
Acceptable level of
safety performance
(ALoSP)

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- ✓ Why measure safety performance?
- ✓ Safety performance indicators
- ✓ Alert level
- ✓ Selecting the target
- ✓ SPI data template and trend graph
- ✓ Acceptable level of safety performance
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DEFINITIONS

Accident

- ✓ *an occurence associated with the operation of an aircraft*
- ✓ *manned aircraft*
- ✓ *unmanned aircraft*
- ✓ a person is fatally or seriously injured; or
- ✓ the aircraft sustains damage or structural failure; or
- ✓ the aircraft is missing or is completely inaccessible

Serious incident

- ✓ an accident nearly occurred
- ✓ associated with the operation of an aircraft
- ✓ manned aircraft
- ✓ unmanned aircraft
- ✓ *Attachment C, Annex 13*

Incident

- ✓ associated with the operation of an aircraft
- ✓ other than an accident
- ✓ which affects or could affect the safety of operation.

ALoSP

The minimum level of safety performance of civil aviation in a State, expressed in terms of:

- ✓ safety targets; and
- ✓ safety performance indicators.

ALoSP

- As part of its SSP, the State **should establish an ALoSP** to define the overall level of safety it seeks to attain.

ALoSP

- **The performance of service providers contributes to the ALoSP of the State.**
- **It provides a measure of the efforts made as compared to the results achieved.**

Safety performance indicators (SPIs)

What is an SPI?

Data-based safety **parameter** used for **monitoring and assessing** safety **performance**.

Definitions

<u>High-consequence indicators</u>. *SPIs* pertaining to the monitoring and measurement of high-consequence occurrences, **such as accidents or serious incidents**. High-consequence indicators are sometimes referred to as **reactive indicators**.

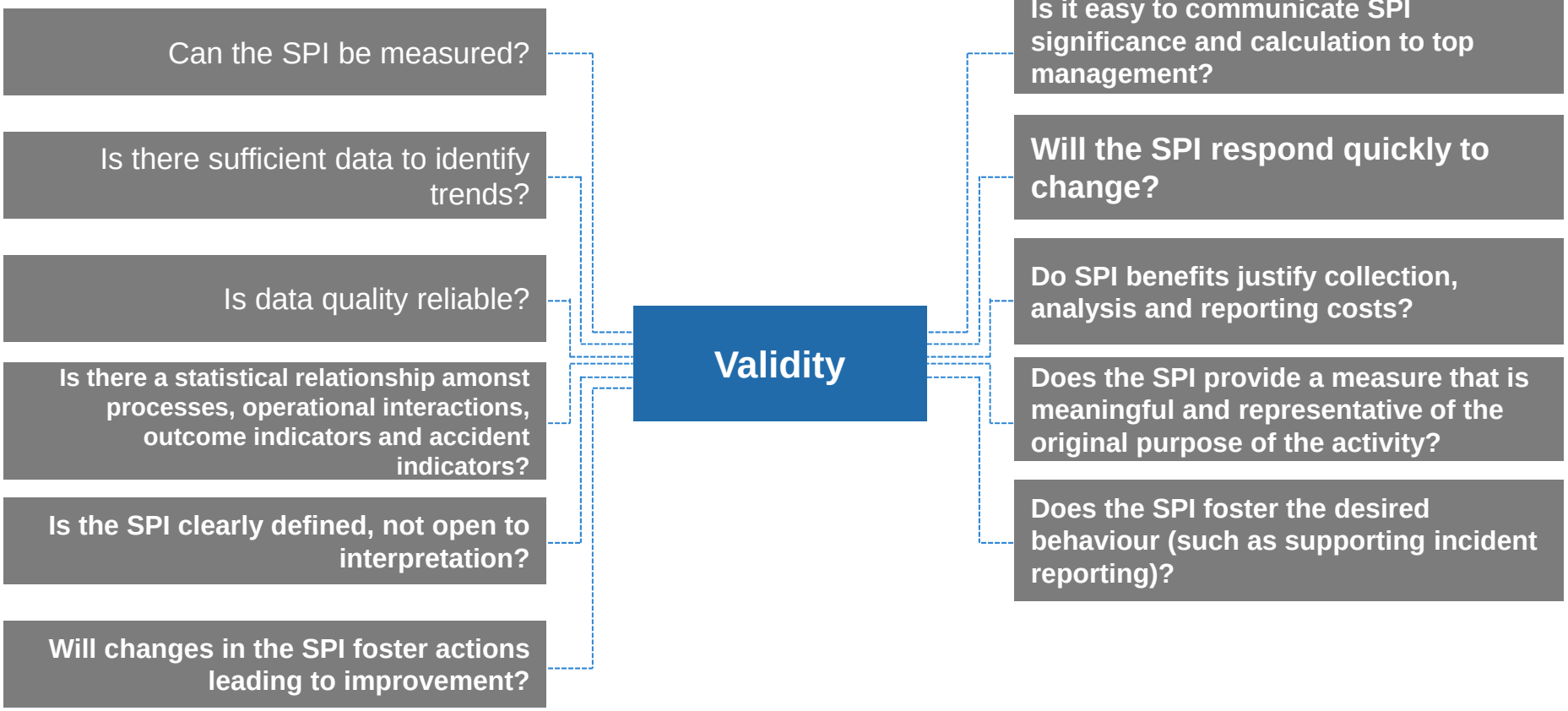
Definitions

Lower-consequence indicators. *SPIs* pertaining to the monitoring and measurement of lower-consequence occurrences, events or activities such as **incidents, non-conformance findings or deviations**. Lower-consequence indicators are sometimes referred to as **proactive** indicators.

SPIs

High-consequence occurrences (accidents and serious incidents) focus only on outcomes and do not expose systematic issues, hazards or latent conditions that might lead to high-consequence occurrences.

