- 4th year of the project

- 12 focus groups

- 15 workshops

- 4-part webinar series

- 3 SDCPS-focused toolkits

- **2018 Focus Area: Safety Performance Monitoring**

Blue: Focus Group
Orange: Workshop

Key Performance Indicator

A **Key Performance Indicator** (**KPI**) is a measurable value that demonstrates how effectively a company is achieving **key** business objectives. Organizations use **KPIs** to evaluate their success at reaching targets. ... Each department will use different **KPI** types to measure success based on specific business goals and targets.

- Cash Flow Forecast
- Gross Profit Margin as a Percentage of Sales
- Funnel Drop-Off Rate
- Revenue Growth Rate
- Inventory Turnover
- Accounts Payable Turnover
- Relative Market Share

Good KPIs…

1. Provide objective evidence of progress towards achieving a desired result,

2. Measure what is intended to be measured to help inform better decision making,

3. Offer a comparison that gauges the degree of performance change over time,

4. Can track efficiency, effectiveness, quality, timeliness, governance, compliance, behaviors, economics, project performance, personnel performance or resource utilization, and

5. Are balanced between leading and lagging indicators.

To develop successful KPIs in the business context, you might consider...

- How you compete?
  - What are your strengths & weaknesses?
- How your processes need to improve?
  - Which improvements would directly affect your bottom line?
- How high should you aim?
  - What are attainable goals?

Dashboards for Business
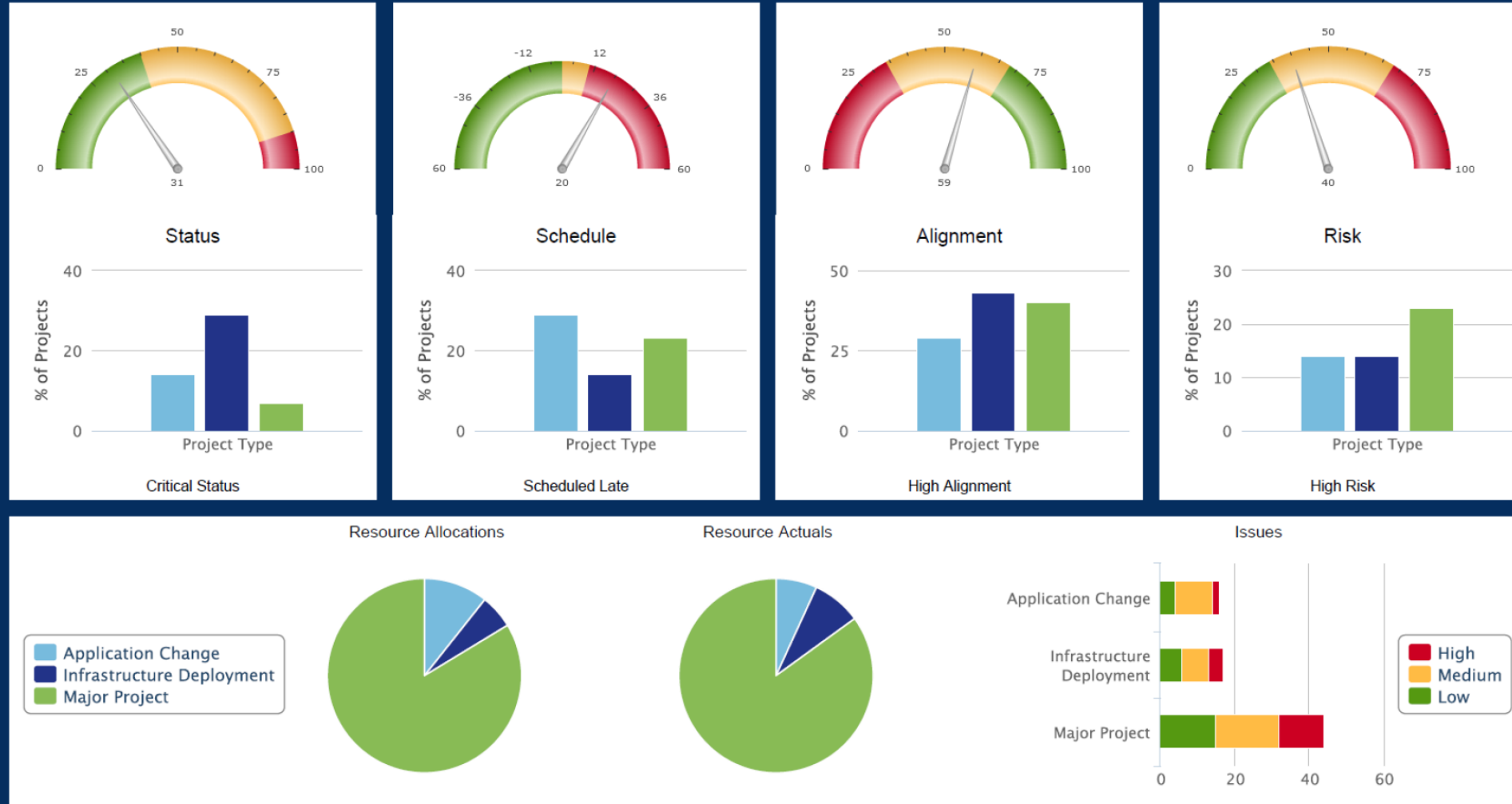
- 2020-2022 ICAO Global Aviation Safety Plan (GASP)
  - Strategic roadmap for States and Service Providers to achieve zero fatalities in commercial aviation operations by 2030.
  - **Expanded role of safety performance monitoring in SSPs and SMSs.**

