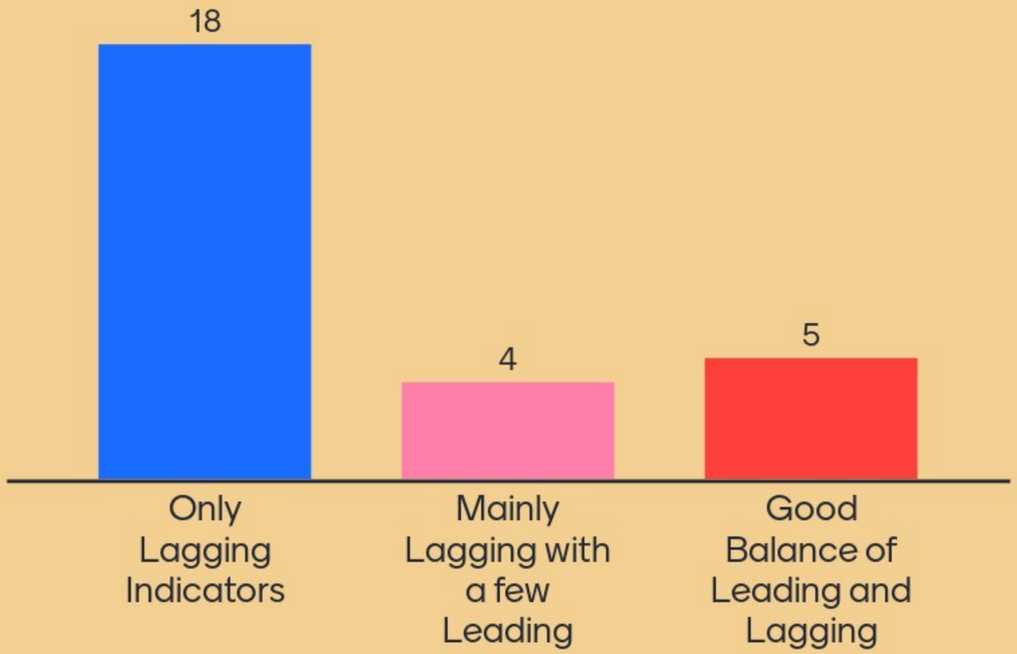
What use are SPIs?

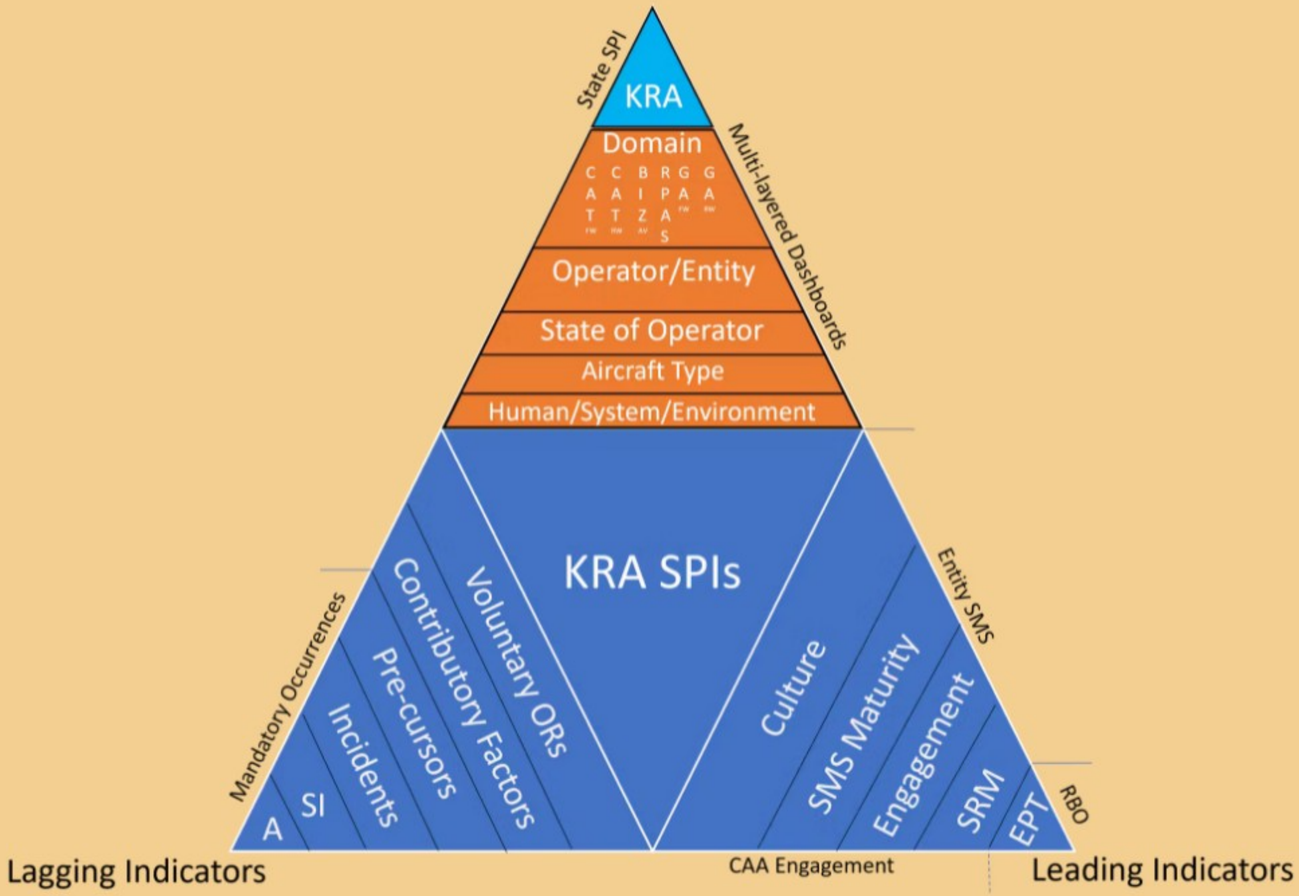
- → Measurement
- → Monitoring
- → Triggering
- → Safety Risk Management
- → Prioritisation
- → Safety Promotion
- → Safety Assurance
- → Resource Saving

What makes a good SPI?

