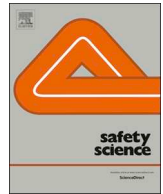




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What is it like for a middle manager to take safety into account? Practices and challenges

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ABSTRACT

Aviation today is seen as a very safe industry, yet recent accidents have shown that vulnerabilities still exist. The literature has often drawn attention to the role played by top managers/CEO in running their businesses profitably, and at the same time keeping them safe from threats. Research has also investigated the way people at the sharp-end of organisations are 'mindful' of the possible threats that can occur in their day-to-day activities, and how they can anticipate (most of) them. But what about the role played by middle managers in ensuring safety in every organisational operation? Even if researchers now agree that middle managers' actions are a valuable asset for organisations and central to pursuing key organisational outcomes, very little is known about how middle managers take safety into account in their daily operations, and the challenges they face. This paper reports on the safety-related practices and challenges of middle managers of the civil aviation industry. Within the Future Sky Safety project, over a two-year research activity, 48 middle managers from a range of aviation organisations agreed to talk about the strategies and actions they put in place on a routine basis, to embed safety in the daily operations. Methodologically, semi-structured interviews were conducted and the qualitative content analysis (QCA) method was used to make sense of the raw material, through a data-driven coding frame. The findings of this research suggest that the practices middle managers identify as central in relation to their role in the management of safety can be grouped into three high-level categories: (1) making decisions, (2) influencing key stakeholders to get the job done, and (3) managing information. This research adds knowledge in relation to the middle managers' role in the management of safety, in particular shedding light on the competency that middle managers from the civil aviation industry rely on to get the job done when it comes to contributing to safety.

1. Introduction

Aviation today is seen as a very safe industry, yet recent accidents have shown that vulnerabilities still exist. As reported in the Annual Safety Review 2017 from the European Aviation Safety Agency (EASA), deficiencies in the area of Human Factors (e.g., situational awareness, CRM, operational communication and knowledge, decision making, planning, and training/competence) contribute to almost half (49.5%) of the total number of serious incidents (EASA, 2017).

The literature has often drawn attention to the role played by top managers/CEOs in running their businesses profitably, and at the same time keeping them safe from threats (Makins et al., 2016). This includes the resources and commitment that both top managers and the overall organisation put in place to support safety management and improvements (Fruhen, Mearns, Flin, & Kirwan, 2014a, 2014b; Tappura, Nenonen, & Kivistö-Rahnasto, 2017; Zuofa & Ocheing, 2017; Zwetsloot

et al., 2017). Research has also investigated the way people at the so-called sharp-end of organisations are 'mindful' of the possible threats that can occur in their day-to-day activities, and how they can anticipate (most of) them (Dijkstra, 2013; Flin & O'Connor, 2013; Frigotto & Zamarian, 2015; Guette, Matthyssens, & Vandenbempt, 2014; Klockner, 2018; McDonald, Callari, Baranzini, Woltjer, & Johansson, 2015; McDonald et al., 2016; Sutcliffe & Vogus, 2014; Weick & Roberts, 1993; Weick & Sutcliffe, 2007; Weick, Sutcliffe, & Obstfeld, 1999).

But what about the role played by middle managers in ensuring safety in every organisational operation? Even if researchers now agree that middle managers' actions are a valuable asset for organisations and central to pursuing key organisational outcomes (Glaser, Stam, & Takeuchi, 2016; Wooldridge, Schmid, & Floyd, 2008), very little is known about how middle managers take safety into account in their daily operations, and the challenges they face (Bhattacharya & Tang, 2013). In their research, Rezvani and Hudson (2016) audio-recorded –

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over a period of one month – the actions and activities performed by one middle manager in the management of safety. The daily interactions that the middle manager had with organisational members were tracked and the different tasks mapped. The authors confirmed the active and strategic role played by middle managers in organisations, in particular in detecting, handling, and filtering information between the different organisational layers. As middle managers operate at the intermediate level of the organisational hierarchy, they act as horizontal integrators who support the distribution of knowledge-based resources throughout the organisation, having “*their fingers on the pulse of operations*” (Dutton, Ashford, O’Neill, Hayes, & Wierba, 1997, p. 407). Access to information gives middle managers strategic leverage in major decision roles, when safety-related issues occur and countermeasures are being considered. They act as ‘*informal safety auditors*’ able to provide “*soft alarm systems in safety management*” (Rezvani & Hudson, 2016, p. 244). This can also be referred to as middle managers’ *safety wisdom* – i.e. the ability to judge, take decisions, influence others, and manage quantitative and qualitative information in order to remain safe (Makins et al., 2016).

Our research aimed at developing an in-depth understanding of the way middle managers contribute to safety in practice. By so doing, this paper aims to add knowledge in relation to the middle managers’ role in the management of safety, in particular shedding light on the practices that middle managers from the civil aviation industry put in place to ensure safety in their organisations’ daily operations, and the challenges they face.

1.1. Future sky safety

This research formed part of the Future Sky Safety programme – an EU-funded transport research programme in the field of European aviation safety, which brings together 33 European partners to develop new tools and new approaches to aeronautics safety, over a four-year period which started in January 2015. Whereas most of the projects of the Future Sky Safety programme are dedicated to technical aspects, this research is part of a project focused on the organisational aspects of safety. It is more specifically part of a work package that aims to understand the role of managers in keeping the aviation industry safe. Whereas the first phase of this work was focused on executive-level management (Executive Board level, e.g. CEO and Directors), and led to a white paper for the industry (Makins et al., 2016), this second phase focused on middle managers, to understand what it is like to be a middle manager in the aviation industry and, more specifically, to take the safety dimension into consideration. Although middle managers are nowadays considered key actors within organisations, they are still the ‘undiscovered country’ when it comes to their contribution to safety, and how to enhance it. To support this, we could count on the contribution of the project partner organisations (and a number of non-partner organisations that were involved during the research activities) as representatives of the European civil aviation industry.