The global aviation community needs safety performance monitoring guidance

- Evidence
  - **Qualitative**:
    - Discussions with industry at focus groups, workshops, and through webinars
    - Review of existing safety performance monitoring standards and best practices
  - **Quantitative**:
    - Safety Performance Indicator Survey (2017)
    - Focus Group and Workshop Safety Data Assessment Surveys

- Key areas for improvement
  - Understanding the threats, errors, hazards and the company defenses to these issues and how combinations of these issues become more severe
    - Avoiding Undesired Aircraft States
    - Recovery processes
    - Resulting Incidents / Accidents

- Online Survey
  - Tablet and mobile device-accessible
  - Database of 57 questions - respondents answer a tailored subset
  - Designed to take no more than 15-20 minutes
- Survey responses are governed by the FSF Privacy Statement
- Targeted Survey Audience
  - Employees of:
    - Airlines,
    - Other Aircraft Operators (e.g. charter/air taxi operators),
    - Air Navigation Service Providers,
    - Regulators,
    - Manufacturers,
    - Training Organizations, and
    - Maintenance Providers
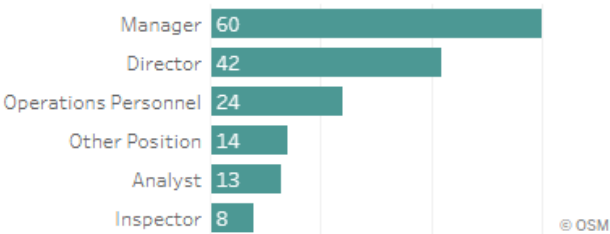
Show responses from organizations that:

Have an SMS 152 Respondents	Do Not Have an SMS 9 Respondents	All 161 Respondents

Global Safety Performance Monitoring Survey Participants

Select a domain, job title, or region below to see how risk is viewed around the world.

Air Navigation Service Provider	Airline	Other Aircraft Operator	Airport	Regulator	Training Organization	Other Domain	Maintenance Provider	Manufacturer
1 Responses	62 Responses	45 Responses	4 Responses	10 Responses	15 Responses	11 Responses	5 Responses	8 Responses

Responses by Job Type

- Manager: 60
- Director: 42
- Operations Personnel: 24
- Other Position: 14
- Analyst: 13
- Inspector: 8

Responses by Region

© OSM

Industry Experience

- < 5 Years: 18
- 5 - 10 Years: 30
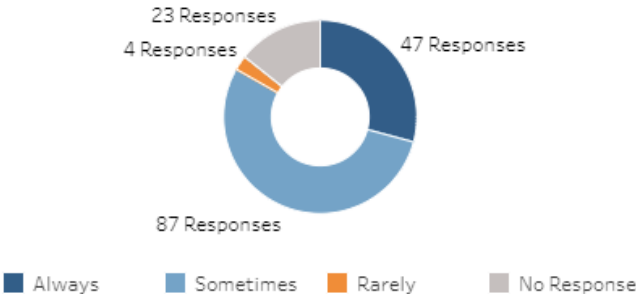- 11 - 15 Years: 20
- 16 - 20 Years: 18
- 20+ Years: 74
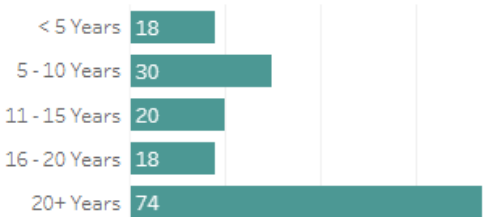
Risk Area Priority

The numbers below indicate the average priority rating for each risk area. Priority ratings range from 5 (High Priority) to 1 (Low Priority). Hovering over a choice provides a detailed breakdown of the rating by domain and the role of the respondent.

