Safety Management Systems in micro and small air operators: mission possible?

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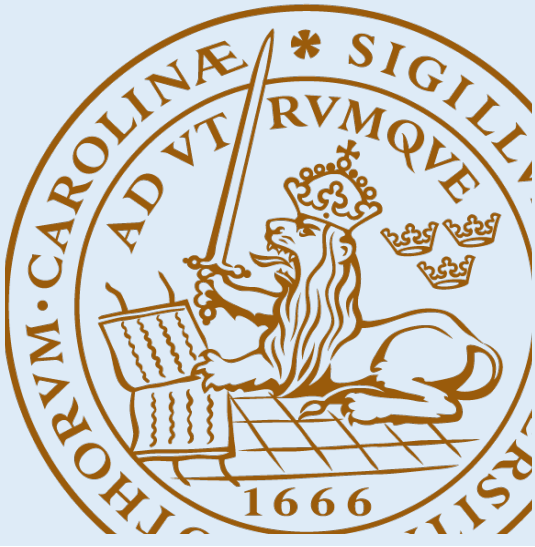

Safety Management Systems in micro and small air operators: mission possible?

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Abstract
This thesis explores the rationality, completeness and functioning of Safety Management Systems (SMS) amongst micro- and small-sized air operators in business aviation. In the absence of thorough literature in this sector of aviation, a survey of prior research on OHS(MS) and on non-aviation micro/small enterprises (MSE) provided a collection of factors contributing to their safety performance. Using a sociotechnical system perspective, this 'generic' profile served as basis for two surveys: one amongst veteran business aviation professionals and leaders, and the other amongst air operator personnel. To complement the industry's self-portrait, neo-institutional theory is also utilised and further explains the strategies and tactics used by many stakeholders. Its validity in business aviation and usefulness for further research is underlined in the process. The results support the existing distinctions between the three main types of business aviation air operators and provide a 'generic' profile for each one of them from socioeconomic and safety perspectives. Similarities and contrasts across all industries are also highlighted. Moreover, the responses to the online survey suggest that neither the micro/small air operators nor the civil aviation authorities could create, even jointly, the conditions of possibility for SMS implementations to be complete, and therefore for air operators' SMS to be fully functional. Although further research is needed, this initial foray into business aviation safety management fuels the argument that the current, hegemonic SMS framework designed by and for large organisations is a misfit to the micro/small air operators, including their 'safety champions' who are best placed to implement it, i.e., corporate flight departments.

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Table of contents

Table of contents **4**
Acronyms and abbreviations **6**
List of tables and figures **7**
Introduction **11**
Safety performance of business aviation 14
Research question 17
Scope 18
Roadmap to this thesis 19
Literature review **20**
Micro/small enterprises 20
Struggling for survival 21
Struggling for safety 22
OHS(MS): scope and trajectory 24
Factors in the MSEs' underperformance in OHS(MS) 27
At authority level 27
At business level 28
At management level 29
At cognitive level 30
The 'generic' micro/small enterprise 31
Research design **34**
Ethics 34
Literature review 35
Document (scoping) review 35
Pilot survey 35
Comparative cross-industry online survey 38
Limitations 41
Results **43**
The missing continent 45
Commercial air operators 46
Socio-demographics 46
Resources for safety 47
Institutional environment 48
Legitimacy 49
Corporate flight departments 51
Socio-demographics 51
Resources for safety 51
Institutional environment 53
Legitimacy 54
Non-commercial air operators 55
Socio-demographics 55
Resources for safety 56
Institutional environment 57
Legitimacy 58

Discussion **59**
The 'generic' micro/small air operators in business aviation 59
Looking for patterns 63
Cross-industry overview: legitimacy 63
Cross-industry overview: resources for safety 64
Cross-industry overview: institutional environment 64
Cross-industry overview: socio-demographics 65
From OHS to SMS: does history repeat itself? 66
Further research 67
Conclusions **70**
References **72**
Appendices **89**
Appendix 1: Institutional theory 89
Old institutional theory 89
New institutional theory 89
Decoupling 90
Isomorphism 91
Organisational strategies and tactics in the face of institutional pressure 92
Institutional Logics Perspective 93
Translation of institutional theory into business aviation 94
Commercial air operators 94
Corporate flight departments 94
Non-commercial air operators 96
Appendix 2: Pilot survey questionnaire and results 98
Appendix 3: Comparative online survey questionnaire and results 100
Appendix 4: Responses from commercial air operators 109
Appendix 5: Responses from corporate flight departments 115
Appendix 6: Responses from non-commercial air operators 122
Appendix 7: Experiment with survey data 129
Appendix 8: Origins of business aviation 132
Acknowledgments **133**

Acronyms and abbreviations

AAIB	Air Accident Investigation Branch (UK) or Bureau (Switzerland)
AOC	Air Operator Certificate (specific to commercial operators)
ATSB	Australian Transport Safety Bureau
BARS	Basic Aviation Risk Standard (by Flight Safety Foundation)
CAA	Civil Aviation Authority
CAANZ	Civil Aviation Authority of New Zealand
CAT	Commercial Air Transport
CBAA	Canadian Business Aviation Association
CFR	Code of Federal Regulations (i.e., US regulation)
Comms.	Communications
CSR	Corporate Social Responsibility
Dpt.	Department
EASA	European Union Aviation Safety Agency
EBAA	European Business Aviation Association
EC	European Commission
EU	European Union
EU-OSHA	European Agency for Safety and Health at Work
FAA	Federal Aviation Administration (USA)
FSF	Flight Safety Foundation
FTE	Full-Time Equivalent
GA	General Aviation
IATA	International Air Transport Association
IBAC	International Business Aviation Council
ICAO	International Civil Aviation Organisation
IS-BAO	International Standard - Business Aviation Operations (by IBAC)
ISO	International Organization for Standardization
MSE	Micro and Small Enterprises
NBAA	National Business Aviation Association (USA)
NOHSC	National Occupational Health and Safety Commission (Australia)
NTSB	National Transportation Safety Board (USA)
OECD	Organisation for Economic Co-operation and Development
OHS	Occupational Health & Safety
OHSE	Occupational Health, Safety & Environment
OHSMS	Occupational Health & Safety Management System
Ops	Operation(s) or operator(s)
PDCA	Plan-Do-Check-Act
QMS	Quality Management System
SARP	Standards and Recommended Practices (ICAO)
SM-ICG	Safety Management International Collaboration Group
SME	Small and Medium Enterprise
SMS	Safety Management System
TC	Transport Canada (in English), Transports Canada (in French)
TSB Canada	Transportation Safety Board of Canada
URL	Uniform Resource Locator (i.e., internet link)

List of tables and figures

Table 1: Global accidents rates by operator type, per 100.000 hours (IBAC) 14
Table 2: Global accidents rates by operator type, per 100.000 departures (IBAC) 14
Table 3: Incidents and accidents, EU member state-registered complex aircraft in non-commercial operations (EASA) 15
Table 4: Accident rates in US Part 91, Part 121, Part 135 operations (NTSB) 16
Table 5: Interpretation of pilot survey answers 36
Table 6: Summary of the respondents' statements to the pilot survey 37
Table 7: Distribution of the survey questions by theme 39
Table 8: Respondents to the online survey (total and by completion rate) 40
Table 9: Respondents (by size of operation) 40
Table 10: Respondents within the scope (by size of operation) 43
Table 11: Average staff number and fleet size for each type of operation 45
Table 12: Types of operation and their 'typical' characteristics (survey results and analysis) 62
Table 13: Order of primacy of the institutional actors in the operator's environment 63
Table 14: Pilot survey question 1 and results 98
Table 15: Interpretation of the answers to question 1 of the pilot survey 99
Table 16: Pilot survey question 2 and results 99
Table 17: Results to online survey question 1 100
Table 18: Results to online survey question 2 101
Table 19: Results to online survey question 3 101
Table 20: Results to online survey question 4 101
Table 21: Results to online survey question 5 101
Table 22: Results to online survey question 6 102
Table 23: Results to online survey question 7 102
Table 24: Results to online survey question 8 102
Table 25: Results to online survey question 9 102
Table 26: Results to online survey question 10 103
Table 27: Results to online survey question 11 103
Table 28: Results to online survey question 12 103
Table 29: Results to online survey question 13 104
Table 30: Results to online survey question 14 104
Table 31: Results to online survey question 15 104
Table 32: Results to online survey question 16 104
Table 33: Results to online survey question 17 104
Table 34: Results to online survey question 18 105
Table 35: Results to online survey question 19 105
Table 36: Results to online survey question 20 105
Table 37: Results to online survey question 21 105
Table 38: Results to online survey question 22 105
Table 39: Results to online survey question 23 106
Table 40: Results to online survey question 24 106
Table 41: Results to online survey question 25 106
Table 42: Results to online survey question 26 106
Table 43: Results to online survey question 27 107

Table 44: Results to online survey question 28 107
Table 45: Results to online survey question 29 107
Table 46: Results to online survey question 30 107
Table 47: Results to online survey question 31 108
Table 48: Results to online survey question 32 108
Table 49: Results to online survey question 6 (commercial operators) 109
Table 50: Results to online survey question 8 (commercial operators) 109
Table 51: Results to online survey question 23 (commercial operators) 109
Table 52: Results to online survey question 26 (commercial operators) 109
Table 53: Results to online survey question 1 (commercial operators) 110
Table 54: Results to online survey question 5 (commercial operators) 110
Table 55: Results to online survey question 13 (commercial operators) 110
Table 56: Results to online survey question 29 (commercial operators) 110
Table 57: Results to online survey question 16 (commercial operators) 110
Table 58: Results to online survey question 24 (commercial operators) 111
Table 59: Results to online survey question 25 (commercial operators) 111
Table 60: Results to online survey question 19 (commercial operators) 111
Table 61: Results to online survey question 31 (commercial operators) 111
Table 62: Results to online survey question 32 (commercial operators) 111
Table 63: Results to online survey question 30 (commercial operators) 112
Table 64: Results to online survey question 28 (commercial operators) 112
Table 65: Results to online survey question 9 (commercial operators) 112
Table 66: Results to online survey question 22 (commercial operators) 112
Table 67: Results to online survey question 21 (commercial operators) 112
Table 68: Results to online survey question 17 (commercial operators) 113
Table 69: Results to online survey question 15 (commercial operators) 113
Table 70: Free text submitted in addition to selecting "other" to question 2 113
Table 71: Results to online survey question 2 (commercial operators) 113
Table 72: Results to online survey question 3 (commercial operators) 113
Table 73: Results to online survey question 7 (commercial operators) 114
Table 74: Results to online survey question 18 (commercial operators) 114
Table 75: Results to online survey question 20 (commercial operators) 114
Table 76: Results to online survey question 6 (corporate flight department) 115
Table 77: Results to online survey question 8 (corporate flight department) 115
Table 78: Results to online survey question 23 (corporate flight department) 115
Table 79: Results to online survey question 26 (corporate flight department) 115
Table 80: Results to online survey question 1 (corporate flight department) 116
Table 81: Results to online survey question 5 (corporate flight department) 116
Table 82: Results to online survey question 13 (corporate flight department) 116
Table 83: Results to online survey question 29 (corporate flight department) 116
Table 84: Results to online survey question 16 (corporate flight department) 116
Table 85: Results to online survey question 24 (corporate flight department) 117
Table 86: Results to online survey question 25 (corporate flight department) 117
Table 87: Results to online survey question 19 (corporate flight department) 117
Table 88: Results to online survey question 31 (corporate flight department) 117
Table 89: Results to online survey question 32 (corporate flight department) 117
Table 90: Results to online survey question 30 (corporate flight department) 118

Table 91: Results to online survey question 28 (corporate flight department) 118
Table 92: Results to online survey question 9 (corporate flight department) 119
Table 93: Results to online survey question 22 (corporate flight department) 119
Table 94: Results to online survey question 21 (corporate flight department) 119
Table 95: Results to online survey question 17 (corporate flight department) 119
Table 96: Results to online survey question 15 (corporate flight department) 119
Table 97: Free text submitted in addition to selecting "other" to question 2 120
Table 98: Results to online survey question 2 (corporate flight department) 120
Table 99: Results to online survey question 3 (corporate flight department) 120
Table 100: Results to online survey question 7 (corporate flight department) 120
Table 101: Results to online survey question 18 (corporate flight department) 120
Table 102: Results to online survey question 20 (corporate flight department) 121
Table 103: Results to online survey question 6 (non-commercial operators) 122
Table 104: Results to online survey question 8 (non-commercial operators) 122
Table 105: Results to online survey question 23 (non-commercial operators) 122
Table 106: Results to online survey question 26 (non-commercial operators) 122
Table 107: Results to online survey question 1 (non-commercial operators) 123
Table 108: Results to online survey question 5 (non-commercial operators) 123
Table 109: Results to online survey question 13 (non-commercial operators) 123
Table 110: Results to online survey question 29 (non-commercial operators) 123
Table 111: Results to online survey question 16 (non-commercial operators) 123
Table 112: Results to online survey question 24 (non-commercial operators) 124
Table 113: Results to online survey question 25 (non-commercial operators) 124
Table 114: Results to online survey question 19 (non-commercial operators) 124
Table 115: Results to online survey question 31 (non-commercial operators) 124
Table 116: Results to online survey question 32 (non-commercial operators) 124
Table 117: Results to online survey question 30 (non-commercial operators) 125
Table 118: Results to online survey question 28 (non-commercial operators) 125
Table 119: Results to online survey question 9 (non-commercial operators) 125
Table 120: Results to online survey question 22 (non-commercial operators) 125
Table 121: Results to online survey question 21 (non-commercial operators) 126
Table 122: Results to online survey question 17 (non-commercial operators) 126
Table 123: Results to online survey question 15 (non-commercial operators) 126
Table 124: Free text submitted in addition to selecting "other" to question 2 127
Table 125: Results to online survey question 2 (non-commercial operators) 127
Table 126: Results to online survey question 3 (non-commercial operators) 127
Table 127: Results to online survey question 7 (non-commercial operators) 127
Table 128: Results to online survey question 18 (non-commercial operators) 127
Table 129: Results to online survey question 20 (non-commercial operators) 128
Table 130: Scores from the comparison between two types of operations 130
Table 131: Consolidation of the results in table 131 based on the theme used in the survey 131

Figure 1: 'Generic' profile of a non-aviation MSE from a socio-technical perspective 32
Figure 2: Distribution of the respondents by ICAO region (pilot survey) 36
Figure 3: Distribution of the respondents by the number of FTEs 43
Figure 4: Distribution of the micro-operators by the number of aircraft in their fleet 43
Figure 5: Distribution of the small operators by the number of aircraft in their fleet 44
Figure 6: Distribution of all the operators by the number of aircraft in their fleet 44
Figure 7: Distribution of the commercial air operators by the number of SMS components with which they encounter particular difficulties 47
Figure 8: Distribution of the corporate flight departments by the number of SMS components with which they encounter particular difficulties 52
Figure 9: Distribution of the non-commercial air operators by the number of SMS components with which they encounter particular difficulties 56
Figure 10: Screenshot of the introductory page to the online questionnaire 100
Figure 11: Screenshot of the fourth and last page of the online questionnaire 108

Definitions of safety management systems (SMS) generally refer to a comprehensive set of policies, processes, procedures and roles that are rooted in legislation and business management models meant to positively impact on the employees' attitudes and behaviours in order to systematically manage safety (Bottani et al., 2009; Fernandez et al., 2007; Hale et al., 1997; ICAO, 2013a, 2018a). Once voluntary – and initially largely ignored by the airline industry (CASA, 2001; Werfelman, 2009), SMS and its avatars have spread through many industries and become the primary management framework endorsed and promoted by both the public and private sectors to manage risks to life, property and the environment. Today, dozens of variations of the core concept coexist under slightly different names and across many industries (Bieder, 2021; Hale, 2005; Li and Guldenmund, 2018; Redinger and Levine, 1998). In aviation however, a significant homogeneity in the SMS requirements and guidance material already exists, as the early years of experimentation and diversity in the SMS models are now long gone (Bieder, 2021; CASA, 2001, 2002a, 2002b; UK CAA, 2000; Hsu et al., 2010). Supposedly in the interest of standardisation, the ICAO model gradually pervaded into pre-existing SMS frameworks (CBAA, 2002; IBAC, 2002, 2008) then into regulatory frameworks (EASA, 2007b; FAA, 2011, 2015) and other industry standards (IATA, 2003, 2017). SMS embodies the performance-based mantra (Sønderby, 2015) in safety and comes with much flexibility for its implementation in daily operations. However, in practice every SMS is unique to the equally unique organisation that implemented it.

Ironically, the diversity spurred by the flexibility and (deceptive) simplicity of the SMS framework is one of the reasons why demonstrating its effectiveness remains an elusive and contentious issue across all industries (Breslin et al., 2010; Fernandez-Muniz, 2007; Hale, 2003; Karanikas, 2017; Karanikas et al., 2019; Kaspers et al., 2016; Li and Guldenmund, 2018; Lofquist, 2017; Moorkamp et al., 2014; Robson et al., 2007; Yeun et al., 2014). More precisely, while the principle according to which investing in risk management does no harm and tends to yield better safety outcomes seems undisputed, we do not have sufficient empirical evidence to prove how to best tackle the inescapable uncertainties, constraints and hazards of daily work. Establishing a causal relationship between the SMS of an organisation and its safety performance is difficult because...

- As far as the "causes" are concerned (i.e., the operation and the SMS elements), they're not standardised despite the homogeneity in SMS requirements: the actual systems are implemented differently, then mature and/or drift differently and are audited differently,
- As far as the "effects" are concerned (i.e., the safety outcomes), their measurement is not standardised: safety metrics are heterogenous except for very few but relatively common safety performance indicators (e.g., accident and incident rates amongst air operators) that only represent an infinitesimally small fraction of daily risk management practices,
- There's also no reliable way of ensuring or even measuring the quality or quantity of raw data feeding the safety metrics: under-reporting is a very common issue of reporting systems (Dekker, 2020; EASA, 2019; UK CAA, 2009), and there's no standardized method of labelling events, in particular 'near misses',
- The effects of a new system may not be visible for several years (Gallagher et al., 2001),
- The SMS implementation may have helped consolidate and optimize pre-existing risk management practices, rather than spurring a whole new perspective against which the 'old ways' could unmistakably be contrasted (Walker and Tait, 2004).

Fox (2009, p. 52) posits that SMS has indeed *"a positive impact on the way organisations make decisions and manage risk"*. Li and Guldenmund (2018, p. 117) conclude that SMS *"can significantly contribute to the improvement of organisational management as a whole"*. Based on their research, Arocena and Núñez (2010) also reach the conclusion that such management systems play an outstanding role in preventing accidents. However, achieving a low accident rate is conditional to putting higher efforts in technical, people- and organisation-oriented preventive measures and skills. Unsurprisingly, firms with null commitment to a management system show the poorest safety performance (Arocena and Núñez, 2010). While some proponents of SMS almost take it for granted that its implementation will automatically lead to better safety performance (Cianfrani, 2014; Galotti et al., 2006; Gamauf, 2014; George, 2014; ICAO, 2006a), many researchers relentlessly probe and question its usefulness, value, ease, cost, practicality, flexibility and relevance (ATSB, 2011; Almklov, 2018; Almklov et al., 2014; Anthony, 2009; Antonsen et al., 2012; Bragatto et al., 2015; Dekker, 2018; Frick, 2014; Gallagher et al., 2001; Hohnen et al., 2014; Hunter, 2015; Lacagnina, 2010a; Le Coze, 2017; Niskanen et al., 2014; Rae et al., 2019; Størkersen et al., 2020; Valluru et al., 2020; Walker and Tait, 2004; Walter, 2017; Werfelman, 2009, 2015).

One of the core arguments for SMS is the use of proactive methods to complement the traditional, reactive accident prevention methods (ICAO, 2018a). Proactiveness is acknowledged as being beneficial to both safety and financial performance (Vredenburgh, 2002). However, the review by Dallat et al. (2019) of 342 risk assessment methods – one of the core 'proactive' elements of any SMS – showed that most are likely to be inappropriate for the task, due to their inconsistency with the prevailing accident causation models and with systems thinking. By focusing on the sharp-end (i.e., 'human error') and considering accidents as resulting from linear processes, they overlook emergent risks elsewhere in the system (Dallat et al., 2019). SMS *"cannot prevent local adaptations or drift"* (Fox, 2009, p. 46) and *"can't be expected to predict and deal with every possible occurrence in advance"* (Rosenkrans, 2016, p. 28). Wachter and Yorio (2013) linked the flaws in the development and implementation of OHS management systems to the impossibility of planning, controlling and defending against all error-prone situations, and to the inherent rigidity of systems facing the natural and inevitable variations of daily work and human performance.

The implementation of SMS appears to positively impact safety but does not eliminate incidents or accidents (Arocena and Núñez, 2010; Fox, 2009; Hale, 2003; Hunter, 2015; Lacagnina, 2010a, 2010b; Lofquist, 2010; Moorkamp et al., 2014; NTSB, 2014; Porter, 2016; Robson et al., 2007; TSB, 2009; Werfelman, 2015). Its presence in organisations *"is a necessary foundation for achieving a safe working environment, but it cannot guarantee it"* (Wachter and Yorio, 2014, p. 128). Even those who claim to have correlated improvements in safety performance to SMS nevertheless agree on the need to close the (numerous) gaps in knowledge and empirical research (Abad et al., 2013; Arocena and Núñez, 2010; Bottani et al., 2009; Hale, 2003; Kines et al., 2013; Legg et al., 2015; Porter, 2016). If the issue of the usefulness of SMS in general wasn't intricate enough, it becomes even fuzzier when entering the realm of micro- and small-sized enterprises (Gamauf, 2014; McKenna, 2008; Sheehan, 2010). Its flaws and shortcomings are more acute in micro- and small-sized enterprises, where the return on investment seems very difficult to reap (Frick, 2019; Larsson, 2003; Legg et al., 2015). Popular beliefs in business aviation posit that SMS demands are ill-conceived for micro air operators due to a disproportionality between their capabilities and the requirements they need to fulfil. But is there any evidence? Two decades ago, Hale and Baram (1998, p. 11) denounced the *"black hole in research and literature"* regarding SMS. Have we made any progress? What about small air operators?

While preparing and conducting this research, many informal discussions on SMS took place with staff from a range of European aviation organisations active in aircraft manufacturing, maintenance, flight operations, consulting, auditing and CAA oversight. The consensus indicates that the introduction of Commission Regulation (EU) 965/2012 (EU, 2012) that imposed SMS and a string of new requirements on every non-commercial operator using complex aircraft registered and/or based in the European Union (e.g., typically with more than one turboprop engine or at least one jet engine) had undesirable consequences. In this sector, which is almost exclusively made of micro and small operators, the new rules motivated a number of them to use a range of tactics against their authority (see appendix 1 for details on institutional theory):

- Escape: prospective aircraft buyers eventually purchased less complex aircraft than originally planned, despite the performance and efficiency decrements, in a move to dodge the flurry of new requirements,
- Concealment: operators hid behind a façade of compliance by filling and signing a declaration of compliance that was sent to their CAA but in reality they had done little – usually nothing beyond the 2-page declaration itself – to effectively comply,
- Buffering: operators gave up – at least on paper – the control of their aircraft and operations to a commercial entity (e.g., AOC, management company),
- Escape: owners sold their aircraft and closed their flight department,
- Dismissal: others attempted to remain under the radar of their competent authority by not declaring themselves to their CAA, although they are legally required to do so. The obligation to declare their operation is based on the type of aircraft they operate. For the owner of a light jet who prepares and performs all the flights alone, the regulatory requirement to implement a management system, even a simplified one for non-complex operations (EU, 2012; SM-ICG, 2015), appears disproportionate. However, the tactic of dismissal only buys time since a CAA can easily identify undeclared operations by cross-checking its list of aircraft registrations (which details the aircraft type) against the list of declarations received. When this happens, the hard-pressed owner-pilots apparently chose a different tactic, switching to either buffering (i.e., placing the aircraft in a commercial structure), concealment or compliance. Still, these cross-checks and changes in tactics appear to be rare due to resource constraints at CAA level that are further worsened by the necessity to thoroughly explain the new requirements to the owner-pilots.

At a recent industry event, a representative from an authority shared some information regarding the operators registered or based in a key European market for business aviation. The data indicates that a slight majority (<60%) of the total number of non-commercial operators in that market declared themselves to their CAA (EU, 2013). However, other sources within the industry report that a number of those operators use a tactic of concealment by submitting a declaration without doing anything else (e.g., they do not even try to implement an SMS, they simply claim that they have one). Although the exact numbers are not known, it seems likely that only a small minority of the small and micro-operators put up a sincere effort to comply and implement an SMS. Indeed, safety regulations can take years to become effective (Bradbury, 2006; Shi, 2009).

Why did it make sense to a non-negligible portion of the sector to avoid using the tactic that EU institutions (Parliament included) and CAAs intended and expected from the industry, i.e., compliance? Was business aviation already 'ultrasafe', like the airline industry (Amalberti, 2013), before the rules were drafted and enacted?

Safety performance of business aviation

Although the safety performance of an industry cannot be summarized in a single safety metric (e.g., accident rate, fatality rate), it is impossible to ignore that for a couple of decades many industries no longer repeat their impressive reductions in fatal accidents seen soon after WW2 (Dekker, 2020; NTSB, 2019; Rae et al., 2018; Zwetsloot, 2009). Commercial Air Transport doesn't escape this asymptotic trend even though it still remains an 'ultrasafe' industry (Amalberti, 2013; IATA, 2019; ICAO, 2019).

Statistics on business aviation are patchy and difficult to compare (tables 1 to 4). Between 2003 and 2016, the International Business Aviation Council (IBAC) published annual Business Aviation Safety Briefs containing both actual safety statistics and estimates for parts of the world where no reliable data are available. IBAC (2016, p. 6) distinguish three separate main types of organisations:

- Business aviation commercial: aircraft flown for business purposes by an operator having a commercial operating certificate (generally on-demand charters),
- Corporate: non-commercial operations with professional crews employed to fly the aircraft,
- Owner-operated: aircraft flown for business purposes by the owner of the business.

The demarcation lines refer to the revenue stream(s) of the owner-operator, to the employment status of the pilot(s), and to the utilization of the airplane since corporate aircraft will not only be used (and sometimes hand-flown) by the business owner. Employees at various organisational levels may also use corporate aircraft for business-related travels (e.g., some organisations restrict the use of corporate aircraft to a few board members and senior executives whereas other companies place no such restriction based on rank).

Table 1

Global accident rates by operator type (extrapolated), per 100.000 hours (IBAC, 2003, 2016)

Operator type	Total accidents (1997-2001)	Total accidents (2011-2015)	Fatal accidents (1997-2001)	Fatal accidents (2011-2015)
Commercial	2,16	1,64	0,78	0,53
Corporate	0,28	0,20	0,09	0,07
Owner operated	0,66	1,44	0,23	0,62
All business aircraft*	0,91	0,86	0,31	0,30

Table 2

Global accident rates by operator type (extrapolated), per 100.000 departures (IBAC, 2003, 2016)

Operator type	Total accidents (1997-2001)	Total accidents (2011-2015)	Fatal accidents (1997-2001)	Fatal accidents (2011-2015)
Commercial	3,17	2,19	1,10	0,64
Corporate	0,40	0,28	0,13	0,11
Owner operated	0,93	1,95	0,33	0,78
All business aircraft*	1,29	1,16	0,44	0,40

* *Note:* these lines also include accidents by government, manufacturers and fractional aircraft operators.