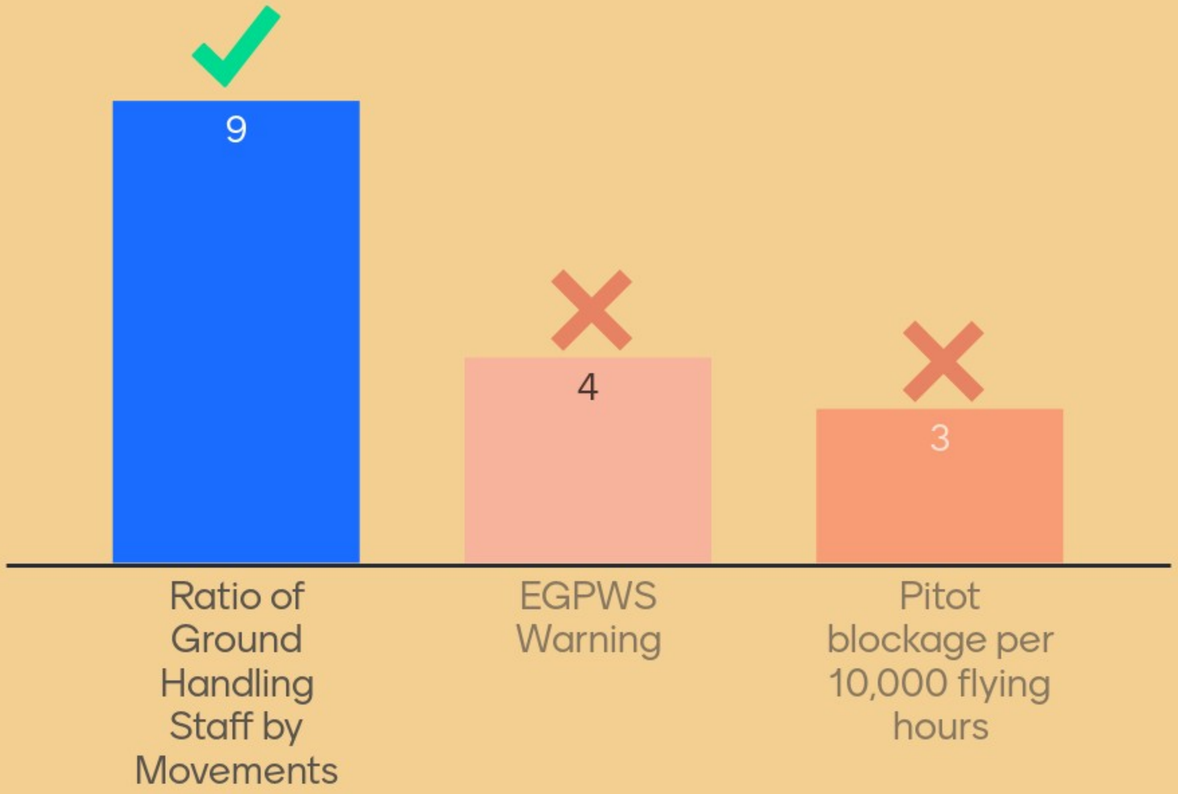
- Repeatable Data
- Normalised Data
- Baseline or ALoSP
- Measures or Triggers
- Actions

What type of SPIs do you currently monitor?

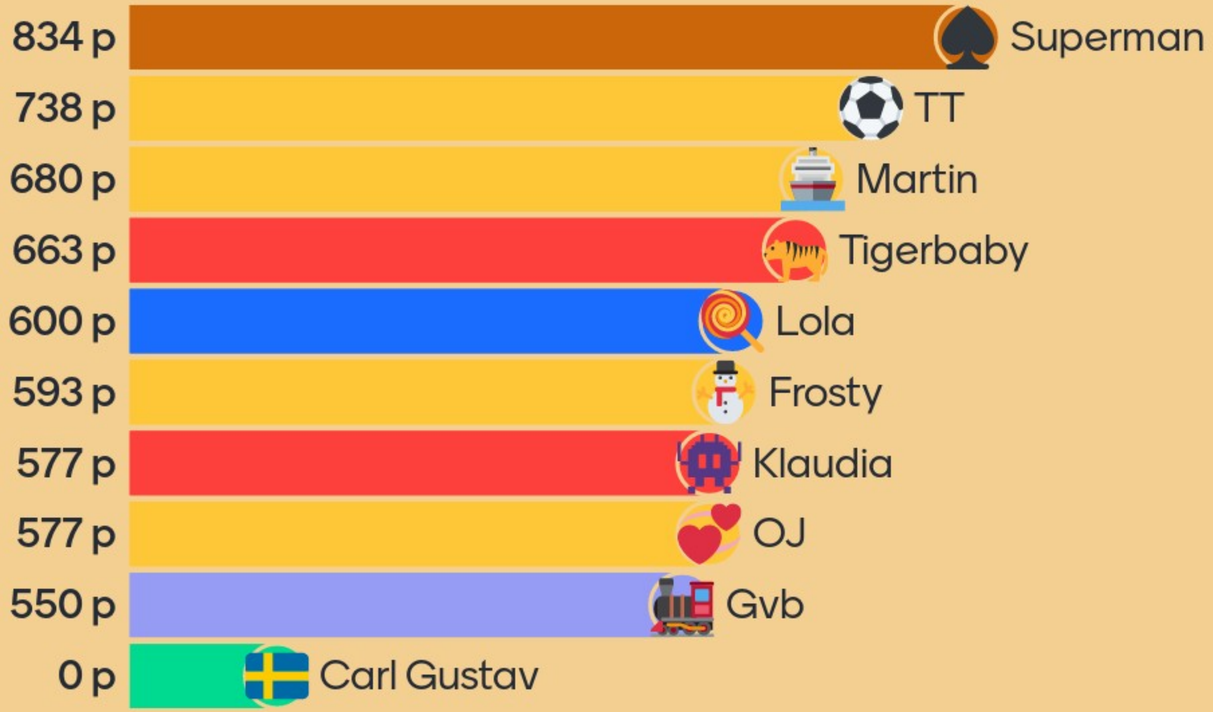



State SPI
KRA
Domain
Operator/Entity
State of Operator
Aircraft Type
Human/System/Environment
Multi-layered Dashboards
KRA SPIs
Mandatory Occurrences
A
SI
Incidents
Pre-cursors
Contributory Factors
Voluntary ORs
Culture
SMS Maturity
Engagement
SRM
EPT
RBO
Entity SMS
Lagging Indicators
CAA Engagement
Leading Indicators