NMAC	CFIT	Runway Safety	Maintenance	LOC-I
3.1	3.1	3.0	3.0	2.9

SMS used for Risk-Based Decision Making

- 47 Responses
- 23 Responses
- 4 Responses
- 87 Responses

Legend:
- ■ Always
- ■ Sometimes
- ■ Rarely
- ■ No Response

Applied Use of Safety Terms

	True	False	Don't Know
Industry refers to top priority safety metrics as SPIs	42.86%	35.40%	21.74%
Industry perceives the terms safety metric & SPI to mean the same thing	51.55%	30.43%	18.01%
Industry sets performance targets for its safety metrics	76.40%	14.91%	8.70%

Show responses from organizations that:

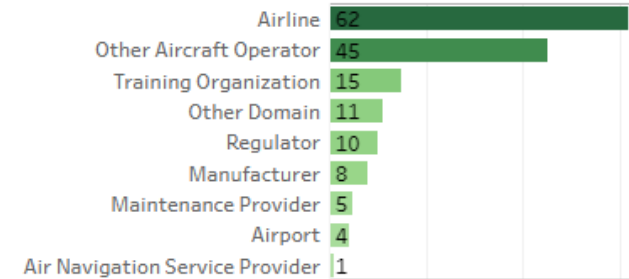| Have an SMS 152 Respondents	Do Not Have an SMS 9 Respondents	All 161 Respondents

Which Risk Areas Does Your Organization Track?

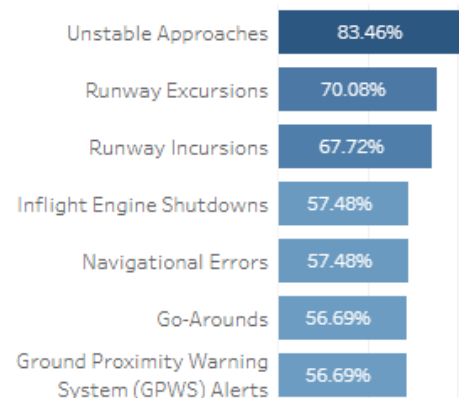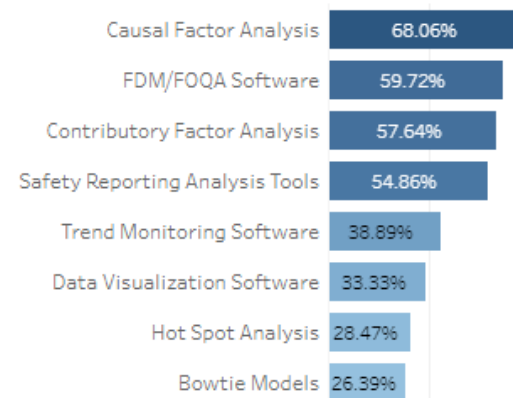| Maintenance	Near Mid-Air Collision	Runway Safety	Loss-of-Control Inflight	Controlled Flight into Terrain
74.53% 120 Responses	59.01% 95 Responses	77.02% 124 Responses	57.14% 92 Responses	67.70% 109 Responses

Responses by Region

© OSM

Responses
3 ———— 88

Responses by Domain

Airline	62
Other Aircraft Operator	45
Training Organization	15
Other Domain	11
Regulator	10
Manufacturer	8
Maintenance Provider	5
Airport	4
Air Navigation Service Provider	1

Tracking, Analyzing, and Measuring Risk

Safety Performance Targets

Unstable Approaches	83.46%
Runway Excursions	70.08%
Runway Incursions	67.72%
Inflight Engine Shutdowns	57.48%
Navigational Errors	57.48%
Go-Arounds	56.69%
Ground Proximity Warning System (GPWS) Alerts	56.69%

Safety Data Analysis Methods

Causal Factor Analysis	68.06%
FDM/FOQA Software	59.72%
Contributory Factor Analysis	57.64%
Safety Reporting Analysis Tools	54.86%
Trend Monitoring Software	38.89%
Data Visualization Software	33.33%
Hot Spot Analysis	28.47%
Bowtie Models	26.39%

Safety Data Sources

Voluntary Reports	93.79%
Mandatory Reports	86.21%
FDM/FOQA	61.38%
Trend Monitoring Data	57.93%
Line Audit Data	53.10%
Public Safety Information	44.14%
Weather Data	40.69%
ACARS	25.52%

