Organizational safety from the work floor perspect

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Description:

A view of the Wright Model A Flyer
in flight with a passenger onboard.

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ORGANIZATIONAL SAFETY from the WORK FLOOR PERSPECTIVE

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Looking at organizational safety from the work floor perspective, with an operational mindset, may identify different causes for deficiencies in organizational safety that may not easily be addressed by authorities. Even though accident rates in aviation continue to slowly decline (ICAO safety reports), certain practices can be observed from a work floor perspective that might reverse this trend. Management style in a company may suppress safety related signals from the work floor. Formal feedback processes may not be effective for all safety related issues. To clarify the threat, we present a model that identifies three components of safety. From case studies also barriers to safety innovations are identified, that are embedded in the procedural and legal oriented mindset of present day management and authorities.
With the increased complexity of present day airborne equipment the question emerges if the certified status of systems and procedures must remain static or does require some maintenance by authorities.
This conference paper will include a, work floor based, analysis of safety related mechanisms in present day aviation operation and will give suggestions for improvement.

Introduction

A safe operation is achieved on the work floor, at the sharp end of operation. This safe operation is a result of the combined efforts of management, providing the work floor with equipment and operating procedures, and the operators on the work floor that comply with, or divert from, these procedures. In an ideal world every situation can be dealt with by following a procedure and all procedures are safe to perform. In a complex world, as present day aviation is, this is not always the case. Reference works on flight deck procedure design include Degani and Wiener (1994, 1997), and more recently Barshi et al. (2016). These use the 3-P and 4-P models, (Philosophy, Policy, Procedure, Practice) to illustrate the embedding of procedures in organizations. The quality of procedures is influenced by the management style in the organization. To visualize this a model is presented to show the interaction between management, authorities and work floor for different management styles. Another model, connected to the first, can be used to pinpoint the areas of attention for safety innovations on the work floor and identify barriers that prevent those innovations.

Organizational Safety

In every organization there are managers that have an operational mindset and managers that have a legal mindset. The overall organizational safety of a company is dominated by the management style that prevails within that company.

Modelling Organizational Safety

Based on work floor observations and case studies a division in management styles can be made in two major orientations: an operation and product oriented, and a process and legal oriented, management style [Huijbrechts & Van Paassen, 2024]. These management styles can be seen as the extremes of a spectrum. The main difference between the management styles is the interaction between management and the work floor:

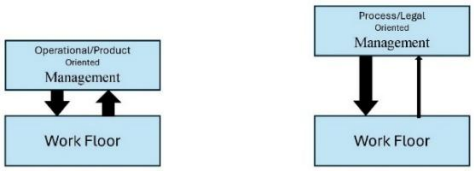

Fig. 1 Management orientations and interaction with the work floor [Huijbrechts & Van Paassen, 2024]

This interaction between management and the work floor may reveal the root cause of problems with organizational safety. To better understand the influence of regulations, the interaction with authorities, compliance and responsibility are added to this model.

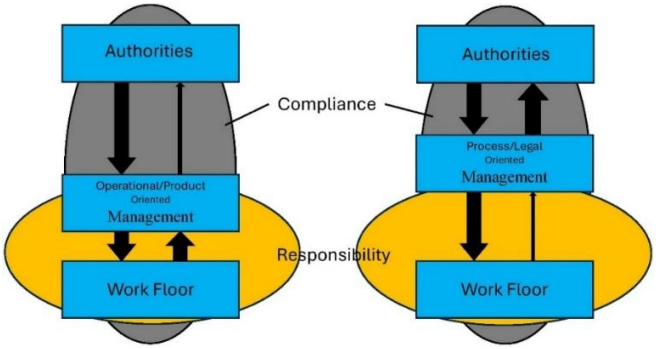

Fig. 2 Compliance versus responsibility within Management orientations [modified from Huijbrechts & Van Paassen, 2024]

This model shows that the more management limits itself to compliance, the more responsibility is shifted to the work floor. This model can be used to show that it is difficult for authorities to get to grips with organizational safety because the situation appears to be better when responsibility is valued over compliance. The latter can be audited, responsibility cannot. It can be used to show the need for mandatory incident reporting and safety management systems to compensate for the deterioration of the feedback loop from the work floor to the management. Examples can even be found where the authorities are part of the organizational safety problem that led to an accident. [The National Diet of Japan (2012), Final Committee Report, B737MAX (2020)] The ultimate question, resulting from this modelling, is whether responsibility can be replaced by a process and regulations.