Indicator validity



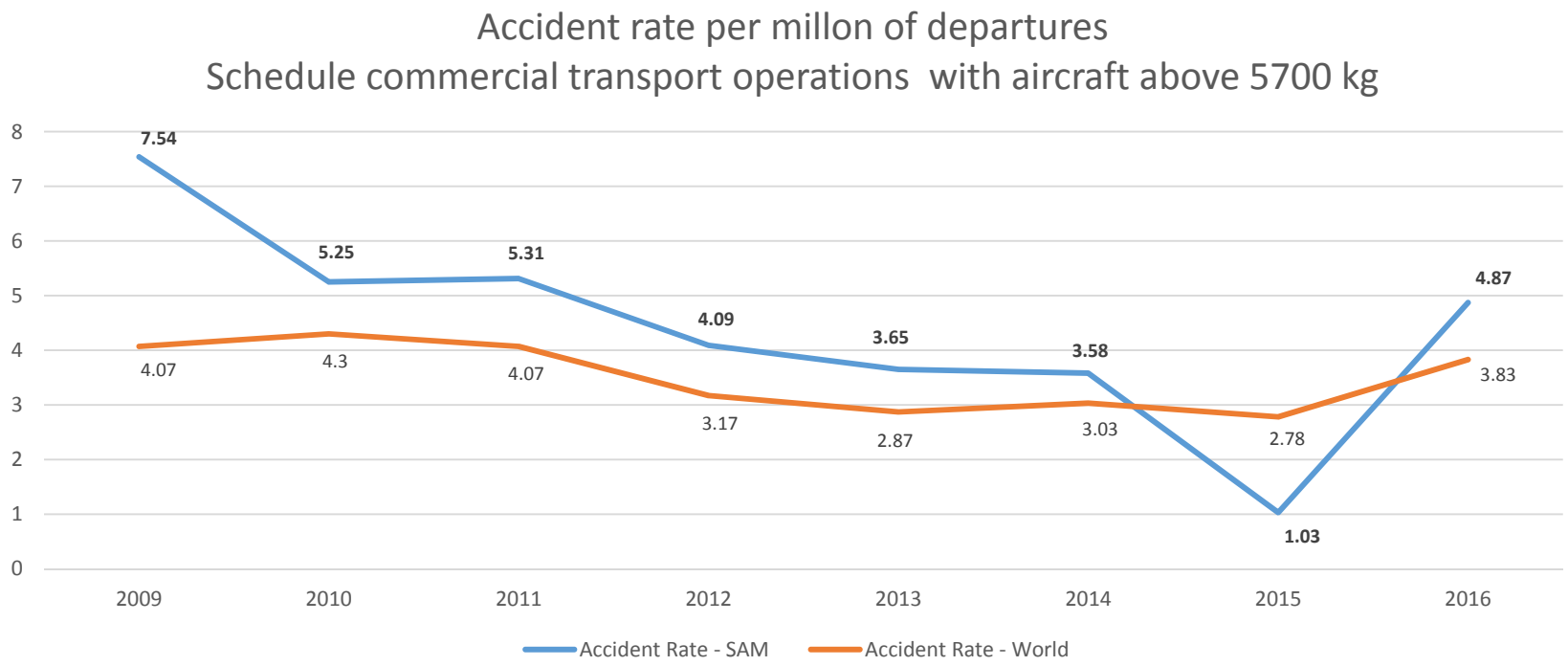
Other definitions

- ✓ An indicator is an **algorithm or formula** that expresses the qualitative or quantitative relationship between two or more variables and that serves to measure to what extent has the target been achieved.

$$\text{Acc/million departures} = \frac{\text{\# accidents}}{\text{\# departures}} \times 1.000.000$$

$$\text{Acc/million departures} = \frac{2 \text{ accidents}}{1.900.000} \times 1.000.000 = \mathbf{1.05}$$

SPI example


Accident rate per millon of departures
Schedule commercial transport operations with aircraft above 5700 kg
8
7
6
5
4
3
2
1
0
7.54
5.25
5.31
4.09
3.65
3.58
1.03
4.87
4.07
4.3
4.07
3.17
2.87
3.03
2.78
3.83
2009
2010
2011
2012
2013
2014
2015
2016
Accident Rate - SAM
Accident Rate - World

How are SPIs expressed? Examples

High-consequence safety indicators					
	SI description	*SI alert level criteria (for 2010)*	*Alert level breached (Yes/No)*	*SI target level criteria (for 2010)*	*Target met (Yes/No)*
1	**CAA aggregate air operator monthly accident/serious incident rate (per 1 000 FH)**	2009 average rate + 1/2/3 SD (annual reset)	Y	The 2010 average rate is 5% better than the 2009 average rate	N
2	**CAA aggregate aerodrome monthly ground accident/serious incident rate — Involving any aircraft (per 10.000 ground movements)**	2009 average rate + 1/2/3 SD (annual reset)	Y	The 2010 average rate is 3% better than the 2009 average rate	Y
3	**CAA ATS monthly FIR serious incident rate — Involving any aircraft (per 100.000 air movements)**	2009 average rate + 1/2/3 SD (annual reset)	N	The 2010 average rate is 4% better than the 2009 average rate	N

How are SPIs expressed? Examples

High-consequence safety indicators - AIR					
	SI description	*SI alert level criteria (for 2016)*	*Alert level breached (Yes/No)*	*SI target level criteria (for 2016)*	*Target met (Y/N)*
1	**AMO monthly serious incident rate (per 1 000 H/H)**	2015 average rate + 1/2/3 SD (annual reset)	Y	The 2016 average rate is 5% better than the 2015 average rate	N


WHY MEASURE SAFETY PERFORMANCE?

Why measure safety performance?

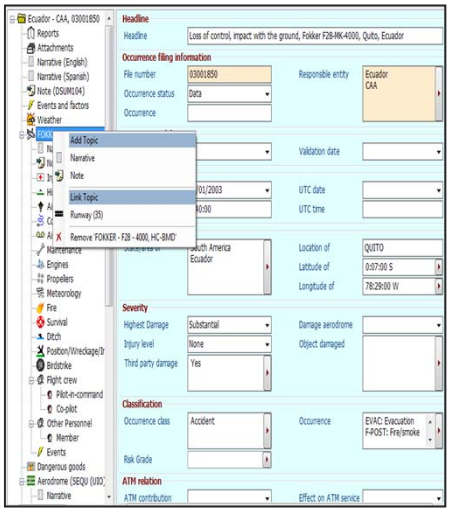
You can’t manage what you can’t measure

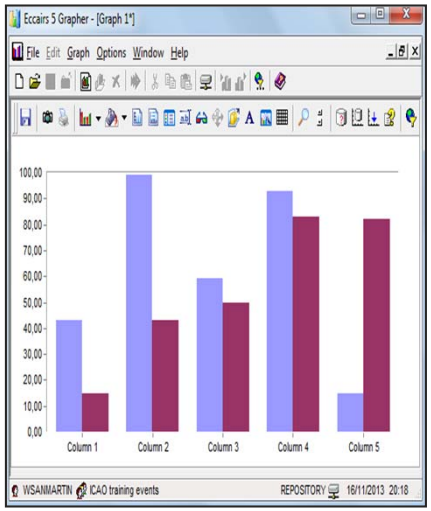
What is needed for measuring?