Tracking, Analyzing, and Measuring Risk by Risk Area
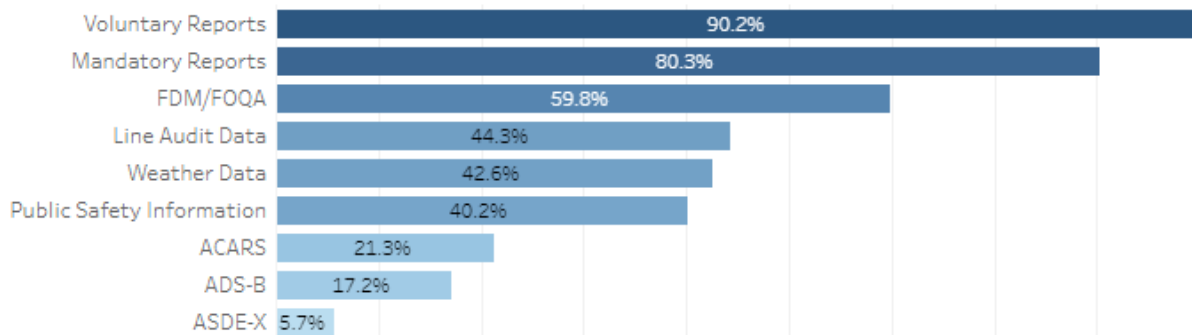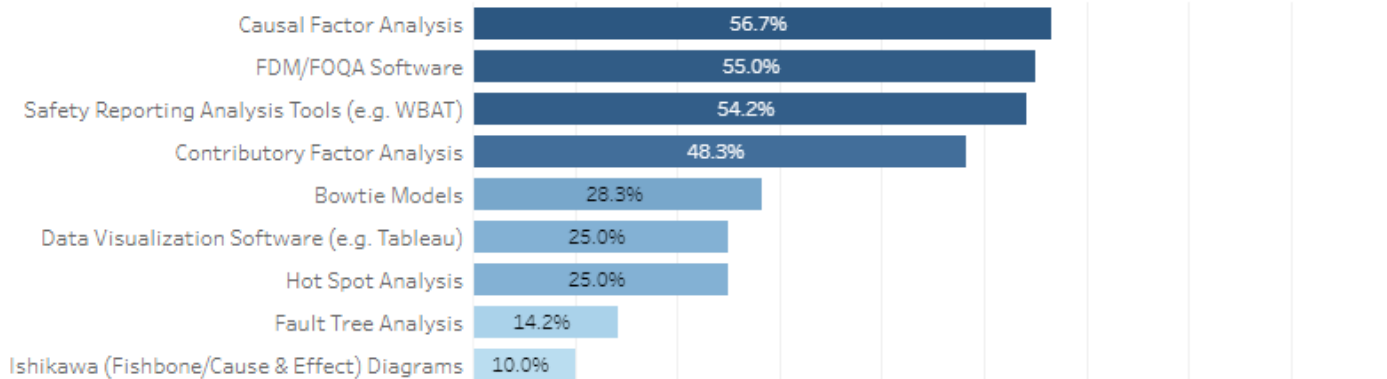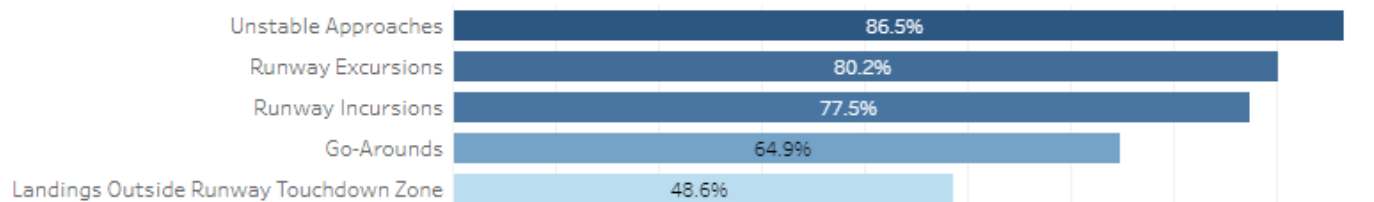
Click to filter data by risk area 🔍 ▼
- ○ Maintenance
- ○ Near Mid-Air Collision
- ◉ Runway Safety
- ○ Loss-of-Control Inflight
- ○ Controlled Flight into Terrain

Safety Data Sources

Source	Value
Voluntary Reports	90.2%
Mandatory Reports	80.3%
FDM/FOQA	59.8%
Line Audit Data	44.3%
Weather Data	42.6%
Public Safety Information	40.2%
ACARS	21.3%
ADS-B	17.2%
ASDE-X	5.7%

Safety Data Analysis Methods

Method	Value
Causal Factor Analysis	56.7%
FDM/FOQA Software	55.0%
Safety Reporting Analysis Tools (e.g. WBAT)	54.2%
Contributory Factor Analysis	48.3%
Bowtie Models	28.3%
Data Visualization Software (e.g. Tableau)	25.0%
Hot Spot Analysis	25.0%
Fault Tree Analysis	14.2%
Ishikawa (Fishbone/Cause & Effect) Diagrams	10.0%

Safety Performance Targets

Target	Value
Unstable Approaches	86.5%
Runway Excursions	80.2%
Runway Incursions	77.5%
Go-Arounds	64.9%
Landings Outside Runway Touchdown Zone	48.6%

Inconsistent Usage of ICAO Terminology

Organizations Have Similar Processes for Setting and Reviewing Safety Performance Targets

Organizations Employ Common Analysis Methods

Opportunities to Expand the Use of Line Audit Data

Limited Use of Leading/Proactive Safety Performance Indicators

Inconsistent Usage of ICAO Terminology

- ## Safety Performance Indicator
  - A data-based parameter used for monitoring and assessing safety performance.