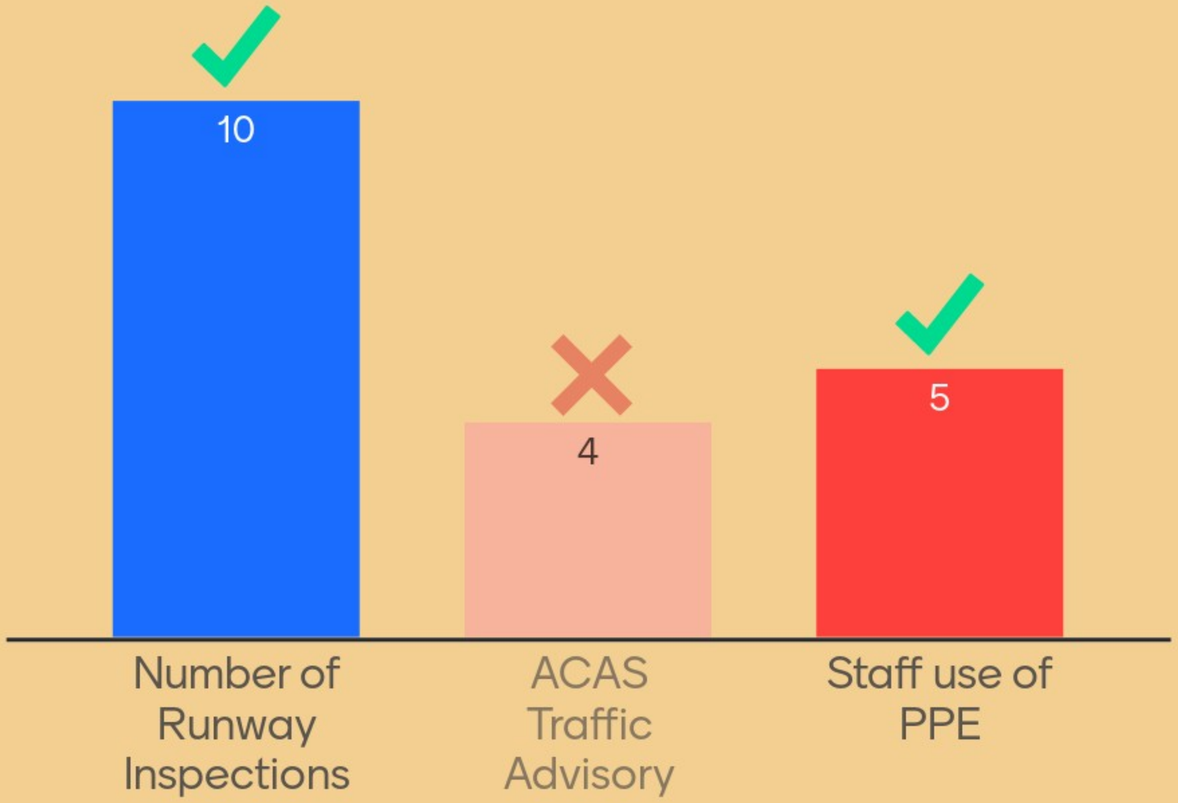
Spot the Leading Indicator



Leaderboard



Spot the Leading Indicator



Leading Indicator?

Mentimeter

Ratio of Ground Handling Staff by Movements

With the right data you could benchmark airports incidents vs staff numbers, so this would be a Leading indicator with Lagging data to assess its effectiveness

EGPWS Warning

This could be a precursor or an incident itself

Pitot blockage per 10,000 flying hours

A good Lagging Indicator but could be better we if we look at aircraft types or locations?

Number of Runway Inspections

A good way of looking at this would be how many inspections are planned per x number of movements and how many were executed.

ACAS Traffic Advisory

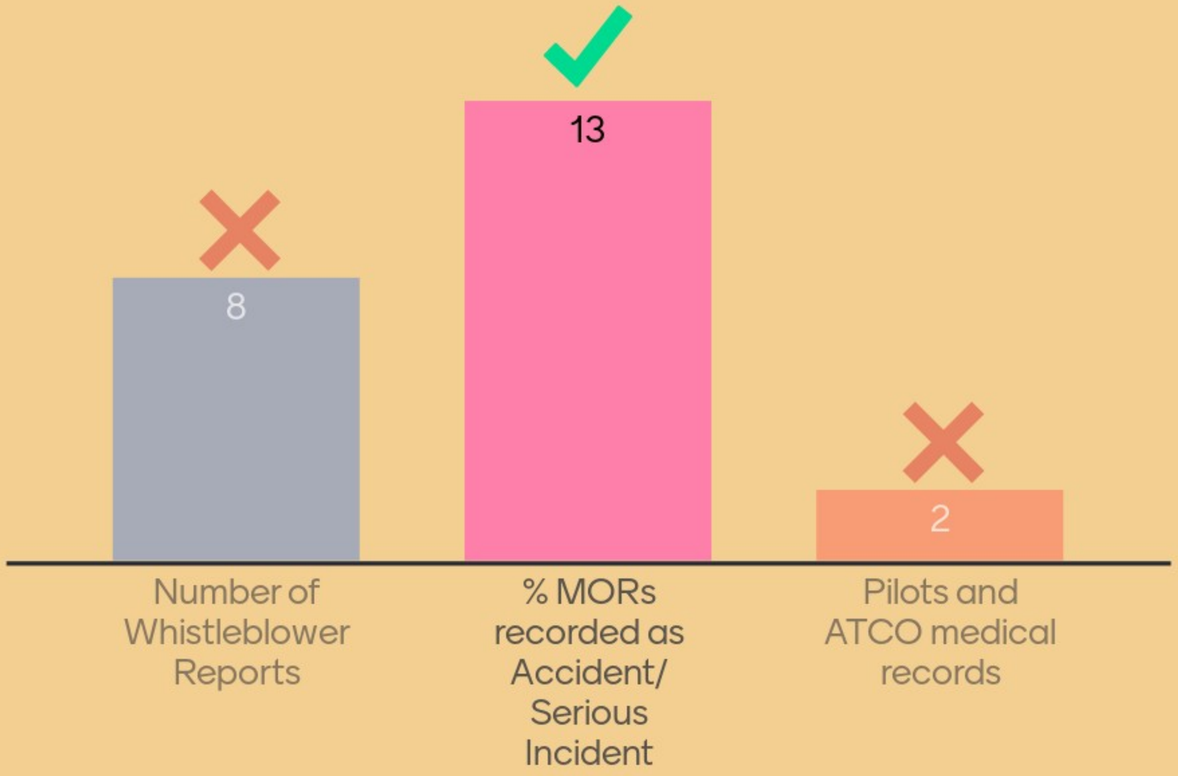
This feeds crews situational awareness, could be an early ‘warning’ precursor.