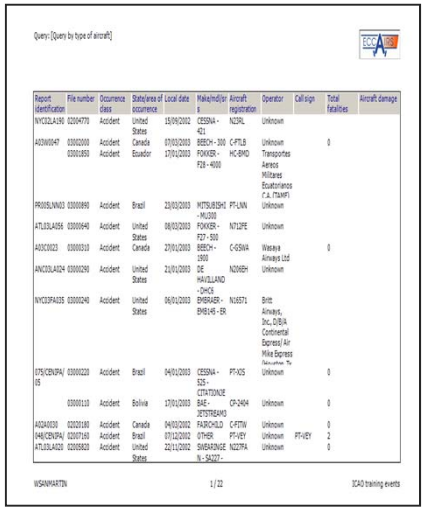
SDCPS: Safety data collection and processing systems: Databases

- ✓ **Inputs;**
- ✓ **Processes; and**
- ✓ **Results**

SDCPS: Safety data collection and processing systems: Databases







SAFETY PERFORMANCE INDICATORS (SPIs)

Safety performance indicators

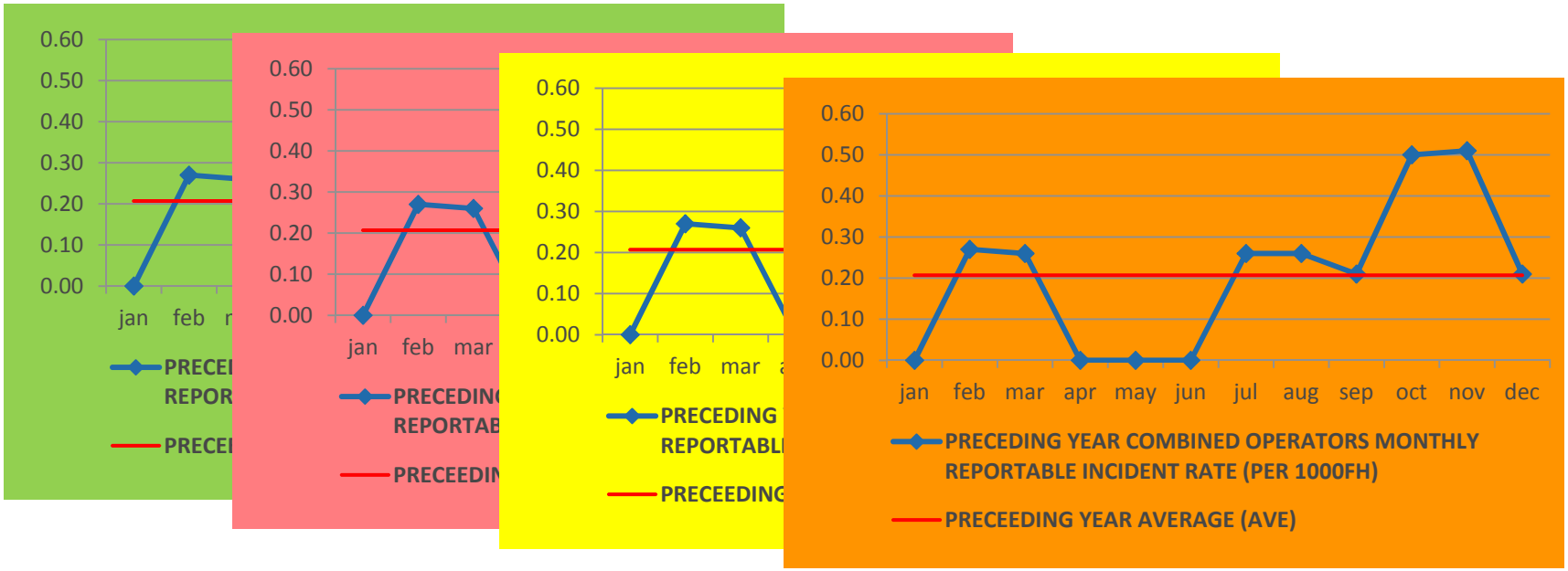
☑ A set of SPIs must be developed to express and measure the safety performance of the State.

☑ SPIs refer to safety-related results.

☑ Accidents, serious incidents, incidents, non-conformities, etc.

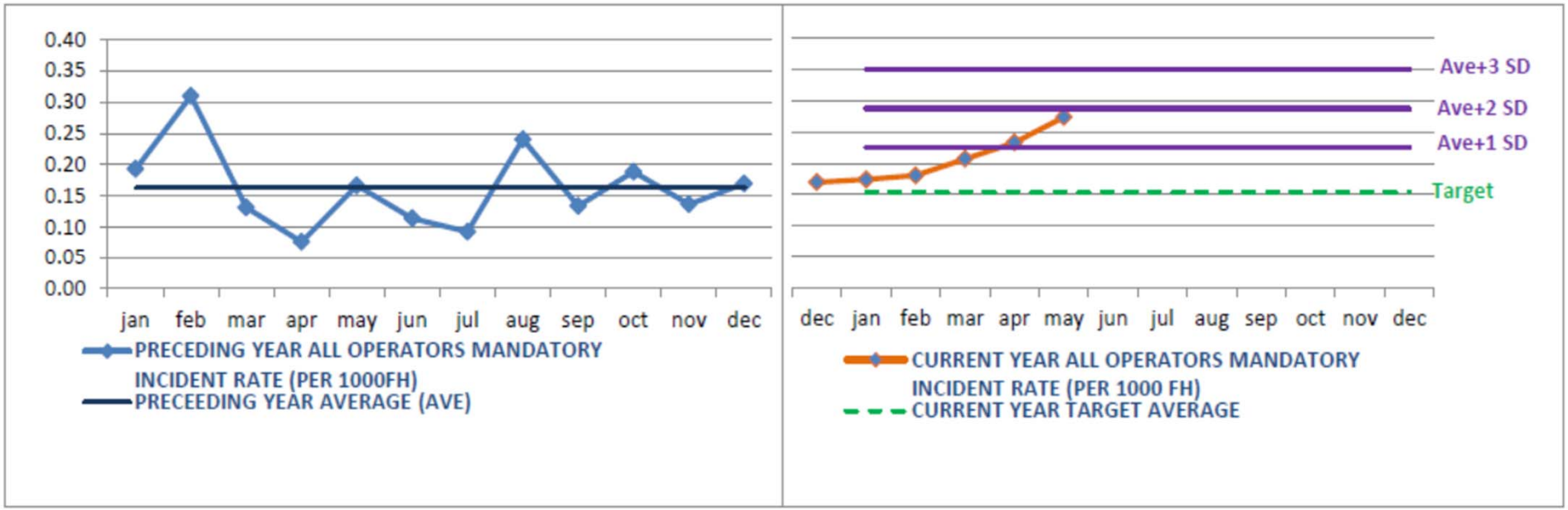
☑ High-consequence and lower-consequence SPIs.

❑ Aggregate SPIs for each aviation service provider sector.



Two SPI performance markers

- ☑ Targets: The **target level** desired for the planned improvement should be set for each SPI
- ☑ Alerts: A high ocurrence rate **alert trigger** must be set for each SPI.