- ## Safety Performance Target
 - The planned or intended objective for safety performance indicator(s) over a given period.

Applied Use of Safety Terms	True	False	Don't Know
Industry refers to top priority safety metrics as SPIs	42.86%	35.40%	21.74%
Industry perceives the terms safety metric & SPI to mean the same thing	51.55%	30.43%	18.01%
Industry sets performance targets for its safety metrics	76.40%	14.91%	8.70%

Organizations Have Similar Processes for Setting and Reviewing Safety Performance Targets
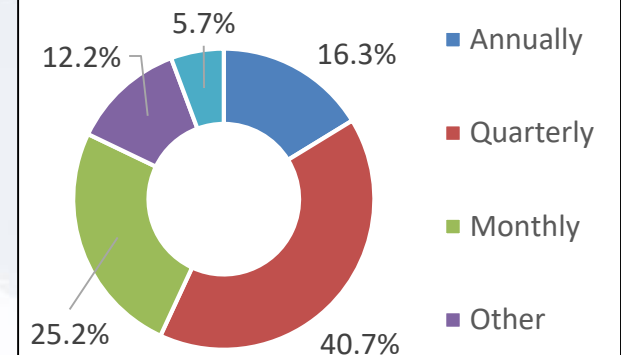

Applied Use of Safety Terms

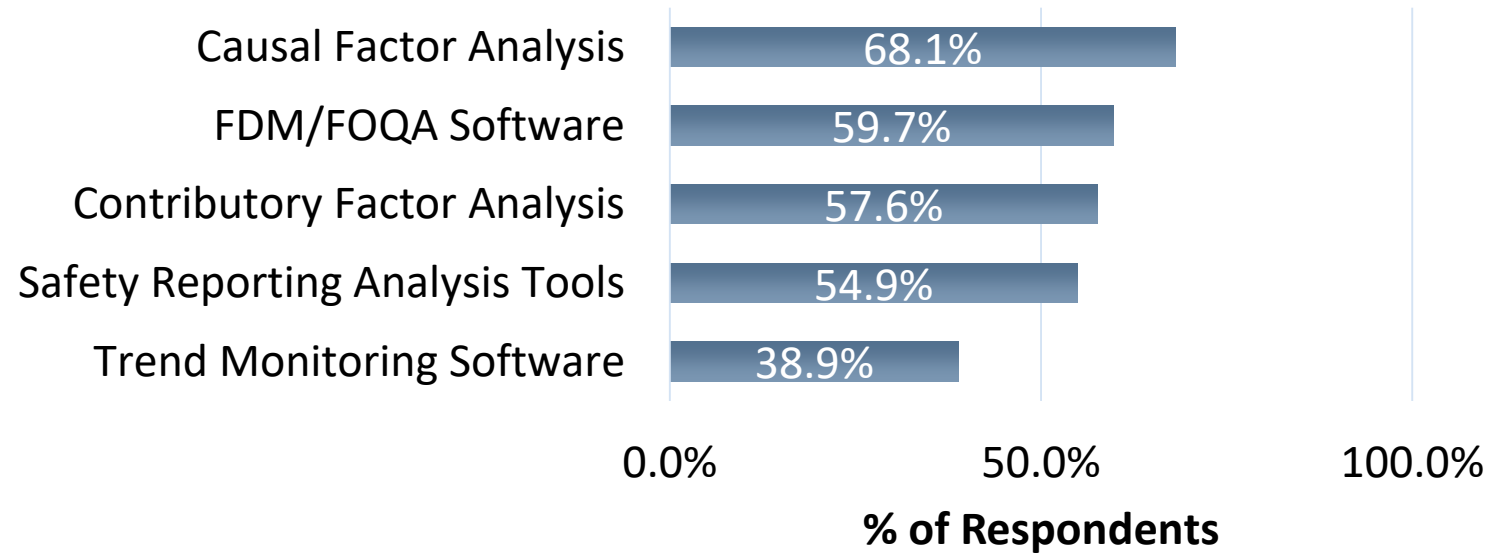|	True	False	Don't Know
Industry refers to top priority safety metrics as SPIs	42.86%	35.40%	21.74%
Industry perceives the terms safety metric & SPI to mean the same thing	51.55%	30.43%	18.01%
Industry sets performance targets for its safety metrics	76.40%	14.91%	8.70%