Tables 1 and 2 suggest that corporate aviation achieves a markedly better safety performance in comparison with commercial and owner-operated business aircraft. For context, the airline industry had a fatal accident rate of 0,029 per 100.000 departures over a 10-year period from 2006 through 2015, for airplanes of 27,2 tons or more (Boeing, 2016). These tables also show stark differences between the types of operations. Over the last two decades, both commercial operators and corporate flight departments improved their accident rates in quite similar proportions, whereas owner-operated aircraft saw more than a doubling of their accident rates. In the aggregate, business aviation saw a modest improvement of its safety performance worldwide.

In Europe, no attempt is made to estimate the accident rate for business aviation as a distinct sector due to the difficulty of reliably determining the volume of activity of both commercial and non-commercial business aircraft. Therefore, EASA blends commercial business aviation with the airlines in its statistics, whereas non-commercial business aviation safety performance is simply reported by the raw numbers of accidents and incidents (table 3).

Table 3

Incidents and accidents, EU member state-registered complex aircraft in non-commercial operations (EASA, 2019, 2020)

	Total (2008-2017)	**Rate per year (2008-2017)**	**2018**	**2019**
Serious incidents	37	3,7	7*	12*
Serious injuries	0	0,0	2	0
Non-fatal accidents	14	1,4	3	1
Fatal accidents	4	0,4	1	0
Fatalities	9	0,9	1	0

* *Note*: the sharp increases in occurrences versus the 10-year averages is likely to be partly due to a more stringent regulatory framework on the reporting of occurrences and on more submissions of reports.

In the US, the segmentation of the industry and the capabilities of the FAA to consistently track activity data allow the National Transportation Safety Board (NTSB) to frequently publish accident statistics (table 4). Year after year, they show the stark contrast between various segments of general aviation (Part 91), commuter and on-demand operations (Part 135), and commercial air transport, also known as air carriers (Part 121).

For context, the number of flight hours per year between 2000 and 2017 (NTSB, 2011, 2019):

- Slightly dipped by only a few percent in Part 121 (air carrier) operations,
- Dropped by nearly 20% by 2002, plateaued until 2009 then increased back to its 2000 value in Part 135 operations,
- Ebbed and flowed but overall shrank by about 10% in Part 91 operations (all uses combined).

In other words, flight activity in all types of operations oscillated following major geopolitical and/or economic crises (e.g., in 2001, 2008) but did not dramatically change in nearly two decades. Table 4 therefore suggests that industry efforts have been effective at reducing the accident rates in the US between 2000 and 2010 but stagnate since, except in corporate aviation.

Table 4

Accident rates in US Part 91, Part 121 and Part 135 operations

Accident rates per 100.000 departures (NTSB, 2001, 2011, 2019b)	**2000**	**2010**	**2017**
Scheduled CFR Part 135	2,0	0,99	0,96
CFR Part 121 – commercial air transport	0,64	0,31	0,35
Accident rates per 100.000 hours (NTSB, 2001, 2011, 2019b)	**2000**	**2010**	**2017**
All CFR Part 135 ops (i.e., scheduled & non-scheduled)	3,2	not available	not available
Scheduled CFR Part 135	not available	1,91	1,53
Non-scheduled fixed-wing CFR Part 135	1,9	1,31	1,30
Non-scheduled rotary-wing CFR Part 135	4,1	0,48	1,16
CFR Part 91 – general aviation (all uses combined)	6,57	6,63	5,67
CFR Part 91 – general aviation (business use)	2,05	1,42	1,78
CFR Part 91 – general aviation (corporate use)	not available	0,26	0,08
CFR Part 91 – general aviation (personal use)	not available	12,44	10,64
CFR Part 121 – commercial air transport	0,38	0,17	0,17
Fatal accident rates per 100.000 hours (NTSB, 2001, 2011, 2019b)	**2000**	**2010**	**2017**
Non-scheduled fixed-wing CFR Part 135	not available	0,27	0,20
Non-scheduled rotary-wing CFR Part 135	not available	0,08	0,29
CFR Part 91 – general aviation (all uses combined)	1,21	1,24	0,94
CFR Part 91 – general aviation (business use)	0,55	0,46	0,37
CFR Part 91 – general aviation (corporate use)	not available	0,04	0,00
CFR Part 91 – general aviation (personal use)	not available	2,40	1,96

In 2017, nineteen turboprops and five jets operated under Part 91 and commonly used in business aviation were involved in an accident (NTSB, 2019). The same year, fifty accidents occurred in Part 135 operations (NTSB, 2019). By removing all helicopter, cargo and scheduled flights to focus on the core of this research (i.e., on-demand passenger flights in business aviation), the initial number drops from fifty to twenty-three.

The accident reports then further reveal that:

- About a third (n=10) occurred in Alaska alone, which is reputed for its challenging environment, but also that
- More than two thirds (n=16) occurred with small piston-engined airplanes, and
- Only seven (i.e., 14% of all Part 135 accidents) occurred with airplanes commonly used in business aviation (e.g., King Air, PC-12), including one which was hit while parked on the airport ramp at night by an unescorted bus. However, no activity data (e.g., flight hours) are publicly available to compute the accident rates for this subset of Part 135 operations.

To summarize, the diversity of the business aviation sector also expresses itself through great diversity (and inequality, from an employee or a passenger perspective) in the accident rates. The different operational environments, regulatory requirements, and their different ways of segmenting the sector blur the picture even more. Consequently, there's probably little value in focusing on the actual numbers of each type of operation. Instead, it should simply be kept in mind that corporate flight departments tend to have a safety record comparable to, if not better than, the airlines, followed by commercial air operators and non-commercial operators.

Research question

In the early stages of the research, a number of questions emerged on the history, rationality and effectiveness of SMS. They were all explored to some extent, in particular by looking for literature describing how MSEs in other industries tackle similar issues. For instance, research on the implementation of management systems and especially in the domain of Quality Management Systems (QMS) in SMEs has identified factors consistently associated with high failure rates ranging between 85% and 95% (Gardner, 2000). The rich seam of literature on QMS was partly explored due to the influence of its framework on ICAO's SMS framework (CAANZ, 2012; ICAO, 2013a), leading to clear structural similarities between them. The challenges faced by SMEs implementing and using such formal management system is well documented (e.g., Bannour and Mtar, 2019; Ben Arab, 2020; Eriksson, 2016; Ilkay and Aslan, 2012; Kakouris and Sfakianaki, 2019; Kumar and Antony, 2008, Zeininger et al., 2017). However, since QMS is more oriented towards productivity than safety despite a recent but increasing interest in incorporating business risks and opportunities into its management model (ISO, 2015), OHS(MS) – which also inherited the QMS framework – appeared more pertinent to explore and to contrast against SMS.

Recent research grounded in institutional theory showed that, in a group of medium- and large-sized aviation organisations (i.e., in ground handling, airport terminal management, catering), the vast majority of them adjusted their functional structures and implemented SMS only because of the pressure coming from their national civil aviation authority (Kurt and Gerede, 2017, 2018). This led them to adopt increasingly similar formal structures (i.e., organisational differences between competitors gradually faded away) and, more importantly, to display strategies aimed at earning legitimacy in the eye of the regulator (and society) while striving to maintain the technical efficiency they acquired during the pre-SMS era. In other words, these organisations implemented their SMS predominantly by coercion and in a ceremonial manner rather than by rational voluntary choice. They aimed at satisfying the legal requirements to the minimum (e.g., on paper only) without risking of disrupting their prevailing *modus operandi* in everyday operations. Consequently, the research found their SMS to be functionally incomplete and misaligned, and practically put both the justification and the added value of the whole implementation effort in jeopardy (Kurt and Gerede, 2018).

However, no such research based on institutional theory could be found for air operators in business aviation. Several other theoretical propositions were considered, such as safety clutter (Rae et al., 2018), or 'safety work vs. safety of work' (Rae and Provan, 2018) which describe phenomena and propose models on how the effectiveness of safety professionals and their safety management activities can be hindered despite the sincere efforts of their organisations. Institutional theory (summarized in appendix 1) then appeared to be the most comprehensive analytical grid to explore the paradox between the current mantra clearly pushing for performance-based norms (Blanc and Escobar Pereira, 2020; EASA, 2014; Frydman, 2014b) and the struggles encountered by the smallest organisations to implement an SMS that's precisely meant to be malleable, tailorable and eventually adjusted to their size and/or complexity. Consequently, this research aimed at situating and profiling micro- and small-sized business aviation air operators that implemented SMS within their industrial environment, but also at venturing beyond market dynamics (e.g., revenue streams, business models, capitalization, competition) by evaluating the influences from their institutional environment.

This can be summarized into the following research question: **can business aviation air operators with twenty FTEs or less implement a fully functional SMS in their operations?**

To qualify as a 'fully functional' SMS in the context of business aviation, an air operator must have documented and fully implemented all twelve SMS elements (commonly grouped into four components), as defined by ICAO (2013a, 2013b, 2018a).

Scope

Air operators in business aviation are not all the same. Some are commercial operators whose primary revenue stream comes from renting aircraft to as many customers as possible (e.g., charters, emergency medical services, air taxi, etc.). Some are the flight department of a multi-national corporation and others provide exclusive transportation to the owner(s) of the aircraft. Consequently, the characteristics, challenges and constraints will likely differ to some degree according to the type of operation.

The International Civil Aviation Organisation (ICAO) has set standards and recommended practices for the aviation industry since 1944. ICAO defined four types of aviation operations, irrespective of the type of aircraft involved (ICAO, 2018b, 2018c), which were relevant to this research:

- Commercial air transport (CAT): involving the transport of passengers and/or cargo and/or mail for remuneration or hire,
- Aerial work: where aircraft are used commercially for specialized services such as agriculture, construction, photography, surveying, observation and patrol, search and rescue, aerial advertisement, etc.,
- General aviation (GA): where operations other than commercial air transport or aerial work are performed, typically leisure flights, flight training, corporate operations, etc.,
- Corporate aviation: non-commercial operation or use of aircraft by a company for the carriage of passengers or goods as an aid to the conduct of company business, flown by a professional pilot(s) employed to fly the aircraft.

Business aviation has no specific definition because it's active in all four types. Indeed, a business aviation aircraft could potentially conduct four consecutive flights in each of those different types of operations on the same day for the same organisation (provided, of course, that it has all the necessary equipment and paperwork). However, many business aviation aircraft are operated in one or two types of operations, possibly three, but four is highly unlikely. This nevertheless shows the diversity of the sector and the difficulty of accurately defining it (see appendix 8 for further information on the origins of the sector).

IBAC (2020) defines business aviation as follows:

> That sector of aviation which concerns the operation or use of aircraft by companies for the carriage of passengers or goods as an aid to the conduct of their business, flown for

purposes generally considered not for public hire and piloted by individuals having, at the minimum, a valid commercial pilot license with an instrument rating.

As far as this thesis is concerned, the definition by IBAC served as primary reference to decide whether a particular organisation would be included or not. In addition, for simplicity and homogeneity purposes, aerial work (as defined by ICAO) and rotary-wing operations were excluded.

Roadmap to this thesis

Both business aviation and SMS are more complex than the clichés about them. Colliding these two particles of society into an academic piece of research inevitably generates a ton of data. Therefore, a roadmap to the thesis may not be totally superfluous.

Due to the lack of literature on SMS in business aviation, the survey of prior research on non-aviation MSEs, on OHS(MS), and the summary of institutional theory (in appendix 1) provide an entry point into each domain. It also allows to sketch what happens (or not) when they find themselves on a collision course, summarized into a 'generic' profile of MSEs. This forms the basis for all subsequent research and sets its four themes (i.e., legitimacy, resources for safety, institutional environment and socio-demographics). Since business aviation contains three main types of operators, the results are presented then analysed for each type of operation separately (raw data for both the pilot survey and the online survey can be found in the appendices). Mirroring the initial survey amongst non-aviation MSEs, a 'generic' profile for each type of operation is then built from the responses to the online survey.

Using the research themes, the thesis then looks for patterns across the three types of operations. This leads to a wider search for similarities and contrasts with non-aviation MSEs, and in turn presents the reader with suggestions for further research and some conclusions.

Literature review

OHS matters in micro, small and medium enterprises have been a topic of recurrent concern and of difficult scientific research for decades, but the picture is rather different for the aviation industry. Searching online databases (e.g., LUBsearch, SCOPUS, ETHoS, ProQuest, etc.) has produced few pertinent results. The scientific literature about SMS – as a complete management system – is by far not as abundant as the literature about its individual parts (e.g., safety culture, safety metrics, reporting). Moreover, there's very little on the quantitative side of SMS due to its complexity (Li & Guldenmund, 2017; Robson et al., 2007; Yeun et al., 2014). There's also very little about SMS in micro or small organisations in business aviation (Burgess, 2016; Porter, 2016). This gap in knowledge led to initially open up the research to MSEs in general. The purpose was twofold:

- Finding out how non-aviation MSEs perform in OHS(MS), but also
- Underlining any theoretical framework pertinent to MSEs and to their implementation of safety management systems.

This section is divided into four parts. The first focuses on what typical non-aviation MSEs are, encounter and do, in order to survive in a market economy. Enterprises differ based on many determinants (e.g., industry, sector, business model, etc.). However, similarities and patterns seem to emerge based on company size alone, and these should be identified early on. The second part provides an overview of the evolution of the management of workplace health and safety, with a focus on the similarities and differences between OHS and SMS. Building on the literature discussing non-aviation micro and small enterprises, the review then takes a wider angle to list the factors potentially contributing to the struggles of MSEs in the third part. These research findings and assumptions then allows to sketch, in the fourth part, a 'generic' profile of a typical non-aviation MSE detailing the many potential reasons why their implementation of OHSMS fail and why their safety record is distinctively worse than that of larger enterprises.

Micro and small enterprises

One of the most common criteria to classify enterprises is the number of employees (OECD, 2016). Small firms now constitute the backbone of most economies. Micro enterprises in particular represent between 70% and 95% of all firms in all countries (OECD, 2016). Moreover, micro businesses also represent a crucial source of employment (Howe et al., 2018). Although the distribution of employment among companies of different sizes significantly varies across European countries (OECD, 2016), micro enterprises provide about 40 million jobs in Europe, which represents about a third of the total number of jobs (EC, 2011). Some industries are particularly prone to having small-sized businesses, such as construction, agriculture, manufacturing and services (Hasle and Limborg, 2006), but this is typically not the case with aviation. In 2008, the air transport sector in the EU counted (EC, 2011):

- 1,9% of micro enterprises (i.e., up to 9 FTEs),
- 2,9% of small-sized enterprises (i.e., from to 10 to 49 FTEs),
- 7,6% of medium-sized (i.e., from 50 to 249 FTEs), and
- 87,7% of large enterprises (i.e., more than 250 FTEs).

Although no estimate of the number of jobs was published at the time, five years later Steer Davies Gleave (2015) considered that air transport and airports provided direct employment to 1,8 million people in Europe. Two long-term trends were also noted: an increase in outsourcing and an overall decrease in both direct and indirect employment (Steer Davies Gleave, 2015). A separate study estimated that business aviation created 88.000 direct jobs in Europe. Slightly less than half of that number was in aircraft manufacturing alone and the second biggest group of employers were the aircraft operators, with about 35.000 direct jobs (Booz Allen Hamilton, 2016).

Micro businesses tend to dominate both the enterprise population and the job market in many sectors. However, technology, societal developments and the environment continually reshape the economy and in turn affect the distribution between the various classes of enterprises (Borley, 1997; Rostow, 1960). Despite strong incentives to grow ever bigger either organically or through mergers and acquisitions (e.g., to prevent an aggressive takeover by a larger company), market forces, performance-based regulations and management models such as the "lean" movement also push large businesses to reduce their size in efforts to centralise power and increase profitability while decentralising work (Sørensen et al., 2007; Walter, 2017). As a consequence, large enterprises are incentivised to push more and more of the non-essential but complex and risky business processes down to small contractors (Borley, 1997; Harrison, 1997; Legg et al., 2015; Steer Davies Gleave, 2015; Walter, 2017). Larsson (2003) also links the increasing fragmentation of economic activity with the pulverisation of risk. Meanwhile, the proliferation of micro enterprises carries on, a trend that became apparent in the 1980s in Europe (Legg et al., 2015; Sørensen et al., 2007), and self-employment becomes the norm (EC, 2017a).

Struggling for survival

Micro- and small-sized enterprises may be vital to the economy but they're also vulnerable in many different ways. The owner-manager's desire for independence, which is often a critical factor in motivating the start of the business (at the risk of also inducing a mentality of 'fortress enterprise' against bureaucracy and free from responsibility for their surroundings), comes with a high price (Spence, 1999). MSEs tend to die very young: 80% of them may well survive their first year, however about only half of the start-ups will still be in business after five years (EC, 2017a). Generally, they don't scale up quickly either, with only one in five firms increasing in size beyond five employees in the first five years (EC, 2017a). By default, survival in a market economy is tough, and even more so for the smallest companies. Compared to medium-sized and large firms, MSEs are more fragile financially (Champoux & Brun, 2003). Comparatively, they also encounter more difficulties to borrow money in order to finance their establishment and survival (Jin & Zhang, 2019; Spence, 1999). They're also more constrained in their development by financial institutions that tend to favour bigger companies in order to maximize their profits (Jin & Zhang, 2019). MSEs also tend to have a lesser knowledge than larger firms of the financial incentives put at their disposal by public institutions, but also perceive them as less useful (Bonafede et al., 2016).

The list of hurdles is close to endless as MSEs must typically face harsh competition and constant pressure to cut their production costs. They cannot benefit from economies of scale and struggle between significant start-up costs, low profit margins and limited cash-flow. MSEs deal with

limited sources of support and limited decision latitude (including, crucially, on prices), and have to manage the pressure of being in a weak position in the supply chain while relying on a small number of customers (EU-OSHA, 2017; Legg et al., 2015; Nandan, 2010; Spence, 1999). Considering how widespread SMEs generally are, it is hardly surprising to see that they're involved in nine out of 10 health and safety prosecutions in the UK (Arewa et al., 2018). However, on aggregate it appears that in an attempt to deter recurrence, small UK companies tend to receive penalties that amount to the double of what large companies pay for similar health and safety offenses. After being hit by OHS fines, three European SMEs out of 10 go out of business (Arewa et al., 2018). Moreover, Lamm (1997) posits that small firms are at a distinct disadvantage compared to larger businesses due to their inability to spread the costs of complying with OHS regulations over a number of products, markets, or plants. These findings also echo research on QMS: MSEs tend to have not enough cash reserves to implement such rule-based management system (Chittenden et al., 1998). If MSEs nevertheless implement a QMS (very few do), it clashes with their largely informal *modus operandi* and increases their operating costs (more than in larger firms) without significantly improving the quality or efficiency of their products or services: the *badge of quality*, reportedly beneficial in the marketplace, usually doesn't outweigh the inconvenience of added bureaucracy and costs (Chittenden et al., 1998).

Struggling for safety

The high financial vulnerability of MSEs and their volatility also create ripple effects on the workforce itself, which often inherits precarious working conditions and contracts, as well as low levels of occupational training (Basaga et al., 2018; EU-OSHA, 2017). Moreover, a recent study indicates that this crucial provision of information, training, instruction and supervision, if given at all in what has become a flexible and open-ended regulatory environment with minimal direction or guidance, tends to be ad hoc, passive, of poor quality, and therefore overall ineffective to reduce occupational risks (Bluff, 2019; Rodrigues et al., 2020). Small firms struggle to provide adequate training due to their numerous resource constraints and tend to rely more on their workers to acquire the necessary knowledge, either through their previous work or informally by personal initiative (Bluff, 2019; Rodrigues et al., 2020). Even when they do design OHS training, managers tend not to give it the attention needed considering the complexity of the tasks, rendering the training ineffective (Colligan and Cohen, 2004). Alas, it doesn't stop here…

Although small enterprises believe their odds of having an incident or an accident at the workplace to be very low, countless studies state instead that they have a poor safety performance (Boustras et al., 2015; Cagno et al., 2014; Frick, 2014; Hasle et al., 2009; Legg et al., 2015; Smallman, 2001; Sørensen et al., 2007; Vickers et al., 2005). This is related to their higher operational risks and lower ability to control them (Hasle and Limborg, 2006), but also to a potentially biased risk perception (Kahneman and Tversky, 1979). MSEs also have a worse safety record compared to larger organisations in the same sector (Arocena and Núñez, 2010; Bluff, 2019; Champoux and Brun, 2003; Eakin et al., 2010; EU-OSHA, 2017; Masi and Cagno, 2015; Micheli et al., 2019; Tremblay and Badri, 2018). Research in Western countries consistently found that accidents involving fatalities and injuries remain markedly more common in small businesses (Arocena and Núñez, 2010; Borley, 1997; Champoux and Brun, 2003; Fabiano et al., 2004; Hasle and Limborg, 2006; Sørensen et al., 2007; Vickers et al., 2005; Vredenburgh, 2002).

The expansion of flexible employment practices such as (sub)contracting has also been linked strongly to higher rates of injury and illness (Gallagher and Underhill, 2012; Valluru et al., 2020). Several studies suggest that (sub)contractors may, for instance:

- Deliver improper training and induction programmes, which may be the result of a disruption in communication or of a filtration of regulatory information between the various layers involved in a project (Loosemore et al., 2007; Valluru et al., 2020),
- Have an SMS that is structurally inadequate (e.g., by blindly copy-pasting another subcontractor's SMS or by hiring a consultant without relevant expertise), unable to cope with the variability introduced by subcontracting, and seen by staff as non-core work that can be overlooked (Valluru et al., 2020),
- Provide personal protective equipment of inferior quality or in lesser quantity (Collinson, 1999; Papadopoulos et al., 2010),
- Be poorly supervised by the principal contracting firm, out of fear of being found liable in case of accident (Quinlan and Bohle, 20108; Smallman, 2001) unless the law clearly holds the principal contracting firm co-responsible in such case (Walter, 2017), and
- Have no choice but to multitask outside their area of expertise and perform tasks they're not fully prepared to perform, due to the combination of their small size with widespread cost-cutting measures (Spence, 1999; Valluru et al., 2020).

Regrettably, Solzhenitsyn's (1978) warning, according to which societies that trade their morals for legalist thinking in order to sustain endless growth are on a path towards paralysis, intellectual mediocrity and a decline of courage seems to have fallen on deaf ears.

In a nutshell, OHS requirements are generally not followed, hazard identification is overly superficial, risk assessments and risk control in particular are either poor or simply not done, problems are addressed in a "whack-a-mole" fashion, safety meetings rarely occur, practically nothing gets written down and written information about safety is largely ignored anyway (Bluff, 2017; Hasle et al., 2009, Walker and Tait, 2004). The close proximity and connection between managers and employees positively affect cooperation, communication, job satisfaction and the psychosocial work environment, but also removes to a certain degree the need for formal policies, processes and practices (Nordlöf et al., 2015; Yorio and Wachter, 2014). All this obviously occurs despite legal obligations to manage hazards and risks stemming from regulatory frameworks (EC, 1989; Nordlöf et al., 2017; OSH Act, 1970) that are generally uniformly applied to all enterprises without due consideration for the huge diversity and fragmentation of MSEs (Micheli and Cagno, 2010; Micheli et al, 2019; Nordlöf et al., 2015), and sometimes without even consulting them or without giving any thought on their capacity to cope with new or changed regulations (Gallagher et al., 2001; Lamm, 1997 Salguero-Caparrós et al., 2020). Several studies have clearly identified that MSEs struggle more than larger businesses to comply with regulations on occupational safety and health (Arocena and Núñez, 2010; Cagno et al., 2014; Hasle and Limborg, 2006; Holmes et al., 1997; Micheli et al, 2019; Nordlöf et al., 2015, 2017; Salguero-Caparrós et al., 2020 ; Sørensen et al., 2007; Vickers et al., 2005), whether they address fairly basic OHS requirements or the more comprehensive and proactive occupational health and safety management systems (OHSMS).

OHS(MS): scope and trajectory

Over the last three decades, several authors reviewed dozens of management systems related to health and safety. Their aim was an attempt to contrast and compare the various systems proposed by the regulators or the industry, and to devise or at least retrospectively identify the essential dimensions and components of a 'universal' or 'generic' management system for health and safety at work (Dalrymple et al., 1998; Gallagher, 2000; Hale, 2005; Hsu et al., 2010; Li and Guldenmund, 2018; Redinger and Levine, 1998; Swuste et al., 2016, 2018). The task is complex, in part due to an essential difference that must be made between process safety and personal safety (Grote, 2012; Hopkins, 2009).

In process safety, the hazards and risks relate to the activities of the organisation whereas in personal safety they concern the human operators themselves and may not necessarily be directly linked to the primary work task (Grote, 2012; Hopkins, 2009). For instance, preventing a loss of control in flight is in the realm of process safety (i.e., of the SMS) whereas preventing an aircraft mechanic from falling while working at height is primarily in the realm of personal safety (i.e., of OHS). Depending on the nature of the work, process and personal safety may or may not be closely related (Grote, 2020). Similarly, OHS activities may be embedded in, or distinct from, those of an SMS, depending on the regulatory framework and/or organisational decisions.

Despite the different characteristics, goals and needs of process safety and personal safety, it appears that their management systems coevolved and became fundamentally similar by consisting of two interconnected elements: a risk control system and a learning system (Hale, 2005). To the point that Li and Guldenmund (2018) don't even make a distinction between OHSMS and SMS in their review of 43 different safety management systems. For Hsu et al. (2010), what characterises an SMS is that it is systematic, proactive and explicit. We find these characteristics in the 'universal' OHSMS described by Dalrymple et al. (1998) and Redinger and Levine (1998), but also in Hale's (2005) generic SMS, and in the ICAO SMS standards, recommended practices and guidance manual (ICAO, 2006, 2009, 2013a, 2013b, 2018a). Robson et al. (2007) consider that OHSMS and SMS overlap but are generally distinct on two aspects. On the one hand, SMS extends beyond the issue of health and safety at the workplace (i.e., personal safety) and addresses both the physical work environment and the surrounding community (i.e., process safety). On the other hand, SMS may indeed focus more on the loss of control of processes from a systemic perspective but doesn't specifically cover a broad range of workplace health concerns (i.e., personal safety), which have always been and remain a pillar of OHS.

Moreover, heavily influenced by the Plan-Do-Check-Act (PDCA) model of continuous improvement that was first formulated by Bacon in the 13th century then popularized by quality management after World War 2 (Saier, 2016; Staton-Reinstein, 2005), both OHSMS and SMS are structured like a QMS (ISO, 2015) while retaining special characteristics that differentiate them from quality management (Gallagher et al., 2001). So, while bearing in mind its limitations and the fact that it doesn't concern the aviation sector, the literature on OHSMS in non-aviation micro and small enterprises is relevant to try and find patterns and similarities with aviation SMS.

History also helps making the point that process safety and personal safety are two sides of the same coin. In the late 18th and early 19th centuries, growing concerns for how humans of all ages

were living, working and dying in the cities, factories, fields, mines or on the oceans led to the first regulations and industry norms protecting people from harm (Delattre, 2018; Frydman, 2014; Hale and Booth, 2019; Swuste et al., 2010). Some were more symbolic than others. Whereas the vessel classification system set up by Bureau Veritas in 1828 in Belgium rested entirely on inspections, neither the UK's 1788 Chimney Sweepers Act nor the Napoleonic labour code of 1841, which both intended to curb the alarming number of workplace fatalities and particularly among women and children, were properly enforced during many years and sometimes even decades. Likewise, the first UK Factory Acts enacted between 1802 and 1831 either didn't foresee any enforcers or allowed them to have dubious close ties with employers, allowing the economic barbarism of the Industrial Revolution (Swuste et al., 2010) to perpetuate. However, it marked the beginning of a movement that grew and matured ever since (Swuste et al., 2010).