ALERT LEVEL
BUSINESS PLAN
CONCEPT
RISKS?
THOUGHT PROCESS
MARKET ANALYSIS
$£¥ FINANCE
TEAM

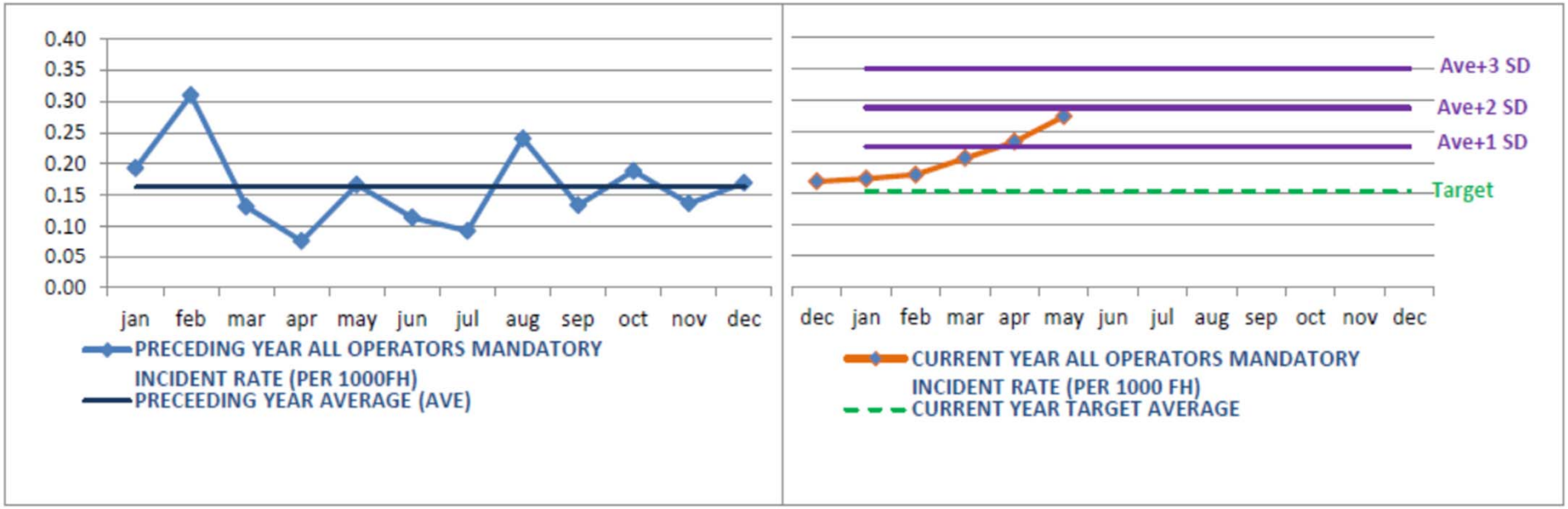
Alert level setting

☑ Statistical alarm warning (out-of-control criteria)

☑ Based on the preceding period's SPI data performance. For example: average and standard deviation values

☑ Average + 1 SD; average + 2 SD; average + 3 SD

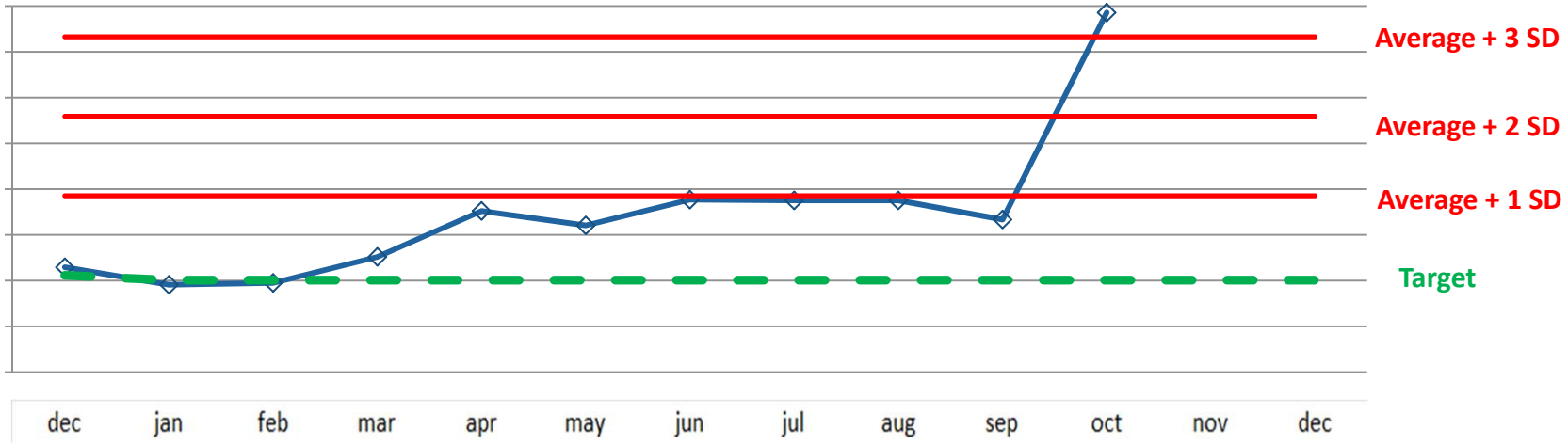
❑ Continuous monitoring of abnormal trends