SPTs - Revision Frequency

- 3.3% Monthly
- 19.5% Quarterly
- 67.5% Annually
- 5.7% Other
- 4.1% I don't know
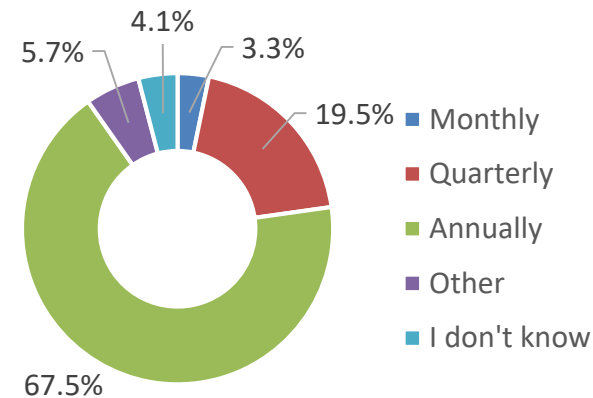
SPTs - Employee Update Frequency

- 16.3% Annually
- 40.7% Quarterly
- 25.2% Monthly
- 12.2% Other
- 5.7%

Organizations Employ Common Analysis Methods

Safety Data Analysis Methods - Top Five

Method	% of Respondents
Causal Factor Analysis	68.1%
FDM/FOQA Software	59.7%
Contributory Factor Analysis	57.6%
Safety Reporting Analysis Tools	54.9%
Trend Monitoring Software	38.9%

0.0%   50.0%   100.0%

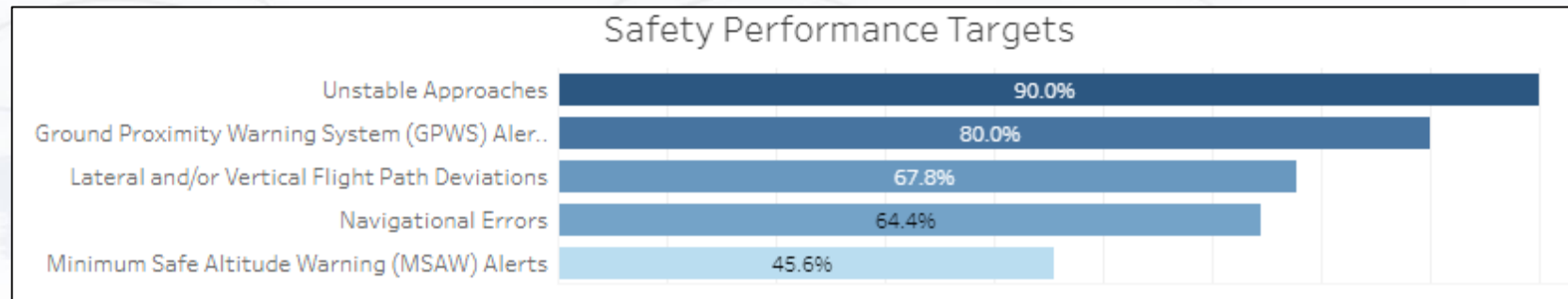**% of Respondents**

Opportunities to Expand the Use of Line Audit Data

- Line Audit Data Use by Risk Area
  - Maintenance: 41.2%
  - Near Mid-Air Collision: 28.3%
  - Runway Safety: 44.3%
  - Loss of Control – Inflight: 31.8%
  - Controlled Flight into Terrain: 29.5%

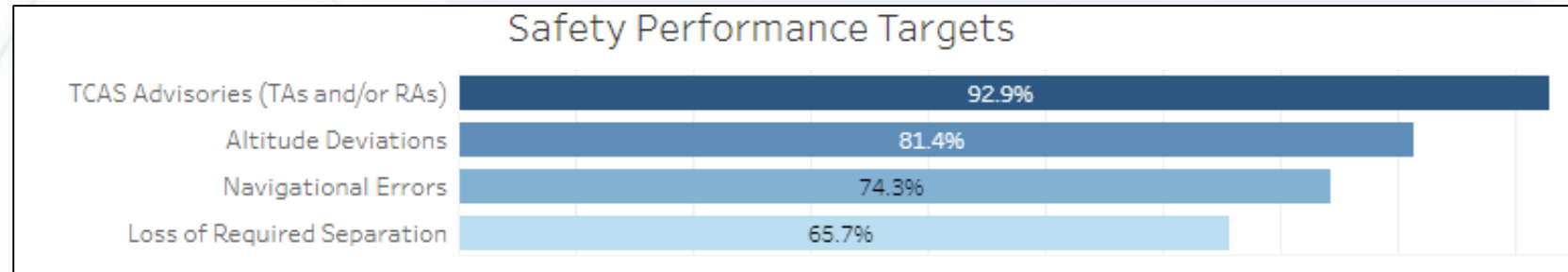## Limited Use of Leading/Proactive Safety Performance Indicators