The first half of the 20th century saw even more resolute efforts to increase the quantity, speed and quality of production while simultaneously protecting people from the immediate dangers of their work environment and of the machinery they needed to operate. Whereas the early OHS developments and initiatives such as the 'Safety First' movement (Swuste et al., 2010) can be traced back to the first decades of the 1900s, the first campaigns and publications on 'Loss Prevention' and on the management of OHS started to appear only after World War II, when large-scale industrial processes first began and occasionally drifted into major disasters (Swuste et al., 2016). It then took several decades to gradually realise that occupational accidents may also be complex processes difficult to predict and that cannot be simply seen as a problem of mere 'unsafe acts' or 'bad apples' in an otherwise safe system (Dekker, 2014). This generated new knowledge on process safety that quickly outpaced developments in personal safety (which prevailed until then), giving rise to a system approach that could explain accidents but still couldn't predict future accident scenarios and probabilities (Swuste et al., 2016, 2018). From then on, OHSMS started to replace "simple" OHS measures primarily targeting the workers' behaviour. Approximately two centuries elapsed from the first recorded outpourings of system thinking (Fressoz, 2012) to becoming increasingly widespread in Western workplaces.

An OHSMS can be distinguished from a traditional OHS programme when it is better integrated in the organisational processes, when it is proactive and when it incorporates evaluation and continuous improvement processes inspired by the PDCA control loop (Robson et al, 2007). Both the impetus for management systems and the regain of interest in fundamental safety research can be traced back to a number of disasters that rocked every high-risk industry throughout the 1960s, 1970s and 1980s, and particularly in the chemical and nuclear sectors. One of the main findings was that professional managers – the new breed of decision-makers generated by Taylorism five decades earlier (Journé, 2018) – probably weren't knowledgeable enough in the first place and had to be better educated and better supported – and somewhat constrained – by formal management systems to prevent them from taking haphazard decisions with lethal consequences (Swuste et al., 2018) in socio-technical systems (e.g., airlines, nuclear powerplants, factories) that became increasingly intractable (Amalberti, 2013; Hollnagel, 2014).

In reaction to major accidents and public outrage in the 1960s and 1970s, some Western countries promptly enacted new prescriptive laws to regulate complex and constantly evolving industries. They also realized the limits of these laws, their unmanageable intricacies and their disproportionate focus on detailed technical aspects at the expense of human and organisational

factors (Hale and Booth, 2019; Swuste et al., 2016). Propelled by globalisation and its neoliberal ideology (Dekker, 2020; Le Coze, 2017, 2020; Sampson et al., 2014) and particularly during times of sudden economic hardship, they then experimented with performance-based regulations and 'responsive regulations' for OHS. States liberalized some of their oversight duties. Under ICAO's "corporatization" initiative from the late 1960s, national civil aviation authorities also started to be privatised or semi-privatised, in order to make their activities more competitive and cost effective (Lofquist, 2010). This shift had a number of consequences across many industries (Gunnigham, 2015; Legg et al., 2015; Lofquist, 2010; Swuste et al., 2016).

First, it opened the door wide open to 'regulated self-regulation' schemes where primarily the businesses – and not solely the regulator – had to define OHS policies and processes to formally manage risk. The technical control of hazards is therefore delegated to those who create them, along with the responsibility for managing risk. This is a significant challenge for small firms (Gunnigham, 2015; Legg et al., 2015; Lofquist, 2010; Swuste et al., 2016), and particularly when years of hard-won experience from past tragedies are swept away from legislation, leaving both companies and authorities in limbo (Gunnigham, 2015; Vickers et al., 2015). Second, the industrial structure in most developed nations changed dramatically: large organisations started to downsize and outsource as described above, and the number of SMEs mechanically increased (Gunnigham, 2015; Vickers et al., 2015). Massive transformations occurred in enterprises of all sizes, but also in the public sector. Third, the nature of regulatory oversight started to gradually evolve from technical inspections to assessing management systems (Frick, 2014; Johnson, 2014).

As the OHSMS concept became more common in the 1990s, a number of industry standards, guidelines and auditing tools also emerged in support of the new performance-based paradigm (Blewett and O'Keeffe, 2011; Zwetsloot et al., 2011a, 2011b). However, and in spite of repeated efforts to define a universal OHSMS model and its essential elements (Redinger and Levine, 1998), the scope of OHSMS is potentially wide. There's no agreement on what it is exactly (Robson et al, 2007), there's no generally established instrument to measure it either (Nordlöf et al., 2017) and a meta-analysis found its effects on safety performance to be indeterminate (Breslin et al., 2010; Smallman, 2001). To a certain degree, and we can also see this with SMS later on (Li and Guldenmund, 2018), each industry shapes and moulds OHSMS to its needs and specificities.

This being said, regulators remain accountable to society for societal needs and didn't completely disappear from the picture after performance-based regulations emerged or even after being privatized. The flurry of new projects, studies, regulations and efforts to continually improve OHS in enterprises and SMEs in particular suggests quite the contrary (Bianchini et al., 2017; EU-OSHA, 2019). Regulatory bodies conduct or sponsor research, but also take action (Bianchini et al., 2017; EU-OSHA, 2019). These studies indicated that the most powerful incentives for MSEs to act on their internal OHS matters were: regulatory inspections (or even simply the threat of one), constructive feedback and face-to-face relations with regulatory inspectors (at the risk of crossing the line with consulting, when putting the inspector in a situation of conflict of interest), provision of free online tools to support risk management activities and intensive communication, education and promotion through any possible media (Arocena and Núñez, 2010; Borley, 1997; EU-OSHA, 2017; Larsson, 2003; Vickers et al., 2005). But then, why do MSEs still underperform in this domain, despite the apparent flexibility of the rules and the regulators' genuine concern and willingness to support?

Factors linked to the MSEs' underperformance in OHS(MS)

At authority level

From the regulators' perspective, effectively promoting and enforcing OHS requirements in micro, small- and medium-sized enterprises is terribly laborious and expensive (Walters, 2001), and comparatively much more difficult than in larger organisations. Legg et al. (2014) posit that the belief that scaling down the regulatory framework developed by and for medium and large enterprises to something simpler for SMEs is too simplistic and outdated. Governmental and industry programmes trying to reach and support SMEs with the aim of improving their work conditions may then fail to acknowledge their incessant fight for survival (Legg et al., 2014). There is therefore an unfulfilled need for sustainable strategies and actions that better integrate OHS matters and basic business imperatives in daily operations (Hasle et al., 2021; Legg et al., 2014), rather than perpetuating the traditional dual approach where OHS specialists are left to try and solve operational problems that others neglect – also known as the 'sidecar' phenomenon of OHS management (Frick, 1990; Hasle et al., 2021). Gallagher et al. (2001, p.57) conclude their review on the effectiveness of OHSMS by asserting that *"small business may require an alternative and simplified 'systematic' management approach because complex OHSMS are impractical"*.

Beyond the inherent intricacies of regulating such a heterogenous, under-resourced segment of the economy where "one-size-fits-no-one" (Holmes et al. 1997; Micheli and Cagno, 2010), other difficulties are commonly identified in research (Bluff, 2019; Legg et al., 2014, 2015; Spence, 1999): MSEs are relatively isolated and geographically scattered, often employ seasonal or part-time non-unionized staff and are likely to seek help from consultants when no internal expertise and/or extra-capacity is available on important and mandatory projects. They typically do not belong to sectorial or industry organisations, which deprives them of an important source of information and, more importantly, of a crucial mean of representation to shape regulations to their specificities and needs (Bluff, 2019; Legg, et al., 2014, 2015).

Ironically but unsurprisingly, regulators have resource constraint issues as well (Frick, 2014; Johnson, 2014; Sønderby, 2015), perhaps even more severe than those encountered by MSEs, and also face efficiency-thoroughness trade-off decisions (Hollnagel, 2009) that significantly compromise the most effective mechanisms at their disposal to raise the safety bar, namely inspections and face-to-face interactions (Hagqvist et al., 2020; Vickers et al., 2005), ideally also involving trade associations, unions and/or other interested parties (Tombs and Whyte, 2013).

In practice, inspectors then tend to focus on larger enterprises in order to repeatedly cover a larger proportion of the workers' population per inspection and therefore consistently overlook MSEs where the "return on investment" of scarce resources appears elusive anyway (Walters, 2001). Vickers et al. (2005) mentioned several industries in the UK where the odds of meeting an inspector were so low that a visit could be expected up to only once every 10 to 15 years, if at all. Tombs (2016) estimated the odds of an inspection at an 'average' workplace to be once every 50 years. The irony reaches new heights when considering research indicating that microbusinesses are further dissuaded of the value of OHS due to how poorly they consider those inspections and interventions (Bonafede et al., 2016), and are somewhat confirmed in their opinion that *"health and safety management is bureaucratic, legalistic and costly to introduce"* (Walker and Tait, 2004, p.70).

Repeated calls for a substantial increase in inspector numbers are generally ignored and are likely to remain systematically ignored (Tombs and Whyte, 2013; Vickers et al., 2005). Johnson (2014) even perceived some reluctance on the part of authorities to see responsibilities transferred from companies back to them. The employment trend is actually going in the opposite direction. For instance, Frick (2014) described the Swedish work environment authority in charge of OHSE matters as a public institution going through a rollercoaster of changes stemming from neoliberal deregulation and in particular the financial crisis of 1991, being stripped to the bones (i.e., high turnover, understaffing, decreasing training budgets) and having to refocus on information and supervision in an attempt to make up for a faltering number of workplace visits. Various authors also report similar trends of abating state oversight (Boustras et al., 2015; Hovden and Tinmannsvik, 1990; Johnson, 2014; Swuste et al., 2020; Tombs and Whyte, 2013; Zwaard, 2007) with Berlioz (2016) even mentioning the case of a young inspector being responsible for 5.000 firms in Berlin and only dropping in on companies that experienced several accidents in a row.

To take an example from the European aviation industry, Steer Davies Gleave (2015) reported a gradual but nevertheless sharp reduction, between 2000 and 2013, of the total number of persons employed in regulatory administration. The staggering reduction of 43% over the 12-year period was published but, admittedly, the report didn't account for the influence of the creation of the European Aviation Safety Agency (EASA) which took over many of the EU regulators' duties and hired many staff members from those National Aviation Authorities (CAA) during that exact timeframe. Checking through EASA's Annual Reports, which detail the number of staffs, suggests however that a reduction of 37,5% of the regulatory administration workforce appears closer to reality (EASA, 2014b). Though it doesn't precisely inform us on the staffing levels for inspectors, it nevertheless does provide some context. Sønderby (2015) also reported a lack of resources and competence at CAAs, as well as some inspectors' resignation against this. Informal conversations with various authority staff also indicate that CAAs have difficulties attracting and retaining inspectors, not to mention those simply retiring, which consequently means that they are generally under-staffed. Well over a decade ago, ICAO (2006a) already characterized the safety oversight resources of its Contracting States as "strained" by industry growth.

At business level

From the enterprises' perspective, an even more thorough and nuanced analysis is needed to explain why SMEs struggle so much and don't seem to be doing enough about it. Due to the heterogeneity, resource constraints and volatility of MSEs (which may not be interested, willing and able to participate in long research, or may lose interest then drop out, or may simply go bankrupt before the end of the project), the scientific literature dedicated to their OHS efforts is admittedly incomplete (Legg et al., 2015), scattered (Hasle and Limborg, 2006), sometimes inconclusive (Micheli et al, 2019; Robson et al., 2007) and repeatedly calls for more research to close the gaps in knowledge. In spite of the scarcity of high-quality published research, several causal factors have been put forward to explain why companies in general struggle with OHSMS practices. Many authors posit that something important is missing: there's a lack of resources, of interest, of knowledge, of understanding, of commitment, of competence, of time, of staff, of structure, of routines, of formalised industrial relations, and/or of external support (Hasle and Limborg, 2006; Legg et al., 2015; Larsson, 2003; Micheli et al, 2019; Nordlöf et al., 2017). Although it may be tempting to consider these factors as root causes, each one of them being

sufficient to explain alone the MSEs' underperformance in non-core activities, we probably should better consider them as mere symptoms of the combination of profound and intrinsic difficulties they typically face in their constant efforts to simply survive.

One frequently omitted aspect is that MSEs don't just struggle with OHSMS: this happens and repeats itself with all bureaucratic demands, from management systems built on the PDCA cycle such as QMS (Chittenden et al., 1998; Gardner, 2000) to project management (Marcelino-Sádaba et al., 2014; Turner et al., 2009, 2010) to accounting. Considering their scarce resources and the immediate, far-reaching and harmful consequences of erratic accounting, one might think that sound book-keeping should be the top priority of any MSE. And yet, despite their heavy use and symbiotic dependence on professional accountants (and although they're facing forms of complexities similar to what large enterprises face), MSEs predominantly restrict their use of accounting firms to routine compliance services, often have weak financial literacy and repeatedly muddle along from one mandatory report to the next (Nandan, 2010). They knowingly struggle with book-keeping despite the equally severe but much greater likelihood of financial trouble (compared to safety trouble) when they don't meet the applicable legal requirements. Common sense and experience tend to guide MSEs rather than specialised training and few small business employers have formal qualifications in management, employment law, accounting, etc. (Lamm, 1997). The issue of competence and of availability of resources for non-productive chores is not limited to health and safety matters. Therefore, it shouldn't come as a surprise when OSHMS visibly takes the back seat to productivity and profitability (Nordlöf et al., 2017).

At management level

Moreover, another aspect is frequently omitted in research: the ownership structure. It is however crucial for two reasons. The first, as noted by Legg et al. (2015), is that the ownership tends to differ from the micro to the small- to the medium-sized enterprise, which may dramatically influence the management style. Micro enterprises are typically founded and managed by their owner(s). Then, if the start-up manages to survive and grow, professional managers – who do not necessarily become shareowners – begin to appear at the helm of the company, and the day-to-day running starts to be shared between the owner-manager and professional managers. This creates a second level of management and the owner usually isn't as involved in the daily operations as he/she used to be. If the company continues to mature and grow, the owner(s) may remain in some capacity, but professional managers are now often running the business (Legg et al., 2015). At the same time, it becomes more complex, the number of management levels increases, the general mindset gradually evolves from "struggle for survival and continuity" to "strong growth and profit", and the operations go from initially zero formalisation of internal policies, processes and procedures to fully documented management systems (Kumar and Antony, 2009; Legg et al., 2015). One could wonder what comes first: business success or sound management practices? The literature struggles to clearly identify the causal links and intricacies of the relationship. However, there's indication that firms with a more systematic approach to management are more likely to be successful and to invest in OHS (Vickers et al., 2005).

At personal level

The second reason why the ownership structure plays a key role in the safety practices of micro enterprises is the fact that owner-managers, who regularly seem to be antipathic to regulations and government interventions (Croucher et al., 2013; Walker and Tait, 2004), are inveterate social creatures (except, probably, corporate psychopaths – Boddy, 2017; Shank, 2018). Lawmakers seem to regularly forget that crucial dimension though, for instance by only focusing (in law) on the economic viability of a business plan when a firm is established but neglecting OHS and management skills. Owner-managers are however key persons permitting to understand how risk and operational decisions are taken, since their personal values, priorities, career trajectory and management skills determine the organisational culture, social relations and attitude regarding the work environment (Croucher et al., 2013; Hasle et al., 2009; Vickers et al., 2005). Productivity and profitability are not the only overarching goals in this domain. Establishing and maintaining good relationships with employees is also extremely important to owner-managers, particularly in very small teams and family businesses. Two separate studies shed some light on how this can play out before and after an incident or an accident happens, and how it influences OHS practices.

Eakin (1992) reported that owner-managers can display one of two types of attitudes towards OHS requirements. Some perceive the health and safety of their workers as a personal responsibility and have no hesitation to intervene and issue orders. They see it as a legitimate extension of their authority, although some may prefer to deflect the responsibility away from them on to an impersonal rule. However, the majority in the study preferred to "leave it up to the workers" to decide which protective measures they needed to take for themselves. Three explanations to this reluctance to enforce preventive measures were suggested. First, owner-managers discounted or normalized workplace risks as insignificant (although they were clearly not so). Second, they balked at the prospect of somewhat infantilizing their employees, which they felt would be inconsistent with the good working relationships, harmonious interactions, close reciprocal bonds and strong norms of personal autonomy that prevailed. Third, owner-managers considered OHS as a personal moral enterprise in which they thought they had no legitimate authority. These explanations resonate with the "social and cultural rationality" proposed by Perrow (1984). According to him, individuals assess the likelihood of negative outcomes primarily on cultural values, personal experience and practical necessity, rather than on technical criteria and probabilities. Social sciences caution us that rationality may be a chimera in the context of risk decisions (Slovic et al., 2002), highlighting the crucial role of social values and trust when perceiving, framing and accepting risk (Slovic, 2001). Moreover, Smith et al. (1988) found that entrepreneurs from smaller firms tend to be less likely to follow a formal rational decision process, which in turn negatively impacts organisational performance. The rationality and adequacy of formalised risk assessments in MSEs seem therefore compromised. In fairness, it is by design a tricky intellectual exercise, especially in complex situations and even more so with intractable systems, where the added value of using expert judgement hasn't been demonstrated and even appears overrated (Karanikas and Kaspers, 2016; Rae and Alexander, 2017). If formal risk assessments are not significantly different from fortune-telling, even conscientious attempts at constraining or resisting interferences from emotions, values and 'gut feelings' formed through personal experience appear like a vain exercise indeed.

When an accident unfortunately does occur, Hasle et al. (2009) identified that owner-managers of small enterprises displayed a stronger defensive attribution bias than managers of fairly large

firms. Self- or group-defensive attribution bias is a common psychosocial mechanism in occupational accidents. In order to maintain control and order, self-esteem, group-esteem and a positive corporate image, owner-managers primarily attribute accidents to unforeseeable circumstances, i.e., bad luck. This fatalistic and self-absolving attitude has several consequences. On the one hand it may indeed help in deflecting prejudice, blame and internal conflicts, but on the other it cripples organisational learning and improvements by thwarting any investigation or subsequent accident prevention measures. Owner-managers displayed an ambivalent attitude towards safety. They may have had a deep understanding of the tasks and have been able to list many causal factors in the accident, but eventually rejected the notion that some factors actually were in their control. Moreover, the self-/group-defensive attribution bias increases with both the likelihood and severity of the accident. In other words, the more severe or the more likely the accident was, the more unavoidable it was believed to have been (Hasle et al., 2009). Owner-managers found it therefore sensible to attribute serious accidents to circumstances beyond their control while workers were often held responsible for their own minor injuries. Holmes et al. (1997) had identified this as well in an earlier study. This resonates with the phenomenon of 'blame culture' (Dekker, 2017; Lupton and Warren, 2018) and perhaps even with the relatively shaky theory of 'accident proneness' from a century ago (Burnham, 2009; Dekker, 2014; Greenwood and Woods, 1919; Visser et al., 2007), but in any case strongly underlines the pertinence of, and need for, proper training on accident causation and human factors in even the smallest companies, as also highlighted by Hasle et al. (2009). Interestingly, some workers themselves engage in defensive attribution in favour of the owner-manager, who then reciprocates by not blaming the worker. However, in the end the situation is detrimental to all and to the promotion of OHS: on the one hand the enterprise doesn't learn anything (to the contrary, this negative training reinforces the existing – but wrong – beliefs) and on the other hand the injured worker eventually returns to the same unsafe work conditions as before the accident.

These two examples illustrate the intricate tectonics at play both within and around MSEs. They highlight what participates in their difficulties in general, and particularly in the field of OHSMS. They also suggest that there's no easy problem and certainly no easy fix to address the MSEs' difficulties. In other words, time and money may generally be critically missing amongst MSEs indeed, but this doesn't justify nor explain anything alone. Moreover, management systems (e.g., QMS, OHSMS) are not a guaranteed panacea. The literature review indicates that they tend to be of very questionable benefit to the smallest firms.

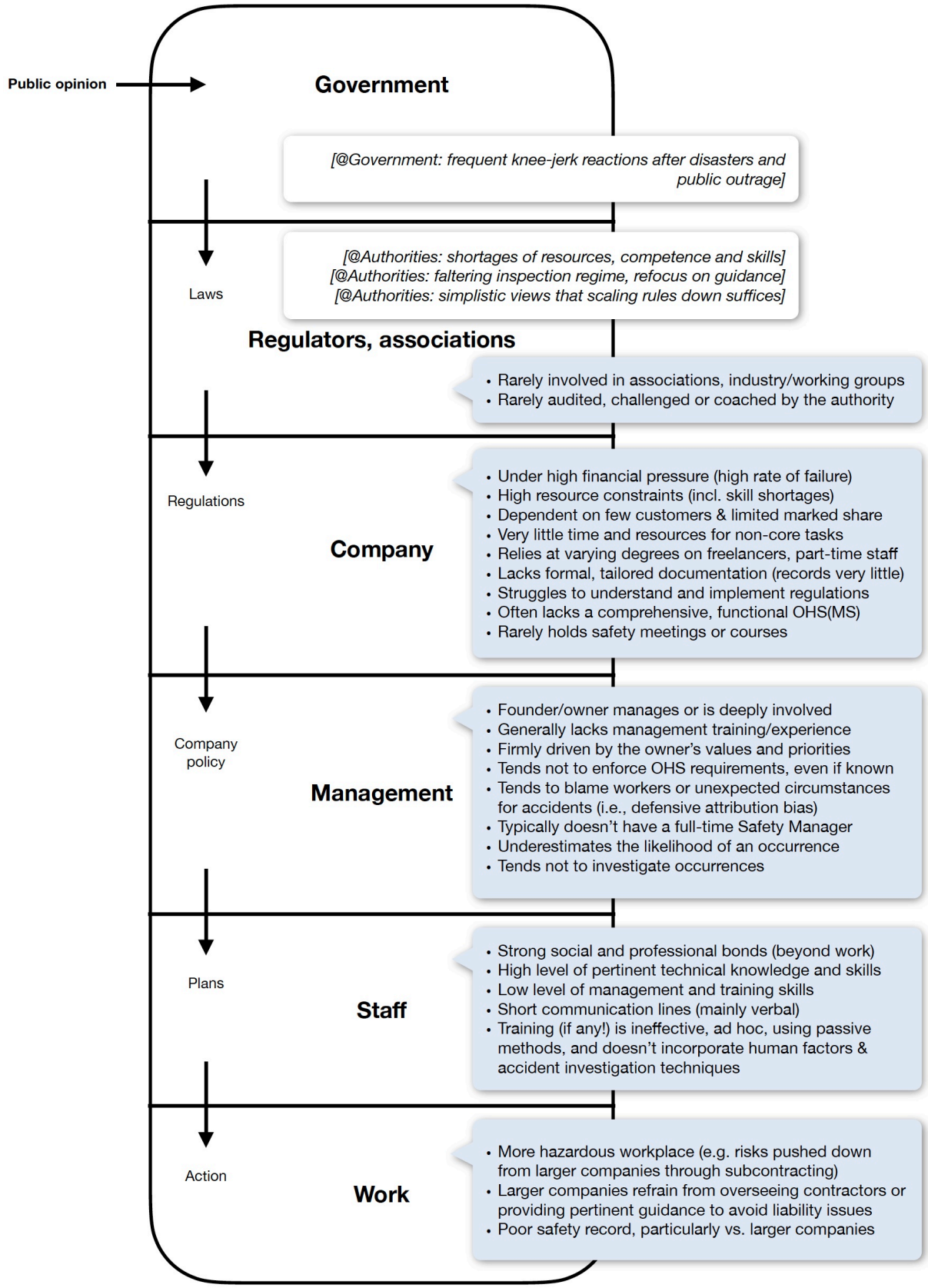
The 'generic' micro/small enterprise

Using Rasmussen's Risk Management Framework of (stable) sociotechnical systems (Rasmussen, 1997), the profile of a typical non-aviation MSE can be sketched. Figure 1 uses six stacked levels to schematically present the sociotechnical systems within which risks are managed (Rasmussen, 1997). The arrows relate to the instruments used by each level to steer and influence the next lower level towards desired outcomes (organisational, societal, etc.). On top of that framework come the insights learned from the literature reviewed for this thesis: the white boxes denote conditions, observed habits and processes at state and institutional level whereas the blue boxes

describe several (but not all) typical conditions or processes commonly found in non-aviation MSEs.

Figure 1

'Generic' profile of a non-aviation MSE from a socio-technical perspective



This 'generic' profile approaches non-aviation MSEs from two complementary angles:

- Socioeconomics: refers to social and economic factors and to the interactions between them, with a focus on the threats to MSEs' survival in a market economy; and
- Safety: relates to the threats to personal safety and/or process safety in MSEs.

It can therefore also be viewed as a non-exhaustive collection of many of the factors described in literature as contributing to the safety underperformance of the smallest organisations despite many efforts to improve it, including at governmental and authority level through OHS laws and initiatives. Considering the depth, breadth and number of those factors, one could wonder how MSEs don't have an even worse safety record. To provide a less fatalistic counterpoint and in turn complete this sketch of MSEs, it would be necessary to also list their strengths and the factors contributing to the reality that some MSEs do manage to survive (and even flourish) and do achieve a safety record comparable to that of the larger enterprises.

For instance, several authors consistently identified the following factors and preconditions as contributing to OHS effectiveness (Gallagher et al., 2001; Gallagher and Underhill, 2012; Tombs and Whyte, 2013, Wright and Head, 2009):

- Tripartite regulatory context involving the regulator, the industry and third parties (e.g., trade associations, unions, public interest groups, insurers, investors, etc.), especially when there is a reasonable balance of power between them,
- Active commitment of senior management to OHS (e.g., as an organisational priority),
- Provision of adequate resources,
- Leading by example,
- Trained and motivated supervisors and managers,
- Empowered and involved workers,
- OHSMS introduced to improve OHS,
- OHS is integral to management performance appraisals,
- Sound risk management,
- Evaluation and prevention processes,
- System customised to the organisation's needs,
- All organisational functions incorporate OHS.

Moreover, this 'generic' profile does not explicitly include institutional theory which provides a sound, detailed and useful framework to explore and hopefully uncover both the motivations and the chances of success of an air operator engaged in the implementation or operation of its SMS. In this research, institutional theory was not intended to evaluate or demonstrate the effectiveness of an operators' SMS. At least it provides a tool to assess whether an SMS has any chance of being completed and operationalised as designed. One could indeed wonder how a new and intricate management system could ever be fully functional and effective if its implementation was unintentionally botched up (for instance due to its complexity or cost), voluntarily misguided (for instance to preserve operational efficiency and/or profitability), or a combination of both.

Research design

A combination of methods was used: a literature review, a document review, a pilot survey, and a comparative cross-industry online survey (Flick, 2018). Since OHS(MS) and SMS share similar structures based on the PDCA cycle and very complementary objectives (i.e., personal safety and process safety), drawing parallels and finding contrasts between them appeared more promising than between SMS and QMS. Both reviews allowed the identification of the socioeconomic specificities of non-aviation MSEs and their particular challenges regarding occupational health and safety, as well as a pertinent theoretical framework for this research (i.e., institutional theory). The (paper) pilot survey then helped test, improve and narrow down the questionnaire to be used during the subsequent online survey, which is at the core of this research. Since there's no clear definition of business aviation and a variety of business models in it, the pilot survey also validated the types of operations to be used to profile MSEs in business aviation. The online survey aimed at profiling business aviation air operators of twenty FTEs or less, and at verifying the pertinence of institutional theory (see appendix 1 for a summary on institutional theory).

