

Considering the Information Available to the Aviation SMS

Sofema Aviation (SA) Takes a detailed look at the opportunities to gather data within your Aviation SMS

Introduction

The maturity of the EASA management system requirements, found in Part-ORO, Part-CAMO, and Part-145 is shifting the industry focus from mere regulatory compliance to a more sophisticated, performance-based approach.

For an EASA approved organisation the "Information Available to the SMS" should no longer be viewed as a static repository of reports, but as a dynamic data ecosystem available to drive the Safety Risk Management (SRM) and Safety Assurance (SA) processes.

Internal Information (The Primary Feed)

- **Safety Reporting:** This is the foundation. It includes Mandatory Occurrence Reports (MORs) and Voluntary/Confidential Reports.

Note - Voluntary reports are often the most valuable because they highlight "near-misses" that didn't result in damage but revealed a systemic weakness.

External Information (The Global View)

- **Regulatory Data:** EASA Safety Information Bulletins (SIBs), Annual Safety Reviews, and Airworthiness Directives (ADs).
- **Manufacturer Data:** Service Bulletins (SBs) and All-Operator Letters from OEMs like Boeing, Airbus, or Leonardo.
- **Industry Benchmarking:** Data shared through regional safety forums or international bodies like IATA.

Important Note - In high-reliability environments, the challenge is rarely a lack of data, but rather the noise-to-signal ratio and the latency between data collection and actionable intelligence.

Organization-Specific Data Perspectives

While the SMS framework is harmonized, each entity looks at the information through a different lens based on their specific risks.

The Operator (AOC)

The Operator is concerned with the flight path and the human-machine interface. Their primary information focus includes operational trends, pilot fatigue levels, weather/terrain challenges, and FDM exceedances. A critical safety signal for an Operator might be a spike in "Unstabilized Approaches" at a specific high-elevation airport.

The CAMO (Continuing Airworthiness)

The CAMO sits in the middle, managing the life cycle of the aircraft. Their data focus is on reliability reports, engine health monitoring, repetitive defects, and the strict tracking of AD compliance. A major safety signal for a CAMO would be a trend showing that "Deferred Defects" (MEL items) are increasing across the fleet, suggesting the maintenance program is falling behind.

The AMO (Maintenance Organisation)

The AMO focuses on the physical integrity of the aircraft and hangar safety. Their data concerns involve Human Factors (HF) in the hangar, the quality of spare parts (detecting suspected unapproved parts), and "turnaround pressure" metrics. A critical signal for an AMO is often a rise in "Installation Errors" or "Tool Accountability Issues" during night shifts or periods of high workload.

Data Integration

A robust SMS relies on the convergence of disparate data streams.

Subjective/Qualitative Feed:

- Voluntary reporting system,
- Internal safety investigations, and
- "Just Culture" surveys.

Required Outcome – to focus on the "why" behind an event, particularly regarding human performance limitations or organizational pressure.

Objective/Quantitative Feed:

The Operator (AOC): Operational and Human Performance Risk

For the Operator, the SMS consumes data primarily centered on the flight path and the human-machine interface. The information provides a real-time view of operational threats, such as environmental challenges, air traffic complexities, and fleet-wide pilot performance trends.

- Flight Data Monitoring (FDM/FOQA),
- Crew reports, and
- Fatigue monitoring systems.

Output - The objective is to identify the delta between "Work as Imagined" (SOPs) and "Work as Done" (Actual Performance).

The CAMO: Strategic Technical and Fleet Risk

The CAMO utilizes information to manage the Technical Risk of the Fleet. As the owner of the Aircraft Maintenance Program (AMP), the CAMO views the following data

- PIREPs, MAREPs, and component MTBUR
- SMS focuses on Systemic Reliability and fleet-wide repetitive defects.

Output - The information measures the effectiveness of the AMP, the current operational environment, to determine if structural/systemic adjustments are required to mitigate latent airworthiness risks.

The AMO: Tactical Process and Execution Risk

The AMO utilizes available information to manage Maintenance Process Risk. The data available to the AMO SMS is typically centered on the hangar floor:

- Production pressure,
- Shift handover integrity, and
- Human factor (HF) trends.
- Deferred Tasks
- Time Pressure Metrics

Output while the AMO monitors repetitive defects, it does so to identify Diagnostic Failures or workmanship issues unique to a specific aircraft or team.