- **Monitoring Safety Performance**
  - Descriptive: "What **has** happened?"
  - Predictive: "What **could** happen?"
  - Prescriptive: "What **should** we do?"
- **Safety Performance Indicators (SPIs)**
  - Lagging Indicators (Descriptive)
  - Leading Indicators (Predictive)
  - (Lagging + Leading) + Analysis = Prescriptive

Limited Use of Leading/Proactive Safety Performance Indicators

CFIT

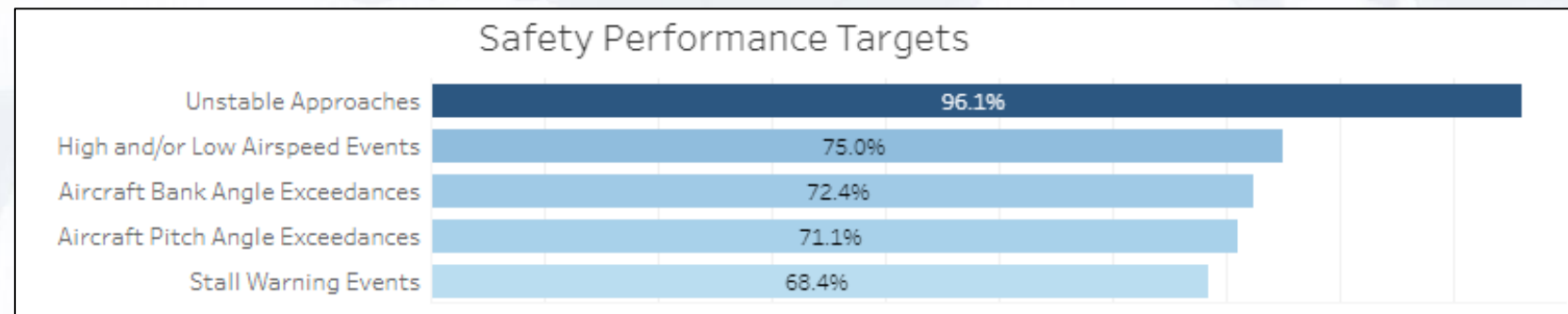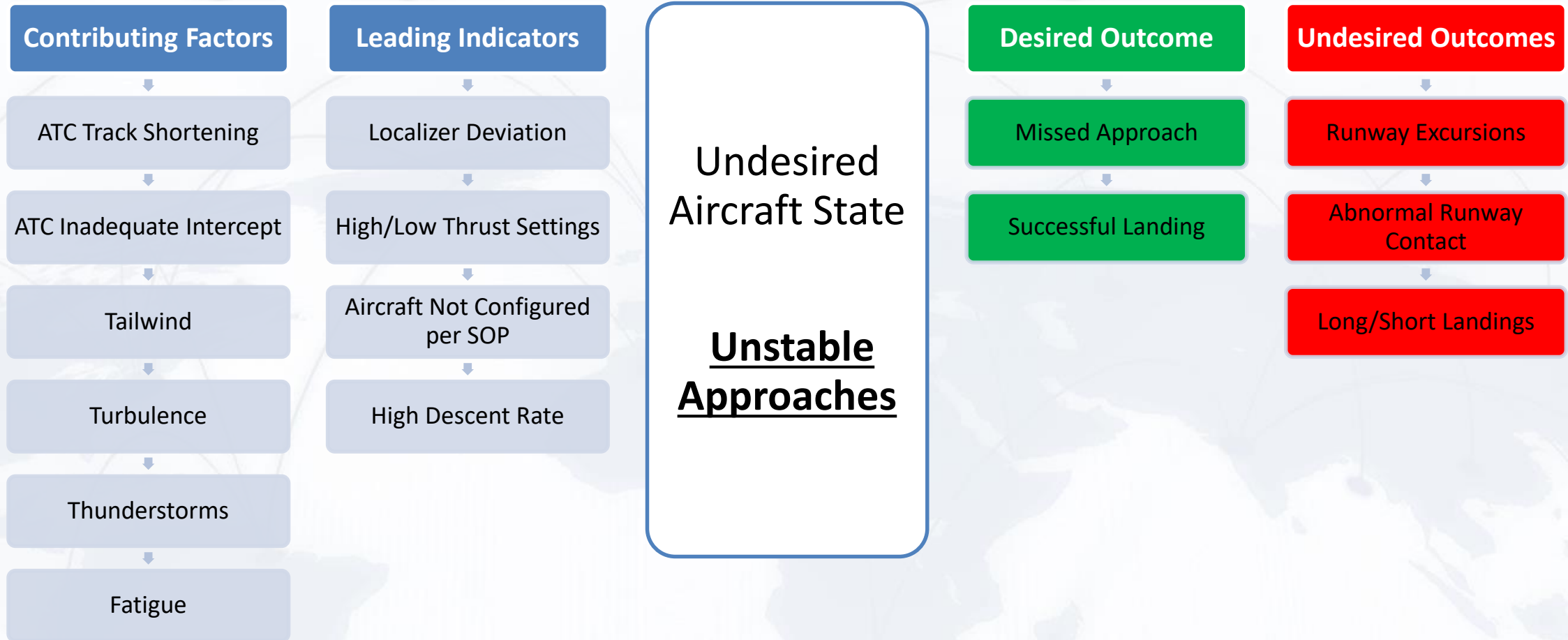### Safety Performance Targets