Ethics

Under the Swedish Ethical Review Act of 2003, no prior formal ethical review was required before the research began. No particular step was required either regarding what is considered to be 'sensitive personal data' under the EU's General Data Protection Regulation (GDPR), since there was no intention or need to obtain such data. However, ethical principles (e.g., fairness, confidentiality, responsibility), and good research practices (i.e., reliability, honesty, respect and accountability – ALLEA, 2017; Vetenskapsrådet, 2017) were incorporated in the interest of confidentiality, privacy, and research quality. They included, e.g.:

- The origin of the data can only be traced by the researcher to the original source,
- Participants in the pilot survey received a verbal explanation and a written prenotification detailing the research (plan, purpose, methods, responsible persons, etc.), reminding them that their participation is purely voluntary, for research purposes only, and that they can terminate their participation at any time. In the case of the online survey, the relevant information was part of the introduction (i.e., the "landing page" of the questionnaire),
- The online survey didn't record any information allowing to trace the responses back to the person who provided them, or even to the device used for that purpose, unless the respondent voluntarily provided the information. When doing so, respondents could choose for which purpose(s) their personal data could be used (e.g., volunteering for an interview, or asking to be kept informed of the outcomes of the research),
- Digital data is kept exclusively by Lund University and by the researcher for a period of three years after examination of the thesis, after which the data shall be erased to ensure the protection of the participants' identity.

Literature review

The initial Boolean keyword searches for relevant terms on online platforms (e.g., LUBsearch, SCOPUS, ETHoS, etc.) used the following criteria for inclusion and exclusion:

- Keywords: SMS, SME (and their respective derivates),
- Publication type: only peer-reviewed journals, without any date limit,
- Population of interest: any organisational context worldwide,
- Nature of intervention: any within the context of SMS was included.

Document (scoping) review

Many documents used for the research emanate from public institutions and were easily available. However, the researcher's personal library provided most of the 'grey' literature. Although those documents were all publicly available at one moment in time, several are not readily available anymore due to updates to the website of the organisation that authored them. Informants (e.g., colleagues, safety practitioners, etc.) also provided very valuable contextual information and documents by e-mail or during unrecorded conversations. This was also considered part of the document review process and handled as per the ethical guidelines detailed above.

Three types of air operators emerged from the review and were initially retained for the research:

- Commercial air operators: charter, emergency medical service, air-taxi, etc.,
- Corporate flight departments: typically tied to large multinational corporations, global groups and Fortune500 companies,
- Owner operations: typically supporting the travel needs of the high-net worth individual(s) who own(s) the aircraft.

These types are an imperfect compromise, due to the diversity of regulatory frameworks and business models in the industry. The demarcation lines used here are fairly similar to those drawn by IBAC (2016) in its Business Aviation Safety Reviews, except for "fractional ownership" (not retained for the research) which hardly exists outside the US in its original form and is then usually reframed as commercial operation.

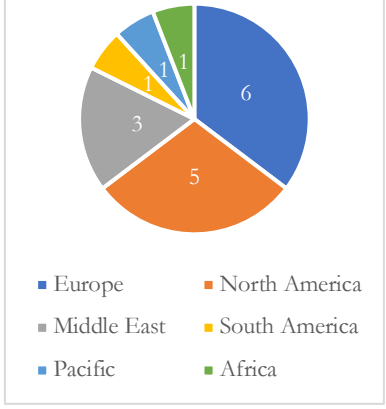
The literature and document reviews were also consolidated through the creation of a presumably 'generic' profile of typical, non-aviation MSEs. This profile contains thirty-seven attributes (seventeen related to socioeconomics, and twenty related to OHSMS).

Pilot survey

A rare opportunity presented itself to submit the profile that emerged from the literature and document review to fifteen 'veteran' business aviation professionals and leaders. This was done through a pilot survey on paper where the thirty-seven attributes of the 'generic' profile for non-aviation MSEs were adapted to business aviation whenever needed and presented as statements. The respondents were asked to state (by ticking boxes) when they thought that a statement was

valid for a type of operation, or to circle the box(es) whenever they were unable to answer. This was meant to identify gaps in knowledge and the odds that the rest of the industry would perhaps encounter similar difficulties during the online survey that would follow. Put differently, for each of the thirty-seven statements and for each of the three types of operation the survey offered the option to either confirm the statement, deny the statement, express personal doubts about it, or declare that the statement wasn't applicable to business aviation at all (which was an even stronger statement than by leaving a box blank). Since some respondents had had extensive careers in more than one ICAO region, they shared their perspective and experience for six regions (figure 2).

Figure 2
Respondents by ICAO region



The objectives of the pilot survey were therefore to:

- Test the adequacy of the three types of operations retained by the researcher to segment the business aviation industry in a coherent manner (e.g., commercial air operations, corporate flight departments, non-commercial air operations),
- Collect the participants' opinion on the validity of each attribute but also on its pertinence in each of the three types of operations identified by the researcher,
- Identify superfluous questions, in order to reduce the size of the subsequent online survey without negatively impacting its quality.

Descriptive statistical analysis (e.g., mean, median, standard deviation) was also used.
See appendix 2 for the questions and aggregated results.

Missing answers (i.e., where none of the boxes were ticked for a particular statement) were conservatively interpreted as an overall disagreement with the statement rather than as a sign of personal doubts that the statement doesn't apply to any business aviation operator. All the responses were aggregated and turned into percentages ranging from zero to a hundred percent where only ticked boxes counted as a clear agreement with the corresponding statement. For each statement and for each type of operation, the resulting number portrays an artificial "average opinion" from a diverse group of respondents rather than an objective reality. The whole range of answers was then cut into five bands and juxtaposed with the Likert scale (below):

Table 5
Interpretation of pilot survey answers

	Percentage band				
	0 – 20%	**21 – 40%**	**41 – 60%**	**61 – 80%**	**81 – 100%**
Interpretation	Strongly disagree	Disagree	Undecided	Agree	Strongly agree

Although the thirty-seven statements were divided into two perspectives, each one of them contained statements pertaining to a range of topics. For instance, the safety management perspective covered entangled issues such as training, safety meetings, awareness of regulatory requirements, communication means, etc.

Translating the answers into percentages (of agreement) provided a few findings:

- Some basic statements were confirmed or denied as expected (e.g., commercial air operators have many customers whereas an owner operation has very few), and therefore were removed from the subsequent online survey,
- The respondents strongly agreed (93%) that commercial air operators are under high financial pressure, and at the same time strongly disagreed that corporate and non-commercial operations were under such financial pressure (14%),
- Both sides of the Atlantic (i.e., EUR and NAM) seemed to perceive the industry the same way regarding commercial air operators and owner operations, but not concerning corporate flight departments. Respondents from NAM appeared to disagree more often and more strongly with the 37 statements than their colleagues from EUR (e.g., meaning that from the respondents' perspective those NAM corporate operators do not struggle as much as their colleagues from EUR). This may be mainly due to the different tax and regulatory regimes, their impact on business aviation, and the size of the corporations and of the sample.

Colour-coding the percentages based on the Likert scale (table 5) further contrasted the types of operations and provided visual cues that each one of them probably operates to a very specific set of factors and intrinsic/extrinsic motivations (Pink, 2011), all of which likely impact safety.

Although they don't constitute definitive statements in themselves, the mean, median and standard deviation of the answers were computed for each type of operation and for each perspective. They assist in translating into numbers the overall direction taken by each type of operation and the 'visual' impression created by the table with all the answers (table 6).

- Commercial air operations: on average, the respondents were undecided (60%) on the socioeconomic perspective and disagreed (36%) on the safety perspective. The standard deviations were 24% and 16% respectively.
- Corporate flight departments: on average, the respondents disagreed (40%) on the socioeconomic perspective and were undecided (36%) on the safety perspective. The standard deviations were 24% and 19% respectively.
- Owner operations: on average, the respondents agreed (66%) on the socioeconomic perspective and strongly agreed (86%) on the safety perspective. The standard deviations were 28% and 20% respectively.

Table 6

Summary of the respondents' statements to the pilot survey

Perspective	**AOC**	**Corporate Flight Dpt.**	**Owner operation**
Socioeconomic	Undecided	Disagrees	Agrees
Safety	Disagrees	Undecided	Strongly agrees

Considering that the statements in the survey originated from the 'generic' profile of typical non-aviation MSEs and therefore questioned the ability of an operator to effectively manage safety (with few exceptions), the stronger a respondent or a group of respondents disagreed to a particular statement, the better the safety performance is believed to be on that particular topic. The results suggest that owner operations generate more concerns about their ability to manage

safety due to the respondents' higher level of agreement with the statements. Conversely, commercial and corporate operators seem to be in a better situation (i.e., with less hindering factors) to effectively manage the safety of their operations.

The objectives of the pilot survey were met:

- The respondents' viewpoints on all attributes and statements were collected on all three types of business aviation operations. Although it was still blurry, the first elements needed to profile them emerged,
- Not a single statement collected a similar level of agreement for all three types of operations. There usually was a stark contrast between them. No respondent denied the existence of any type of operation either, although it was possible to do so. This validated the existence of at least three types of operations within the business aviation sector. However, as stated earlier, the concept of owner operation was slightly adjusted to be more encompassing in the online survey,
- A few questions were either removed or reworded for clarity, brevity and consistency.

Comparative cross-industry online survey

The objectives of the online survey were to:

- Identify, from socioeconomic and safety standpoints, the characteristics of the three types of micro/small air operators in business aviation,
- Determine if the demographics of the respondents match those of the industry,
- Contrast aviation and non-aviation MSEs,
- Find evidence (or absence) of decoupling strategies and isomorphism.

The analysis of the results from the pilot survey allowed the sharpening and trimming down of the 'profiling' part of the online questionnaire. The initial distinction between three types of operations used in the pilot survey was retained, but one of the types was renamed and conceptually expanded: "owner" operations became "non-commercial air operations" out of concern that "owner operations" is on the fringe of general aviation, restrictive, and leaves a gap with corporate flight departments. The three types of air operators eventually used and defined were:

- Commercial air operators: charter operators, air-taxi, ambulance,
- Corporate flight departments: typically tied to (very) large multinational corporations, global groups and Fortune500 companies,
- Non-commercial air operators: typically for a small/medium enterprise(s) or one or more owner(s).

Questions related to institutional theory were subsequently added to what eventually formed a set of 32 questions (with answers and details on the explanatory power of each question). Expecting a very low response rate and a number of respondents dropping out before reaching the end of the survey, all the questions were rated (i.e., high, medium, low) by the anticipated explanatory power of the answers with regards to the research question, then reorganised in order to have the most important questions answered first. Sociodemographic attributes were essential in order to

contrast the responses from the three possible types of operations identified in the document review. However, these attributes were not put on the first page of the survey but rather on the second, based on suggestions found in the literature (Toepoel, 2017) that online surveys need to first catch the respondents' interest and curiosity.

Considering the diversity of business aviation, it seemed important to constrain the potential dispersion of the responses beyond what is reasonable and workable by crafting industry-specific answers rather than using typical survey instruments (e.g., Likert scale, yes-no answers, etc.). This was also seen as a way of keeping the number of survey questions within reason and of reducing the time needed to respond to the survey and to analyse the answers. Therefore, it contained mainly close-ended unordered and ordered questions, and only exceptionally offered the option to insert free text as an answer in addition to several proposals. These answers had to be analysed in order to determine to what extent they matched any of the proposed answers (e.g., simply using different words or adding nuances), or whether they offered a completely new answer that hadn't been considered while designing the questionnaire and that wasn't covered by any other proposal.

The questionnaire addressed the following themes:

- Socio-demographic attributes: combination of topics supporting the profiling of MSEs (location, fleet size, number of FTEs, implication of management, etc.),
- Resources for safety: to be consistent with a systemic approach, this theme explores the issue of the availability of resources at the air operator and its many facets,
- Institutional environment: influences and interactions with institutions (e.g., industry groups and associations, CAAs) as well as their capabilities (e.g., resources, competence),
- Legitimacy: based on institutional theory, the presence (or absence) of markers of isomorphism and ceremonial implementation were sought.

The main theme for each question was as follows:

Table 7

Distribution of the survey questions by theme

Question number	Themes	Nbr. of questions (N = 32)
6, 8, 10, 11, 12, 14, 23, 26	Socio-demographic attributes	8
1, 5, 13, 16, 19, 24, 25, 27, 28, 29, 30, 31, 32	Resources for safety	13
9, 15, 17, 21, 22	Institutional environment	5
2, 3, 4, 7, 18, 20	Legitimacy	6

A dedicated account was created exclusively for this research on an online survey platform. Eight so-called 'collectors' were then created, each being assigned a unique URL to the questionnaire, in order to evaluate the response rate of the various communication channels. The survey was tested by a handful of business aviation professionals who didn't belong to an organisation targeted by the research. Their feedback on the questions, answers and online platform was used to improve the usability and clarity of the survey.

Several business aviation organisations distributed an URL to the survey through their respective communication channels, primarily newsletters or on their online forum. Social media were also used to spread URLs (e.g., Twitter, LinkedIn). The editor of an aviation safety newsletter with

65.000 subscribers also incorporated a brief invitation to complete the survey in several issues of his newsletter for close to two weeks. This newsletter reaches individuals either active or interested in the aviation industry and particularly in safety, but not specifically in business aviation. A six-week window allowed participants to submit their responses. The questions and aggregated results are available in appendix 3.

The subsequent analysis followed the standard process of data cleaning, screening, deidentification and safeguarding (Toepoel, 2017). A good part of the analysis also consisted in tagging and filtering the responses based on the type of operation and the size of the operator. Since the questions were ordered by importance (i.e., not by theme) in an attempt to achieve a good completion rate, the questions and results were reordered at a later stage and are presented by type of operation in the following section.

Fifty-three respondents completed the online survey. One response concerned unmanned aviation and was excluded. Out of the fifty-two responses left (table 8), 79% were complete. Eleven respondents (21,2%) didn't reach the fourth and final page. Most of them (eight out of ten) abandoned the survey without submitting their responses to the second page of the questionnaire, which addressed the socio-demographic aspects of the respondent's organisation (e.g., ICAO region, fleet size, number of staff). Three respondents stopped after submitting those details and therefore replied to nearly half the questionnaire (fourteen questions out of thirty-two). Percentages were always based on the number of responses received, not on the total number of respondents.

Table 8

Respondents (total and by completion rate)

	n	**%**
Responses for manned aviation only	52	100,0%
Surveys fully completed	*41*	*78,8%*
Survey pages completed: 1 out of 4 (without sociodemographic data)	*8*	*15,4%*
Survey pages completed: 2 or 3 out of 4 (with sociodemographic data)	*3*	*5,8%*

Sociodemographic data provided by 44 respondents allowed to classify the operators by size (table 9).

Table 9

Respondents (by size of operation)

	n	**%**
Responses for manned aviation and with sociodemographic data	44	100,0%
Responses for a micro-operator (i.e., 1-9 FTEs)	*17*	*38,6%*
Responses for a small operator (i.e., 10-49 FTEs)	*22*	*50,0%*
Responses for a medium operator (i.e., 50-249 FTEs)	*2*	*4,5%*
Responses for a large operator (i.e., ≥ 250 FTEs)	*3*	*6,8%*

Since the survey yielded little data from micro air operators only (n=17), slightly larger operators of up to twenty FTEs were also included in the scope. This number also echoes a distinction sometimes made in aviation law between complex and non-complex operators, for instance in the European Union where the number of FTEs in an organisation is currently one of the clearest criteria (EU, 2012). Although other consideration can come into play, a European air

operator will most likely be labelled as 'complex' by its CAA if it has twenty FTEs or more. Interestingly, EASA gradually removes this distinction after discovering that 'small' air operators dedicate too much effort to try and fit into the comparatively easier category, and by doing so invest fewer resources into the implementation and operation of their SMS (ICAO, 2021b).

The respondents who declared in which ICAO region their operation and aircraft were based (n=31) came predominantly from North America (64,5%), then from Europe (16,1%), the Pacific (9,7%), and finally the Middle East, South America or the North Atlantic region (3,2% each). A few individual responses contained conflicting information, which casted some doubts on the accuracy of their answer related to the geographical region. It is possible that some respondents were uncomfortable with the thought of providing information they perhaps felt would reveal too much about themselves and/or their organisation, based on the 9 questions that preceded the sociodemographic ones. This could also partly explain why seven respondents didn't go further than the page with those sociodemographic questions. However, in terms of safety performance the picture painted by those who did provide geographic information wasn't particularly different from the picture painted by those who didn't. Regardless of the reasons why information about the base of operation could be incorrect or missing, it was deemed too unreliable and therefore no analysis based on the ICAO region was undertaken.

Limitations

First of all, only two languages were used, restricting the field of research to English and French.

Secondly, the maturity of both the business aviation industry and the regulatory framework(s) can vary considerably from one ICAO region to the other and impact the air operators' SMS. Although the online survey could only be completed by staff from operators with an SMS, there was no guarantee that the operator's SMS is fully implemented and operational. Despite a common denominator (i.e., the ICAO Standards and Recommended Practices or SARP), there's little homogeneity between regions in terms of how those SARP are transposed into national law(s) and consequently enforced, especially concerning SMS. For instance, all European commercial air operators are legally required to implement a management system encompassing all safety and compliance matters (EU, 2012) but not their US counterparts in on-demand Part 135 operations (FAA, 2019a, 2019b; Porter, 2016; UK CAA, 2009). The US Federal Aviation Administration (FAA), which didn't quickly incorporate SMS into its regulatory framework (FAA 2008a; Lawton, 2008; Rosenkrans, 2015; Werfelman, 2009), once considered that developing and operating an SMS is not practical for all aviation stakeholders and therefore only requires SMS in airline operations (FAA, 2008b). This may partly explain why only 1% of the 1.905 Part 135 operators have voluntarily implemented an SMS and achieved FAA acceptance, and only another 11% is currently in the process (Business Air News, 2020; FAA, 2020b, NTSB, 2021a). Moreover, there are no direct regulatory penalties for not participating in the FAA's SMS Voluntary Program or for not complying with it once it is implemented and accepted by the FAA (2019b). In a worse-case scenario, the FAA's acceptance and recognition of the operator's SMS may simply be withdrawn (FAA, 2019b). Interestingly, in 2017 the accident rate of US non-scheduled Part 135 operators was about sevenfold that of US airlines (NTSB, 2019). Following a string of fatal accidents deemed preventable according to the US National Transportation Safety

Board (NTSB), SMS is on their "Most Wanted" List of Transportation Safety Improvements for Part 135 operations for five years (NTSB, 2019a, 2021). This likely played a role in the FAA Administrator's recent announcement that he hoped to propose a rule mandating SMS in Part 135 operations by mid-2022 (Aviation International News, 2020). Although the gap is slowly narrowing, the voluntary SMS of a US charter operator currently faces very different constraints compared to the mandatory SMS of a European charter operator.

In addition, safety performance management (ICAO, 2018a) in business aviation is fragmented. Air operators tend to generate little safety data (unless, for instance, they have implemented a flight data analysis programme that will produce considerable amounts of data on every flight). They also tend to struggle with the analysis and long-term storage of this data in an easily exploitable format (especially when switching from one SMS software provider to another), and logically tend to keep sensitive information confidential (e.g., fleet size, activity, occurrences, etc.). The tendency to hire the lowest possible number of personnel and to have them wear multiple hats, as is customary in many micro enterprises, contributes to the difficulties to make time for collecting data and to come up with a comprehensive status of the industry. At sector level, no industry group or regulator contacted for this research was able to provide accident rates specifically for small operators although they are in the majority (Eurocontrol, 2010; NBAA, 2019). Despite a genuine interest in getting this data, the complexity and substantial resources that would be required to obtain it and to keep it updated appear to have had a deterring effect (UK CAA, 2009). Even determining the number of active air operators and their activity level with satisfying accuracy and confidence is a tricky exercise. This prompted Eurocontrol, the European organisation for the safety of air navigation, to make its statistical analyses based on the aircraft type rather than on the nature of the flight (Eurocontrol, 2010). Likewise, consultancy firm Flight Global (2012, 2013) publishes safety statistics based on the number of airframes active in business aviation rather than on the number of flight hours or departures (e.g., as is customary in the airline world). In other words, in this industry one regularly tries to avoid comparing very few apples with even less oranges.

Thirdly, considering the above and the low number of respondents, it was not possible to check if (and in the affirmative, to what extent) the sample was biased by either a greater or lesser willingness of the respondents to share safety-sensitive information. On the one hand, it seems fair to assume that respondents to a safety survey that is primarily shared through a daily newsletter on aviation safety are personally more interested and invested in safety than those who didn't reach the survey or didn't even sign up for the newsletter. On the other hand, it is perhaps not a complete coincidence that the URL that collected the greatest number of responses was not only the one distributed to the widest audience, but also the URL where the respondents had the greatest number of degrees of separation with me. In comparison, the URLs and invitations to participate distributed through personal networks on a much more personal basis (with follow-up e-mails and reminders) generated the smallest number of responses. Nonetheless, in an effort to keep the survey as short and focused as possible, the respondents' motivation to participate was not probed.

Results

Thirty-one respondents were identified as being within the scope (table 10) and provided data on the number of FTEs and aircraft in their employer's fleet.

Table 10

Respondents within the scope (by size of operation)

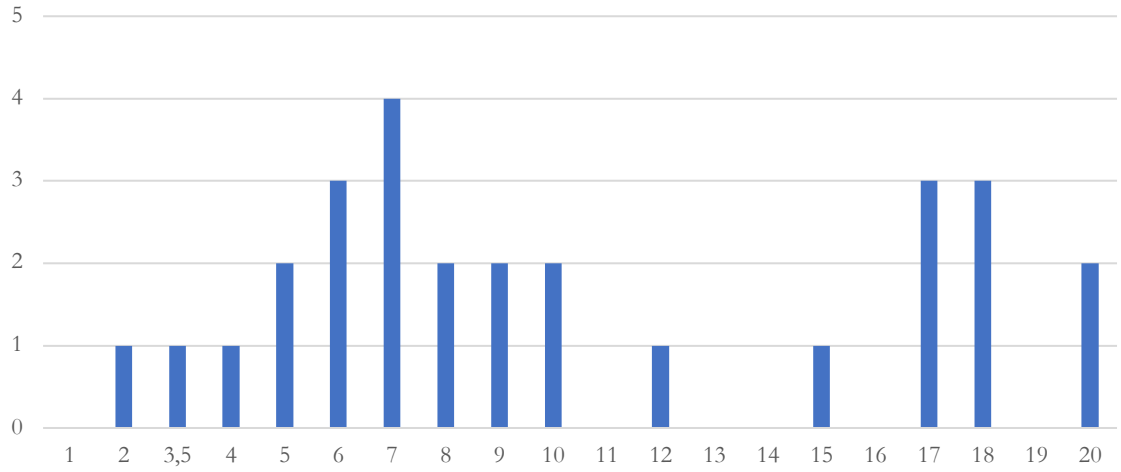
	n	%
Total respondents within the scope (≤ 20 FTEs)	31	100,0%
Responses for a micro-operator (i.e., 1-9 FTEs)	*17*	*54,8%*
Responses for a small operator (i.e., 10-49 FTEs)	*14*	*45,2%*

In terms of FTEs, the respondents' data indicates that (figure 3):

- Micro air operators in the sample have on average 6,3 FTEs (median=7,0), whereas
- Small air operators have on average 15,5 FTEs (median=17,0).

Figure 3

Distribution of respondents by the number of FTEs (N=31)

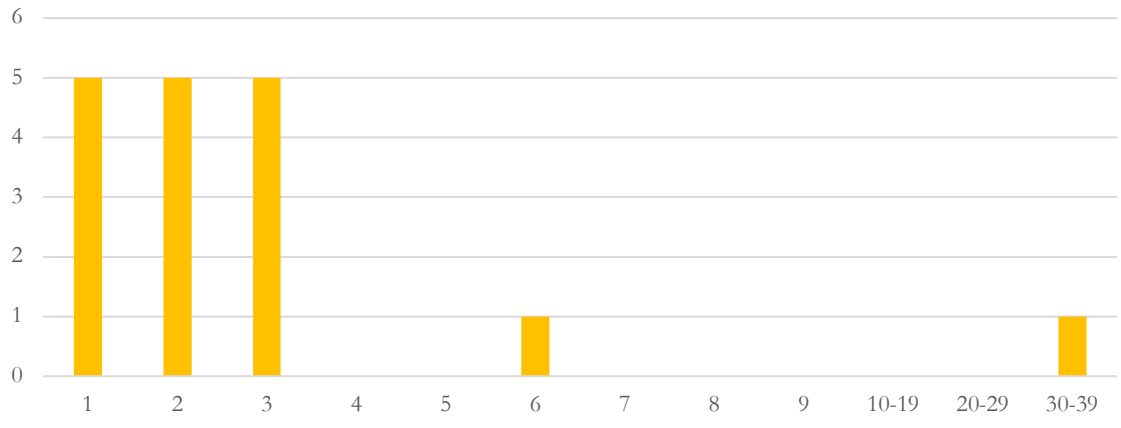


Regarding the fleets (figures 4 and 5, or appendix 3), the respondents' data indicates that:

- Micro air operators in the sample have on average 3,9 aircraft (median=2,0), whereas
- Small air operators have on average 3,6 aircraft (median= 3,0).

Figure 4

Distribution of the micro-operators by the number of aircraft in their fleet (N=17)



One anonymous respondent from a commercial micro-operator stated that the organisation had over 30 aircraft, which didn't seem to fit the number of FTEs declared. While an error cannot be completely ruled out, it could also be an indicator of a significant reliance on part-time freelancers. Therefore, since the answer could indeed be factually correct but couldn't be confirmed, that outlier's data was kept but flagged as such (z-score=3,8).

Figure 5

Distribution of the small operators by the number of aircraft in their fleet (N=13)

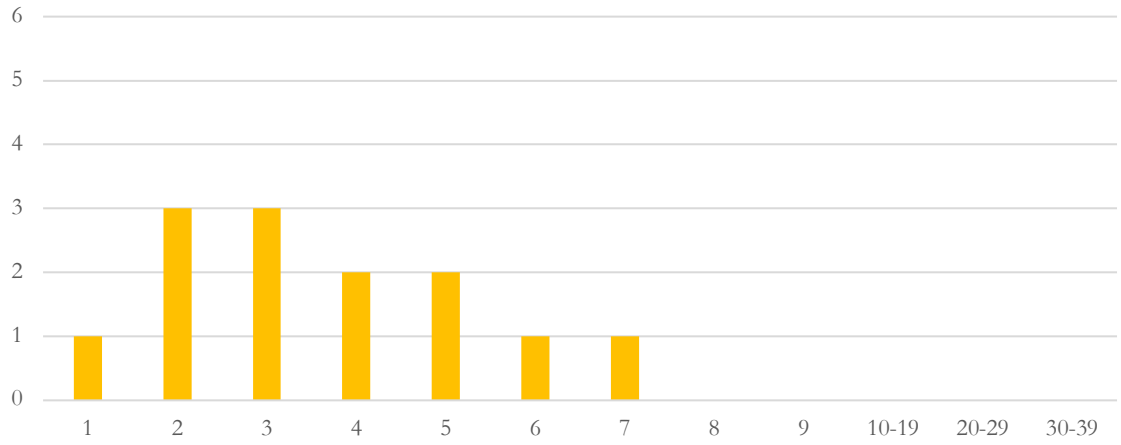
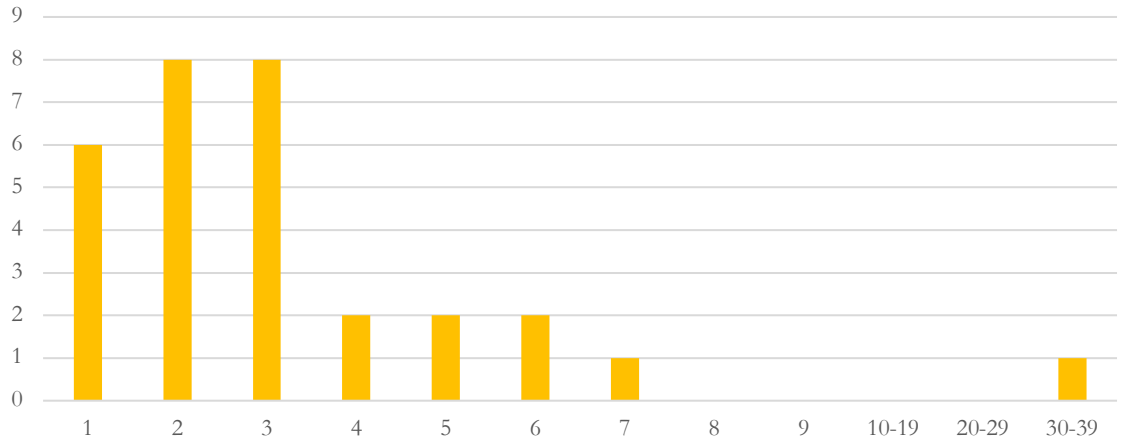


Figure 6 then aggregates all the data available for both micro and small air operators.