The Management System Interface (MSI)

One of the more complex aspects of the EASA SMS is the legal requirement for an Interface. In an ecosystem where the Operator, CAMO, and AMO are often separate legal entities, the "Information Available" can become siloed.

- An intelligent SMS must facilitate a bilateral flow of data. If the AMO identifies a structural crack during a C-check that suggests a fleet-wide issue, that information must be shared with the CAMO to consider adjustments to the AMP and communicated to the Operator to assess operational risk.
- If the Operator's pilots report a recurring "soft" technical issue that doesn't trigger a fault code, that qualitative data must reach the CAMO & AMO to prevent "No Fault Found" (NFF) outcomes that mask underlying technical degradation.

Advanced Analytics: From Reactive to Predictive

For organizations with high safety maturity, the focus is moving toward Predictive Risk Management. This involves using the available information to identify "weak signals"

- Statistically insignificant events that, when viewed in aggregate across the CAMO/AMO/AOC interface, indicate a drift toward the "Edge of the Envelope."
 - Using existing data (e.g., past component failure rates) to update the probability of future risks as new information (e.g., a change in operational climate) arrives.

- Moving beyond "lagging indicators" (accidents/incidents) to "leading indicators" (training performance, audit completion rates, and the frequency of voluntary reports).

Critical Constraints: The Integrity of Information

The most sophisticated analytical tools are useless if the data is compromised. Three factors remain the primary barriers to effective information utilization:

- **Just Culture Fragility:** If the workforce perceives a shift toward punitive measures, the "Information Available" will immediately skew toward the purely technical, omitting the critical human-centric data that explains *why* the system failed.
- **Software Interoperability:** The lack of standardized data protocols between MRO software and CAMO reliability tools often results in manual data entry, which introduces errors and increases latency.
- **Confirmation Bias in Analysis:** There is a risk that the SMS only "looks for what it knows." An intelligent SMS must actively seek "disconfirming evidence" to challenge its internal safety assumptions.

Output A transparent information loop where every stakeholder understands that their specific data point is a piece of a larger, systemic safety ecosystem.

Processing: Turning Data into Actionable Intelligence

The SMS must have a mechanism to ensure information doesn't just sit in a database. Under EASA rules, this follows a specific flow:

- **Hazard Identification:** Information is screened to find the "red flags." If the data shows "hydraulic leaks are occurring after C-Checks," that is a hazard.
- **Risk Assessment:** The SMS uses the information to determine the **Probability** and **Severity** of an occurrence.
- **Pattern Recognition:** The system looks for "weak signals." One tool left in an engine is an incident; three tools left in three different engines over six months is a systemic failure in the tool control process.

The Interface: Sharing Information Between Entities

Information cannot stay in silos. Under EASA Part-CAMO and Part-145, there is a legal requirement to define Safety Management Interfaces in the CAME (Exposition for CAMO) or MOE (Exposition for AMO).

- **Operator to CAMO:** The Operator must report operational issues that affect airworthiness, such as hard landings or lightning strikes.
- **CAMO to Operator:** The CAMO must inform the Operator of technical risks, such as fuel consumption trends that might affect flight planning.

- **AMO to CAMO:** The AMO must report findings during maintenance that suggest the maintenance program itself (controlled by the CAMO) might be inadequate for the environment the aircraft is flying in.

Challenges in Information Availability

Even with perfect regulations, several factors can degrade the quality of information:

1. **Just Culture Gaps:** If engineers or pilots fear punishment, they will stop reporting. The SMS then "goes blind."
2. **Data Overload:** Organizations often have too much data but not enough Analysis. Having 10,000 flight hours of data is useless if no one has the expertise to interpret the "noise."
3. **Fragmented IT Systems:** If the AMO uses one software and the CAMO uses another, and they don't sync, critical airworthiness information can be missed during the hand-off.

The goal is to move from Reactive (learning from what went wrong) to Proactive (learning from what is starting to go wrong) and eventually Predictive (anticipating risks before they appear).