Alert level setting

3 Criteria:

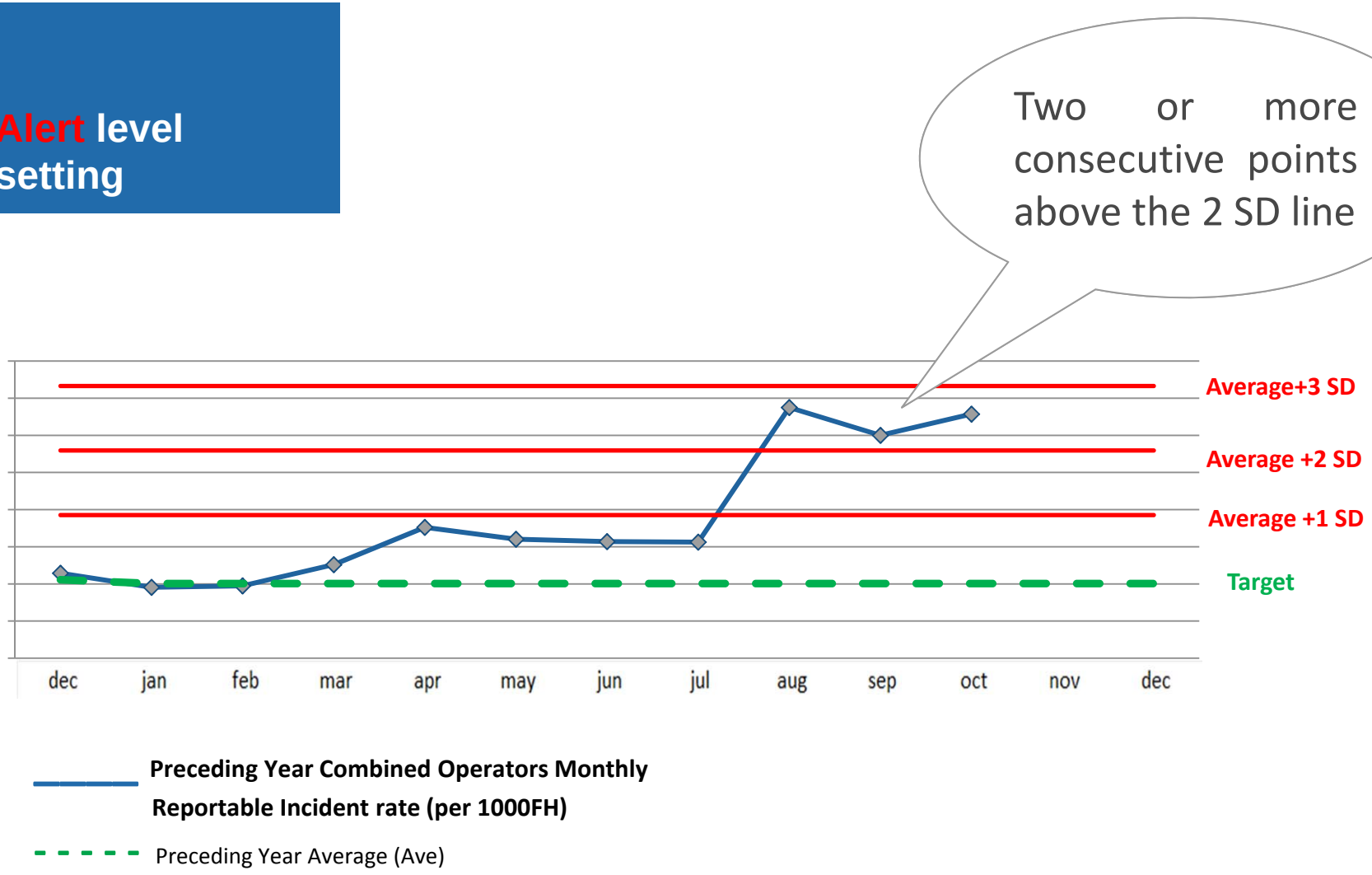
Any single point is above the 3 SD line



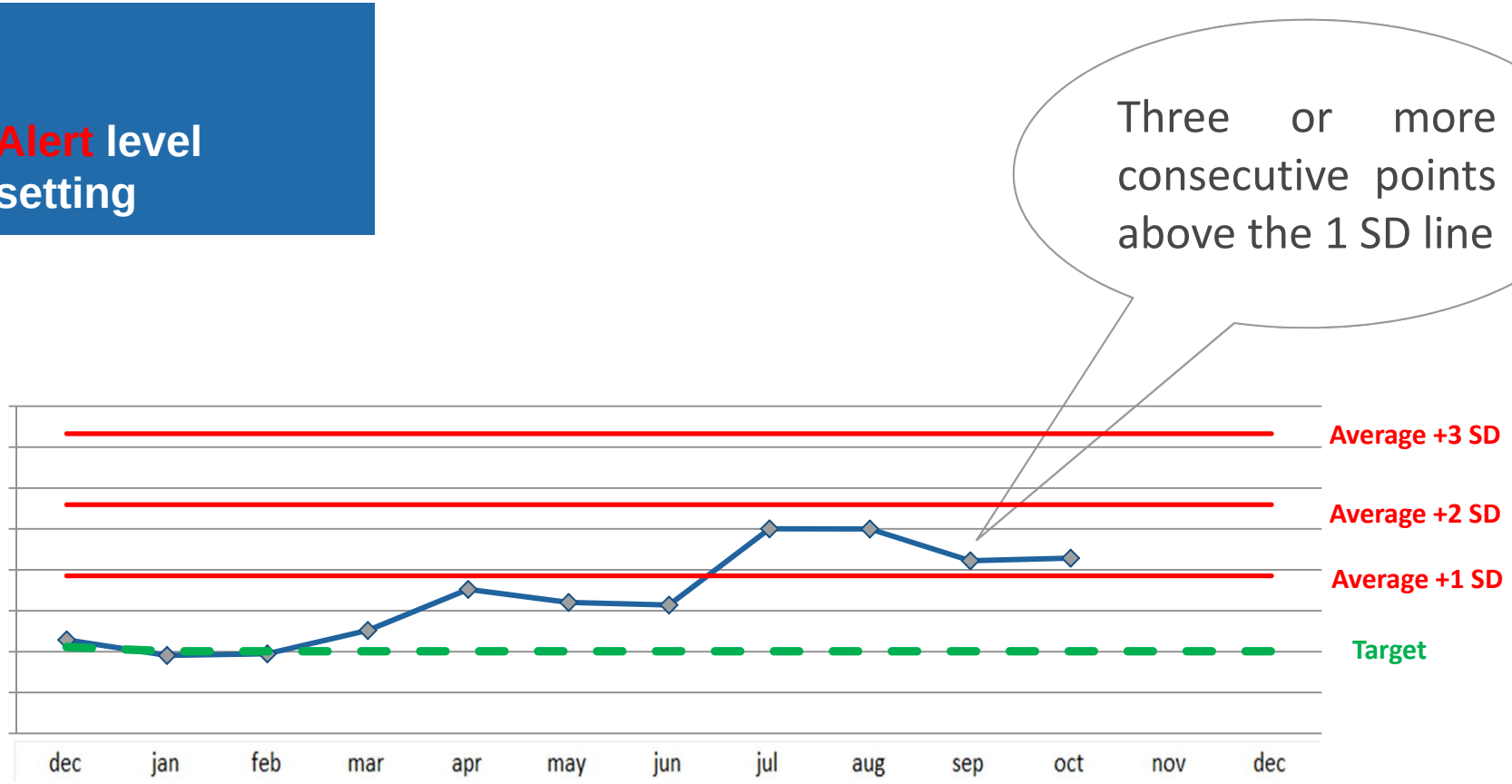
Preceding Year Combined Operators Monthly Reportable Incident rate (per 1000FH)

Preceding Year Average (Ave)