Figure 6

Distribution of all the operators by the number of aircraft in their fleet



For the entire population considered here (N=31), the air operators have on average:

- 10,5 FTEs (median=9,0; standard deviation=5,4) and
- 3,9 aircraft (median=2,0; standard deviation=5,7).

Concerning the types of operation (table 30), there was an almost equal number of respondents from corporate flight departments (38,7%) and from commercial air operator (35,5%). A minority came from non-commercial air operators (25,8%). The type of operation didn't make much difference for the average numbers of both FTEs and aircraft: those averages were essentially the same across all three types of operation (table 11). If we remove the outlier (with over 30 aircraft) from the pool of commercial micro air operators, the average number of aircraft per operator drops to 2,8. However, the average numbers of FTEs and aircraft for non-

commercial operators is higher than anticipated. This signals that perhaps the distinction between the corporate flight departments and the non-commercial air operators wasn't clear enough to a few respondents. It is admittedly a thorny issue, particularly when the aircraft owner(s) use the aircraft for both business and leisure, which is frequent in non-commercial operations.

Table 11

Average staff number and fleet size for each type of operation

Operators with ≤20 FTEs (N=31)	**Commercial air ops.** (n=11)	**Corporate flight dpt.** (n=12)	**Non-commercial** (n=8)
Avg. FTEs per operator	11,2	9,8	10,5
Avg. aircraft per operator	5,4	2,6	3,3

The responses didn't always paint a clear picture of each type of operation. Upon analysis of the pilot and online surveys, presenting the rest of the survey results by type of operation appeared optimal to help profile and differentiate the operators. The results are further subdivided by theme, then compared and summarized in the following chapter.

The missing continent

Eurocontrol (2010) noted that out of the 3.200 organisations that filed a flight plan associated with business aviation in 2009, 1.900 (59,4%) operated only one aircraft. In the US, the National Business Aviation Association (2019) reported that 75% of the companies using business aircraft had only one, whereas 12% had two and 13% had three aircraft or more. In contrast, 20% of the respondents to the online survey declared having one aircraft, 27% have two, and 53% have three aircraft or more. This indicates that the online survey didn't reach the micro air operators very well, especially single-aircraft operations (i.e., only 10% of the respondents were in that category and answered all the questions). Alternatively, one or more reasons not to dedicate time and energy to the survey prevailed among those who were nevertheless reached. Prior research in non-aviation MSEs would offer potential explanations such as a lack of time, of interest, of perceived benefits, etc.

Another possible explanation is that operators with one aircraft couldn't respond to the survey simply because they had not yet implemented an SMS. Indeed, only organisations that implemented SMS were invited to, and effectively could, answer the survey questions. Therefore, the missing continent of single-aircraft operators in the survey data is a possible indicator that, irrespective of the legal requirements, SMS has difficulties to convince them too of its worth (NTSB, 2021). Amalberti (2001) posits that there can be over 8 years of inertia between new safety measures and the ability to correctly assess their results. With the benefit of hindsight, one could also ponder about the cautionary value of Arocena and Núñez' research (2010, p. 417) among hundreds of SMEs in various industries which showed that *"a considerable number of companies do not even meet the minimum legal safety requirements, even though the survey was done seven years after the (…) law came into force".*

Commercial air operators

Six respondents (54,5%) were from micro-operators and five (45,5%) were from small operators. Detailed results can be found in appendix 4.

Socio-demographics

Only a fraction of the operators' management team appears to know the SMS regulatory requirements whereas the majority is only partially aware (table 49), and there were no significant differences between micro and small operators. The subsequent question concerning the attitude of management towards SMS indicates that in general staff is mildly encouraged and incentivised to participate in the SMS (table 50). Involvement is only expected from a third of the respondents.

This somewhat contrasts with societal expectations that commercial air operators are the safest means of mass transportation thanks, in part, to being committed to safety and to stringent state oversight. Indications that public institutions take on that responsibility can be found, for instance, in EASA's motto "Your safety is our mission", in their mission statement (EASA, 2021a) or in the EU Aviation Strategy (EASA, 2021b). A fundamental principle in aviation rulemaking is that operators carrying people or property for compensation or hire (FAA, 1986) must achieve higher standards than non-commercial operators (Lee, 1926), leading to different sets of standards (ICAO, 2018b, 2018c) and regulatory requirements. This is based on the notion that a private aircraft owner is thought to have more knowledge, understanding and ultimate control on the amount of risks that he/she is willing to take (and expose others to) than citizens who purchase a ticket assuming that their safety is somehow guaranteed by the states overseeing the commercial air transport sector (AAIB, 2020, ATSB, 2017). Although in the 1920s the rationale behind the more stringent expectations for commercial operators (at the urging of aviation industry leaders) was to increase the trust of the public and in turn to achieve their full commercial potential (FAA, 2020c), applying the same requirements to private operators would be impractical, burden this segment of the industry, and most likely push it towards economic collapse. Safety, compliance and profitability are inextricably intertwined and particularly in aviation where flying with 'acceptable risk' is an integral part of its culture (Reason, 1997).

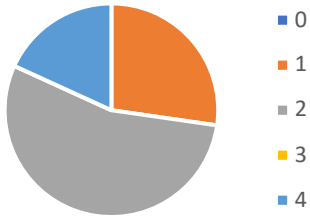
Since SMS has become the only standard available for managing aviation safety, it would seem logical that commercial operators demonstrate an ability to comply and manage safety under the comparatively more stringent rules and oversight (vs. non-commercial operations). Based on the answers to these questions (Q6, Q8), micro and small commercial operators in business aviation seem to encounter difficulties finding their way to manage safety, despite the presence of a global framework and vast amounts of guidance material. This appears consistent with non-aviation MSEs which generally struggle to understand and implement OHS regulations.

Another question suggested that the majority of company owners/founders are at the helm of the aviation operations on either a daily or frequent basis (table 51). On the means to communicate safety-relevant information (table 52), commercial operators seemed to prefer verbal means over maintaining a balance between verbal and written communications.

Resources for safety

The majority of respondents from commercial operators declared that their resources were limited and that investments only occur if mandated by law or if unavoidable, whereas the rest stated that they were readily available (table 53). The following question on the ability of the organisation to deal with ancillary tasks (e.g., management systems, accounting, administration) yielded an almost unanimous response: commercial air operators generally meet the deadlines and requirements (table 54).

Figure 7
Distribution of the commercial air operators by the number of SMS components with which they encounter particular difficulties



On the difficulty of implementing or maintaining any SMS component in daily operations, the respondents had the possibility of selecting as many as four components (figure 7). There were 23 selections from 11 respondents (table 57). Two of them (18,2%) ticked all four components. About a quarter of the respondents (27,3%) ticked only one component, and more than half ticked two (54,5%). Of all the possible pairs, no particular combination of components emerged. However, it is concerning that nearly three quarters of the respondents (72,7%) struggle with at least two SMS components, if not all of four of them.

Along those lines, the responses were quite homogenous across the board when describing the organisational efforts to implement SMS (table 58). Those efforts were seen as either difficult or balanced between difficult and easy. Implementing an SMS is definitely not an easy task. On a related subject, only a third of the commercial operators sought external help (table 59). Among those who did, half of them let the contractor completely manage the SMS implementation.

In this theme, the responses also appeared somewhat at odds with societal expectations concerning commercial operators (i.e., the availability of resources to support and ensure the ultrasafe performance expected – Medina-Muñoz et al., 2018). Like their non-aviation counterparts with OHS(MS), micro and small operators struggle to implement a comprehensive SMS, tend not to seek assistance from third parties (possibly due to a lack of resources), and have their Safety Manager usually dealing with other duties in the organisation (table 56). However, it is not known whether this is due to a lack of resources and/or if managing the operator's SMS doesn't require a full-time position.

This deserves to be put in relation with the responses (table 61) related to the frequency of formal risk management activities (covering the risk assessment, the mitigation and the recording of the assessment). These activities appear to be done either very infrequently by nearly two thirds of the operators, or on an almost monthly basis by the others. When it comes to the tactical use of a Flight Risk Assessment Tool (table 62), a stark contrast appears. While all types of practices are distributed almost evenly, the overwhelming majority of the respondents from larger operators stated that a FRAT is used before every flight. The value and integrity of these activities are further compromised by hazard identification processes that the respondents perceived to be leaning more towards superficiality than comprehensiveness.

The responses concerning accidents and incidents (table 55) indicated that, overall, the commercial operators either had never experienced such type of event or did so in the past year. When it comes to the investigation of those incidents and accidents (table 63), the respondents were almost equally distributed between the 6 possible choices, which is surprising considering the greater scrutiny under which states (should) place commercial operators. This also appeared in the question (table 64) about the recording of safety information learned through company experience (e.g., daily operations, near-misses, occurrences). Most commercial operators record such information only rarely, or if required by law. This begs the question of whether the 'fly-fix-fly' or 'trial-and-error' mantra from the pioneering days of aviation (Leveson, 2020) isn't still ingrained in the industry and enabled by very slow progress towards a more proactive systems thinking approach (Dallat et al., 2019). This mantra may also be so deeply rooted in human nature that it is tough to resist unless regulations, proper oversight and/or the availability of resources create the conditions of possibility for learning, especially when both the gradient towards the least effort and the pressure towards cost-effectiveness dominate in a system (Rasmussen, 1997).

Institutional environment

The question on the frequency of the CAA inspections (table 65) yielded a range of different answers. The subject of the availability of resources at the CAA reproduced the schema (table 66), and there seems to be a mild level of agreement on how under-resourced the authorities are. On a related topic, the question on the CAA's understanding and application of SMS (table 67) yielded a range of responses. Interestingly, more than a quarter of the commercial operators haven't had any interaction with their authority on SMS yet. The others appear to rate their CAA's knowledge and experience as comparable or higher to theirs.

The responses didn't exactly match what society generally expects from its authorities in charge of overseeing commercial operators (UK CAA, 2021), such as stringent requirements but also, and perhaps more importantly, a reliable inspection regime that guarantees the safety of the public (including, for instance, the EU Ramp Inspection Programme – EC, 2021). A similar pattern was already noted amongst non-aviation MSEs (Bonafede et al., 2016). Therefore, both regulators and regulated organisations appear to stumble over identical issues (i.e., obtaining sufficient resources to adequately function) regardless of the industry they're in (EASA, 2014; ICAO, 2006a).

The resource constraints that started to emerge in the previous themes do not radically change when addressing how CAAs are perceived, and the similarities with non-aviation MSEs are once again underlined. It seems that, irrespective of the industry, in largely similar institutional environments (i.e., struggling authorities), similar causes (i.e., limited resources and knowledge) coalesce to create similar consequences (i.e., struggling safety management efforts and faltering inspection regimes). However, the gradual shift to risk-based oversight that is meant to help authorities prioritise their limited resources on organisations that are perceived as riskier wasn't explored in the survey but continues to deserve further research. One might for instance wonder if the public knows about this doctrinal shift and if it agrees with it and all its consequences.

On the influence operators have in order to steer their regulatory framework (table 68), 82% of the respondents indicated that in their opinion the smallest operators had very little to no influence at all. It is worth contrasting these answers against those offered to the question on the operators' memberships to industry associations and on their participation to activities on regulatory matters (table 69). Over a quarter of the commercial operators were not members to any industry association, and less than a fifth regularly participate in the regulatory activities of their association(s).

Legitimacy

Concerning the arguments for implementing SMS, the questionnaire offered the option to provide an individual answer, which was taken by one respondent. The free text response then had to be interpreted to identify its underlying themes (table 70), allowing the results to be consolidated (table 71). It appears that compliance is the leading argument, far ahead of safety, for the implementation of SMS amongst the commercial operators. The following question asked whether there was a secondary argument to implement SMS (table 72). Respondents who reported compliance as the primary argument for implementing SMS then tended to cite safety as secondary argument, and vice versa.

It isn't particularly surprising that nearly three quarters of the micro and small commercial air operators in the sample implemented SMS primarily to meet regulatory requirements, since SMS has become mandatory to commercial air operators, whether their competent authority requires it or not. Even in the US where there currently are no SMS regulatory requirements for 'Part 135' charter operations (FAA, 2020a), the fact that other nations and particularly Europe (e.g., through its Third Country Operator regulation and Ramp Inspection Program) require foreign operators to have an SMS elicits those commercial operators to implement it if they wish to conduct international operations. The responses therefore provide an indication of the significant influence of regulations in the operators' decision-making processes to implement SMS, but do not suffice alone to validate or invalidate institutional theory.

The following question was about the importance of the first argument to implement SMS against the second, in case there was indeed a second argument. The overwhelming majority of respondents stated that the prime argument had either equal or a bit more importance than the second argument, underlining that compliance and safety are closely interrelated and essential for the survival of a commercial air operator. The number of respondents also shows that a couple of them contradicted their answers to the two previous questions, and perhaps the questionnaire wasn't clear enough.

Another question was related to the precise moment when the SMS implementation formally started, in relation with any official mandate (table 74). Commercial air operators seem to have waited and get closer to the deadline before embarking on the SMS implementation, without any (or few) assistance from a third-party (table 59). Asked whether the structure of the organisation (i.e., duties and responsibilities) changed because of the SMS implementation, the extent of the changes appears very limited, as nearly half the respondents stated that the structure remained largely unchanged (table 75).

Regarding the level to which the operator tailored its Operations Manuals (table 73), only less than half the commercial operators use manuals that accurately reflect their daily operations. Several entangled issues extending well beyond SMS possibly contribute to this result:

- Availability of resources to document daily operations,
- Knowledge,
- CAA oversight,
- Internal reporting practices,
- Preferred means of communication,
- Management style,
- Institutional isomorphism,
- Safety clutter (Rae et al., 2018), etc.

These responses are not particularly surprising in the context of micro and small operators, but the breadth and depth of the decoupling between their documentation and their *modus operandi* is significant (i.e., in one case a respondent stated that the commercial operator obtained a template manual that hadn't been tailored and isn't even used in daily operations). This provides evidence of decoupling and therefore support to institutional theory amongst commercial air operators.

The gap between actual operations and documentation in a highly regulated and certified environment where internal audits and CAA inspections are the norm also raises the issue of the strategy and tactics used by the operator to address institutional pressure to implement and maintain an SMS while preserving its technical and financial efficiency. Although the online survey wasn't designed to precisely identify these strategies, anecdotal evidence suggests that strategies of acquiescence, compromise or avoidance (in particular the tactic of concealment) are commonly used, possibly simultaneously. Further research would be needed to identify which strategy and tactic(s) are observable at each operator.

Overall, the responses clearly indicate decoupling strategies to achieve legitimacy with multiple institutional actors, thereby revealing significant struggle between legitimacy (e.g., achieved through compliance and certifications against industry standards) and technical efficiency (e.g., achieved by aiming to meet the customers' pressing expectations on cost and premium service quality). This also implies that for almost half the commercial operators the SMS implementation was done in a superficial manner (i.e., primarily on paper), significantly undermining the odds that it would ever be complete and functional. The fact that most commercial operators reported struggling with at least two SMS components (table 57) may be correlated to this deduction.

Corporate flight departments

In this group, seven (58,3%) respondents were from micro-operators and five (41,7%) were from small operators. Detailed results can be found in appendix 5.

Socio-demographics

The question regarding the knowledge of SMS regulatory requirements amongst the operator's management team indicated that it is fragmented for most of them (table 76). These results are mirrored in the answers to the question concerning the attitude of management towards SMS where the operators seem to be making resolute efforts to involve their staff in the SMS, and even more so in larger departments (table 77).

On the involvement of the company owner(s) or founder(s), the responses were distributed almost evenly across the seven proposals of the survey (table 78). Finally, on the means to communicate safety-relevant information (table 79), corporate flight departments appear to use a combination of written and verbal means, with a preference for the former.

The picture that emerged from this theme suggests that, despite their micro or small size, management teams at corporate flight departments make visible efforts to know, understand and apply the SMS framework in their operations. They also tend to expect their staff to be involved, and to rely more on written communications as their preferred means to share safety-relevant information. Although not every respondent depicted this type of approach, it is nevertheless more in line with the SMS requirements and contrasts against non-aviation MSEs.

Resources for safety

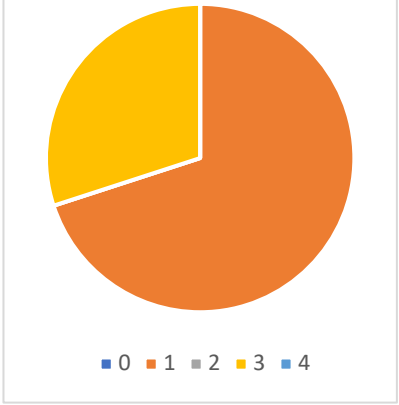
Being tightly coupled with a parent organisation that has significant means and sometimes considerable expertise in multiple areas of management (e.g., OHSE, security, crisis management, public relations, etc.), corporate flight departments generally benefit from the availability of resources and support that positively impact both the implementation and day-to-day running of the SMS. For the most fortunate flight departments, the parent company will completely take over the duties and responsibilities associated with one or more specific domains. This type of symbiotic relationship effectively allows a corporate flight department to concentrate on its core business. In turn, the entire corporation also benefits from the specialisation of various and mutually supporting departments over a wide range of topics, and from economies of scale.

A slight majority of the respondents declared that their resources are readily available whereas a third stated that they are generally limited and that investments only occur if mandated by law or if unavoidable (table 80). In a related question on their ability to deal with ancillary tasks, most corporate flight department -regardless of their size- seemed equally split between those that occasionally miss deadlines or requirements and those to whom it happens rarely (table 81). The responses regarding the presence of a Safety Manager showed that slightly more than half the

operators have a part-time Safety Manager who performs other duties in the organisation, whereas it is a full-time position at close to a third of them (table 83).

On the difficulty of implementing or maintaining any SMS component in daily operations, the respondents had the possibility of selecting as many as four components (figure 8). Out of 12 respondents, the only one that didn't answer this question had actually dropped the survey before reaching that question. About two thirds of the respondents ticked only one component ('safety assurance' leads the way), and a third of them ticked three (table 84). None ticked two or four responses. It is quite surprising that, although the option of not ticking an SMS component was offered (i.e., indicating that the implementation or daily operation of the SMS was not perceived as a difficulty), none of the respondents did. Along those lines, the responses regarding the organisational efforts to implement SMS were distributed across nearly all possible answers and centred approximately on 'balanced between difficult and easy' (table 85). Interestingly, a respondent (10%) found the implementation of SMS very easy. Most corporate flight departments used a third party to assist in the implementation and roughly a fifth of all the operators let the contractor manage it (table 86).

Figure 8
Distribution of the corporate flight departments by the number of SMS components with which they encounter particular difficulties



On the topic of hazard identification, nearly half the respondents described their process as varying between superficial and comprehensive, closely followed by a third judging it as comprehensive (table 87). This needs to be contrasted against the responses related to the frequency of formal risk management activities (covering the risk assessment, the mitigation and the recording of the activity). In the aggregate, the majority of the operators rarely performs this activity, if ever (table 88). However, at a more tactical level, more than half the corporate flight departments stated that a Flight Risk Assessment Tools is used before every flight (table 89).

On the topic of incidents and accidents, a slight majority declared that their department never had any (table 82). The others suffered this type of event either over a decade ago or within the past few years. When it comes to the investigation of incidents and accidents, corporate flight departments appear willing to investigate most if not all occurrences (table 90). This also appeared in the question about the recording of safety information learned through company experience (e.g., daily operations, near-misses). More than two thirds of them stated that they always or at least often record safety information (table 91).

A contrast with the 'generic' non-aviation micro/small enterprise began to appear in the previous theme and is sharpened in this theme. Micro and small corporate flight departments obviously differ from non-aviation MSEs in many ways. Depending on the amount of support they receive from its parent company, a micro corporate flight department may be 'micro' on paper but achieve what only larger operators could achieve, thanks to other corporate departments. Caution is therefore needed when using labels and making comparisons with (and between) flight departments. In this context, most respondents nevertheless perceive the resources for safety as readily available, and declare they are in an accident-free environment where the organisation is resolutely committed to learning from experience and to preventing incidents and accidents.

Although the survey doesn't precisely explain the superior safety record of corporate flight departments, it presents several factors (among others) that are likely to be present, possibly in a unique combination specific to corporate aviation:

- Ample resources,
- Strong management commitment to safety and to learning from experience,
- Consistent efforts to identify hazards and manage risks,
- Adequate knowledge of SMS regulatory requirements, etc.

However, not all corporate flight departments find themselves in such an ideal configuration to implement an SMS and manage safety, as indicated by responses that resources are scarce (8%), that deadlines and requirements are commonly missed (17%), that hazard identification is seen as superficial (18%), that the implementation was difficult (20%), or that the department suffered an incident or an accident in its history (42%). Such signs of difficulties also suggest that good 'safety performers' do not necessarily excel in every domain, and in particular with their SMS. Despite the presence of capacities for safety, every single respondent stated that his/her organisation faces issues with at least one of the four SMS components, if not three.

Interestingly, those who reported encountering significant difficulties with SMS do not necessarily struggle with the rest: two thirds of them report having resources that are readily available, using manuals that accurately reflect daily operations, not having particular issues with meeting deadlines and requirements, etc. Within that small subgroup of "strugglers against the odds", some operators did have an occurrence in a recent past, whereas others never had. Some have managers who are very aware of the SMS regulatory requirements although they're almost never inspected by their CAA (table 92), whereas others are only somewhat aware (table 76). Some implemented SMS only to comply with regulations, others purely for safety reasons (and had experienced an incident or accident). Ample resources, knowledge and intrinsic motivation (Pink, 2011) do not guarantee a successful implementation of SMS, even for corporate flight departments.

Institutional environment

On the provision and adequacy of resources at CAA level, a first question was about the frequency of their inspections or audits (table 92). The responses were scattered across the possible answers and described an environment of scarcity at the CAAs, and of long periods without any form of inspection or audit, whether their frequency is written in law or not (EC, 2012, 2013). However, it can be argued that those who didn't have an answer effectively indicated that their organisation is not being audited. Two groups then emerge: one is regularly audited (33,4%) and the other almost never (66,6%).

On the availability of resources at the CAA, about half the respondents stated that the authorities were clearly under-resourced (table 93). When it comes to the CAA's understanding and application of SMS, those who could answer stated that the level was quite comparable to theirs (table 94).

On the subject of influence on regulatory requirements, two thirds of the corporate flight departments stated that in their opinion they had very little to no influence at all, whereas the remainder felt they had some (table 95). It is worth contrasting these answers against those offered to the question on the ratio of operators being members of industry associations and to their participation to activities on regulatory matters (table 96). Although most were members, only a third of them were active participants.

If CAAs tend to ignore corporate flight departments, the reverse is not true: they're quite active in industry associations and regularly participate in their activities related to safety and regulations. They also consider having some influence on the regulatory framework. This stance on regulations and the involvement in rule-making activities replicate what parent companies commonly do in their own industries (Borisov, Goldman, Gupta, 2015; Dusso, Holyoke, Schatzinger, 2019; Unsal, 2020) to *"mitigate regulatory uncertainty and gain favourable regulatory outcomes"* (Kong, Radhakrishnan, Tsang, 2017, p. 528), either directly or through the myriad of trade associations orbiting around major political decision centres (Center for Responsive Politics, 2020; European Commission, 2020; Kinderman, 2013).

Legitimacy

One respondent opted to provide an individual answer detailing the argument for implementing SMS. This free text response then had to be interpreted to identify its underlying theme (table 97) which was then consolidated with the results (table 98). Compliance and safety are clearly and equally the two primary reasons why corporate flight departments implement SMS regardless of their size. This also appeared in the following question about a secondary argument to implement SMS (table 99). On the importance of the first argument to implement SMS against the second, there was a parity between those for whom both arguments had equal importance and those for whom the first argument had a bit more importance.

The breadth and depth of the issue of legitimacy in a flight department can greatly vary depending on its parent company (see appendix 1). The online survey wasn't detailed enough to fully address this issue in each organisation. Moreover, the aggregated results do not bring greater clarity either, since corporate flight departments equally cited safety and compliance as their prime argument for implementing SMS. However, more often than not, compliance wasn't even presented as a second argument after safety.

What appears to be a positive organisational context for, and commitment to, safety doesn't exempt corporate flight departments from having to balance between compliance and efficiency, as indicated by their responses regarding the operations manuals. Although the majority of respondents described their manuals as accurately reflecting their daily operations, the rest stated that it was only accurate on the most important topics. Whether the mismatch concerns an excess or a lack of documentation or a mismatch against daily practices wasn't researched through the online survey. Still, as stated earlier, many factors come into play to explain decoupling tendencies among business aviation operators. Although small compared to the other types of operations, the gap between actual operations and documentation nevertheless raises the issue of the strategy and tactics used by flight departments to address institutional pressure to implement and maintain an SMS while preserving their technical efficiency. Many informal

discussions with corporate flight department staff suggest that strategies of acquiescence or compromise and tactics of influence are being used. Further research would be needed to identify which strategy and tactic(s) are observable at each operator.

Another question was related to the precise moment when the SMS implementation formally started (table 101). In some cases, the respondent didn't know the answer, or the question wasn't applicable to their situation. For those who knew or to whom the question was pertinent, nearly two thirds started the implementation efforts well ahead of any regulatory deadline, whereas the rest started either once the framework was public, or near the deadline, or well after it.

The final question on the theme of legitimacy asked whether the structure of the organisation (i.e., duties and responsibilities) changed because of the SMS implementation (table 102). Most underwent some changes, but not significant ones. This could signal some SMS-induced isomorphism. However, since corporate flight departments tend to be rigorously structured and managed "by default", further research would be needed before reaching a conclusion.

Non-commercial air operators

In this group, four respondents (50%) were from micro-operators and another four (50%) were from small operators. Detailed results can be found in appendix 6.

Socio-demographics

Concerning the knowledge of SMS regulatory requirements amongst the operator's management team, nearly two thirds of the respondents indicated that it is incomplete or even non-existent (table 103). These results may provide context for the subsequent question concerning the attitude of management towards SMS and that indicates that staff are mildly encouraged and incentivised to become involved in the SMS (table 104).

Another question (table 105) suggested that the level of involvement of the company owners/founders in the aviation operations varies significantly from one operator to another.

Finally, on the means to communicate safety-relevant information (table 106), although the operators stated using both verbal and written means, they seemed split between those who prefer one over the other method, without any interest for using a single means of communication and only a faint interest in a balanced approach.