2. Literature review

2.1. Defining ‘Middle Manager’

In the literature middle managers have been conceptualised either by their hierarchical placement in the organisation, or by their operational function. It has been noted that despite the fact that the term ‘middle manager’ is well established in literature, one would not find people with the job title ‘middle manager’ in organisations (Van Rensburg, Davis, & Venter, 2014, p. 166).

Mintzberg (1980; 1983) in his theory of organisations suggests that an organisation comprises three levels (strategic apex, middle line and operating core), and two supporting components (techno-structure and support staff). Here, the middle managers constitute the middle line, providing the link between the strategic apex and the operating core.

The role is one of converting the objectives and broad plans of the strategic apex into operational plans carried out by the operating core. This definition is also shared by other authors in the area of middle management, who place the middle managers at the intermediate level of the organizational hierarchy, two or three levels below the CEO, and above the staff level, supervising (supervisors and staff) and being supervised (by top managers) (e.g. Currie & Procter, 2005; Dutton & Ashford, 1993; Floyd & Wooldridge, 1997; Huy, 2001).

Operational descriptions for middle managers have been proposed by different authors. Middle managers are individuals who give and receive direction (Stoker, 2006, p. 32), make decisions about how to implement the organization’s strategic objectives (Beck & Plowman, 2009, p. 912), serve as organisational linking pins to proactively identify new opportunities emerging at lower levels, overcome obstacles by mobilizing support for initiatives from top managers (Glaser, Stam, & Takeuchi, 2016, p. 1341), and function as mediators between the organisation’s strategy and day-to-day activities (Nonaka, 1994, p.14).

In our research we adopted the following operational definition: “any manager in the *middle line* of the organisation, having managers reporting to them (but not belonging to the executive level) and also requiring to report to managers at a more senior level (including directors and vice-presidents), and holding budget responsibility”.

2.2. Defining ‘Practice’

Researchers in the field now agree that *there is no such a thing as ‘Practice Theory’* (Nicolini, 2012, p. 8). Rather, practice should be studied and comprehended by embracing the different approaches that constitute it, via the perspectives of the praxeology work of Giddens (1984, 1991) and Bourdieu (1977, 1990); practice as something that is socially shared by the members of the same community (Wenger, 1998); the studies of the cultural and historical activity theory (Engestrom, 2000); post-Heidggerian and Wittgensteinian developments (Schatzki (2001, 2012); ethno-methodology as a way to understand practice, and practical actions; Mediative Discursive Analysis; and Situated learning theory). All practice theories recognise that there is an interconnection between the human action and the system in which it unfolds. In this context, the focus of the analysis is in what people actually do, i.e. their activities, performances, and work, in the creation and recreation of all aspects of social life (Nicolini, 2012). Streams of research in the domain also include the role of organisational routines (Becker, 2004; Becker & Lazaric, 2009; Feldman and Orlikowski, 2011; Pentland & Rueter, 1994), and the role of artefacts (Masino, Zamarian, & Maggi, 2000; Orlikowski, 2000) in understanding the practices in place to leverage organisational change. Nicolini (2012) suggests that to study practice empirically, all these approaches should be regarded as a *toolkit* (p. 213), as they share a number of similarities in their ontologies that allows them to be used in conjunction.

In our research we were interested in capturing and describing the recurrent safety-related actions that middle managers perform in their daily work. By so doing, we embraced a pluralist approach for our practice-based definition, which included the following elements:

- The middle managers were studied as actors *shaping their day-to-day contexts* by means of their (social) actions. In this approach, there is the recognition of the agentic power of human action (i.e. people are not only products of their organisational environment and its social systems, but actively contribute to it and hence help to produce it (Feldman and Orlikowski, 2011, p.1240)) which operates both with the limitations and possibilities afforded by societal constraints. Thus, practice is rendered visible by a set of actions, regulated by rules and constituted through situated activities and interactions. As Giddens defines this principle of the ‘duality of structure’, *the structural properties of social systems that are both the medium and the outcome of the practices that constitute those systems* (Giddens, 1984,

pp. 70–71). The routinisation of the daily actions, in this view, becomes critical to derive a sense of ‘ontological security’ of the world that they are creating and re-creating.

- By further looking at the recurrent safety-related actions (or ‘routines’, *repetitive patterns of actions* (Becker, 2004).) put in place by the middle managers, we were interested in the observable patterns (i.e. the selection of successful performances to previously encountered problems) and the generative mechanisms of the routine, in which individuals are engaged collectively. (Feldman, Pentland, D’Adderio, & Lazaric, 2016; Kozica, Kaiser, & Friesl, 2014; Le Boterf, 2006, 2010; Pentland, & Rueter, 1994; Pentland, Hærem, & Hillison, 2010; Struzyna, 2017; Suchman, 1987). The practices tend to be durable. As Schatzki (2001, 2012) proposes, practices are made up of “doings and sayings”, assembled and bound together with the “linkages” of explicit rules, and shared practical understandings. The maintenance of practices over time depends on ‘the successful inculcation of shared embodied know-how’ (Schatzi, 2012, p. 14)
- It was focused on the *actual activities* carried out by the middle managers. This is in line with human factors studies dealing with complex socio-technical systems recognizing that real work is never identical to the tasks prescribed by the organisation (Engestrom, 2000; Falzon, 2006; Leplat, 1991, 2008; Montmollin (de), 1999). Methods to understand the actors’ actual activities, supporting organizational change and improvements, include descriptive methods to work analysis (Nicolini, 2009; Oddone, Re, & Briante, 2008; Vicente, 1999).

3. Method

3.1. Research design

In the period 2016–2017, extensive field research was carried out involving middle managers from different organisations representative of the European civil aviation industry. It included aircraft manufacturers, air navigation service providers, airlines, and airports. As we were interested in collecting as many perspectives as possible, we decided not to use a quota sampling procedure when involving the participant organisations and their middle managers. As a consequence of this, we had 3 manufacturers, 1 airport, 3 air traffic control centres, and 2 airlines.

Purposive sampling was applied to recruit the middle managers from the selected organisations (Marshall & Rossman, 2010). In line with the definition adopted in this research, all interviewees were middle managers, mostly not safety managers as such, but coming from a variety of functions including engineering, research, and operations. The number of interviewees per organisation varied depending on the time and resources availability offered by each selected organisation. Supervisors were not involved in this research. Overall, 48 middle managers were recruited.