Alert level setting



Alert level setting

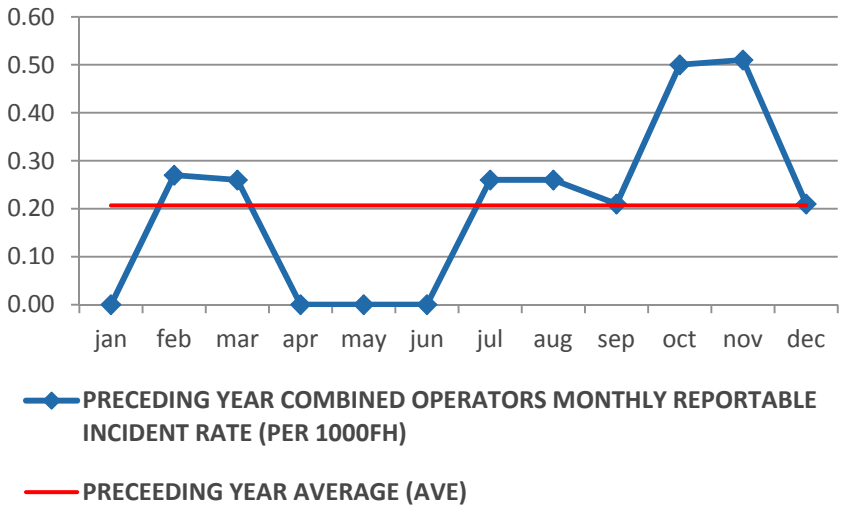


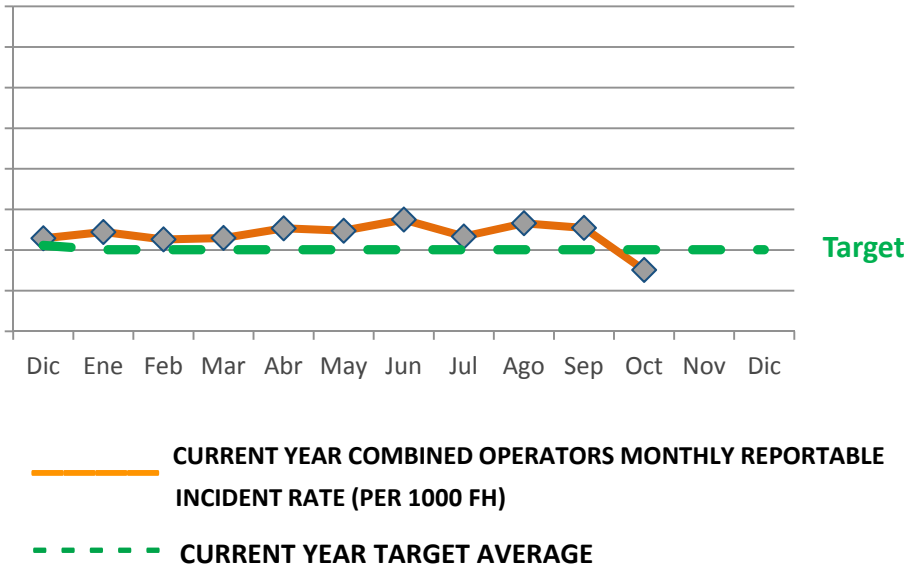

SELECTING THE TARGET

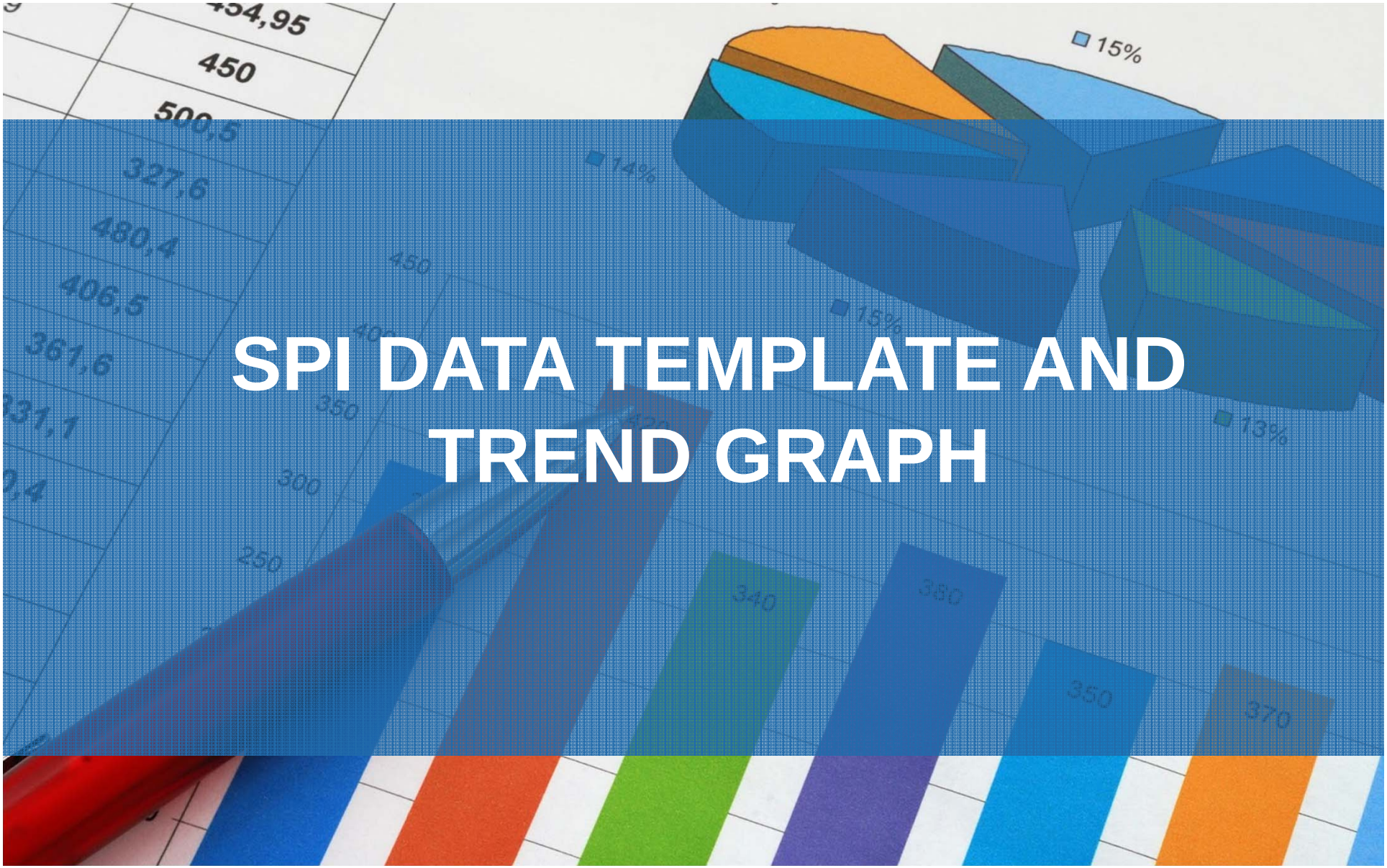
Target level setting

- ☑ An improvement in the (desired) planned incident rate for a new monitoring period.
- ☑ Reduction of the **current period's average** (for example, 5%), compared to the **preceding period's average rate.**

❑ Achieve the **target** at the end of each monitoring period.







SPI DATA TEMPLATE AND TREND GRAPH

SPI data template and trend graph

- ☑ Use a standard SPI data template.
- ☑ Write down the **number of occurrences and movements** at relevant intervals
- ☐ Verify **Alert** and **Target** settings for planned improvements (example 5%)

SSP High Consequence Safety Indicator Example (with Alert and Target Setting Criteria)

Preceding Year				
Mth	All Operators Total FH	All Operators Incidents	Incident Rate*	Ave (line)
jan	51,837	10.00	0.19	0.16
feb	48,406	15.00	0.31	0.16
mar	53,354	7.00	0.13	0.16
apr	52,513	4.00	0.08	0.16
may	54,037	9.00	0.17	0.16
jun	52,673	6.00	0.11	0.16
jul	54,086	5.00	0.09	0.16
aug	54,043	13.00	0.24	0.16
sep	52,383	7.00	0.13	0.16
oct			0.19	0.16
nov			0.14	0.16
dec	53,006		0.17	0.16
		A	0.16	
		SD	0.06	