Safety Components in Aviation Systems

Aviation systems are developed by a manufacturer together with procedures to operate the system. After a certification process the system, and corresponding procedures, are released to be used by operators within aircraft operating companies.

Modelling Safety of aviation Systems

Manufacturers and operators of aviation systems strive to achieve a 100% safety for their systems. Safety can be divided in an instrumental, procedural and operational component. In time there is a development and an operational phase:

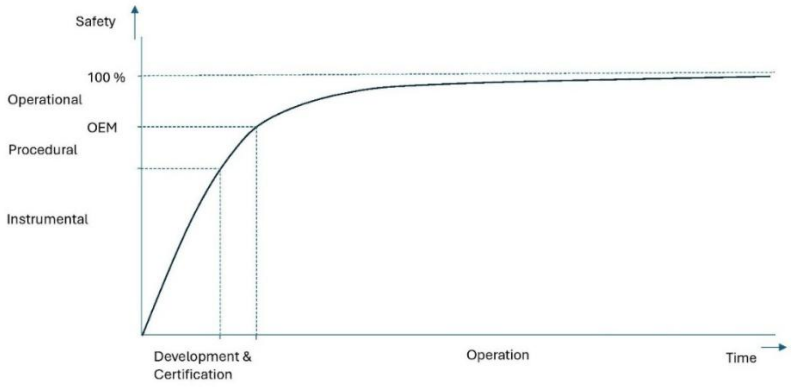

Fig. 3 Safety of aviation systems

Instrumental safety: Manufacturers try to develop systems that have a high instrumental safety. A certification process must assure a sufficient instrumental safety level when released for operation.

Procedural safety: Original Equipment Manufacturers (OEM) provide procedures to operate their systems. Manufacturers of aircraft try to use operational information to design their procedures and present them to crews in Flight Crew Operation Manuals (FCOM). Some of these procedures are mandated by regulations, certified, and incorporated in the Aircraft Flight Manual (AFM).

Operational safety: Operators on the work floor will fill in the last gap to achieve a safe operation. Resilient human operators interact with systems, using procedures. During operation unwanted system behaviour is corrected and operators can, based on their experience, choose to adapt, or divert from, published procedures.
The operational experience can be used to correct/improve instrumental and procedural safety.

This model can be used to show the effect of design philosophies, e.g. ecological interface design, on different safety components. It can be used to show the effect of company efforts to improve safety and can be used to assess the effectivity of feedback processes on the different safety components.

Feedback from the operation (Work Floor)

Feedback from the operation ranges from recommendations resulting from accident investigations (A very reactive and undesirable feedback loop) to work floor suggestions to improve procedure and system safety to prevent incidents and accidents (proactive). Safety culture in aircraft operating companies can be categorized along these lines [Hudson P.T.W. 2001]. A proactive culture, aimed at preventing incidents and accidents, is preferable over a reactive culture. Safety management systems are intended to achieve this.

Observation of Bulletin Records in the FCOM of contemporary aircraft types [The Boeing Company] shows that during operation system behavior occurs that cannot be foreseen in the certification phase. It also shows that manufacturers do feel responsible for problems with system behavior and try to correct this. The feedback loop through safety management systems appears to be effective for instrumental safety. On the other hand in FCOM examples can be found of impractical, and even unsafe, procedures that are still in operation. If an unsafe procedure is certified it may remain active for decades before being corrected [Huijbrechts & Van Paassen, 2024]. Companies are advised to adapt procedures to the companies' needs [FAA 2017, Barshi et al. 2016] and several companies have programs to improve their procedures based on operational experience [Flight Safety Foundation 2021]. Other companies rely on the OEM procedures and the resilience of their operators to cope with possible imperfections in procedures. In smaller companies, the knowledge or assets to adapt procedures may not be available. In bigger companies, a fear for liability issues may suppress initiatives to improve safety by adapting procedures.
Concluding, the feedback loop through safety management systems is less effective for procedural safety than for instrumental safety.