The interviews at each selected organisation were conducted by different researchers involved in the project. To make sure that data reliability and validity were met, the researchers met periodically during the research data collection (e.g. to share possible interview prompts) and analysis process (e.g. to address doubts and inconsistencies in data coding). At the beginning of each interview, the researcher explained to the interviewee the interview scope and objective; how the anonymity and confidentiality of the responses were dealt with; and how interview recording and transcription were managed (Bengtsson, 2016; Stenbacka, 2001). The interviews lasted an average of one hour. Interviews were conducted in English. Responses were recorded manually by note-taking, and transcribed. The transcriptions were shared with the interviewees for validation. All data recording, coding and analysis were supported by NVivo (v.11 Plus for Windows, © QSR International) (Bazeley, 2007).

Overall, the field research design involved two stages: (1) the exploratory stage and (2) the confirmatory stage (Fig. 1). The exploratory

stage served to specify and consolidate the coding frame able to make sense of all transcriptions, and hence the study phenomenon. All transcribed interviews collected during the exploratory stage (28 interviews) and the confirmatory stage (20 interviews) were coded in the given coding frame and analysed using the Qualitative Content Analysis (QCA) method (Schreier, 2012). Both the exploratory and confirmatory stages are detailed below.

3.2. Stage 1: Exploratory phase

The scope of this stage was to investigate the range of the middle managers’ activities which they perceived could impact, or be impacted by, safety. As this was an exploratory phase, the initial intention was to perform the interviews with no pre-determined theoretical assumptions/models guiding the field research; hence, unstructured interviews were preferred. Overall, 28 middle managers were invited to talk about their current job and the actual activities they carried out daily, and how these were likely to have an impact on safety.

A project in NVivo was created, all 28 anonymised interviews were uploaded, and a memo-journal with the project background and objective started. Consistent with the research questions/objective of the study (i.e. *What are the practices that middle managers from the civil aviation industry put in place to ensure safety in their daily operations?, What are the challenges that they face?*), the Qualitative Content Analysis (QCA) method was used (Schreier, 2012). This method is particularly suited for studies that aim to explore and then describe “*the meaning of categories through latent examination of their context*” (Bryman, 2012, p. 542). The unit of analysis was each interview, while with reference to the coding unit it was agreed (after the first trial that segmented the text by sentences) to use a ‘meaning unit’ (i.e. any portion of text, regardless of length, to which it was believed a code may apply) (Campbell, Quincey, Osseman, & Pedersen, 2013; Grbich, 2013; Krippendorff, 2004).

The researchers individually analysed their raw material (i.e. the interviews that they personally conducted) to find categories based on the new concepts/themes identified in the data. Following this, the researchers met, shared the common data-driven emerging/recurring themes across all interviews, and compared and agreed on the identified categories/sub-categories. As a result of this activity, a trial coding frame was advanced and specified (each code/node was provided with a label, a definition, examples and decision rules (Schreier, 2012)). This and the codification activity process were described in a working document. The related tree-node structure was created in NVivo and the corresponding summary excerpt recorded. Following the trial coding frame, the interviews were re-coded by the researchers in the NVivo project. Each interview was coded by two researchers, so that the inter-coder reliability could be tested. This pilot phase lasted approximately six months, in which every doubt about the coding activity was addressed and potential changes to the coding frame documented. The coding frame reliability was tested and retested by two independent researchers until it reached an ‘excellent agreement’ (indeed the final coding frame K-coefficient was 0.87) (Krippendorff, 2004; Krippendorff & Bock, 2009).

The exploratory stage’s main outcome was the consolidated coding frame that supported us in interpreting the data and making sense of the study phenomena. The coding activity process, the comments, and the related changes were all recorded in the NVivo memo journal. The consolidated coding frame included six high-level categories, and within each category a number of sub-categories (Fig. 2). As this paper is focussing on the practices/routines of the middle managers to take safety into account, we provide the coding frame breakdown for the three categories that regard the overall practice of (1) ‘Managing Information’, (2) ‘Making Decisions’, and (3) ‘Influencing Others’ (Table 1). The other three categories were relevant for the second part of the research and paper, to explain what it takes to support middle managers’ contribution to safety.

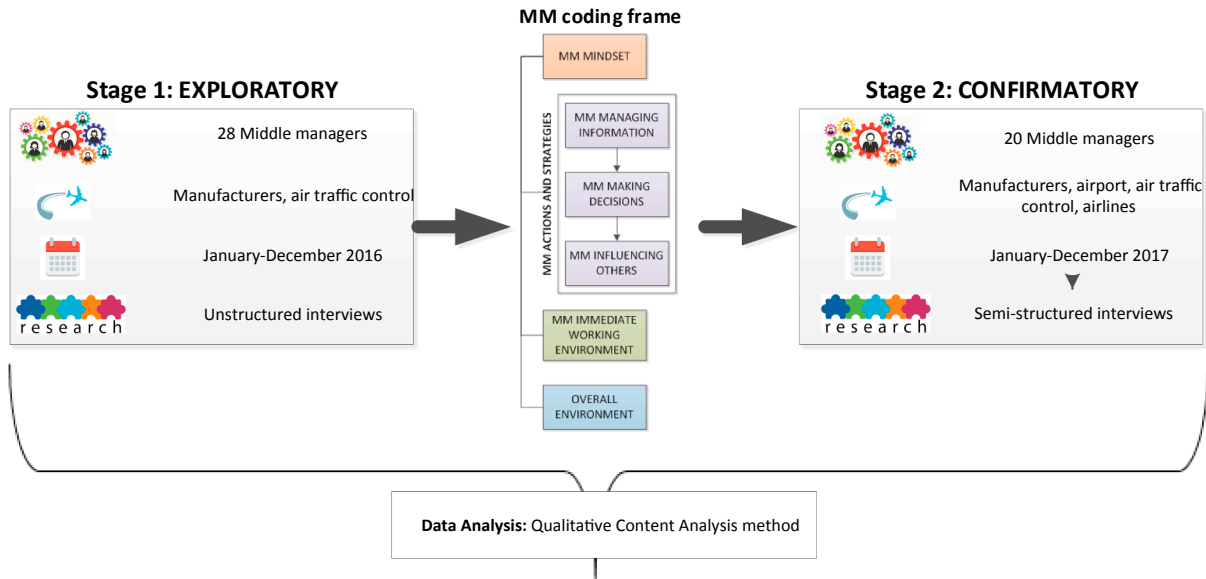


Fig. 1. Field research stages.