Ave+1SD	Ave+2SD	Ave+3SD
0.23	0.29	0.35

Current Year Alert Level setting criteria is: Preceding Year Ave + 1/2/3 SD

Current year								
Mth	All Operators Total FH	All Operators Incidents	Incident Rate*	F	ng ve ne)			Current Year Target (line)
dec	53006	9.00	0.17					
jan	51635	9.00	0.17	0.23	0.29	0.35	0.15	
feb	44295	8	0.18	0.23	0.29	0.35	0.15	
mar	48323	10	0.21	0.23	0.29	0.35	0.15	
apr	47176	11	0.23	0.23	0.29	0.35	0.15	
may	47469	13	0.27	0.23	0.29	0.35	0.15	
jun				0.23	0.29	0.35	0.15	
jul				0.23	0.29	0.35	0.15	
aug				0.23	0.29	0.35	0.15	
sep				0.23	0.29	0.35	0.15	
oct				0.23	0.29	0.35	0.15	
nov				0.23	0.29	0.35	0.15	
dec				0.23	0.29	0.35	0.15	

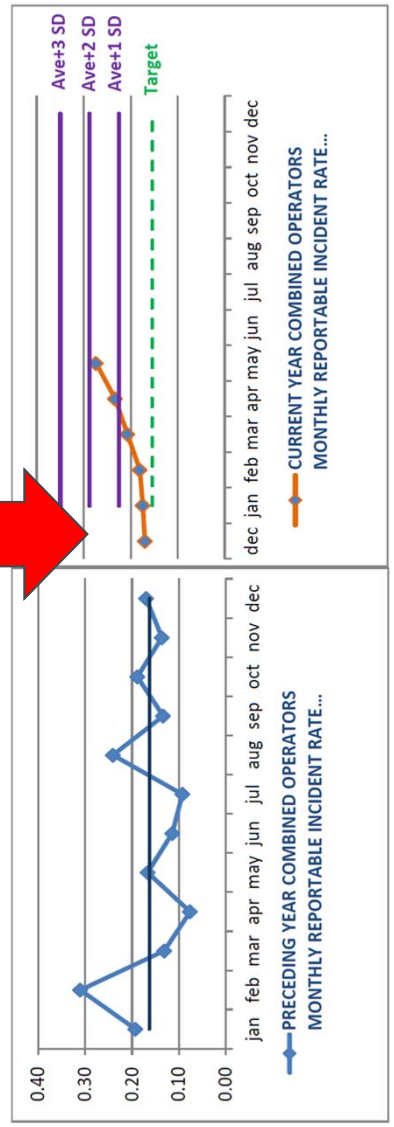
** Rate Calculation:(per 1000 FH)*

Current Year Target is say 5% Ave rat improvement over the Ave rate for the preceding year, which is: **0.15**

Number of occurrences and movements

Alerts

Target

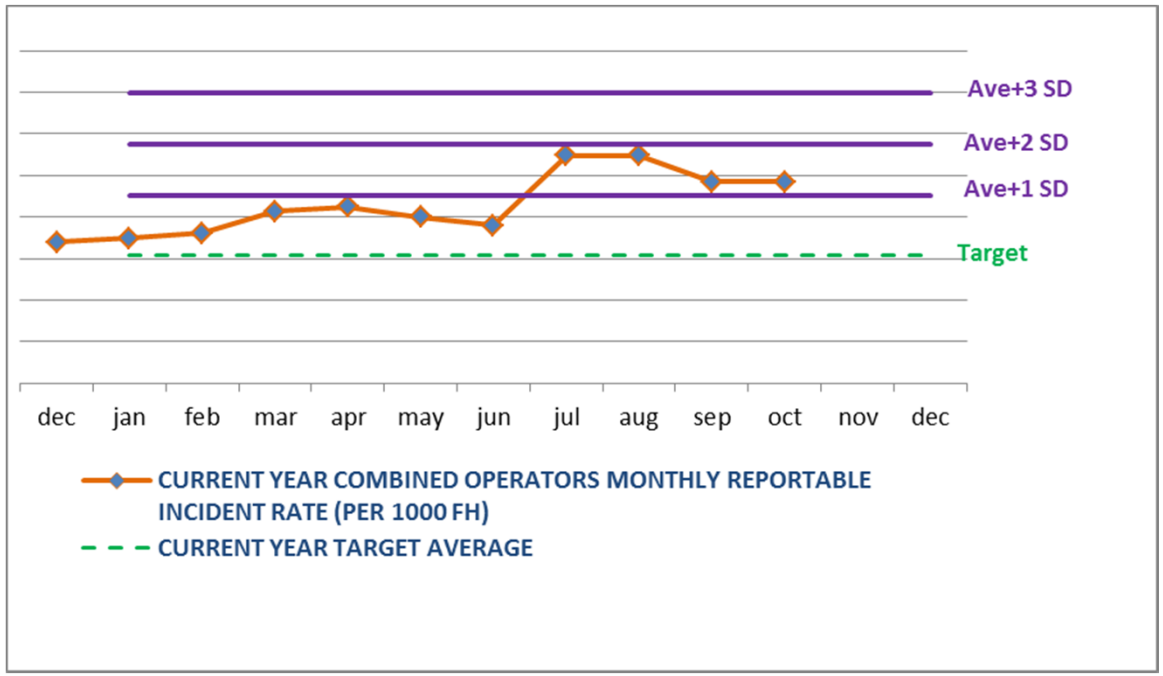


ACCEPTABLE LEVEL OF SAFETY PERFORMANCE

Acceptable level of safety performance

At the end of the monitoring period:

☑ Each SPI is checked against its own alert and target, the results of which will determine if :



☑ Alert level not breached – Yes / No

☑ Target achieved – Yes / No

Acceptable level of safety performance

Therefore:

An SPI package is manifested in its aggregate alert/target performance

High Consequence Safety Indicators

	Safety Indicator (SI) Description	SI Alert Level/ Criteria (for 2010)	Alert level Not Breached [Yes (4), No (0)]	SI Target level/ criteria (for 2010)	Target Achieved [Yes (3), No (0)]
1	CAA aggregate Air Operators monthly accident/ serious incident rate [per 1000 FH]	2009 Average Rate + 1/2/3 SD. (annual reset)	4	5 % improvement of the 2010 Average Rate over the 2009 Average Rate.	0
2	CAA aggregate A… ground acci… involv…		4	3 % improvement of the 2010 Average Rate over the 2009 Average Rate.	3
	…per	…09 Average Rate + 1/2/3 SD. (annual reset)	0	…ovement of the 2010 Av… over the 2009 Average R…	0
		Sub-total	8	…b-total	3
		Max	12	…ax	9