Staff use of PPE

Grey area? This is what they should be doing! Not using PPE could a contributory factor, a better leading indicator may be around the training and availability of PPE.

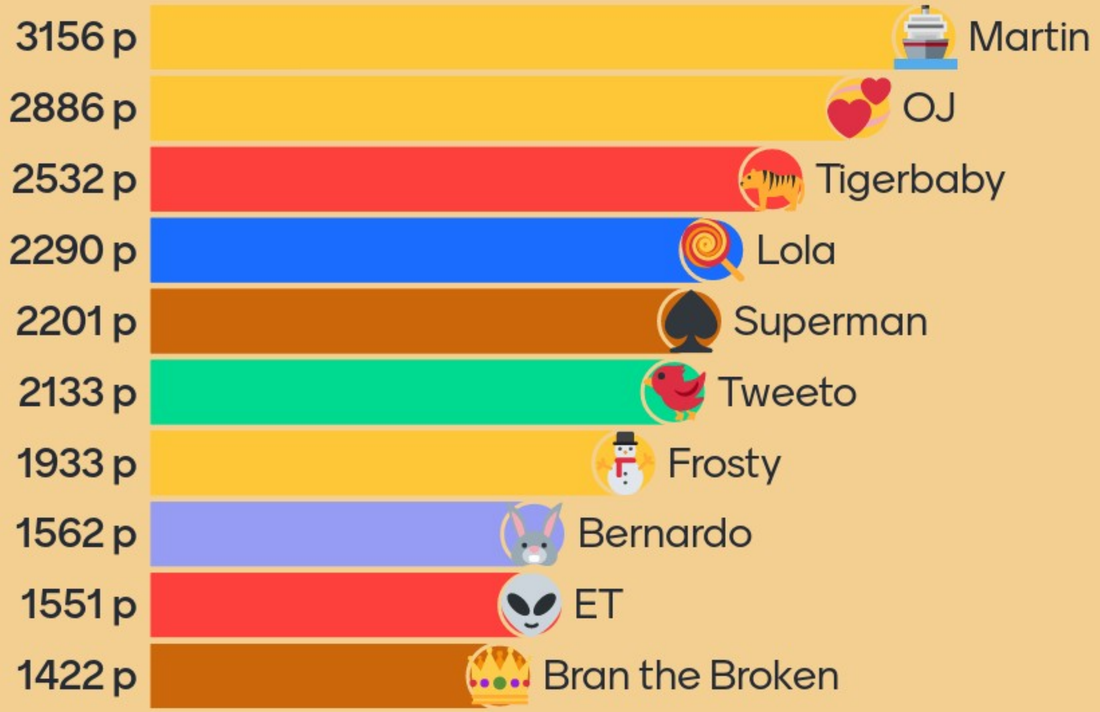
1

Spot the Lagging Indicator



Spot the Lagging Indicator

Leaderboard



Lagging Indicator?

Mentimeter

Number of Whistleblower Reports

It could be a Leading Indicator showing how well the process is operating but does raise questions as to why do reporters feel they cannot use the usual reporting channels, what's the culture like?

% MORs recorded as Accident/Serious Incident

A straightforward high level Lagging Indicator but could do with focus, are you looking at the State Picture or Service Providers?

Pilots and ATCO medical records

What about them? Is this about medical certification failures or self-reporting of medical issues, two different viewpoints? It also depends on who you're looking at, an examiner that never records a failed medical could be suspicious, a pilot self-reporting mental health issues or another medical condition represents a healthy culture and system, there could be several indicators here.

Number of overdue findings

Could be a Leading Indicator monitoring responsiveness to findings, but is it the right measure they could get findings all the time so why is that, is it a problem with them or with you?

Incorrect take off performance calculations

It needs a rate to make it useful but may be difficult to measure. As a precursor or contributory factor, it may or may not be reported if nothing adverse subsequently happened. Consistency of the data we use is important to the quality of an SPI.

MOR Reporting Rate per 10,000 flying hours

It could indicate an underreporting issue but a good preforming service provider with a healthy reporting system may have a few or a lot of MORs so we have to be wary of the So what, what action is to be taken as a result?

1

What are good examples of Lagging Indicators?

Number of birdstrike reportsNumber of ACAS RA reports

VOR precursorIncidents

Number of airspace infringement

Number if birdstrikesNumber of RWY incursions

number of incidents

Rate of RI

number of incidents

Quality of analysis

What are good examples of Lagging Indicators?

Number of reported acas.Number of CFIT.Number RI?

Number of incidents, number of acc, number of SI, Rate of AI, Rate of RI,

Number of voluntary reports.

Rate of serious incidents

SMS Maturity level

Training completion rates

Number of inspectors

Number of mecanics

Mentimeter

What are good examples of Lagging Indicators?

SMS maturity levels

Training completion rates

percentage audit performed

weak data

Number of mecanics

Percentage of safety oversight program completed

Number of workshoops about birdstrikes Number of pilots successfuly pass the training

Rate of available inspectors position nation-wide

14

What are good examples of Lagging Indicators?

Percentage of audits performed

NumbePercentage of safety training for inspectors completedr of audits perfomed.Number of audits perfomedNumber of ACAS inspection.

Rate of safety oversight program completed

organisation turnover rate

E2

Exposure data

Audit data

MOR/VOR

What are good examples of Lagging Indicators?

ECCAIRS2

ICAO AD data

ICAO AC data

MOR, VOR

ECCAIRS 2ECCAIRSAudit resultsTrafic data by airport

What are good examples of Leading Indicators

Percentage of safety training for inspectors completed

SoE

FDM coverage rate

Runway incusion

Number of audits perfomed

Test

SMS maturity level

reporting culture

What are good examples of Leading Indicators

Number of ACAS inspection.

training completion rate

Number of mecanics

organisation turnover rate

Rate of available inspectors postion nation-wide

Percentage of audits performed

ECCAIRS

ECCAIRS data

What are good examples of Leading Indicators

ECCAIRS2

Occurance data

ECCAIRS data

Audit data

Occurrence reporting system

Reporting and number of flights

Surveys

FDM reps form SP, reports, assessments, official warnings

What are good examples of Leading Indicators

Notification vs safety event

ECCAIRS / Audit

input from service providers

What data sources to you use for your SPIs?