Indicator	%
Unstable Approaches	90.0%
Ground Proximity Warning System (GPWS) Aler..	80.0%
Lateral and/or Vertical Flight Path Deviations	67.8%
Navigational Errors	64.4%
Minimum Safe Altitude Warning (MSAW) Alerts	45.6%

NMAC

Safety Performance Targets

Indicator	%
TCAS Advisories (TAs and/or RAs)	92.9%
Altitude Deviations	81.4%
Navigational Errors	74.3%
Loss of Required Separation	65.7%

LOC-I

Safety Performance Targets

Indicator	%
Unstable Approaches	96.1%
High and/or Low Airspeed Events	75.0%
Aircraft Bank Angle Exceedances	72.4%
Aircraft Pitch Angle Exceedances	71.1%
Stall Warning Events	68.4%
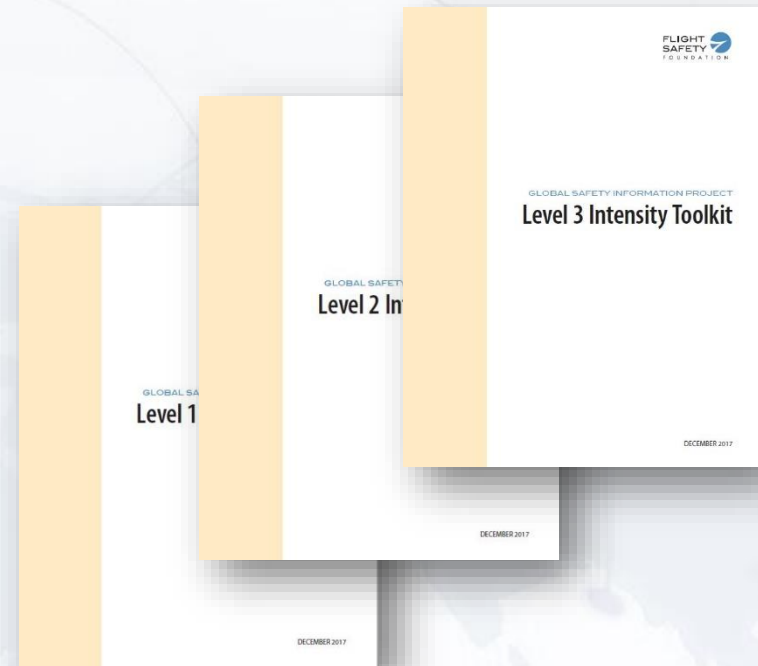
As we learn the levers of the safety business, the maturity on SPIs will grow

Bow Tie Example

GSIP — GLOBAL SAFETY INFORMATION PROJECT

FLIGHT SAFETY FOUNDATION — independent • impartial • international

Controller assigning improper altitude — 1 in 300,000 → Mistake captured — 99%

Communication failure between controller and crew — 1 in 50,000 → Mistake captured — 99%

Pilot improperly setting altitude — 1 in 70,000 → Mistake captured — 99%

All other contributors — 1 in 500,000 → All Other Barriers — 99%

Near Mid Air Collision — 1 in 2.5M

Bow Tie Example

Near Mid Air Collision — 1 in 44,000

TCAS RA

- Both Crews Respond in safe maneuvers — 85% → **No Adverse Outcome** — 99.99999%
- Crews Respond Rapidly and Avoid Collision — 5% → **Passenger/Crew Injury** — 1 in 890,000
- One crew may not have responded in time — 2% → **Aircraft Damage** — 1 in 2.2M
- Unsuccessful Response — .1% → **Fatal Accident** — 1 in 43M

Poll: My organization would benefit the most from an improvement in the following area