3.3. Stage 2: Confirmatory phase

In 2017, a second wave of interviews was held. The confirmed coding frame and a comprehensive review of the literature provided the basis to outline the semi-structured interview guideline. The interview guideline comprised six sections: (a) participant’s mindset and approach to safety; the consolidated practices participants have when (b) managing information; (c) making decisions; and (d) influencing key stakeholders (i.e. top executives, peers, staff, customers) in relation to safety; (e) available resources and culture in place at the participant’s managed unit/department; (f) the overall environment – including both within and outside the organisation. Twenty additional middle

managers were interviewed. Once the interview transcriptions were validated by the interviewees, we uploaded them in the NVivo project. Two researchers were involved in the codification activity of all interview contents within the novel coding frame. Each researcher extracted from the NVivo project the word document containing the coded material within each category/subcategory that was performed, and shared it with the colleague. The two principal researchers met in June 2017 to discuss the overall coding activity of the 20 interviews collected during this stage (e.g. if any coded segments should have been coded within a different subcategory, etc.). Once the agreement was achieved, the data analysis started, using the QCA method (Schreier, 2012).

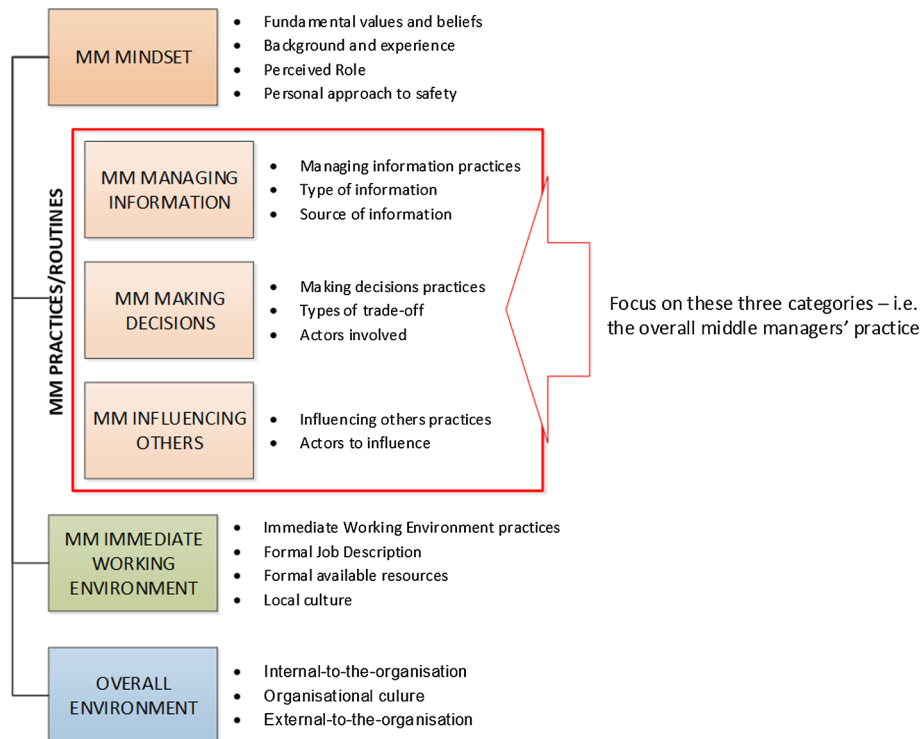


Fig. 2. Research consolidated coding frame.

Table 1
Consolidated coding frame breakdown.

Category	Sub-category	Definition (Description + Example + decision Rule)
Managing information	Managing Information practices	D: This includes information about the specific actions and strategies that the MMs adopt to manage (get, process, disseminate...) the safety-related information at their level. It also includes information about whether the MM proactively seeks information or more passively receives it. E: "90% of the information I have comes from discussions with my team members. It is my approach to cope with too much information". R: It is not related to the formal processes of information management within the organisation but rather to what the MM actually does to get, process and disseminate information.
	Type of information	D: This includes information about the nature of the information used by MMs, be it either formal or not, official or not, quantitative or qualitative. E: "I discovered there is a quantitative approach and a qualitative one. It is not black and white" R: It is not related to where they get the information from or how they process it.
	Source of information	D: This includes information about the formal or informal means or channels through which the MMs get their safety-related information. E: "My main source of safety information – and the most effective one – are the people. [...]". R: This is not related to the nature of the information or how MMs process it.
Making decisions	Making Decisions practices	D: This includes information about the specific actions and strategies that the MMs put in place to create the right environment (information, stakeholders...) to make decisions. E: "Usually the decisions are agreed, but in case of disagreement, all the pieces of information are reported to the Management and the Management chose the action(s) to put in place". R: It is not a description of the formal processes to make decisions within the organisation.
	Type of trade-offs	D: This includes information about the dimensions/aspects taken into consideration in the decisions the middle managers have to make. E: "There is a trade-off between capacity and safety". R: It is not related to the decision rule when several dimensions/aspects are at stake but to the various dimensions/aspects involved in the trade-off MMs have to make.
	Actors involved	D: This includes information about the actors involved in the middle managers' decision-making process. E: "Such decisions are well prepared by the design teams. We make the decision collectively. I invite experts both involved in the development and out of my domain when need be to have 'fresh eyes' because it is never black or white" R: It is not related to the decision rules and thresholds if any but just to who is involved.
Influencing others	Influencing Others practices	D: This includes information about the specific actions and strategies that the MMs put in place to influence key-stakeholders E: "In case one of these actions has an impact on other centres, I'm the one who contacts all the areas / people affected, in order to guarantee a successful implementation of the work plan" R: It is not related to the hoped way of influencing people, but rather the actual actions of doing it.
	Actors to influence	D: This includes information about the people and entities, etc. that the MMs aim to influence – e.g. top managers (upward influence), peers (lateral influence), and staff (downward influence), and external influence – e.g. customers and external stakeholders- E: "A significant part of my job consists in influencing: other divisions (programs...), my team, etc. R: It is limited to the people that MMs intentionally try to influence.