ECCAIRS

ECCAIRS

Audit results

Eccairs 2

occ reportsfindings

AIG investigation reports

Occurence reportsInspectionsAudit reportsSMS

ECCAIRS data

Mentimeter

What data sources to you use for your SPIs?

MOR in ECCAIRS

ECCAIRS2

Audit data

Trafic data by airport

Eccairs 2, audit results

MORs, Audit inspections findings,

Occurrence data

Service providers data

16

What data sources to you use for your SPIs?

Surveys

Reporting and Traffic data airports

Eccairs

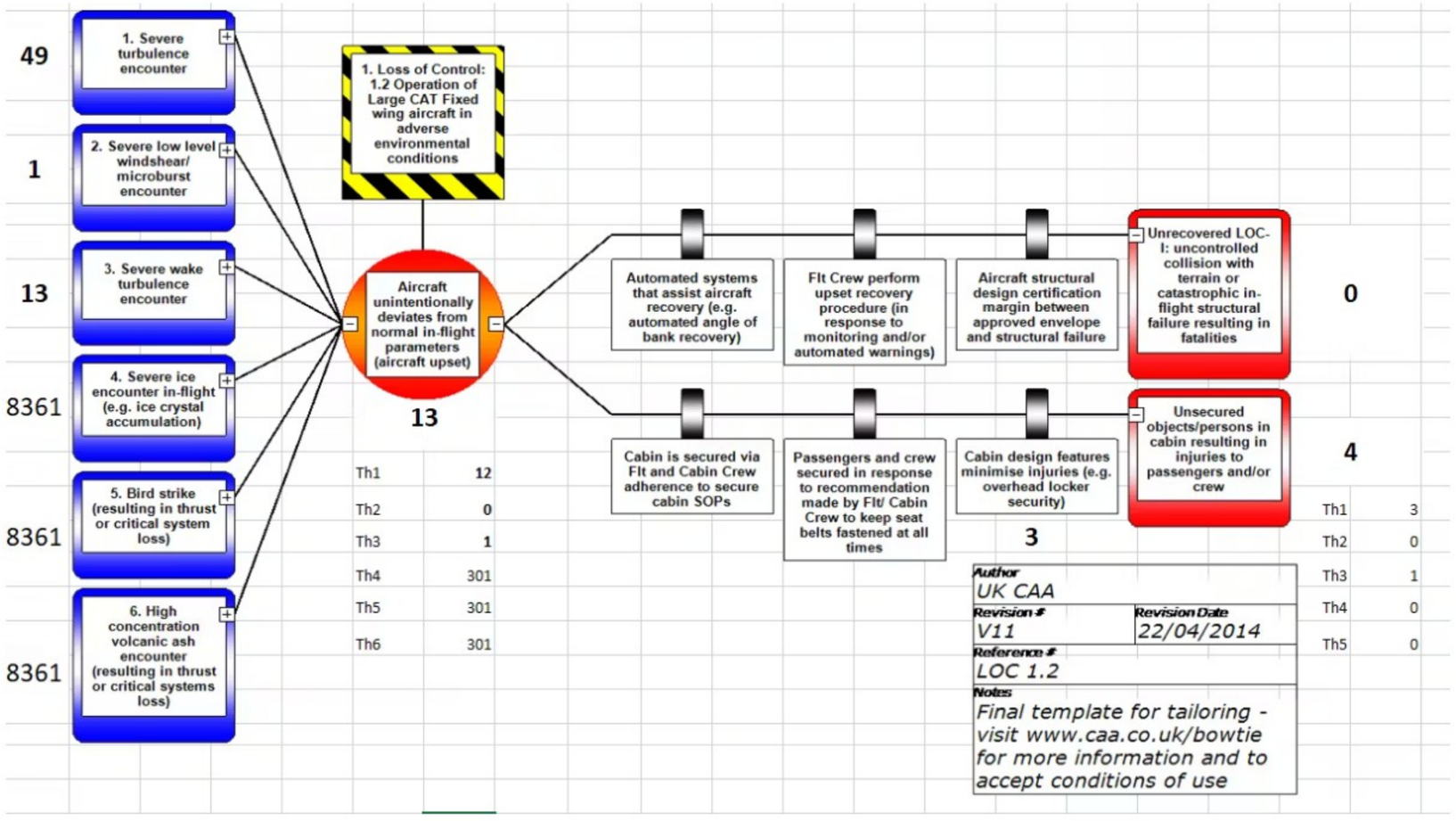
kpi of the organisation

Input from service providers

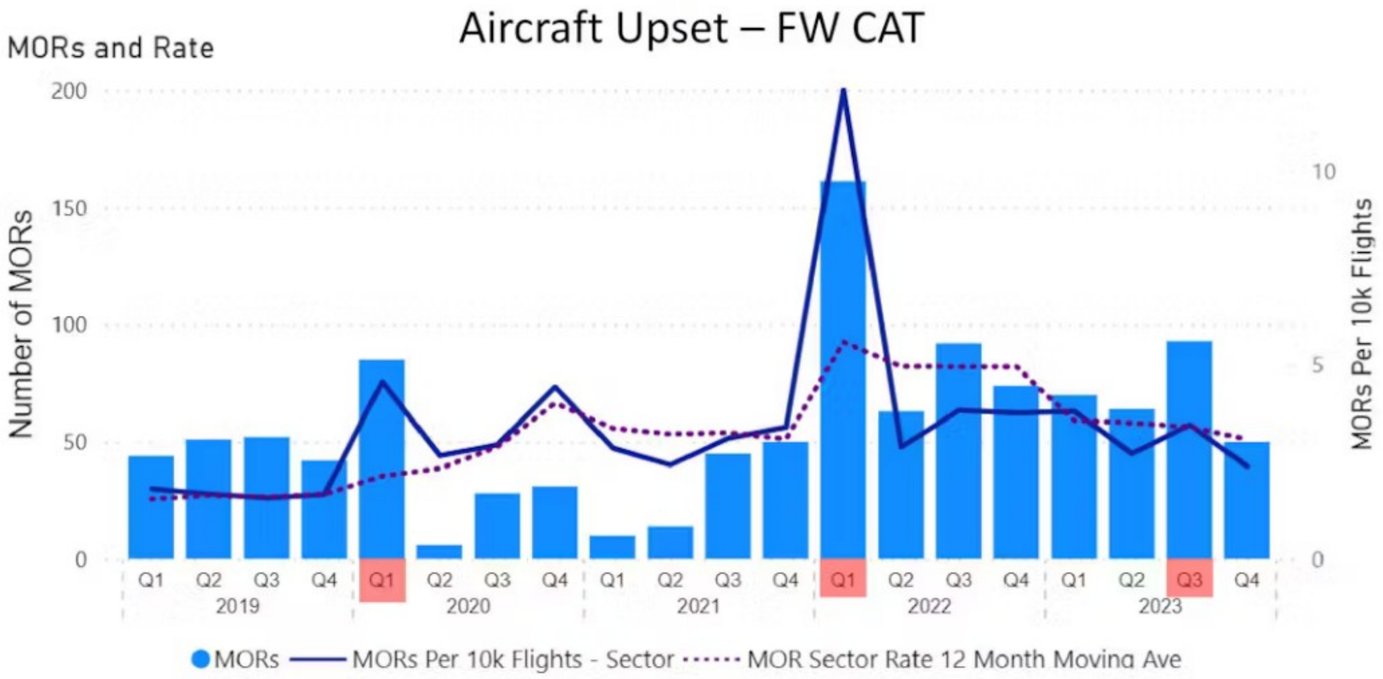
MOR and VOR data

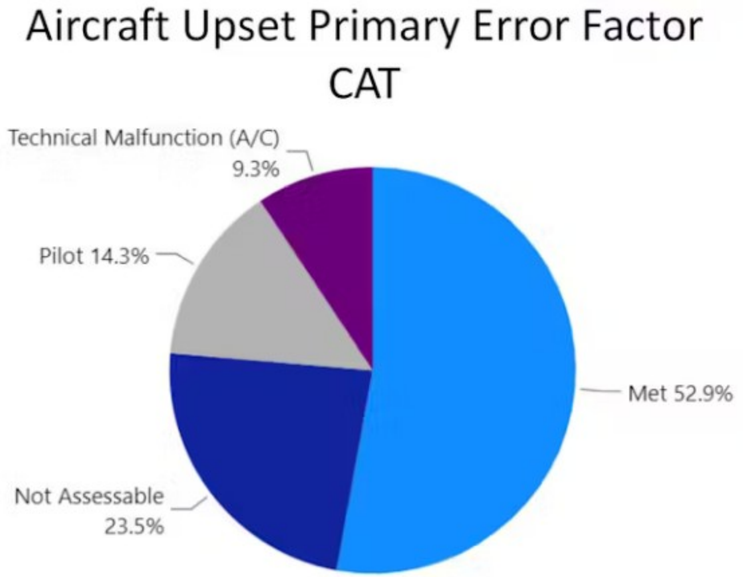
16

BowTie Out of control

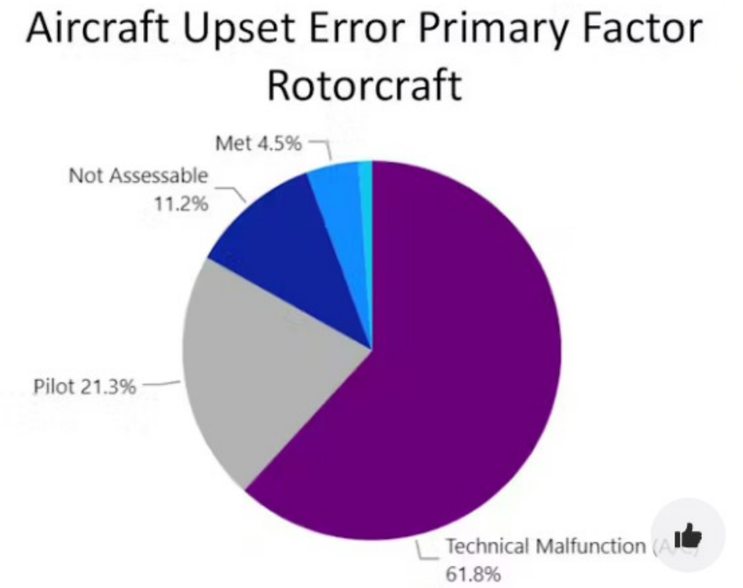

49
1. Severe turbulence encounter
1
2. Severe low level windshear/ microburst encounter
13
3. Severe wake turbulence encounter
8361
4. Severe ice encounter in-flight (e.g. ice crystal accumulation)
8361
5. Bird strike (resulting in thrust or critical system loss)
8361
6. High concentration volcanic ash encounter (resulting in thrust or critical systems loss)
1. Loss of Control: 1.2 Operation of Large CAT Fixed wing aircraft in adverse environmental conditions
Aircraft unintentionally deviates from normal in-flight parameters (aircraft upset)