Barriers to innovations in safety of aviation systems

By assessing the effectivity of feedback from the work floor on safety innovations in procedures and aviation systems 2 major barriers can be identified that can be correlated to a legal mindset/thinking pattern:

The certified status of procedures and equipment: Case studies show that once a procedure, or aviation equipment, is certified it tends to remain unchanged until an incident, or accident, clearly shows its safety level is insufficient [Huijbrechts & Van Paassen, 2021]. Managers, at aircraft manufacturing companies, may consider the responsibility for safety of a certified procedure/system to be shifted to the authorities. In those cases authorities often have to take the initiative to demand improvements. The latter may require recommendations in accident reports. Thus the certified status of procedures and equipment can operate as a barrier to safety innovations.

Liability: In the aftermath of accidents aircraft operating companies can face huge liability claims if the company can be blamed for the procedures they used that may have contributed to the accident. Liability considerations often play a role in the decision to change or adapt company procedures. Process/Legal oriented managers can prefer to use third party (OEM) procedures and leave adaptation of these procedures for operational, or even safety, reasons to the individual operators (pilots). In this way liability has become a barrier to safety innovations.

How can we improve safety in aircraft operations?

Apart from indicating where the source can be found and creating awareness it is difficult to give a cure for organizational safety problems. What can be done is find a way to break the barriers that nowadays exist for innovations in procedural safety. With a new generation of pilots entering aviation operation we have to put the experience of the present generation in the procedures to maintain the present safety level [Huijbrechts & Van Paassen, 2023]. Although many companies use OEM procedures, the initiative to improve these procedures will not be taken by the manufacturers themselves, authorities or individual aircraft operating companies.

Collecting information to improve Flight Deck Procedures

An independent party, e.g. the Flight Safety Foundation (FSF) or International Air Transport Association (IATA), can take the initiative to ask aircraft operating companies to Share Experience and reveal where, and why, they have adapted procedures to improve safety. When a platform is created it can then be used as a stepping stone to harvest the information that is enclosed in the experience of individual operators. Operators on the work floor may have good reasons to divert from company or manufacturers procedures based on their own experience. Operators may recognise flaws in legislation that can be improved. They may have discovered safety problems in certified equipment or procedures. Operators may also recognize situations that are not covered by manufacturers procedures that would benefit from better guidance. If this information is collected this can be used to develop an advice to manufacturers to improve their FCOM's and certifying authorities to improve safety of certified systems/procedures.

Does the Certified Status of Procedures and Equipment require maintenance?

The certified status of procedures and equipment was identified as a barrier for safety innovations and the bulletin records of contemporary aircraft models address system behavior that cannot be foreseen in the certification stage. Although manufacturers do feel responsible to correct faulty system behavior, the question arises if the certified status of procedures and equipment also needs a more proactive approach to correct possible unforeseen deficiencies. For workers and managers with an operational mindset the responsibility for a safe operation is continuous. Workers, managers and authorities, with a more procedural mindset, tend to feel that responsibility ends when a process is completed and all boxes are ticked. This has led to an attitude that can be categorized as reactive on Hudson's safety culture ladder. Certifying authorities may improve their responsibility for certified systems and procedures. The use of feedback from the operation and a more proactive attitude is already suggested by US governmental institutions [Cardosi et al. 2024] Authorities can keep a close look at incident reports to assess if the fault mechanism that led to the incident was addressed in the certification process and monitor if corrective actions are taken.

Conclusions

Modelling organizational safety leads to the question if responsibility can be replaced by a process and regulations.

Two major barriers to safety innovations can be identified, resulting from a legal mindset:

1 The certified status of procedures and equipment 2 Liability

For safety innovation the feedback loop to manufacturers to adapt procedures based on operational experience must be improved.

Certifying authorities can develop a more proactive attitude towards already certified systems and procedures.

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