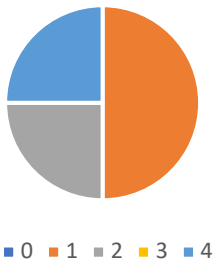
Micro and small non-commercial operators appeared to have a relatively similar profile compared with non-aviation MSEs. The picture that emerged suggests that management teams encounter difficulties understanding, implementing, and fostering participation in their SMS.

Resources for safety

Nearly three quarters of the respondents declared that resources were readily available (table 107). The following question on the ability of the organisation to deal with ancillary tasks (e.g., management systems, accounting, administration) indicated that half the respondents occasionally missed a deadline or a requirement, whereas the others were equally split between those for whom it was common and others for whom it was rare (table 108). On a related subject, all the operators managed the implementation even though half of them sought some external help (table 113). The responses concerning the organisational efforts to implement SMS indicate that although two thirds of the operators portrayed them as balanced between difficult and easy, the remaining third ranges between difficult and very difficult (table 112). Concerning the presence of a Safety Manager, three quarters of the operators indeed have a Safety Manager and primarily on a part-time basis (table 110).

This suggests that the availability of resources does not automatically guarantee the timely performance of ancillary tasks. This also raises the question of which resources were considered by the respondent. A consensus seemed to emerge from many informal discussions with operator and authority personnel indicating that time is more often an issue than the availability of financial resources although, in theory, they should easily allow the hiring of more personnel and in turn "buy time" to the entire team. However, considering that business aviation staff need to be highly skilled to be effective, it hinders operators from sporadically using free-lancers and consultants, especially contract pilots who continually need to undergo very specific and expensive training (even compared to the simulator training costs for airline pilots).

Figure 9
Distribution of the non-commercial air operators by the number of SMS components with which they encounter particular difficulties



Regarding the difficulty of implementing or maintaining an SMS in daily operations (figure 9), half the respondents ticked only one component, two ticked four, and the remaining two ticked two components (table 111). When looking at which component was considered particularly difficult, none of them seems to cause trouble: they all equally do (i.e., four 'votes' each). In a manner comparable to the corporate flight departments, those who encounter the most difficulties with their SMS didn't necessarily struggle with everything else. Most reported having ample resources and generally dealing well with ancillary tasks. However, those struggling the most also experienced an incident or an accident in a very recent past (i.e., 1 to 5 years), reported that their manuals are only accurate on the most important issues, implemented SMS primarily to satisfy regulatory requirements, are regularly inspected by their authority (i.e., every year or two), and have managers with very different levels of SMS awareness and who appreciate but do not elicit participation from staff. Although more research is needed, it appears that ample resources and extrinsic motivation in the form of authority oversight do not guarantee a successful implementation of SMS either.

On the topic of hazard identification (table 114), only a fourth of the respondents described the process as comprehensive. The others indicated that the process is either superficial or somewhere between superficial and comprehensive. A similar pattern emerged from the responses (table 115) related to the frequency of formal risk management activities (covering the

risk assessment, the mitigation and the recording of the activity). Only a quarter of the respondents reported that these activities take place about ten times per year or even more, whereas the others stated that it occurred once or twice per year at the most. On a more tactical level, about two thirds of the non-commercial operators reported using a Flight Risk Assessment Tool, although some do so only on a minority of their flights (table 116).

On the subject of incidents and accidents, half the non-commercial operators never had any (table 109). The others suffered this type of event in the last year or the past few years. When it comes to the investigation of those incidents and accidents (table 117), half of the respondents stated that were rarely investigated - if ever. Only a fourth of the operators always investigate such events. This needs to be contrasted against the answers (table 118) regarding the recording of safety information learned through company experience (e.g., daily operations, near-misses). Half the respondents stated that they often recorded safety information if not always. However, the other half of the operators does not record such information or does so only rarely or if required by law. This type of operation seems keener on documenting company experience than on performing formal internal investigations of incidents and accidents. The survey didn't explore this apparent paradox. However, it could be explained by pragmatism and attribution bias. Non-commercial operators may find greater value in optimizing their capacities for safety through a regular stream of feedback on daily operations than in dedicating resources and very specialized expertise (they may not even have in the first place) to an exceptional event which, if serious, will likely be investigated by an accident investigation body anyway or, if less than serious, may not, from their perspective, yield sufficient return on the investment or justify a formal investigation. The latter may echo a tendency noted among non-aviation MSEs to simply blame workers or unexpected circumstances for incidents and accidents.

Institutional environment

Regarding the resources at CAA level, more than a third of the operators are never inspected or audited (table 119). The others undergo an audit or inspection every two years or once a year at the most. This bimodal distribution of the answers (i.e., having two maxima instead of one 'bell curve') seems to be *a priori* related to the regulatory framework of the operator: most (75%) non-commercial operators in the NAM region are never audited whereas all those based in the EUR or PAC regions report being audited. However, as indicated earlier, geographical information from the respondents is deemed unreliable. It remains that most (62,5%) micro and small non-commercial operators stated undergoing annual or biannual audits by an authority they generally perceive as clearly lacking resources and expertise on safety management (table 120).

On the CAA's understanding and application of SMS (table 121), the majority of non-commercial operators characterized CAA staffs' knowledge and experience as clearly below theirs. None of the respondents perceive it as higher than theirs.

The respondents also indicated, almost unanimously, that they think they had very little to no influence on the regulatory requirements applicable to them (table 122). On that topic, it is interesting to note that nearly all the respondents stated being part of an industry association and participating to their activities related to safety and regulations, either sometimes or regularly (table 123).

Legitimacy

Three respondents provided an individual answer concerning the arguments for implementing SMS which then had to be interpreted to identify their underlying themes (table 124) and consolidated with the other answers (table 125). Safety was by far the first reason for the implementation of SMS (nearly two thirds of the answers), compliance being the only alternative answer. This is the highest score achieved by 'safety' amongst the three types of operations in the sample. Upon closer examination, the operators appear to have branched off according to their size. All micro non-commercial operators (n=4, average staff=5,3, average fleet=2,5) stated that safety was the prime argument (compliance coming second), whereas small operators (n=4, average staff=15,8, average fleet=4,3) tended to cite compliance first and safety second. A similar pattern of commitment to safety emerged regarding the timeframe chosen to implement SMS, i.e., generally (well) before any regulatory deadline although for some the question wasn't applicable, or the implementation started once the framework was made public. Still, considering the size of the sample, and the heterogeneity and geographic distribution of the respondents (which influences the level of SMS regulatory requirements), those results need to be taken with caution.

However, the apparently positive organisational context for safety doesn't exempt non-commercial operators from having to balance conformity and efficiency, as indicated by their responses regarding the operations manuals. Only a quarter of the respondents described their manuals as accurately reflecting their daily operations, and half of them stated that they were only accurate on the most important topics. The rest stated that the manuals correspond very little to their operations, or that there is no company manual, which is rather intriguing (e.g., could an SMS or even an organisation function without any manual at all?). Therefore, decoupling strategies appear to be present among the majority of the operators, possibly aided by the generally light touch oversight from the CAA and the absence of a parent company with high(er) expectations (i.e., to the contrary of corporate flight departments).

The final question on the theme of legitimacy asked whether the structure of the organisation (i.e., duties and responsibilities) changed because of the SMS implementation. Nearly two thirds of the respondents stated that their organisational structure didn't change (table 129).

Discussion

This section is divided into four parts. The first part presents a 'generic' profile for each type of operation. The second attempts at finding patterns across the responses from the three types of air operators, one theme after the other. The third part figuratively puts all four 'generic' profiles sketched from this research side-by-side (i.e., for both aviation and non-aviation MSEs). In the process, the question whether history repeats itself in micro-enterprises across all industries is raised. The fourth part proposes a few areas for further research.

Not included here but available in appendix 7, an experiment was conducted with survey data to try and determine if the gap between the three types of operations could somehow be put into numbers like in the pilot survey, with the objective to better identify similarities and contrasts between the three types of operations.

The 'generic' micro/small air operators in business aviation

Overall, micro and small corporate flight departments gave the most convincing responses regarding their ability to both implement an SMS and safely manage their operations, particularly when contrasted against the other two types of operations. They contrasted themselves, sometimes sharply, against the long list of factors that were identified as negatively impacting OHS(MS) and therefore effecting safety in non-aviation MSEs. This appears attributable, in a corporate flight department, to the fact that:

- Resources for safety are readily available,
- Completing non-core tasks is rarely a struggle,
- Hazard identification processes are rather comprehensive,
- Comprehensive risk assessment activities are completed more often,
- Staff involvement in the operator's SMS is expected,
- Safety meetings occur (very) frequently,
- Safety 'lessons learned' are very frequently recorded on a voluntarily basis,
- Company manuals usually accurately reflect daily operations,
- A Flight Risk Assessment Tool is usually completed before every flight,
- Occurrences are almost always investigated,
- If the operator had ever been involved in an occurrence, it usually was over a decade ago.

Considering their safety performance that is equivalent if not better than that of the airlines, corporate flight departments emerge as value-driven business structures (Osterwalder and Pigneur, 2010). Although costs and legitimacy remain important, this rational approach clearly signals their own commitment as well as the commitment of their parent company to safety and to SMS.

On the other hand, micro- and small-sized commercial air operators painted a picture of significant struggle and variability across all the respondents. This was somehow unexpected since commercial operations are supposed to undergo greater scrutiny and standardisation efforts

from their respective competent authorities which appear to have very significant resource and competence issues as well. In their overwhelming majority, the prime argument to implement an SMS was regulatory compliance, which signals a high probability of ceremonial implementation (i.e., only on paper) and decoupling strategies in their routines (partly confirmed by the responses indicating a significant disconnect between company manuals and daily operations). A large variability was also noted on several topics such as: the quality of hazard identification processes, the frequency of safety meetings and the investigation of occurrences. Other issues included the following points:

- Resources for safety are generally limited,
- Completing non-core tasks is occasionally a struggle,
- Comprehensive risk assessment activities are rarely completed,
- Most of the time, company manuals do not accurately reflect daily operations,
- If the operator had ever been involved in an occurrence, it usually was in the past year.

Despite a projected image of incommensurable luxury, exclusivity and safety, micro and small commercial air operators emerged as cost-driven business structures quite similar to non-aviation MSEs and even to low-frill airlines (which appear to have a comparatively better safety record, but bearing in mind safety statistics in business aviation are patchy and can be misleading).

Non-commercial operators also described their fair share of challenges. Although they also declared, in their great majority, to have readily available resources, to frequently record 'lessons learned' and to have chosen to implement an SMS primarily for safety reasons, the similarities with corporate operators stop here. Significant difficulties quite similar to those encountered in commercial operations emerged, such as the fact that:

- Completing non-core tasks is occasionally a struggle,
- Knowledge of SMS regulatory requirements varies but is usually low,
- Comprehensive risk assessment activities are rarely completed,
- Company manuals reflect daily operations only on the most important topics,
- If the operator had ever been involved in an occurrence, it usually was within the past five years.

The non-commercial operators' responses sometimes appeared paradoxical. For instance, it was difficult to grasp the rationale behind declaring benefiting from readily available resources and implementing an SMS primarily for safety reasons while at the same time admitting that risk management activities are patchy and that company manuals reflect very little of daily operations or only on the most important topics. Rather than being paradoxical, perhaps their responses simply expose the diversity and complexity of navigating between goal conflicts and resources constraints in an uncertain, volatile environment.

Therefore, it is probably not a complete coincidence if the overall picture that emerged from the survey results somehow matches the accident statistics where corporate flight departments have an accident rate nearly eight times lower than their counterparts in commercial and non-commercial operations. Indeed, corporate flight departments appear to be in the most favourable configuration since they do not face the daily struggle for survival experienced by most commercial air operators and in particular the smallest ones. They can also lean on a typically

large and wealthy parent organisation that is highly likely to have integrated or even mastered OSHE management systems at industrial level, and that have at least understood the safety benefits of taking a value-driven approach. This is not necessarily the case when a non-commercial operation supports a small- or medium-sized enterprise or the person(s) owning the aircraft.

Moreover, this research hasn't even touched upon the 'elephant in the room' of micro private flight operations, regardless of the type of operation conducted, where the personality of a single person holding significant authority and power will likely impact the organisational climate and overall safety performance, whether it is the aircraft owner(s) or for instance the pilot managing the operation on his/her/their behalf. This is particularly the case with (corporate) psychopaths, misers and unchallenged practitioners (sometimes cursorily labelled as 'rogues' – Kern, 2006) whose influence and recurrent norm-breaking behaviours may not effectively be mitigated by another layer of management before reaching front-line employees and colleagues, and contribute – possibly greatly – to incidents and accidents (AAIB, 2010; ATSB, 2017; BEA, 2019; NTSB, 2012, 2014; RNSA, 2017).

Table 12 (overleaf) summarizes the analyses from the online survey results and structures the information using Rasmussen's socio-technical framework also used for non-aviation MSEs. Even though the profile of each of the three types of business aviation operators is derived from a small number of respondents and probably doesn't fully convey the richness and diversity of a whole economic sector, it is striking to note so many differences between similar operators (size-wise and, arguably, mission-wise too), but also similarities in their perception of their environment and, crucially, of their (in)ability to adapt to it and to influence it (or not).

Table 12

Types of operations and their 'typical' characteristics (survey results and analysis)

Socio-technical level	**Corporate flight dpt.** (revenue stream: usage fees to the parent company)	**Commercial operators** (revenue streams: usage fees, subscription fees and/or leasing to third parties)	**Non-commercial ops** (revenue stream: usage fees to the aircraft owner(s) or to the parent company)
Government	*(Not addressed in the surveys, but no significant change is expected in comparison to non-aviation enterprises)*		
Regulators	Usually perceive CAAs as clearly under-resourced		
	Strong belief of having very little to no influence on rule-making applicable to them		
	CAA's SMS expertise perceived as comparable to the operator's		CAA's SMS expertise seen as lower than the operator's
	Variable frequency of CAA audits which are either very infrequent or never done	Large variability in the frequency of CAA audits	Variable frequency of CAA audits which are either infrequent or never done
Associations	Regularly participates	Sometimes participates	
Company	Perceived the SMS implementation as balanced between easy and difficult		
	Rarely struggle to complete non-core tasks	Occasionally struggle to complete non-core tasks	
	Resources are readily available	Resources are generally limited; investments are only made if mandated by law or if unavoidable	Resources are readily available
	Hazard identification processes lean more towards comprehensiveness	Hazard identification processes vary between superficial and comprehensive	
	Occasionally complete risk assessment activities	Rarely complete risk assessment activities	
	Hold about 4 safety meetings per year	Large variability in the frequency of safety meetings	
	On average, struggle with just 1 SMS component (assurance)	On average, struggle with at least 2 SMS components	On average, struggle with 2 SMS components
	SMS implementation driven by safety and compliance	SMS implementation driven by compliance	SMS implementation driven by safety
	Most influential public (for their legitimacy): parent company	Most influential public (for their legitimacy): CAA	Most influential public (for its legitimacy): aircraft owner(s)
	SMS implementation started well before any deadline	SMS implementation started near the regulatory deadline	SMS implementation started once the framework was public (ahead of any deadline)
	Company manuals usually accurately reflect daily operations	Most of the time, company manuals do not accurately reflect daily operations	Company manuals rarely accurately reflect daily operations
	Record safety 'lessons learned' very often, and spontaneously	Record safety 'lessons learned' primarily out of legal obligation	Record safety 'lessons learned' quite often, and spontaneously
	Knowledge of SMS regulatory requirements is moderate or better	Moderate knowledge of SMS regulatory requirements	Knowledge of SMS regulatory requirements varies significantly but is usually low
	SMS implementation support had typically been sought	SMS implementation more likely to have been managed internally	Parity between in-house SMS implementation and use of external support
Management	If it exists, the position of Safety Manager is usually part-time		
	Staff involvement in the SMS is expected	Staff involvement in the SMS is appreciated	
	Owner/founder occasionally involved in daily operations	Company owner/founder frequently involved in daily ops	Company owner/founder involved only when needed
	Almost always investigate occurrences internally	Large variability of practice regarding the internal investigation of occurrences	Some variability of practice regarding the internal investigation of occurrences
Staff	Use a mix of verbal and written methods, with a preference for written communication	Use a mix of verbal and written methods, with a preference for written communication	Mixed methods with a preference for verbal comms.
Work	Usually perform a risk assessment before every flight	Variability in the performance of pre-flight risk assessments	
	If ever involved in an occurrence, it was over a decade ago	If ever involved in an occurrence, it was likely within the past year	If ever involved in an occurrence, it was within the past 5 years

Looking for patterns

Cross-industry overview: legitimacy

Legitimacy is an essential element for the survival of micro and small air operators in business aviation. Legitimacy is achieved by conforming the operator's structure, systems and processes to the beliefs and values in its institutional environment. Access to vital resources is consequently granted as long as good faith, trust, face and economic value are maintained (Kurt and Gerede, 2017). Every business aviation operator has arguably the same institutional actors in their environment:

- A competent authority (CAA) overseeing the airworthiness of the aircraft, the competency of the crew members and the safety of the operations,
- Aircraft owner(s), either natural or artificial person(s) who may also own the operator,
- Operator owner(s), either natural or artificial person(s) who may also own the aircraft,
- The users of the aircraft, who may just charter it or be part of the structure that owns it,
- Society, including the states where the aircraft operates, the populations overflown, and the general public.

What differentiates the operators in terms of legitimacy is the amount of influence that each institutional actor (e.g., CAA, parent company, owner, etc.) has on the operator and therefore the distinct order of primacy each actor has. Moreover, which institutional actor tops the list is arguably one of the most important determinants in the implementation of an operator's SMS (the other being the provision of resources, which will influence whether an operator is driven by cost or value). Table 13 proposes the typical order of primacy of institutional actors.

Table 13

Order of primacy of the institutional actors in the operator's environment (by type of operation)

	Commercial air ops	**Corporate flight dpt.**	**Non-commercial ops**
Primary actor	CAA	Operator owner (i.e., parent company)	Aircraft owner(s)
Secondary actors	Aircraft owner(s) Aircraft user(s) Operator owner(s) Society	CAA Aircraft user(s) Aircraft owner(s) Society	CAA Aircraft user(s) Operator owner(s) Society

This research closely associated compliance and legitimacy because compliance strongly helps operators earn legitimacy in the eye of all its institutional actors. However, corporate flight departments tend to be distinct from the other types of operation. Irrespective of the regulatory environment, their legal framework is typically augmented by strong corporate expectations in terms of management systems and industry/company standards and certifications that are arguably equivalent to, if not higher than, the regulatory requirements for commercial air operations. For flight departments, compliance also tends to include conformance with so-called voluntary norms and standards, whether the choice is made by the parent company or by the flight department itself.

In the aggregate, both safety and compliance were presented as the prime reason for implementing an SMS in all three types of operations. Whichever reason was preferred, the other generally had about the same weight in the decision, even for corporate and non-commercial operators who benefit from less stringent regulations and authority oversight at varying degrees (e.g., while this holds true in the current FAA environment, the regulatory gap between commercial and non-commercial operations of business aircraft has recently considerably shrunk in the EASA environment).

The analysis of the online survey data provides evidence of the crucial importance of legitimacy as well as indicators of isomorphism and decoupling strategies across all three types of operations. These findings validate institutional theory in business aviation.

Cross-industry overview: resources for safety

While bearing in mind the limitations of this research and the diversity of the sector, the contrast between commercial and non-commercial operations on the issue of the availability of resources appears to be significant. For 72% of the respondents employed by a commercial air operator, the investments in safety only occur if mandated by law or if unavoidable (Q1). In contrast, on average 65% of the respondents from the other two types of operations stated that the resources for safety were readily available in their organisations. However, this tension on the resources wasn't reported as hampering the commercial operators in dealing with their ancillary tasks such as administration, management systems, etc. (Q5). This indicates that the necessary investments tend to be indeed made but may nevertheless also suggest that the margins for safety are thinner than in corporate and non-commercial operations. Further research would be needed to clarify this point.

A triple paradox emerged from the analysis of the survey data. Overall, all three types of operations and all the respondents who reached Q16 in the comparative online survey (N=30) reported struggling with SMS. More surprising, in this research:

- All commercial operators clearly struggle more than the other two types of operations despite being placed under the most stringent regulatory framework and inspection regime,
- Although it is to a lesser degree than their counterparts, all corporate flight departments struggle, despite ample resources, knowledge and strong intrinsic motivation,
- All non-commercial operators struggle, nearly as much as commercial operators, and particularly so despite ample resources and extrinsic motivation through occasional CAA inspections.

Another paradox appeared regarding Flight Risk Assessment Tools since roughly two thirds of all business aviation operators use such tool (at least on a minority of flights) despite the absence of any legal obligation to do so. This may be an indication that micro and small operators have more interest in risk management tools that yield actionable information for a particular mission as part of their pre-flight preparations, rather than in broad systemic risk analyses that tend to dilute the very specific and diverse threats to safety encountered on each flight. In other words, these

results may simply indicate a greater appetite for tactical risk management than for strategic risk management.

Cross-industry overview: institutional environment

Out of concern that the online survey might be too long or become too complex, the questions focused on the competent authorities and on the industry associations but didn't address other pertinent (and sometimes more influential) institutional actors. This partly explains the striking homogeneity of the responses from all types of operations worldwide. A consensus emerges that aviation authorities are under-resourced to complete their tasks. That unequivocal statement sheds some light on the probable reasons why the inspection regimes of all micro/small operators appear so thin, in particular for commercial air operators that are only 18% to see an inspector more than once a year (Q9). Most corporate and non-commercial operators are rarely or even never inspected. Another consensus emerged on the infrequent to low participation of micro/small operators in industry initiatives (Q15) and on their relative inability to influence the regulatory framework applicable to them (Q17). However, corporate flight departments slightly distance themselves and have a slightly more constructive stance on these two topics compared to the other types of operations, probably as a result of a long tradition in their parent company to engage in those types of activities within their respective industries.

Cross-industry overview: socio-demographics

In this theme, each type of operation had relatively distinctive responses and no pattern emerged across them. However, despite the heterogeneity of the respondents' employers, both micro and small operators had on average about three to four aircraft (Q12) but had either six or sixteen FTEs (Q11). This highlights the glaring absence of single-aircraft operators in this survey and also the unknown influence of freelancers and part-time staff.

From OHS to SMS: does history repeat itself?

Building and contrasting the self-portraits of the three types of business aviation MSEs (table 12) against the 'generic' profile of non-aviation MSEs (figure 1) revealed interesting similarities and differences. First of all, the difficulties encountered by competent authorities in their attempts at discharging their duties and responsibilities appear to be widespread regardless of the industry considered. This is not totally unexpected for a couple of reasons. One the one hand, it aligns well with personal experience and anecdotes gleaned during this research on the public sector's abating oversight. On the other hand, governments occasionally investigate and publicly expose their own difficulties or the difficulties of their CAA (see also ICAO, 2006a). For instance, the report of the Auditor General of Canada (2012) on the adequacy of Transport Canada's oversight on the civil aviation industry provided an early and detailed example of the challenges of shifting to risk-based approach in a performance-based (SMS) environment. It clearly shows how a 'first world' industrialised nation tries – and to some extent fails – to close the growing gap between a strained CAA and, on the whole, a thriving industry despite its cyclical ups and downs (Covid-19 pandemic excluded). This being said, it is not unavoidable. Even though the United Arab Emirates rose only relatively recently as a country with a high Human Development Index (United Nations Development Program, 2020), in less than two decades of operation its CAA nevertheless topped ICAO's Universal Safety Oversight Audit Programme in 2015 (Arabian Aerospace, 2015; ICAO, 2021a) with an average score of 99,3% across the 8 audit areas assessing each state's compliance with ICAO SARP. In comparison, the world average is currently at 69,8% (ICAO, 2021a).

Secondly, the most interesting contrast between non-aviation and business aviation MSEs is on the subject of resources. Literature on non-aviation MSEs repeatedly highlights their lack of resources or at the very least their difficulties in obtaining them. This is arguably not the case in business aviation, for two reasons. On the one hand, half the respondents stated that resources were readily available, whereas 42% of the respondents stated that they were limited (Q1). However, only 16% of all the respondents stated that their organisation commonly missed deadlines or requirements (Q5). On the other hand, aviation is an expensive industry with barriers to entry that may not be comparable to other sectors (e.g., nuclear power generation), but that are nevertheless out of reach of typical MSEs. In other words, and without discounting that some respondents do face significant resource issues (i.e., primarily those in commercial operations), corporate and non-commercial business aviation air operators do not appear to be constantly fighting for their survival like non-aviation MSEs.

Considering that every single respondent reported encountering difficulties at varying degrees to implement and/or operate an SMS, including those with potentially the easiest access to considerable resources, isn't history nevertheless repeating itself? Doesn't the relative 'failure' of SMS in business aviation MSEs reproduce the relative failure of OHS(MS) in non-aviation MSEs? More precisely, if resources are not a prime factor in the success or failure of an SMS implementation, then what is? What if the whole framework was once again a misfit for the smallest organisations (Gallagher et al., 2001; Lamm, 1997; Legg et al., 2014)?

Further research

Fascinating accounts were shared, each deserving more research than they could possibly receive for this project. Five specific areas were identified.

- SMS guidance for aviation organisations started to appear around the turn of the millennium (CASA, 2001, 2002a, 2002b; UK CAA, 2000). Several years before ICAO or any nation finalized and published a rule or standard on SMS, two prototypes of a functional SMS framework in business aviation were issued. One by IBAC in their International Standard for Business Aircraft Operations (IBAC, 2002) and the other by the Canadian Business Aviation Association (CBAA) in their Private Operator Certificate Procedures Manual (CBAA, 2002). The SMS requirements of these two documents are strikingly similar in terms of both contents and format. This is not totally surprising, considering that CBAA is a founding member association of IBAC, that at the time both IBAC and the IS-BAO project were managed by former inspectors from Transport Canada and that Transport Canada was one of the first CAAs to prepare a regulatory framework for SMS (initially in air traffic control then in air operations, issuing requirement for SMS in 2004). In other words, the early prophets of SMS knew each other, collaborated and rubbed off on each other's projects. Interestingly, in those early days both the structure of the SMS framework and the thorny issue of how to implement an SMS were very different from ICAO's approach. First, regarding the framework, the principles of quality management were already present in the SMS requirements set by CBAA and IBAC, but they were not ordered in a way that matches the PDCA cycle. The "proto-SMS" by IBAC and CBAA had all the essential ingredients, but not a logical connection and flow from one to the other and didn't require Safety Performance Indicators and Targets (CBAA, 2002; IBAC, 2002). In contrast, ICAO's framework of four components and twelve elements published four years later (ICAO, 2006) is totally aligned on the PDCA cycle. As far as aviation is concerned, it seems that all the diversity in the SMS frameworks started to disappear once ICAO published its Safety Management Manual (ICAO, 2006). As a consequence, IBAC decided to adopt the ICAO framework in 2008 (IBAC, 2008, 2009; ICAO, 2006). Second, regarding the methods to implement SMS, the approach was radically different. The strategy initially promoted by Transport Canada, IBAC and possibly CBAA was to first describe the system (e.g., the airline, the airport, the maintenance organisation, etc.), to identify and prioritize its safety issues, and only then to incorporate the SMS elements (IBAC, 2005). For reasons that are not entirely clear, ICAO reversed the workflow: training would be provided first in order for people to understand what's expected of them, then the implementation would start and lead to formal risk management activities. Rather than asking the SMS to mould itself into the organisation, it was then up to the organisations to adapt to a rather rigid framework. One could assume that this strategic shift was done with the best intentions, in an attempt to standardize and to ease the implementation efforts, and to provide positive, tangible results at a faster rate to elicit support for the brand-new concept at all levels of the organisation. However, there's no evidence to tell whether this is indeed a better approach or not. It should nevertheless be possible to research this topic since the early implementors of IS-BAO are more likely to have used the approach promoted by IBAC since there was no ICAO influence yet.