3.4. Data reliability and validity

Different strategies were used to enhance data reliability and validity in this research. Data reliability (Krippendorff, 2004; Krippendorff & Bock, 2009) regards achieving stability (i.e. *Does the coder's use of codes change over time?*), accuracy (i.e. *Has the used coding frame been tested and assessed with high reliability?*) and inter-coder reliability (i.e. *Would different coders code the same data the same way?*) (Campbell, Quincy, Osserman, & Pedersen, 2013). In this research, the three reliability aspects have been met, as described in the methodology section. Further, it involves the traceability of all key-decision and development points along the research implementation, to corroborate the findings and the conclusions. This has been achieved using the NVivo project as a social platform where all the activities performed could be monitored, and the memo journal as a tool to record in a systematic and transparent way the evolution of the project, the decisions made by the researchers involved, and the achievements reached in each phase. To meet data validity, the findings were reviewed and validated by key-informants (e.g. experts from the same sector or context).

4. Findings

As we aimed to understand and characterise the way middle managers contribute to safety in practice, we present here the findings concerning to the safety-related practices/routines put in place by the middle managers in the management of safety that have been recorded

using our coding frame. Therefore, the focus of analysis here has been only on the three categories of the coding frame (out of the six comprising the coding frame) that regard the overall middle managers' practice of (1) 'Managing Information', (2) 'Making Decisions', and (3) 'Influencing Others' (Table 2).

In relation to (1) 'Managing Information', all safety-related information that the middle managers receive, have access to, look for, or would like to receive/have access to in practice, to support their decisions or influencing practices were categorised. The focus was to detect the 'independent' management of information – i.e. what the middle

Table 2
The categories/subcategories of the coding frame related to the middle managers' practices.

Parent node/child node #CATEGORY/#subcategory	Unit of analysis #Interviews	Coding unit #Quotes
Influencing others practice		
Actors to influence	34	85
Influencing Others practices	44	136
Making decisions practice		
Actors involved	22	52
Making Decisions practices	39	144
Type of trade-offs	41	131
Managing information practice		
Managing Information practices	34	98
Source of information	38	112
Type of information	42	112

Table 3
Sources of information.

Formal	Informal
<ul style="list-style-type: none"> Technical groups/ departments, and/or Meetings/ committees Panel of key experts/stakeholders to collect current needs: Updates, and data coming from customers All published safety information: e.g. “capitalizing all the time, including what happened elsewhere, the FAA/EASA (Federal Aviation Administration/European Safety Agency) recommendations, identifying the state of the art, the in-service experience...” Specifically, SSAs (System Safety Analysis), FMEAs (Failure Modes and Effects Analysis), Zonal safety assessments, written reports from accidents/ incidents, in-service events, inputs from other industries. Attending Safety conferences Local/organisation database (for key-statistics, like statistics number of SMI (Separation Minima Infringement) missed approaches etc.) Collect published success stories of safety-related events Corporate safety bulletins Figures provided by selected suppliers: e.g. “MTBF, in-service events, etc.” Exchange data with partners 	<ul style="list-style-type: none"> Making use of personal networks, or top managers’ contacts. Exchange information and up-to-speed news with colleagues/peers from other units/departments. Staff /Supervisors: Key-informants/ experts: e.g. pilots; safety engineers (i.e. “they warned us that these – MTBF (Mean Time Between Failure) in-service events -were theoretical figures” Informal exchanges with suppliers: e.g. “[...] since they do research as well.”

manager deliberately refers to when dealing with (safety related information). As indicated in the literature, thanks to their position at “the intersection of the vertical and horizontal flows of information”, middle managers have access to information in their ‘monitor’, ‘disseminator’ and ‘spokesperson’ roles (Rezvani & Hudson, 2016), and can use the information as an input to play major decisional roles (Bamford & Forrester, 2003; Conway & Monks, 2011; Nonaka & Takeuchi, 1995) and make better-informed safety related decisions (see Table 3).

In relation to (2) ‘Making Decisions’, the information about the way middle managers make decisions in practice (e.g. what they rely on, who they interact with, etc.) were categorized. The literature on this topic confirms the middle managers’ role as ‘agents of change’ (Balogun, 2003; Huy, 2001), and hence their proactive participation in decision making to leverage innovation and change in organization, and overall foster improvement in organisational performance (e.g. based on their ability to decide where to allocate external and internal resources) (Cheng, Song, & Li, 2017; Radaelli, Currie, Frattini, & Lettieri, 2017).

In relation to (3) ‘Influencing Others’, the information about the way middle managers use their strategic influence to achieve their organisational goals, were categorized. Researchers have studied the extent to which middle managers can influence strategic change through the different organisational layers, promoting upward influence to champion alternatives and shape the top managers’ strategic agenda (Floyd & Wooldridge, 1994; Dutton & Ashford, 1993; Dutton, Ashford, O’Neill, Hayes, & Wierba, 1997; Dutton, Ashford, O’Neil, & Lawrence, 2001; Ling, Floyd, & Baldrige, 2005); leverage downward influence to facilitate adaptability at the operating level by adjusting the planned organisational strategies at the operational level to fit with the current specific operational state/situation (Ahearne, Lam, & Kraus, 2014; Pappas & Wooldridge, 2007); strengthen lateral influence, by exchanging information from formal and informal activities with peers and with their respective departments (Bamford & Forrester, 2003), and make use of their networks to keep up-to-speed with and make sense of all possible strategic changes (Bäckvall & Englund, 2007; Conway & Monks, 2011).