13
Th1 12
Th2 0
Th3 1
Th4 301
Th5 301
Th6 301
Automated systems that assist aircraft recovery (e.g. automated angle of bank recovery)
Flt Crew perform upset recovery procedure (in response to monitoring and/or automated warnings)
Aircraft structural design certification margin between approved envelope and structural failure
Unrecovered LOC-I: uncontrolled collision with terrain or catastrophic in-flight structural failure resulting in fatalities
0
Cabin is secured via Flt and Cabin Crew adherence to secure cabin SOPs
Passengers and crew secured in response to recommendation made by Flt/ Cabin Crew to keep seat belts fastened at all times
Cabin design features minimise injuries (e.g. overhead locker security)
3
Unsecured objects/persons in cabin resulting in injuries to passengers and/or crew
4
Th1 3
Th2 0
Th3 1
Th4 0
Th5 0
Author
UK CAA
Revision #
V11
Revision Date
22/04/2014
Reference #
LOC 1.2
Notes
Final template for tailoring - visit www.caa.co.uk/bowtie for more information and to accept conditions of use

LOC-I: Aircraft Upset





- Storm Ciara & Dennis: Feb 2020.
- Storm Dudley, Eunice & Franklin: Feb 2022. First time 3 storm warnings were issued in the same week since records began.
- Storm Betty & Agnes: Aug-Sep 2023.