- The introduction of Commission Regulations (EU) 965/2012 and 800/2013 that address business aviation in the European Union (EU, 2012, 2013) has had numerous effects on the smallest operators and the tectonics of the industry. However, very little of this has been formally researched yet.

- Upstream of the issue of the effectiveness and soundness of law mentioned above, there seems to also be substance for research on the soundness and rationality of the methods used to draft, enact and review regulations. For instance, the public archives related to the EU rulemaking processes that led to the issue of both Regulation (EU) 965/2012 laying down the technical requirements (e.g., SMS) and administrative procedures related to air operations (EU, 2012) and, to some degree, of Commission Regulation (EU) 800/2013 that addresses business aviation (EU, 2013), contain their share of intriguing content. The sources of information, the participants to the rulemaking tasks (and particularly the absentees to those groups), the areas of concerns to the groups and their priorities, the political bargaining occurring behind closed doors, the type and number of comments on the proposed changes and how EASA responds to them, etc.; all this draws a picture of a process where the realities of the outside world, in particular those of the micro and small operators, had difficulties to reach the negotiating table. Moreover, Woodlock and Hydén (2020) touched on the interactions between law and safety science expertise at EU/EASA levels as part of a process to create scientific knowledge-based laws and legitimacy. However, no trace of, or even reference to, scientific literature on SMS or OHS in SMEs, or even simply on SMEs, could readily be found in the drafts of EU 965/2012 for business aviation.

- The curves of incident and accident statistics follow their asymptotic journey initiated in the 1950s and gradually get ever closer to zero. It would however be interesting to understand to what degree this continuous improvement could also be attributed to purely economic factors and market dynamics (i.e., irrespective of safety management efforts). Unprofitable and undercapitalised operators are more likely to have less resources for safety, and therefore to display both riskier daily practices and more brittle defences. However, they could also be extremely lucky and not have a single fatal accident despite an overall lower safety performance. Is the aviation industry getting safer and safer in the long run only because it is getting better and better at managing risks and uncertainty? What's the influence from operators with a lower safety performance being pushed out of business (e.g., through bankruptcies, mergers and acquisitions) before they ended up in an accident? Therefore, it may be time to also formally consider the financial performance of an operator alongside its safety performance. This also touches on a related issue: when the cost of non-compliance with safety regulations is virtually zero, for instance because the regulators are overworked and unable to adequately oversee a significant portion of an industry, and because the non-compliant organisation is lucky enough to carry on without incidents or accidents, this distorts the supposedly level playing field and pressures those organisations that do comply to cut corners as well.

- Informal discussions and anecdotal evidence gained during this project concurred with personal experience that the industry has become very reliant on, if not even addicted to, e-learning courses (Moore et al., 2011), regardless of the topic (e.g., SMS, regulations,

etc.). The trend is likely to gain increasingly popularity following the Covid-19 pandemic and widespread stay-at-home measures taken by various governments. The accessibility, flexibility and relatively low cost of online training options are the main reasons for their success worldwide (Ossiannilsson and Landgren, 2012). Their quality and effectiveness in the aviation industry, on the other hand, deserve a much closer look. Several commercial companies offer online SMS courses for aviation. However, no authority, established institution or industry body independently assesses their overall value, and certainly not against a recognised standard. There is no benchmark and even no specific minimum requirements in terms of contents. It is up to each customer to decide whether the course satisfies its specific needs. This may be to simply tick a box in order to cheaply meet regulatory requirements and easily satisfy some CAA inspectors, rather than to actually acquire knowledge and put it to good use in practice.

Conclusions

"Risk does not exist 'out there', independent of our minds and cultures, waiting to be measured. Instead, human beings have invented the concept [of] risk to help them understand and cope with the dangers and uncertainties of life. (…) danger is real, but risk is socially constructed."
(Slovic, 2001, p.19)

This research doesn't appear to have found a single micro/small air operator in business aviation that implemented a fully functional SMS in its operations, partly since all respondents reported struggling with at least one of the four core SMS components. Quite surprisingly, this also concerns the type of operation (i.e., corporate flight departments) that continuously achieves – by far and even before the SMS era – the best safety performance in its sector, and that also seemed to be the best placed to gather many conditions of possibility for a successful SMS implementation. The 'mission' may not be impossible but appears nevertheless quite difficult.

The history and evolution of SMS in aviation is intertwined with that of OHS (Bieder, 2021; Grote, 2020; Li and Guldenmund, 2018; Swuste et al., 2018). Although personal safety and process safety are not identical, the systems that gradually emerged to manage them are very similar in their structures and functions (e.g., based on the PDCA loop which is geared towards improvements in production). Management systems are isomorphic across many industries and this represents a formidable - if not daunting - challenge to the smallest organisations. As the literature shows, such organisations generally struggle with most formal, bureaucratic demands since they invariably compete and conflict with the firms' urgent and relentless efforts to survive. Despite the rise of "regulated self-regulation" and decades of research clearly indicating that the thorny issue of scalability is repeatedly mishandled in OHS, most norm-makers continue to simplistically assume that scaling-down a framework primarily written by (and for) large organisations suffices (Gallagher et al., 2001; Lamm, 1997; Legg et al., 2014). Performance-based regulations also seem to have a knack for leaving almost everyone in limbo (Vickers et al., 2015).

This may sound paradoxical since the management systems imposed by 'self-regulation' are supposed to be adjusted to the size and/or complexity of the organisation. Originally, it might have seemed convenient and efficient to apply the PDCA cycle to all management systems (e.g., QMS, OHSMS, SMS, etc.) in the interest consistency. However, it now appears quite naive to hope that such a simple, production-driven concept will tame all the uncertainty, complexity and variability in the world, no matter the level of sophistication of its translation into standards and regulations. Amalberti (2001) asserts that these systems near the end of their life. Breaking the 'ultrasafe barrier' they helped achieve (bearing in mind that not every business aviation air operator can currently attain ultra-safety) will require new research and new systems.

Whereas the analysis of the existing literature provided a 'generic' profile of non-aviation MSEs, the subsequent surveys generated a 'generic' profile of the three main types of micro and small air operators in business aviation. Although they deserve some fine-tuning based on a larger amount of data and/or on more specific data, at least they provide a starting point that was missing.

Considering the limitations to this research and its 'missing continent' of single-aircraft operators, the findings are only indicative. However, in the aggregate, both groups of respondents shared similar views on the attributes of, and contrasts between, these three types of operators.

Regardless of their industry, all MSEs seem in agreement that their competent authorities are not given the means to appropriately discharge their responsibilities (e.g., oversight and support). They also perceive to have very little to no influence on regulatory frameworks that are tailored to larger organisations and that ignore their specific needs and challenges. However, like their non-aviation counterparts, micro/small air operators are infrequently involved in industry groups, which is usually detrimental to an organisation's knowledge, understanding and ability to influence the applicable regulations and industry standards. Authorities seem to reap little return from their limited, precious resources (and in the process the resources of the frontline actors they oversee) that are invested in an inadequate strategy that triggers all kinds of unintended responses and tactics, and particularly undesirable ones (e.g., dismissal, concealment). Authorities don't seem to lack clear-headedness about the state of their industry; however, it appears counterproductive to keep on insisting that MSEs essentially do what only larger organisations seem better equipped of doing.

Contrasts and similarities emerged between the three types of air operators. Although the profiles cannot be correlated with accident statistics (which are patchy and hardly comparable in this data-deprived sector), they nevertheless suggest that corporate flight departments generally gather – but not always – the necessary conditions of possibility for their SMS to be functionally complete and effective. The other types of operations did not appear as fortunate and successful in that endeavour. However, SMS is not a guaranteed panacea. This research showed that even corporate flight departments encounter difficulties – sometimes significant – to implement SMS or to keep it up and running.

This research also found markers of decoupling and, to a lesser extent, of isomorphism amongst the micro/small operators surveyed, thereby validating (new) institutional theory as a useful tool to try and understand the tectonics at play in business aviation. It also underlines the importance of legitimacy in both the failures and relative successes of SMS.

To some extent, safety science also applies the norm-makers' "one size fits all" mantra by focusing on large-scale and industrial accidents occurring in large organisations, e.g., Three-Mile Island, Chernobyl, Piper Alpha, Challenger, etc. (Swuste et al., 2018). System thinking may be the most sensible approach to understand and prevent failures in both personal safety and process safety (Dallat et al., 2019), however it is commonly out of the smallest organisations' reach that are too preoccupied with the fulfilment of their missions and their survival. Neither the hegemonic SMS requirements nor the prevailing accident models provide practical tools to help the smallest organisations to simultaneously create safety and manage their daily operations (Hasle et al., 2021). In addition to the requirements to document and record nearly everything, they're left with an apparent paradox: SMS is simultaneously too heavy for their capabilities and too light to address their entanglement in networks of contractors and suppliers. Further research should explore whether the canvas of Network Failure Accidents (Le Coze, 2020) wouldn't be more valuable than the current flurry of shaky and disjointed SMS that barely interact with each other. SMS may have become unavoidable, but it is neither carved in stone nor unfixable.

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Appendix 1 – Institutional theory

Institutional theory is particularly interested in the reasons why organisations within a field adopt certain formal structures, activities and routines, and in doing so tend to become homogenous. Strangely, very little research has ever been conducted in the aviation industry using this theory (Kurt and Gerede, 2018; Sakyi and Azunu, 2013), and never in business aviation. It would however be useful to detail how micro and small air operators respond to SMS mandates, which strategies they use, and whether an SMS implementation has any chance of success. To do so, several concepts were extensively used, among which legitimacy needs to be defined first. In this research, Suchman's (1995, p. 574) definition is retained:

> *"Legitimacy is a generalized perception or assumption that the actions of an entity are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs, and definitions."*

Old institutional theory

Originally (i.e., in the immediate post-World War 2 era), most of the research focused on the internal workings of organisations (Mizruchi and Fein, 1999). Taking its roots in organisational sociology, 'old' institutionalism therefore studied and focused heavily on the issues of influence, coalitions, competing values, moral frames, power, deflection of purposes and informal structures within an individual organisation in order to understand and theorize how organisational change occurred (Greenwood and Hinings, 1996; Kurt and Gerede, 2018). It explored the interactions between an organisation and its environment, but emphasised the role of the beliefs, values, norms, attitudes and actions of those with the power to define directions and interests within the organisation. Old institutionalism also focused on how the formal, rational mission of the organisation could be diverted by vested interests or conflicts of interests. 'Old' institutionalists argued that change is one of the dynamics used by organisations as they struggle with differences in values and interests (Greenwood and Hinings, 1996). In contrast, 'new' institutionalists emphasised the concept of persistence – rather than change – and zeroed in on the crucial relations between organisations and their environment (Mizruchi and Fein, 1999).

New institutional theory

Starting in the 1970s, the focus indeed shifted to how organisational change – not anymore within an organisation but within an entire field of organisations – was significantly influenced by issues such as organisational legitimacy, myths, resource dependence, etc. (Greenwood and Hinings, 1996). Within just a few years, several foundational publications provided key concepts that quickly coalesced into a new institutional theory. Among those early contributions, Meyer and Rowan (1977) argued that, in order to mollify and reassure potentially influential publics, organisations were prone to constructing stories about their actions by incorporating the practices and procedures that society, through its institutions, considers rational about organisational work and therefore expects from those organisations. Regardless of the actual rationality and efficacy of those practices and procedures, organisations nevertheless incorporate them to gain legitimacy, which positively impacts their opportunities, resources and stability, and

eventually enhances their survival prospects. Meyer and Rowan label all those institutional policies, programmes, products, services and techniques as powerful myths. In their view, many organisations create myths about themselves. However, they do so only ceremonially because the demands of those myths can sharply conflict with efficiency criteria and the demands of their work activities. So, although all these forms of expectations may have little to do with the technical notions of performance, accomplishment or efficiency, organisations must nevertheless accommodate them in order to survive (Greenwood and Hinings, 1996). In other words, how organisations behave is not only a response to market forces, but also to diverse institutional pressures. Pressure from regulators of course (e.g., when mandating an SMS), but also from market leaders, unions, professional bodies, industry associations, or even pressures emanating from general expectations of society whose processes, obligations or realities can attain the status of a rule. Therefore, in the everlasting struggle between ceremonial conformity and technical efficiency, organisations resort to two interrelated methods: decoupling, and a logic of confidence and good faith (Meyer and Rowan, 1977).

Decoupling

Decoupling essentially means that gaps will be allowed to form between an organisation's formal structure and its actual activities. More importantly, this indicates whether a practice is adopted for real or only ceremonially (Kurt and Gerede, 2018; Meyer and Rowan, 1977). Some well-described symptoms of a decoupling process include:

- Despite being documented, approved and distributed, company policies, processes and procedures are neglected and not implemented in daily work,
- Inspections and audits are ceremonialized,
- Goals become vacuous or ambiguous,
- Activities are performed outside management's purview,
- Individuals are left to informally fix inconsistencies,
- The ability to navigate the efficiency-thoroughness trade-offs in violation of the rules becomes very important (consequently, 'professionalism' is actively encouraged), and so does the ability to get along with other people (Meyer and Rowan, 1977).

Decoupling provides real advantages as it enables organizations to adjust their daily activities to practical needs while maintaining a formal structure that provides legitimacy (Meyer and Rowan, 1977). This implies a number of things. First, organisations should not be seen as static in their decoupling process, but rather as continually moving along a continuum between efficacy and legitimacy. Second, although the organisations active within an industry tend to adopt similar formal structures (i.e., become isomorphic), they may nevertheless display much diversity in actual practice. Third, decoupled organisations are not necessarily anarchies, despite a lack of coordination and control. Fourth, staff are not only committed to support their organisation's ceremonial façade, but also to make things work backstage and avoid chaos (Meyer and Rowan, 1977).

To describe decoupling visibly takes us to the main focus of the old institutional theory: the internal working of organisations. Indeed, decoupling can't be described without considering personal needs and motivations and how they're being met. This is where the logic of confidence

and good faith becomes imperative in order to positively impact the organisation's decoupling processes and its struggle between efficacy and legitimacy. In order to achieve legitimacy, both confidence and good faith must be maintained between all the parties involved (i.e., both inside the organisation and within its institutional environment). Meyer and Rowan (1977) added a third element to the equation, namely the maintenance of face, and described how all these entangled elements influence each other. In practice, the confidence in an organisation (and ultimately in the institutional myths that rationalise its existence) can only be sustained if that organisation assures that none of the involved parties loses face. Maintaining face preserves the formal structure of an organisation as it tries to absorb uncertainty and participates to a general aura of confidence. However, this is only possible when people assume that everyone is acting in good faith; i.e., organisations with a decoupled structure can only perform their daily routines provided that people can assume that things really are as they seem to be and that managers and employees properly perform their roles.

Isomorphism

DiMaggio and Powell (1983) pushed Meyer and Rowan's argument further and tied it even more explicitly to organisational and sociological theory (in particular: Fennel, 1980; Hannan and Freeman, 1977; Hawley, 1968, Meyer, 1979). Intrigued by the remarkable similarity of organisations in industrial societies, they argued that their isomorphism (i.e., their adoption of similar formal structures) has arisen as a result of their quest for legitimacy within their environment, and not because of 'natural' selection or objective efficiency requirements, which have presumably played their role earlier. In their view, after disparate organisations have survived the emergence of a new industry and its structuration into an established organisational field, powerful forces kick in to lead them to become more similar to one another (i.e., they become isomorphic). Two types of isomorphism are identified: competitive and institutional. Competitive isomorphism, which is more prevalent as an organisational field emerges and structures itself, involves the pressures towards homogenisation resulting from the competition for resources and customers. Institutional isomorphism doesn't rule out market forces as a driver towards similarity but emphasises the role of competition for political and institutional legitimacy, and for social as well as economic fitness (Aldrich, 1979; DiMaggio and Powell, 1983; Mizruchi and Fein, 1999).

DiMaggio and Powell (1983) identified three mechanisms of institutional isomorphism which are rooted in different conceptions of the way in which behaviour diffuses…

- **Coercive isomorphism**: results from both the formal and informal pressures exerted by cultural expectations and by actors upon which an organisation is dependent for its resources,
- **Mimetic isomorphism**: in response to ever-present uncertainties, organisations model themselves after similar organisations which, they believe, are more legitimate and more successful,
- **Normative isomorphism**: the homogenisation stems primarily from the professionalisation of the workforce involving two processes; the training and filtering of personnel throughout the career progression (socialized into similar worldviews), but also

the structuration of organisational fields through networking and trade associations where highly visible organisations serve as models.

DiMaggio and Powell pointed out that, although those mechanisms involve separate processes, they may not be empirically distinguishable. Two or three could operate simultaneously and their effects would not necessarily be clearly identifiable (DiMaggio and Powell, 1983; Mizruchi and Fein, 1999). It would therefore be problematic to focus on one mechanism and neglect the others that might provide equally plausible accounts of the isomorphic process. For instance, Mizruchi and Fein (1999) persuasively argued that mimetic isomorphism receives disproportionate attention from North American researchers, at the expense of the other mechanisms, reflecting a dominant tendency in that region to minimise relations of power and coercion among organisations and to favour a cognitive approach to perception and action.

Organisational strategies and tactics in the face of institutional pressure

Oliver (1991) also noted a lack of attention to the strategic behaviours employed by organisations. She rebuked the institutional theorists' assumptions that organisations invariably conform to the rules, myths or expectations of their institutional environment. Instead, she suggested that organisational behaviour may vary from passive conformity to active resistance and proposed a typology of five different strategic responses, each strategy manifesting itself through one or more of three possible tactics:

- **Acquiescence**: the organisation accedes to institutional pressures by…
  - *Habit*: following taken-for-granted, invisible norms that percolated through society,
  - *Imitation:* mimicking institutional models (e.g., mimetic isomorphism), and/or
  - *Compliance:* (pro-)actively obeying and incorporating rules, values and norms.

- **Compromise**: when confronted with conflicting institutional demands or with inconsistencies, the organisation attempts to partially comply and promote its own interests through tactics of…
  - *Balance*: managing and balancing the expectations of multiple constituents,
  - *Pacification:* devoting most of its energy to compliance to appease institutional expectations while simultaneously mounting a minor level of resistance, and/or
  - *Bargain:* negotiating and obtaining concessions from institutional stakeholders.

- **Avoidance**: in a manner similar to the decoupling process mentioned earlier, the organisation attempts to preclude the necessity of conforming through…
  - *Concealment:* disguising non-conformity behind a façade of acquiescence,
  - *Buffering:* attempting to reduce the scrutiny from external entities by decoupling or removing its activities from their view, and/or
  - *Escape:* exiting the domain or significantly altering its own goals, activities or domain.

- **Defiance**: the organisation rejects institutional norms and expectations through…
    - *Dismissal*: ignoring institutional rules and values, particularly when they sharply diverge from internal objectives or when the potential of enforcement is perceived to be low,
    - *Challenge:* contesting and defying rules and requirements, and/or
    - *Attack:* assaulting, belittling or forcefully denouncing the sources of institutional pressure.

- **Manipulation**: the organisation actively alters, re-creates, or controls the institutional pressures and expectations, or even the constituents that imposed them, through…
    - *Co-optation:* influential constituents are imported to neutralise institutional opposition and enhance legitimacy,
    - *Influence:* shaping the norms, values and belief systems in the institutional environment, and/or
    - *Control:* dominating rather than influencing the institutional constituents and processes.

Not only does Oliver (1991) provide a broader (and less fatalistic?) repertoire of possible organisational behaviours in response to institutional expectations and pressures, but she also theorises how an organisation's response may influence its internal performance and the external criteria, measures or standards used by institutional constituents.

Institutional Logics Perspective

Institutional theory continuously evolves and matures. In the process it gradually sheds its deterministic flavour and advances its studies beyond initial concepts such as isomorphism (Thornton, Ocasio, Lounsbury, 2015). Relatively new ideas are introduced, such as the constitution of society by several institutional orders (e.g., family, state, market, religion), each one having its own institutional logic (e.g., risk, efficiency, professionalism). Although those institutional logics may be 'invisible' phenomena (such as safety culture), they will nevertheless interact and compete for influence in multiple societal domains and affect the world (Hasle et al., 2021; Thornton, Ocasio, Lounsbury, 2015). Societal actors have the capability to exploit and reconcile those multiple logics, thereby enabling problem-solving and institutional change where the transposition of a logic can infuse the same practice from one domain to another despite a potentially different meaning (Friedland and Alford, 1991; Thornton, Ocasio, Lounsbury, 2015).

Not too distant from Perrow's (1984) "social and cultural rationality" and from neo-institutional theory, Institutional Logics Perspective (ILP) therefore considers that organisations take action based on cultural and symbolic perceptions, rather than on their actors' rational choices or on economic reasons (Hasle et al., 2021). By being much more sensitive to how multiple, competing cultural and symbolic value systems can underlie every organisation, ILP considers that organisational practices, choices and strategies also depend on how these co-existing value systems are balanced inside 'constellations of logics' (Hasle et al., 2021). ILP is therefore a promising, additional lens for future research on the effects of culture and institutions in many domains (Thornton, Ocasio, Lounsbury, 2015), including business aviation.

Translation of institutional theory into business aviation

In the absence of any prior research, assumptions were made based on available literature, including the few limited publications dealing with institutional theory in aviation (Kurt and Gerede, 2018). What follows is a description of the most probable roles and influences of institutional actors on business aviation operators. These assumptions start from two core tenets of institutional theory, namely:

- organisations need to mollify and reassure influential publics, and
- isomorphic organisations will have increasingly similar structures.

Commercial air operators

For commercial air operators, it is vital to first obtain and subsequently maintain the appropriate licenses and/or certificates to operate. It is a *sine qua non* condition to market their services and this inevitably colours their decision-making. Inspiring confidence to passengers, preferably at the lowest possible cost (which may nevertheless appear exorbitant to the average citizen), is also a very important consideration. Although this aspect hasn't been researched here, commercial air operators generally have a third public they need to convince: the aircraft owner(s). Business aviation is typically different from airline operations where aircraft are either directly purchased by the airline or obtained through a leasing company (Bourjade, Huc, Muller-Vibes, 2017). In business aviation, aircraft made available for charter generally belong – but not always – to either a natural or an artificial person (typically through a financial institution) who places the aircraft in management with an air operator, uses it as needed, then charters it the rest of the time through the operator to recoup its costs. In this entanglement of influential publics, commercial air operators arguably have to navigate intricate goal conflicts while staying clear of events threatening their survival, such as an accident, losing their certificates, handing over an aircraft under management to another commercial air operator, or simply being unprofitable.

However, it might be difficult to find clear evidence of isomorphism due to the fact that commercial operators had to have a formal structure before SMS, and that the new management system does not require large changes, especially if the operator had implemented a Quality Management System before SMS. In other words, commercial operators had likely already adopted increasingly similar structures and only made little to no further change when SMS became unavoidable.

Corporate flight departments

For a corporate flight department, the parent company is its whole *raison d'être* and arguably outweighs the CAA in terms of influence. Provided a flight department makes economic sense (vs. airlines and other modes of transportation), its survival depends primarily on its ability to meet both the travel needs and the expectations of the parent company in terms of safety, compliance, security, costs, flexibility, confidentiality, legitimacy, etc. Compared to a CAA, the primacy of a parent company will likely fluctuate, depending on whether the flight department operates in a rudimentary or stringent regulatory framework, whether it only interacts with its

CAA for administrative matters or undergoes frequent inspections, how often it is audited or inspected, and/or how high the expectations from the corporation are.

Corporate expectations, if any, typically aim higher than what regulations require for this type of non-commercial air operation. Some corporations go as far as requiring that their flight department obtains an Air Operator Certificate as if they were a commercial operation, although the aircraft is never available for charter. However, this choice would primarily be made for fiscal or legal reasons (i.e., clarifying the relationship with any occasional non-staff passenger who participates to the operating costs of a particular flight) rather than purely for safety reasons. Moreover, this approach to regulations seems to be prevalent in Europe only. More frequently, and possibly in addition to requiring an AOC, a corporation may call for a certification against voluntary industry standards (e.g., IS-BAO, ISO, BARS) or require the development, implementation and enforcement of company standards based upon their own experience, which may indeed be substantial. Although rare, some corporate flight departments will soon reach their hundredth anniversary (see annex 8), possibly without a single fatality or major injury in their history. Whether a flight department must meet corporate expectations that match or exceed the most stringent legal requirements available (i.e., AOC) varies greatly from one operator to the other. A number of reasons may play a role in any impetus to go beyond legal requirements.

First, corporate and industry standards generally fill a void in the regulatory framework. For centuries, the *"majestic pyramid of norms"* (Frydman, 2014b, p.14) tended to consist of the normalisation of people (through law) or objects (through science and research) but initially paid very little to no attention to technical norms which were then deemed devoid of any political stake (and therefore power). If needed in litigation, 'best practices' and technical norms could always be invoked (Frydman, 2014a). In post-industrial economies, technical norms nevertheless gradually expanded into the tertiary sector and filled a gap between law and science (Frydman, 2014b). Indeed, services emerged as a hybrid creature entangling people and objects, challenging the legal divide between them in the process (i.e., people and objects are not alike, nor the disciplines to normalise them). Standards and norms on products and services have now filled every aspect of our daily lives and increasingly compete against the rule of law and political institutions (Frydman, 2014a). Each industry and its constituents are not only the source of innovation but also the source of fluid 'soft laws' that will influence to some extent how the industry evolves (Gunningham and Rees, 1997), and which may also lead the way to 'hard laws' (Terpan, 2015; Woodlock and Hydén, 2020). If this approach appears pragmatic since lawmakers cannot proactively regulate or even reliably foresee any innovation and its far-ranging ripple effects, it does raise questions about the very limited representation of society when norms and standards are created 'by the industry for the industry' and quickly spread through many economic domains (Frydman, 2014b, Terpan, 2015). To ensure effective, efficient, compliant and safe production, those standards and norms have become ubiquitous instruments of management, standardisation and power. This particularly applies to firms that use their own aircraft as business tools and tend to expect a uniform application of any pertinent corporate or industry standard throughout its departments and branches, possibly including their flight department. Regarding SMS specifically, modern risk management emerged in the 1950s, as large corporations determined that it would be more cost-effective for them to self-insure (Li and Guldenmund, 2018). By the end of the 1980s and its series of disasters, they had established their first version of SMS (Li and Guldenmund, 2018), which later inspired the regulators. In other words, SMS has its 'natural habitat' in multinational corporations and their flight departments.

Another reason for corporations to have additional expectations for their flight department is tied to the legitimacy of the parent company itself and particularly through the prism of corporate social responsibility (CSR). Although CSR is an ambiguous, contested and multidimensional concept (Cherry and Sneirson, 2011; Fairbrass, 2011; Kinderman, 2013), it can prove to be an important legitimisation tool for firms (Beddewela and Fairbrass, 2016; Solano et al., 2019; Zhen, Luo, Maksimov, 2015), and in particular for those coming from a controversial sector such as the extractive industries (Du and Vieira, 2012; Frynas, 2010) – which also happen to be among the early adopters and intensive users of corporate airplanes and helicopters at all organisational levels, from rig workers to senior executives. Without delving into the sincerity and effectiveness of CSR initiatives (Crowther and Ortiz Martinez, 2007; Frynas, 2005), company-wide legitimization efforts can percolate down to a corporate flight department. Criteria such as 'the environment' and 'public relations' have acquired the same weight in enterprise risk management as the direct consequences of safety hazards (Baybutt, 2016), and even made their way into some risk matrices used in corporate flight operations. However, beyond CSR concerns the disastrous consequences of losing employees and particularly top managers in an accident (NTSB, 2007), including from a liability standpoint, can also act as a strong deterrent against taking shortcuts on safety. Especially when ample resources and a favourable organisational context that values safety allow, incite and even expect staff to exceed legal requirements. This may for instance involve the use of several aircraft although each one of them could carry all the personnel who need to travel.