Lower Consequence Safety Indicators

	Safety Indicator (SI) Description	SI Alert Level/ Criteria (for 2010)	Alert level Not Breached [Yes (2), No (0)]	SI Target level/ criteria (for 2010)	…ed …No (0)
	CAA aggregate Air Operators Organization annual surveillance/ audit outcomes	>25% Average LEI; OR any level 1 finding; OR >5 level 2 findings per audit	2	<10% Average LEI; AND <1 level 2 finding per audit	
	CAA annual Air Operator Line Station surveillance inspection Ave LEI% (for each Operator).	>25% Average LEI; OR any level 1 finding; OR >5 level 2 findings per audit	2	<10% Average LEI	
	CAA annual Foreign Air Operators Ramp sampling inspection program.	>25% Average LEI; OR any level 1 finding; OR >5 level 2 findings per audit; OR <25% of Foreign Operators inspected	2	Not less than 50% of Foreign Operators to be inspected	0
	CAA aggregate Aerodrome Operators Organization annual surveillance/ audit outcomes	>25% Average LEI; OR any level 1 finding; OR >5 level 2 findings per audit	0	<10% Average LEI; AND <1 level 2 finding per audit	0
	CAA aggregate ATS Operators Organization annual surveillance/ audit outcomes	>25% Average LEI; OR any level 1 finding; OR >5 level 2 findings per audit	2	<10% Average LEI; AND <1 level 2 finding per audit	
	CAA aggregate ATS quarterly FIR TCAS RA incidents rate - involving any aircraft [per 10,000 flight movements]	2009 Average Rate + 1/2/3 SD. (annual reset)	2	5 % improvement of the 2010 Average Rate over the 2009 Average Rate.	
	CAA aggregate D&M/ MRO Organization annual surveillance/ audit outcomes	>25% Average LEI; OR any level 1 finding; OR >5 level 2 findings per audit	2	<10% Average LEI; A… level 2 finding per au…	
	CAA aggregate AMO (MRO) quarterly rate of component warranty claims due to (Major) technical defects.	2009 Average Rate + 1/2/3 SD. (annual reset)	0	5 % improvement of th… Average Rate over the … Average Rate.	
		Sub-total	12	Su…	
		Max	16		

No Alert %	71.4%	**Target Achieved %**	35.3%
Overall ALoS Performance (for Year 2010)		57.8%	

Acceptable level of safety performance

At the beginning of a new monitoring period:

☑ The organisation establishes its minimum desired consolidated value, based on overall alert and target results (for example (ALoSP)), taking into account the preceding period's performance (**57.8%** shown in the figure)

☑ Could **60%** be a possible ALoSP to be established in the following monitoring period?

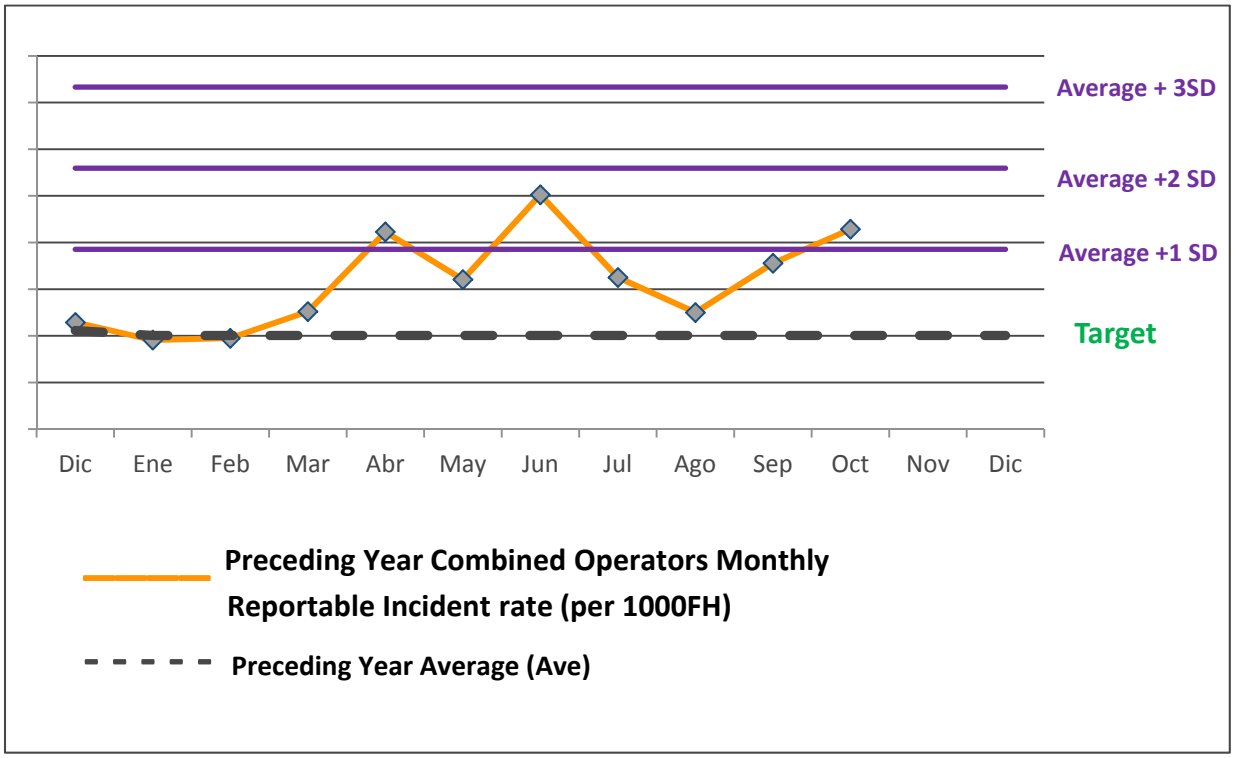
	CAA aggregate D&M/ MRO Organization annual surveillance/ audit outcomes	>25% Average LEI; OR any level 1 finding; OR >5 level 2 findings per audit	2	<10% Average LEI; AND <1 level 2 finding per audit	1
	CAA aggregate AMO (MRO) quarterly rate of component warranty claims due to (Major) technical defects.	2009 Average Rate + 1/2/3 SD. (annual reset)	0	5 % improvement of the 2010 Average Rate over the 2009 Average Rate.	0
		Sub-total	12	Sub-total	3
		Max	16	Max	8

No Alert %	71.4%	**Target Achieved %**	35.3%
Overall ALoS Performance (for Year 2010)		57.8%	


QUESTIONS

QUESTION

☑ At the end of a 12-month monitoring period, there were three data points (April, June and October) above the "Average + 1SD" alert line as shown below:



☑ Question: Has this alert graph breached any alert condition?

☑ Answer: **NO**, they are not **consecutive points**.

QUESTION

☑ Is a target setting the planned alert level to be achieved?

TRUE or FALSE?

☑ Answer: **FALSE**

☑ The **target** level means what is to be achieved.

☑ The **alert** level means what is not to be breached.

QUESTION

☑ Can an acceptable level of safety performance (ALOsP) be established and monitored for the achievement of alert and target results derived from the SPI package?

TRUE or FALSE?

☑ Answer: **TRUE**

SUMMARY

- ☑ Safety performance management is based on measurements.
- ☑ An SPI package is developed for measuring safety performance.
- ☑ Establish individual SPIs with **targets** and **alerts** based on safety metrics principles.
- ☑ Consolidate the **target** and alert results of SPI packages to show the overall performance of the safety system.
- ❑ Establish and obtain an acceptable level of safety performance for the organisation through the consolidated results of the SPI package.


QUESTIONS?