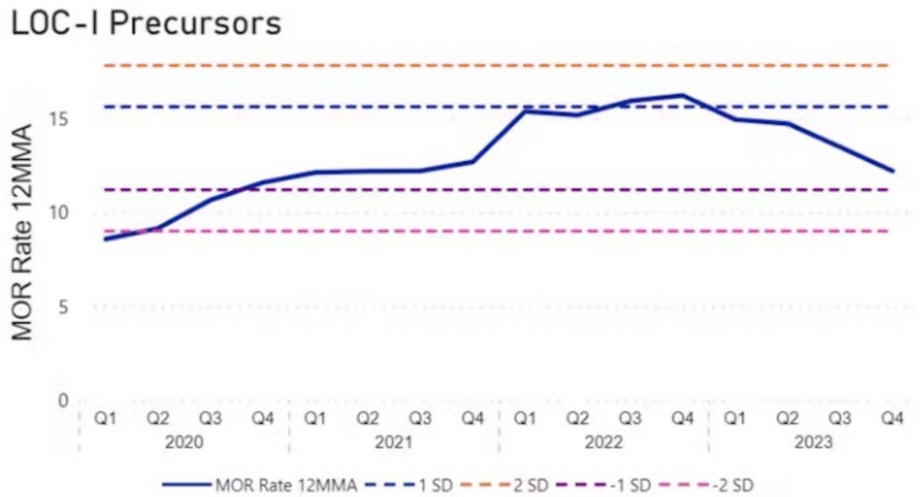


- Aircraft upset is one of the potential precursors to LOC-I that is measured as part of SPIs.
- International accident data shows that meteorological conditions are one of the top contributors to global fatal accidents for fixed wing aircraft.
  - Likewise, UK data for aircraft upset shows that over 50% of reports have met conditions as the primary contributory factor. Peaks in reporting are often caused by poor weather conditions as shown above.
- It is worth noting that the causes for aircraft upset vary significantly between sectors, with rotorcraft (bottom right) having technical malfunction as the main driver behind reporting.

LOC-I: SPI

- As seen from the risks discussed in these meetings, the LOC-I KRA covers a very diverse set of topics and has a wide range of measurable safety performance indicators.
- The table to the right shows some of the proposed SPI measures that are being developed as part of the state safety programme.
- The graph below shows one set of measures related to LOC-I precursors in FW CAT

KRA	SPI	Domain(s)
LOC-I & MAC	Non-Emergency Diversion Refusal	AAA & CAT
LOC-I	Turbulence Events	AAA, AW & CAT
LOC-I & A/C Env	Smoke and fume events	AW & CAT
LOC-I	ATR Loss of electrical systems - no. of failures	AW
LOC-I	SAFA findings breakdown	AW
LOC-I	Global supply chain health	AW
LOC-I	Incomplete maintenance	AW
LOC-I, CFIT & MAC	Inflight shut down per 10,000 flying hours	AW
LOC-I	Incorrect application of the MEL to icing conditions	AW
LOC-I	Nominated Persons	AW
LOC-I	RW Total loss of gearbox per 10,000 flying hours	AW
LOC-I & CFIT	GPS Jamming	CAT
LOC-I & A/C Env	Lithium Batteries	CAT
LOC-I	No. De-Icing Errors	CAT
LOC-I	Training carried out to maintain competence - split up roles	CAT
LOC-I	Incorrect loading of baggage	CAT FW
LOC-I	Insecure load in the hold	CAT FW
LOC-I & RE	Incorrect take off performance calculations	CAT FW
LOC-I	Laser strike per 10,000 flights	CAT FW
All	Fatal accident rate	CAT & GA
All	Flight crew impairment/incapacitation	CAT & MED & GA
LOC-I, CFIT & MAC	FOSIA rate per 100,000 hours flown	GA
LOC-I	Loss of Control Events	GA & RPAS
LOC-I	RPAS event by failure mode	RPAS



- Aircraft upset
- Flight crew handling
- Distraction & workload
- CRM
- Use of Automation

Measured as part of other SPI

- *Loading*
- *Ground handling*
- *Fatigue*
- *Wildlife*
- *Lasers*
- *Dangerous Goods*