4.1. Managing information

Middle managers often refer to formal and informal channels for safety-related information. This includes looking for information in their personal network or listening to peers and/or staff and/or field operators, and actively screening information coming from outside the organisation.

“Informal information from my personal network and from my manager’s personal network”.

“My main source of safety information – and the most effective one – is the people. I get safety information from my staff, my team members and whoever has key responsibilities here”.

Middle managers believe that creating personal relations is critical to receive information sooner than through the official means, and from people who would not come to you otherwise. Knowing people well and getting information from trusted sources is a way to receive selected information and overcome the challenge of too much information.

“Anyone can come and see me easily or send an email [...]. Some people won’t come to you. It’s important to get a personal relation”.

“90% of the information I have comes from discussions with my team members. It is my approach to cope with too much information”.

Participation in meetings and workshops where safety is discussed, and/or attendance at safety conferences, is considered critical for the middle managers to be up-to-speed with the latest information and news. The issue is not only collecting information, but challenging it, to assess if it is consistent and relevant, if it reflects the reality of what has happened (for example, if it is received from operators, or if it comes from outside the organisation).

“For me the main input is the information coming from personnel, even though I have to be good at filtering it – because controllers could tend to exaggerate things a bit”.

“I also request to participate in the yearly safety conference to understand the weaknesses encountered in operations and the things to be corrected”.

“I do follow the safety evolution through written reports or my participation in a number of committees”.

The use of and involvement in internal workshops/meetings is a way of creating the right atmosphere to speak up and share everyone’s safety-related concerns.

“Apart from the work I’ve described, I’d like to think that people feel free to speak up. If anyone has an idea, it’s taken seriously. The atmosphere is such that if they would have something to say they would say it”.

“During the internal safety action group meetings, the events of the past month are discussed. Everyone is given a chance to comment on events (coming from daily operations). If an event is recurring, it becomes a safety issue”.

Discussing and analyzing safety data (mainly reports or operational problems) with safety managers and connecting the data to the operational context is critical for getting the job done.

“For example, in the past we had a high number of Missed Approaches. Per se, the high number of missed approaches was not a safety issue, as Missed Approach is a published procedure part of the normal business.

However, this number was an indication of something that was not going in the expected way”.

“All the data are discussed with the Local Safety Manager or Flow Manager – depending on the type of data”.

For middle managers in operational functions, encouraging their staff to report even low-level events is a ‘must’. It can be done by means of explicit behavioral objectives (challenging, speaking up), and by creating a supportive ‘Just Culture’ environment where people feel safe to report (i.e. without personal repercussions for reporting ‘honest mistakes’).

Middle managers make use of different types of information, whether official or not, quantitative or qualitative, and make use of both informal communications with peers/staff or technical groups, and formal, using official reports, and written information (e.g. statistics, figures, etc.) from databases. There is a shared feeling that middle managers are asked to refer to quantitative indicators for getting their job done. The qualitative information regards mainly hazard analysis, expert judgement, and/or quantitative risk models. Middle managers report that there is not a preferred choice between the two types of information, as one completes the other [e.g. “I discovered there is a quantitative approach and a qualitative one. It is not black and white”]. Further, they comment that the increase in information and speed of receiving information poses some issues.

“We are data-rich but not necessarily information-rich”.

“The more information you have, the harder it is to make decisions. The data is so segmented that it is sometimes not clear what it all means”.

“We’ve got tons of information, dashboards, etc. I do not need more”.

Discriminating between important and non-important information becomes the real challenge.

“Do we have the necessary data to support decision making?”

“When / how do we decide we have enough data to justify a decision?”

Sources of information for the middle manager can be either formal or informal. Middle managers agree that there is no ‘one-stop-shop’ for all safety and other relevant data (i.e. the data and information needed to take safety into consideration is not exclusively ‘safety data’ or ‘safety information’ but can be data/information on other aspects). ‘Numbers’ are valued in the middle manager’s work, thus all parameters, including the ones from other operational units and centres and contexts, reports, etc., are monitored and analysed. In addition, the informal sources are a necessary complement and they cover a critical part of the middle manager’s information management. This could be summarised in the table below:

4.2. Making decisions

Making Decisions includes the specific actions and strategies that the middle managers put in place to create the right information-based and viewpoint-based environment to make decisions. Middle managers agree that it depends on the decisions: some decisions are made individually, some are made by one department, some are made collectively. One case that could seem easy is when there are precise thresholds supporting the decision:

“The engineers would run the risk index. It was OK”.

However, even in these cases, middle managers may consider it insufficient:

“I wasn’t confident because we were not able to reproduce the problem, we couldn’t understand 100% the problem.”

More generally speaking, in many situations, there are grey areas that require middle managers to adopt other practices than reliance on thresholds to address safety. In some cases, middle managers make decisions on their own or with the sole support of their staff. However,

before making the decision, they gather, consolidate and analyze information, ideally coming from different sources. Among the examples mentioned by the interviewees were decisions that have to be made quickly, or decisions that require not to be “polluted” by or interfered with via pressures or considerations that are too commercial or business-oriented. In such cases, the middle manager explains the decision to all the impacted stakeholders and warns them in advance when possible.

“I explained to them why I had made this decision. (...) I had sound reasons to believe that there was a risk”

“The only margins I have are related to urgency. I can intervene directly on things that require, according to my judgement, to be done immediately.”

“We did not involve the Program in the decision because we didn’t want any interference from any commercial or budget aspects. We then explained our decision to the Program.”

“We took the decision not to release the aircraft. We had background to sustain our position.”

Conversely, for some decisions, especially those that allowed sufficient time for exchanges with other actors, middle managers prefer to confront several viewpoints to inform the decision. The number and profiles of the actors involved vary depending on the middle manager’s anticipation of the reach of the decision and the time and resources available to make it. Such an approach enables middle managers to consider the various impacts of the possible options at different time-frames and the impacts on different stakeholders. These collective discussions and debates can be part of formal frameworks within organisations or result from more informal practices.

“We make the decision collectively. I invite experts both involved in the development and out of my domain when need be to have “fresh eyes” because it is never black or white”.

“The safety dimension is however addressed collectively by a panel involving: systems design, multi-program people, test pilots, customer support, the chief engineer, the safety department. I make up my mind on safety based on the panel’s discussions”.

“This organisation has forums involving different viewpoints allowing debating and collectively deciding”.

“It is based on regular progress meetings involving in the same room people more sensitive to financial aspects and other more sensitive to safety aspects.”

“It is key to confront several viewpoints and validate together with these other people”.

“The various Heads have different background & experience. This is positive because they have different approaches & build the whole picture”.

“There is also an informal one. Since at our level we know each other in the various departments, we can share doubts but eventually, the ones in charge of the topic (e.g. programs) make the decision”.

“The trade-offs involve multiple dimensions. The main question is: is the proposed action going to make a difference to be worth the hassle to all impacted?”.

In case of doubt in relation to the safety impact of a decision, middle managers tend to choose a conservative option even if it induces economic or operational consequences. However, the need for having more rational arguments when it comes to safety is underlined by some managers to make sound trade-offs.

“I am engaged in an effort to make the safety argument more rational with respect to operational and economic arguments.”

In case of residual disagreement or if a problem cannot be solved at the middle manager’s level, they escalate the issue to the upper management.

“If I have not been able to fix a safety issue myself, I’d raise it to my

manager”.

“We had good reasons. We escalated the case and had a favorable trade-off from the chief engineer.”

A challenge to making safety informed decision-making noted by several middle managers is the complexity of the air transport system, of its components and interactions.

“The challenge is to make rational choices. The air transport system has become so complex, performant and constraining that it is hard to say if an option is better than another. We perform analyses to try to convince ourselves, but reality is complex and extremely heterogeneous, thus hard to model.”

4.3. Influencing Others

Explaining the implications, the associated safety stakes, the broader safety picture, potential consequences (safety, time, resources, impact on customers, etc.) is a key aspect of the influencing-process. Overall, having excellent interpersonal skills is crucial – this includes explaining in clear, simple and pragmatic way; explaining the underlying reasons and vision, etc.

“I explained to them [all chief engineers, safety managers...] why I had made this decision”.

“It was difficult for me to explain these contradictory decisions to my teams, to explain the impossible”.

“In case one of these actions has an impact on other centres, I’m the one who contacts all the areas / people affected, in order to guarantee a successful implementation of the work plan”.

Further, middle managers believe it is critical to demonstrate to all stakeholders their own interest in the process, to understand each party’s stakes, identify the important questions.

“I invested some time and effort to try and understand each party’s stakes, identify the important questions.”

Besides technical competences, middle managers agree that a great part of their actions involve non-technical skills, such as gaining credibility, becoming trustworthy (especially through experience, role, position, personal influence), and negotiating. Overall, they agree that this involves having an open communication approach to explain the rationale of decisions to staff.

“My role is to avoid adding noise to the system i.e. to cool my teams by explaining why there can be contradictory opinions, by giving meaning to the decisions”.

Regular collaboration, discussions and exchanges (meetings or work or informal networking) with people from different horizons and background (finance, project manager, stakeholders) facilitate the influencing process.

“However, it is based on regular progress meetings involving, in the same room, people more sensitive to financial aspects, and others more sensitive to safety aspects. (...) What helps a lot is the daily work between the different people: project manager, technical deputy of the chief engineer and safety representative”.

In terms of ‘whom to influence’, the findings confirmed that middle managers’ actions are addressed to top managers (upward influence), peers (lateral influence), staff (downward influence), and external influence – e.g. customers and external stakeholders. This is:

- Upward influence.

“I can influence my bosses but I do not sit around the decision table”.

“I would be comfortable voicing safety concerns to my managerial line and trust they would act upon my concerns”.

- Lateral influence.

“A significant part of my job consists in influencing: other divisions (programs...), my team...”; “My responsibility is to remind my teams that understanding everything that is safety-related is key”.

- Downward influence.

“What I need is that the 70 persons in my department take safety into account. It is very easy to explain to them that in their trade-offs, they need to take safety into account”.

- External influence.

“It will require as it always does negotiations with our programs clients”.
“In this case, I had to persuade the airport company to look more after the issue, even though it is true that the airport company always demonstrate to be sensitive to safety and willing to spend money if needed”.

5. Discussion and conclusions

The research reported here examined the practices that middle managers from the European civil aviation industry put in place to embed safety in their daily activities. As this phenomenon is still quite obscure within the sector literature, extensive field research was carried out, involving different stakeholder organisations, and middle managers, and hence multiple perspectives have been collected, coded and analysed.

Although previous research on middle managers’ actions highlighted a vast number of activities, the findings of this research suggest that the practices middle managers identify as central in relation to their role in the management of safety can be grouped into three high-level categories: ‘Managing information’, ‘Making Decisions’, and ‘Influencing Others’. Even if analysed separately, all of them constitute the distinctive and idiosyncratic competency that middle manager rely on to get the job done when it comes to contributing to safety. These practices have to an extent already been identified and analysed in the literature as part of an effort to comprehend the middle managers’ role and activities within organisations (for example, middle managers’ role in information exchange: Nonaka & Takeuchi, 1995; Wooldridge et al., 2008; middle managers leveraging innovation within organisation by influencing strategic change through the different organisational layers: Ahearn et al., 2014; Bamford & Forrester, 2003; Conway & Monks, 2011; Dutton et al., 1997; Floyd & Wooldridge, 1997; Pappas & Wooldridge, 2007). However, our research deliberately adopted a ‘safety angle’ in the analysis of the middle managers’ practice, and this guided the way all interviews were performed, coded and analysed. Throughout the study, we considered whether middle managers would use any ‘special’ practices (what can also be called tactics) for safety, as opposed to their other daily concerns. The results suggest that at a high level they do not, since the same overall categories of managing information, making decisions and influencing others apply equally to safety as to other concerns. At a broader level, it also means that any middle manager can focus on safety – they already have the skill-set to do so.