Level Bust Analysis

Updated: 04/02/2022

UTC date: 01/01/2019 – 31/01/2022

Total No. Of Occurences: 1163

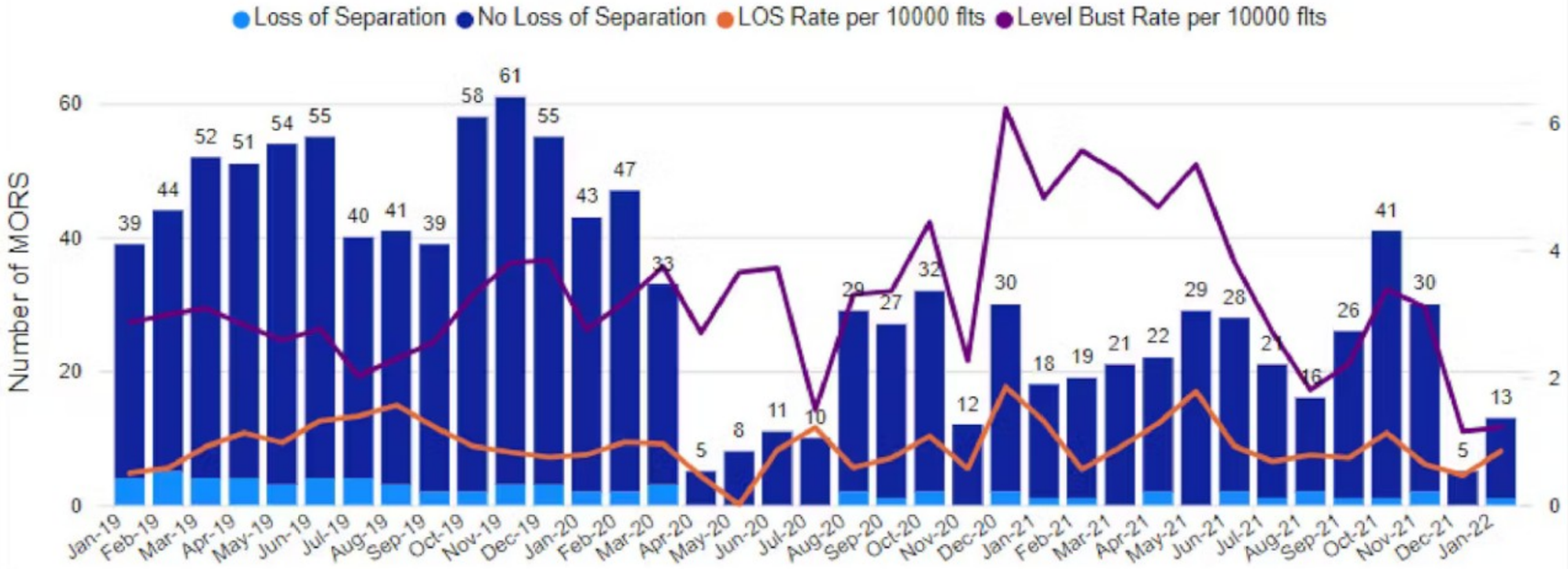
Last 3 Months Occurences: 76

Last Month Occurences: 5

UK Operator: All

Civil Aviation Authority Intelligence

Reported Events in UK Airspace



Key Words

Insights

- Pilot error due to aircraft handling
- Incorrect pressure (QNH) settings
- Altitude deviation due to weather avoidance
- Clearance confusion (un-readable transmission or read back correct but not correctly actioned
- Incorrect altitude selection in FMC
- Incorrect actions from ATC
- Aircraft technical malfunction with automatics/transponder
- Pilot distraction due to workload.

LB	File number	UTC date	Headline	Narrative
1	201900839	04 January 2019	Level bust.	At approximately 1945 A330 checked on frequency m readback correctly. A number of other aircraft checked the a/c had left FL400. I advised the a/c to level off at had read back the instruction "descend FL220". Neith FL220 at approximately the same time. No separation
1	201900842	06 January 2019	Level bust.	S92 was approximately 5 NNE of Aberdeen heading d to other traffic in the sector. I then observed S92 Mode climbed back up to 3A. No other traffic was affected.
1163				

ACAS RA

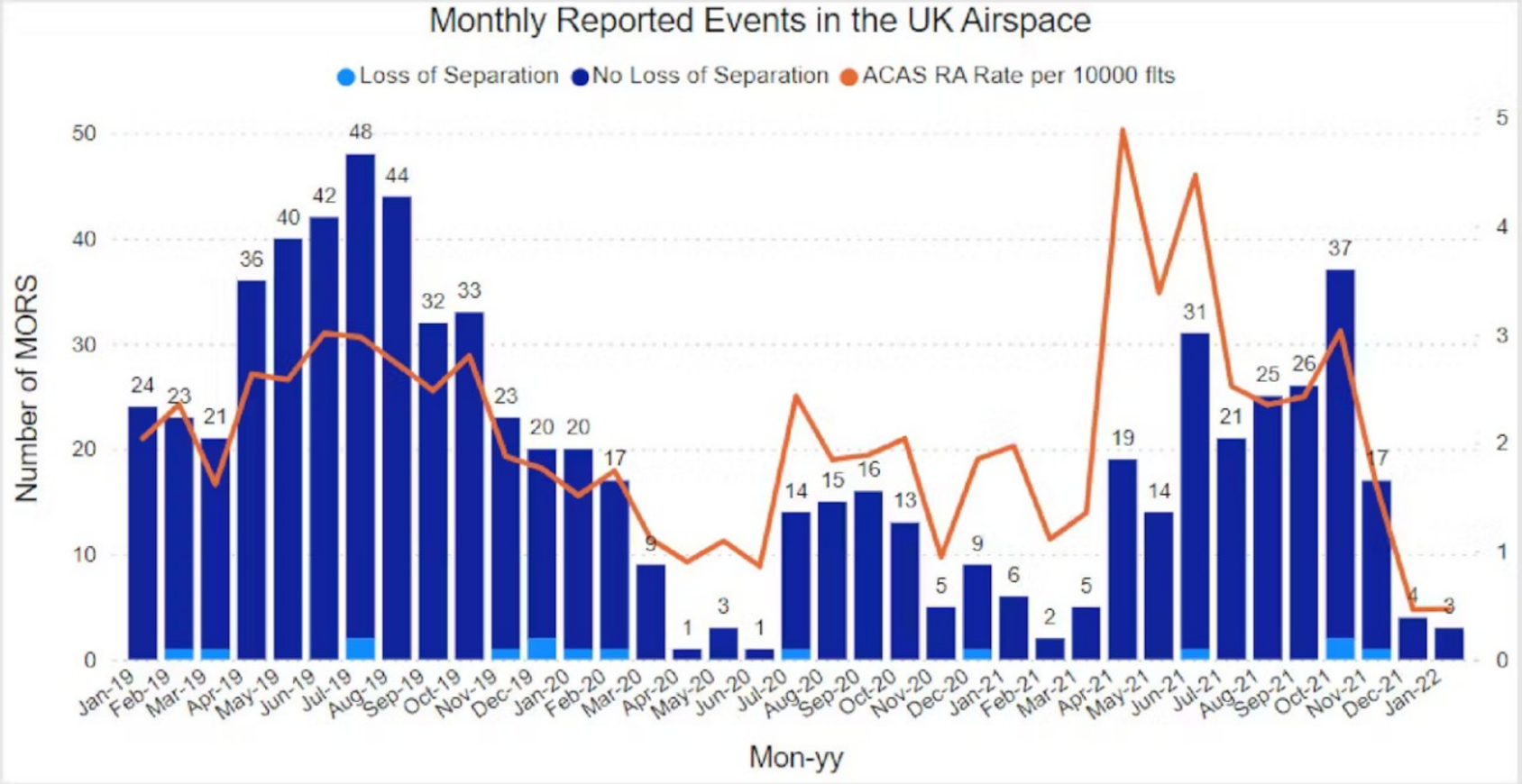
UTC date: 01/01/2019 – 31/01/2022

Mentimeter

Civil Aviation Authority Intelligence

Total No. Of Occurences: 719 **Last 3 Months Occurences:** 58 **Last Month Occurences:** 4

UK Operator: All



UTC date	File number	Headline
01 January 2019	201900585	TCAS RA.
04 January 2019	201900870	TCAS RA.
05 January 2019	201900844	TCAS RA.