Managing information in relation to safety involves a broad set of actions, such as searching, collecting and analysing different types of information, and from a multitude of sources. Interestingly, besides the formal procedures and implementation processes that are defined at organisational level (and that frame employee actions), a number of strategies are implemented by middle managers drawing from informal means of communication, personal networks and chats with the team and peers in informal settings. This enables middle managers to be facilitators of safety-related information exchange and knowledge creation between the different organisational layers, as they are in the position to detect, critically handle, and filter issues coming from the day-to-day reality at the operative frontline, and propose solutions that can be discussed with peers, and report back to the top management

and to external stakeholders. As suggested by Rezvani and Hudson (2016), middle managers have an advantage in comparison to top managers, as they can count on collecting safety-related information not from just attending meetings, but directly from the operational level. Hence, top managers generally need to rely on the middle managers' feedback for their strategic decisions. Thus, middle managers' safety-related decisions are facilitated by their position within the organisation and the privileged access to information, and the role played within their specific unit/department, to manage the team and implement activities, in collaboration with other units/departments. Decisions that are likely to affect safety can be taken individually, or counting on the available organisational resources. The top management, within this frame, seems to be a 'supportive partner' for the middle managers, a positive resource that one can refer to when in need of help. The findings in our research confirm this role played promoting upward, downward and lateral influence when safety is involved. This is consistent with the general literature regarding the ways middle managers influence strategic change throughout the organisation. What the findings show is an 'external influence' in relation to safety, involving outside-of-the-organisation stakeholders (e.g. clients, subcontractors, etc.), with whom some of them have frequent contacts in relation to their daily activities.

To support the above, middle managers believe in the leadership role that they can play, in sponsoring actions, motivating the team, attracting people willing to share the latest events and 'rumours' in the management of safety. Sharing of information and developing personal relationships play a crucial role in the process of safety-related knowledge creation within organisation.

Critically, all three safety-related practices show dimensions of power that middle managers act upon to attain their organisational goals. As Dekker and Nyce (2014) state, power is embedded in the way organisations review their lessons learned from the analysis of incidents and/or accidents, and hence is "heavily inherent in the life of risk-managing organizations" (p.44). They claim that power is everywhere safety work/research is concerned, in the ability to collect meaningful data, to interpret them and influence the course of action. Thanks to their position and role in the organisational hierarchy, middle managers have the opportunity to "determine the narrative, or the "truth" of the event" (*ibid*, p.47), and as such play a critical role in embedding safety concerns, influence organisational agendas, taking strategic decisions. Other authors have reviewed the concept of power and safety, and provided a taxonomy (e.g. Antonsen, 2009; Rosness, Blackstad, & Forseth, 2011). Indeed, middle managers exercise their power of 'know-how' and 'know-what' thanks to their central position in the organisational information flow. Further, they have the power of 'know-who' in their ability to networking to form alliances useful to influence organisational agendas and champion alternatives in order to take informed decisions.

In relation to this discussion on power, it must be noted that the aviation industry is highly focused on safety, where a major fatal accident can sometimes mean the financial ruin of an airline, and any such major accident can have a significant effect on the economic 'bottom line' of many organisations. There is also relatively strong regulatory oversight in the aviation industry, such that if a middle manager wishes to raise a safety concern, then a higher level manager who chooses to override that concern does so at some risk. This means that middle managers in at least some aviation organisations have a degree of 'latitude' and power to raise safety concerns even when those concerns can have negative business effects (e.g. increased cost; production and delivery delays; etc.). The extent to which this high-safety-focus business context exists in other industries is therefore a key determinant of the degree to which insights from this study can be transferred to other industries. It may well be that lessons learned from these organisations can be translated, or at least adapted or tailored, to other high risk industries such as nuclear power, oil and gas, etc., where there is also a high focus on safety. But ideally this would need to be

determined empirically, by carrying out similar studies in such industries, and then perhaps extending the approach to areas currently considered the 'wild west' of safety culture, i.e. healthcare.

In line with the approach taken to study the middle managers' practice, the activities are studied and understood in their specific contexts, as they are presented and told by the middle managers themselves as part of their repertoire of successful performance to achieve the organisational goals. This has offered an opportunity not only to describe the actual practice (i.e. the 'what', the agentic capacity of human action in both its routinized and improvised forms that agents repeatedly and regularly develop in certain ways in achieving organizational outcomes), but also to inform about the mechanisms underlying that practice (i.e. the 'why', to explain the practices as primary building blocks of social reality) (Feldman and Orlikowski, 2011). This is for example the use of formal and/or informal channels to get information, to promote change and/or influence what actions people may take. The middle managers' activity is partly directed and partly constrained by procedures defined at the organisational level, but many issues are still left to be solved in situ, through "rational" choices in the face of a multitude of contingencies and ambiguity of their daily conduct.

Overall, we can re-affirm that there is no doubt about the active and strategic role that middle managers play within organisations, and in particular to ensure that safety is taken into account in each and every action of their daily practice. As such, as an important part of organisational resilience, organisations should feed, protect and value this practice and expertise that contributes to the safety of its operations. Beyond the organizational structure and processes that may support them, middle managers develop a sense of each situation and adapt their strategies and practices to find the best information to make-up their mind safety wise and to get their safety-related insights across to the relevant actors of the organization through appropriate messages and means.

One limitation of this research is that the middle managers that were interviewed did not represent proportionally all the European aviation stakeholders. Having a more representative sample could have additionally supported a cross-case analysis to infer whether 'specific' practices can be drawn for each of the Air Transport System segment (e.g. manufacturers, airports, air traffic control centres, airlines, etc.).

As organisations in the current economic environment struggle to run their businesses safely and efficiently, the findings from this research represent a valuable contribution to comprehend the role middle managers play in the management of safety, in particular in the aviation domain, and highlight the practices that are put in place to keep up with the safety-related challenges. Further research on the topic would benefit from the investigation of similar research questions in another industry or across several industries.

Conflicts of interest

The authors have no conflicts of interest to report

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Appendix A. Supplementary material

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ssci.2018.10.025>.

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