Other reasons may also explain why multinational corporations and their flight department may go beyond regulatory requirements. Their presumably distinct survival strategies and management characteristics are commonly presented as the result of their large size (Legg et al., 2015). However, differences in companies are more likely to be the result of mediating variables that change with their growth (e.g., resources, management, organisational structure, control systems) rather than with their size *per se* (Nordlöf et al., 2015). Company size is a proxy for other variables that impact OHS performance (Nordlöf et al., 2015), but simplifications may be misleading (Turner et al., 2009).

Although it cannot be generalized, corporate flight departments commonly appear to be valued-driven rather than cost-driven (Osterwalder and Pigneur, 2010), and therefore willing to invest in safety beyond minimum legal requirements. Despite the positive influence of this approach on safety, it also increases the risk of creating internal bureaucracies through patterns of internal over-regulation following governmental de-regulation (Dekker, 2020; Størkersen et al., 2020), over-proceduralization (Bieder and Bourrier, 2013), audit explosion (Størkersen et al., 2020), or safety clutter (Rae et al., 2018).

Non-commercial air operators

In the case of non-commercial operators, the primarily voluntary nature of SMS (except in Europe), the relative rarity of the CAA audits (e.g., in Europe, at least once every 48 months – EC, 2013), and the extremely limited number of end-users of the aircraft might suggest that the need for a good reputation and for continued demonstrations of compliance with the rules to the CAA is lower than in the other types of operations. However, depending on the situation of each individual operator, the apparent simplicity and 'low profile' (from the perspective of the CAA and of the public) of non-commercial operations may be misleading.

Beyond a certain amount of technical and operational complexity (e.g., when first acquiring or transitioning to a turbine-engine aircraft), the owner of the aircraft, i.e., either a natural or an artificial person such as an SME, is likely to contract aviation professionals to manage all aspects of the aeroplane(s) and/or helicopter(s). Some owners may also be licenced and qualified to fly the aircraft. In order to survive, the micro- or small-sized team managing the operation therefore has to make economic sense and appear legitimate from the CAA's perspective, but also and more importantly from the owner's perspective. Other aspects beyond the organisation's control may affect its survival, i.e., essentially the wealth and fortunes of the owner(s), but they're beyond the scope of this research. The flight department of an SME may well enjoy an environment fostering an organisational culture towards sound safety management practices that is similar to what larger/global corporations generally provide, including care for the employees' psychological safety. However, micro non-commercial operations may also prove particularly challenging when the owner(s) and user(s) are cost-driven and/or directly involved in the management and operation of their aircraft, especially from the pilot seat. More often than not, owner(s) see aircraft as convenient business tools and time-savers, but they've not necessarily dedicated copious amounts of private and/or professional time to 'learn the ropes' of the industry and to acquire expert knowledge on safety matters.

More specifically, staff in micro non-commercial operations with very limited degrees of hierarchical separation with the aircraft owner(s) and/or end-user(s) are more exposed to the risks of ill-considered interferences in safety-critical matters than in other types of operations. These interferences may take various forms, ranging from explicit orders to implicit expectations. For instance, to reach the destination airport despite bad weather (NTSB, 2001), to always make soft landings and even on contaminated runways, to improperly stow unsecured luggage and goods in the aircraft cabin, to perform a flight despite acute fatigue (AAIB, 2017), etc. Not meeting an irascible owner's unreasonable expectations would jeopardise the logic of confidence and good faith necessary to the staff's legitimacy and expose them to retribution, and even to instant firing once the flight is completed (this scenario is also plausible in commercial ops).

From this perspective, such operators resemble non-aviation MSEs where, in the absence of any robust system to consistently manage safety and protect staff, the owner's knowledge, values, expectations and priorities firmly drive the organisation with little to no counterbalancing authority (Hasle et al., 2009; Kumar and Antony, 2009; Legg et al., 2015). Regulators and CAA inspectors may anecdotally be aware of such issues, however there is no concerted effort to specifically and proactively address an owner's potentially harmful influence. Databases of accident investigation reports and anecdotes in non-commercial operations unfortunately contain many examples of disregard of operational limitations and basic safety rules due to time and/or financial pressure (AAIB, 2020; BEA, 2015, 2016a, 2016b; BFU, 2010; CNN, 2010), a phenomenon sometimes referred to as "get-there-itis" or "get-home-itis" syndrome (BEA, 2020; Velazquez, 2018). These occasional organisational issues add to also occasional individual issues where the piloting and aeronautical decision-making skills of owners who choose to be at the control of their aircraft (especially high-performance aeroplanes) may mismatch the complexity and demands of the flight (BEA, 2014, 2016a). Non-commercial operations in business aviation therefore appear to be situated across the fuzzy demarcation between general aviation (i.e., leisure flying) and commercial operations, which should be the domain of "professional" flying rooted in expert judgement painstakingly acquired through lifelong learning and practice (and luck).

Appendix 2 – Pilot survey questionnaire & results

Table 14

Pilot survey question 1 and results

Q1: Which of the following propositions applies to a typical micro air operator (i.e., with <10 staff)? Please tick the box for each category of operation where you think the proposition is true. The categories being; the commercial operator (e.g., charter, EMS), the flight department (with or without an AOC) tied to a large corporation, and the non-commercial ops for one or more owners. *(n=15)*

From a socio-economic perspective, a typical micro air operator…	**AOC**	**Flt Dpt**	**Owner**
Has a high potential for failure (> 50% chance of bankruptcy in the first 5 years)	78,6%	00,0%	28,6%
Is managed by its owner(s)/founder(s), who is/are also involved in operations	60,0%	26,7%	80,0%
Has relatively few customers (possibly only one, the owner)	13,3%	53,3%	100,0%
Is under high financial pressure	92,9%	14,3%	14,3%
Is firmly driven by the CEO/AE/General Manager's values and priorities	71,4%	71,4%	57,1%
Its staff displays strong social and professional bonds	46,2%	84,6%	46,2%
Has high resource constraints	93,3%	20,0%	46,7%
Has limited access to external sources of advice and support	38,5%	38,5%	84,6%
Often suffers from skill shortages	46,7%	53,3%	93,3%
Is highly vulnerable in case of accident	73,3%	40,0%	86,7%
Prioritizes according to the most pressing issue of the moment	64,3%	35,7%	64,3%
Devotes little time and resources to 'non-core' tasks	40,0%	46,7%	93,3%
Mean =	***60%***	***40%***	***66%***
Median =	***62%***	***39%***	***72%***
Standard deviation =	***24%***	***24%***	***28%***

From a safety management perspective, a typical micro air operator…	**AOC**	**Flt Dpt**	**Owner**
Lacks awareness on regulatory requirements regarding SMS	20,0%	26,7%	100,0%
Struggles to implement SMS regulatory requirements	40,0%	53,3%	93,3%
Has a low level of management and training skills	40,0%	46,7%	100,0%
Lacks resources for SMS	53,3%	46,7%	80,0%
Uses oral rather than written communication	13,3%	33,3%	100,0%
Lacks formal, tailored documentation that is appropriate to the operation	6,7%	20,0%	93,3%
Rarely holds dedicated safety meetings	20,0%	26,7%	93,3%
Records very little information	13,3%	26,7%	93,3%
Underestimates the probability and severity of an accident	28,6%	42,9%	100,0%
Does not have a full-time Safety Manager	50,0%	64,3%	100,0%
Often lacks a comprehensive, fully functional management system for SMS	64,3%	78,6%	100,0%
Is likely to seek help from a consultant to implement or run the SMS	50,0%	85,7%	35,7%
Its manager tends not to enforce SMS requirements, even when they are known	54,6%	27,3%	81,8%
Its manager tends to blame workers or unforeseen circumstances for accidents	61,5%	30,8%	53,9%
Has difficulties in implementing and understanding good safety practices	28,6%	21,4%	92,9%
Tends not to investigate accidents and incidents	27,3%	45,5%	90,9%
Is rarely inspected or challenged by a CAA on its safety practices	33,3%	58,3%	100,0%
Is rarely involved in sectorial or industry associations/working groups	30,8%	38,5%	84,6%
Tends to rely on its employees to acquire SMS knowledge thru past/current work	50,0%	66,7%	83,3%
Training, when provided, is ineffective, ad hoc, using only a few passive methods	33,3%	16,7%	91,7%
Training does not adequately incorporate HF and accident investigation concepts	41,7%	41,7%	100,0%
Mean =	***60%***	***40%***	***66%***
Median =	***62%***	***39%***	***72%***
Standard deviation =	***24%***	***24%***	***28%***

Table 15

Interpretation of the answers to question 1 of the pilot survey

	Percentage band				
	0 – 20%	**21 – 40%**	**41 – 60%**	**61 – 80%**	**81 – 100%**
Interpretation	Strongly disagree	Disagree	Undecided	Agree	Strongly agree

Table 16

Pilot survey question 2 and results

Q2: For which nation, continent or region do your answers apply?	
EUR - Europe	6
NAM – North America	5
MID – Middle East	3
SAM – South America	1
PAC – Pacific	1
AFI - Africa	1
Total	**17**

Appendix 3 – Comparative online survey questionnaire & results

This appendix mirrors the contents and structure of the online survey and presents the results for the 31 respondents coming from organisations with 20 FTEs or less.

Questionnaire page 1

Figure 10

Screenshot of the introductory page to the online questionnaire

Questionnaire page 2

Table 17

Results to online survey question 1

Q1: How would you characterise the resources for safety in your operation (e.g., people, equipment, support, training, management systems, etc.)?	**(N = 31)**
The scarcity of resources is both ever-present and significant. This clearly impacts our safety margins.	6,5%
The resources are generally limited. Investments only occur if mandated by law or if unavoidable.	41,9%
Resources are readily available.	48,4%
Other (please specify)	3,2%
"Other" responses: – Respondent #10: *"Scarcity of resource is caused by the fact that the accountable manager and the director of operation do not believe in safety management. They just want the minimum to make believe that there is an SMS in the company. The authority just looks the other way. (A [country name] tradition)"* – Respondent #30: *"Available resources for a SMS cannot be linked to a safety margin. As the HFSS msc studies should have made clear, is dat safety emerges by what all resources involved in operations do in order to come home after a day of work. Spending resources to implement and execute a SMS result in more financial pressure on operations"*	

Table 18

Results to online survey question 2

Q2: What was the prime argument to implement SMS in your organisation?	**(N = 31)**
Regulatory compliance	48,4%
Safety	32,3%
Efficiency	0,0%
Don't know	3,2%
Other (please specify)	16,1%
"Other" responses: – Respondent #1: *"Safety and best practices; marketing to passengers"* – Respondent #3: *"Ensure a culture of safety and best practices"* – Respondent #5: *"Contract requirements when submitting a request for proposal (RFP)."* – Respondent #19: *"Proof of SMS was needed to operate to Europe. We also adopted ISBAO for that reason."* – Respondent #22: *"Lack of understanding of the benefits" was the original answer and the respondent was contacted to clarify. "Standardisation of training, procedures, and accountability" was provided instead and used from then on.* – Respondent #25: *"View of safety challenges without emotion and identifying trends"* – Respondent #22: *"Competitive advantage"* – Respondent #22: *"Customer requirement"*	

Table 19

Results to online survey question 3

Q3: Was there a secondary argument to start implementing an SMS in your organisation?	**(N = 31)**
Regulatory compliance	29,0%
Safety	29,0%
Efficiency	3,2%
No other real reason than the first (mentioned above)	32,3%
Don't know	6,5%

Table 20

Results to online survey question 4

Q4: With reference to these reason(s) to implement SMS in your organisation, how important was the primary argument over the secondary one? (If there was only one argument, simply skip this question)	**(N = 24)**
Both arguments had roughly equal importance.	37,5%
The primary argument had a bit more importance over the secondary one	50,0%
The primary argument had significantly more importance.	4,2%
Unsure, don't know.	8,3%

Table 21

Results to online survey question 5

Q5: How does your organisation generally deal with ancillary tasks (e.g., accounting, administration, management systems, etc.) that are not directly related or a prerequisite to flying activities?	**(N = 31)**
We commonly miss deadlines and/or requirements from those tasks.	16,1%
We generally meet the requirements but may occasionally miss a deadline or a requirement.	58,1%
Our resources allow us to handle any requirement with very few or no missed deadline.	25,8%

Table 22

Results to online survey question 6

Q6: How would you characterise the knowledge of SMS regulatory requirements amongst your management team (or team leaders, if no formal structure is in place)?	**(N = 31)**
Very aware.	22,5%
Somewhat aware.	51,6%
Not so aware.	22,6%
Not at all aware.	3,2%

Table 23

Results to online survey question 7

Q7: To what degree has your organisation tailored the Operations Manuals and company documentation?	**(N = 31)**
We do not have any manual specific to the organisation (e.g., only aircraft manuals issued by the Original Equipment Manufacturer).	3,2%
We obtained a template Operations Manual but didn't tailor it at all and don't use it in daily operations.	3,2%
The company manual(s) reflect(s) very little of actual daily operations.	6,5%
The company manual(s) reflect(s) actual daily operations only on the most important topics.	41,9%
The company manual(s) accurately reflect(s) actual daily operations.	45,2%

Table 24

Results to online survey question 8

Q8: How would you characterize the attitude of the (aviation) managers towards SMS?	**(N = 31)**
There is no encouragement (e.g., training, communication) or incentive to participate, and no repercussion if SMS processes are not followed. Staff involvement is purely optional (i.e., there's an attitude of "laissez-faire").	9,7%
Staff are mildly encouraged and incentivised but there is no serious repercussion for not participating in the SMS. Staff involvement is appreciated.	58,1%
Staff are encouraged, incentivised and actively involved in the SMS. Staff involvement is expected.	32,3%

Table 25

Results to online survey question 9

Q9: How often is your organisation inspected or audited by a civil aviation authority? This doesn't include airport ramp inspections such as SAFA checks.	**(N = 31)**
Never.	25,8%
Possibly only once every four years.	12,9%
About once every two years.	19,4%
Once a year.	22,6%
More than once a year.	12,9%
Don't know (no inspection or audit yet).	6,5%

Questionnaire page 3

Table 26

Results to online survey question 10

Q10: In which ICAO region are your operations and aircraft based?	**(N = 31)**
Africa (AFI)	0,0%
Asia (ASIA)	0,0%
Caribbean (CAR)	0,0%
Europe (EUR)	16,1%
Middle East (MID)	3,2%
North America (NAM)	64,5%
North Atlantic (NAT)	3,2%
Pacific (PAC)	9,7%
South America (SAM)	3,2%

Table 27

Results to online survey question 11

Q11 [Open-ended question]: How many employees or full-time equivalents (FTE) work in your aviation organisation exactly?	**(N = 31)**	**Operator category**
2	3,2%	Micro (1 – 9 staff)
3 ½	3,2%	
4	3,2%	
5	6,5%	
6	9,7%	
7	12,9%	
8	9,7%	
9	6,5%	
10	9,7%	Small (10 – 49 staff)
12	3,2%	
15	6,5%	
17	9,7%	
18	9,7%	
20	6,5%	

Table 28

Results to online survey question12

Q12 [Open-ended question]: How many aircraft does your organisation operate?	**(N = 31)**
1	19,4%
2	25,8%
3	25,8%
4	6,5%
5	6,5%
6	6,5%
7	3,2%
30 – 39	3,2%
None (survey answered based on generic industry experience)	3,2%

Table 29

Results to online survey question 13

Q13: Has your organisation been involved in an aviation incident or accident?	**(N = 31)**
No.	54,8%
Yes, in the past year.	22,6%
Yes, in the past 5 years.	9,7%
Yes, in the past decade.	3,2%
Yes, more than a decade ago.	9,7%

Table 30

Results to online survey question 14

Q14: Which of the following would best characterize your organisation?	**(N = 31)**
Commercial air operator	35,5%
Corporate flight department	38,7%
Non-commercial air operator	25,8%

Questionnaire page 4

Table 31

Results to online survey question 15

Q15: How often does your organisation participate in the activities of industry association(s) on safety or regulatory matters?	**(N = 30)**
We're not members of any industry association.	20,0%
We're members but rarely participate.	16,7%
We're members and sometimes participate.	33,3%
We're members and regularly participate.	30,0%

Table 32

Results to online survey question 16

Q16: Are any of the SMS components particularly difficult to implement or to keep up and running in daily operations? Tick all that apply.	**(N = 30)**
Component "Safety policy and objectives": SMS duties and responsibilities, documentation, ERP, etc.	12
Component "Safety risk management": hazard identification, risk assessment and mitigation.	13
Component "Safety assurance": safety performance management, change management, continuous improvement.	17
Component "Safety communication": training, education and communication.	14

Table 33

Results to online survey question 17

Q17: How much influence do you think micro air operators (such as your organisation) have in your country/region, in order to steer the regulatory framework and regulations?	**(N = 30)**
None.	16,7%
Very little.	60,0%
Some.	23,3%
A significant amount.	0,0%
A lot.	0,0%

Table 34

Results to online survey question 18

Q18: When did the SMS implementation formally start?	**(N = 30)**
Well in advance of any regulatory mandate (if any).	26,7%
Once the framework was made public but still in advance of the deadline.	20,0%
Near the regulatory deadline.	20,0%
Well after the regulatory deadline.	10,0%
Don't know.	13,3%
Not applicable (e.g., start-up operation launched after the deadline)	10,0%

Table 35

Results to online survey question 19

Q19: How would you characterize the hazard identification processes in your organisation?	**(N = 30)**
Superficial.	30,0%
Varies between superficial and comprehensive.	43,3%
Comprehensive.	26,7%
Don't know.	0,0%

Table 36

Results to online survey question 20

Q20: Has the structure of your organisation changed because of the SMS implementation?	**(N = 30)**
No. The duties and responsibilities remain largely unchanged.	43,3%
Partly. The duties and responsibilities went through some changes, but new positions and titles were created to meet the requirements.	40,0%
Yes. Either there were no clear duties and responsibilities in the past, or a significantly different structure was adopted as a result of the SMS implementation.	16,7%

Table 37

Results to online survey question 21

Q21: How would you characterize your authority's understanding and application of SMS?	**(N = 30)**
Their knowledge and experience are clearly higher than ours.	10,0%
Their knowledge and experience are quite comparable to ours.	50,0%
Their knowledge and experience are clearly lower than ours.	20,0%
Don't know (e.g., no interactions on SMS yet).	20,0%

Table 38

Results to online survey question 22

Q22: What is your perception on the availability of resources at your national aviation authority?	**(N = 30)**
The authority appears clearly under-resourced.	53,3%
The authority appears to have just enough resources.	33,3%
The authority appears rather well resourced.	13,3%

Questionnaire page 5

Table 39

Results to online survey question 23

Q23: What is the level of involvement in the aviation operations of the owner(s) or founder(s) of your organisation?	**(N = 29)**
No involvement at all.	10,3%
Extremely rare.	6,9%
Only when needed.	17,2%
Occasional.	17,2%
Frequent.	24,1%
Daily.	24,1%

Table 40

Results to online survey question 24

Q24: Assuming you were present at the time of the SMS implementation in your organisation (or that you can obtain an answer from someone involved at the time), how would you characterize the company efforts during the implementation of SMS?	**(N = 29)**
Very difficult.	3,5%
Difficult.	31,0%
Balanced between difficult and easy.	51,7%
Easy.	10,3%
Very easy.	3,5%

Table 41

Results to online survey question 25

Q25: Did your organisation seek the help of an independent consultant or firm to facilitate the SMS implementation?	**(N = 29)**
Yes, and the third party managed the SMS implementation project almost completely, with our support.	13,9%
Yes, but in a support role and under the management of our own company staff.	31,0%
No.	48,3%
Don't know.	6,9%

Table 42

Results to online survey question 26

Q26: What is your primary means to communicate safety-relevant information within your organisation?	**(N = 29)**
Verbal communication.	0,0%
Mainly verbal communication but also written on occasions.	24,1%
A balance between verbal and written communication.	34,5%
Mainly written communication but also verbal.	37,9%
Written communication only.	3,5%

Table 43

Results to online survey question 27

Q27: On average, how often does your organisation hold meetings that are strictly dedicated to safety? If there's no such meeting (i.e., safety is one among several other topics addressed in management meetings), please state how often those meetings occur and tick the very last answer.	**(N = 29)**
Never.	10,3%
Once a year.	10,3%
Once every six months	17,2%
Once every three months.	34,5%
Once a month	24,1%
Once a week.	3,5%
Safety matters are not the subject of specific meetings.	3,5%

Table 44

Results to online survey question 28

Q28: Overall, how often does your organisation record safety information learned through company experience (e.g., daily operations, occurrences, near-misses, etc.)?	**(N = 29)**
Never.	6,9%
Rarely.	24,1%
Only when required by law.	17,2%
Often.	27,6%
Always.	24,1%

Table 45

Results to online survey question 29

Q29: Does your organisation have a Safety Manager?	**(N = 29)**
Yes, on a full-time basis.	20,7%
Yes, on a part-time basis (i.e., the Safety Manager performs other duties in the company).	58,6%
Yes, however the Safety Manager's duties and responsibilities are contracted to a third party.	3,5%
No.	17,2%

Table 46

Results to online survey question 30

Q30: How often are occurrences such as accidents and incidents formally investigated internally? This question doesn't concern any external investigation conducted by an authority.	**(N = 29)**
Never.	10,3%
Rarely.	13,8%
Only when required by law.	13,8%
Often.	10,3%
Always.	37,9%
Don't know (never happened).	13,8%

Table 47

Results to online survey question 31

Q31: On average, how often does your organisation complete formal risk management activities that include the risk assessment itself, the mitigation and the recording of the activity? Note: this question doesn't take into consideration the use of Flight Risk Assessment Tools.	**(N = 29)**
Never.	24,1%
Once or twice a year.	44,8%
About five times a year.	13,8%
About ten times a year.	3,5%
More than ten times a year.	13,8%

Table 48

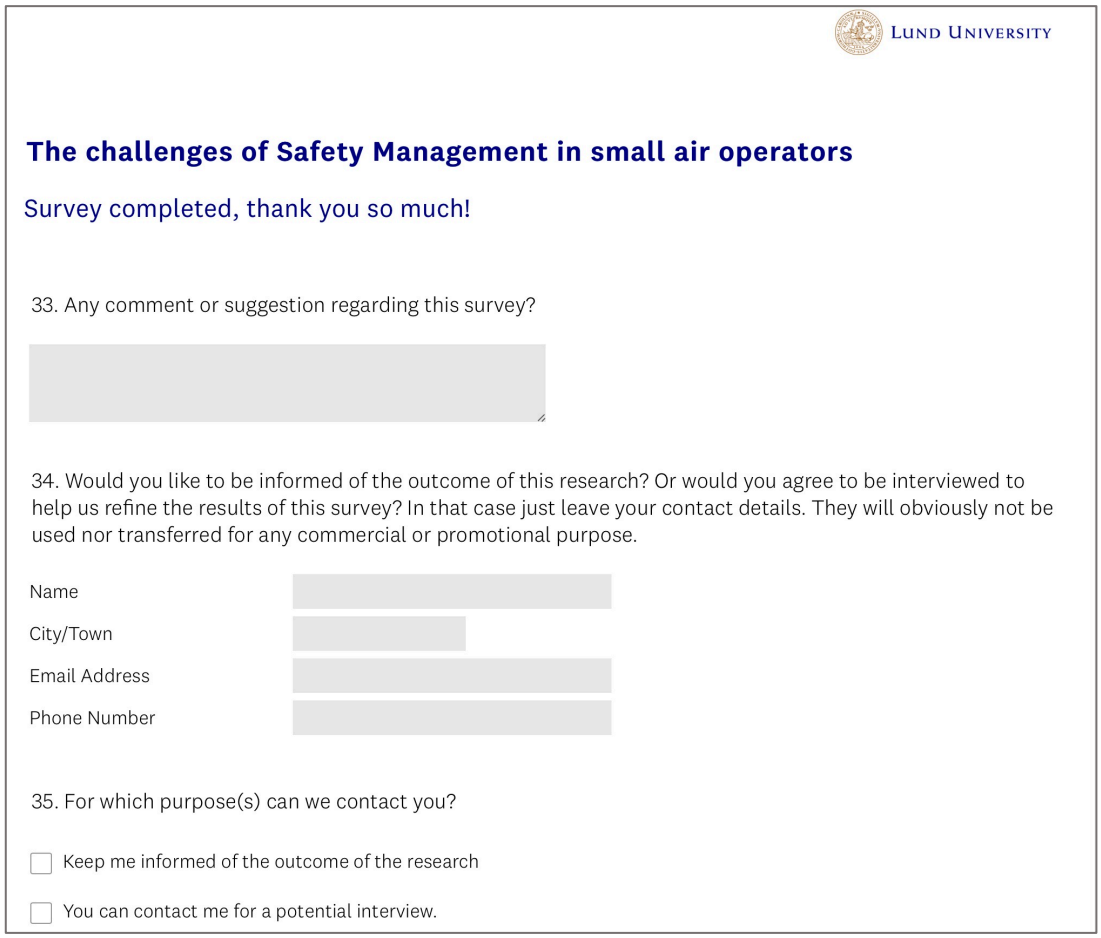
Results to online survey question 32

Q32: Does your organisation use what's commonly known as a Flight Risk Assessment Tool before every flight in order to identify, assess and mitigate risks?	**(N = 29)**
No.	31,0%
Yes, on a minority of flights.	20,7%
Yes, on most flights.	10,3%
Yes, on every flight	37,9%

Questionnaire page 6

Figure 11

Screenshot of the fourth and last page of the online questionnaire



Appendix 4 – Responses from commercial air operators

Theme 1: socio-demographics

Table 49

Results to online survey question 6 (commercial operators)

Q6 - How would you characterise the knowledge of SMS regulatory requirements amongst your management team (or team leaders, if no formal structure is in place)?		**Very aware**	**Somewhat aware**	**Not so aware**	**Not at all aware**
Commercial air operators (n=11)	n	2	8	1	0
	%	*18,2%*	*72,7%*	*9,1%*	*0,0%*
[Data for commercial ops with >20 FTEs, n=7]	*[%]*	*[57,1%]*	*[14,3%]*	*[0,0%]*	*[28,6%]*

Table 50

Results to online survey question 8 (commercial operators)

Q8 – How would you characterise the attitude of the (aviation) managers towards SMS?		**Staff are encouraged, incentivised and actively involved. Involvement is expected.**	**Staff are mildly encouraged and incentivised. Involvement is appreciated.**	**Staff are not encouraged nor incentivised. Involvement is purely optional.**
Commercial air operators (n=11)	n	4	6	1
	%	*36,4%*	*54,6%*	*9,1%*
[Data for commercial ops >20 FTEs, n=7]	*[%]*	*[57,1%]*	*[14,3%]*	*[28,6%]*

Table 51

Results to online survey question 23 (commercial operator)

Q23 – What is the level of involvement of the company owner(s) or founder(s) in the aviation operations?		**Daily**	**Frequent**	**Occasional**	**Only when needed**	**Extremely rare**	**No involvement at all**
Commercial air operators (n=11)	n	4	3	2	1	0	1
	%	*36,4%*	*27,3%*	*18,2%*	*9,1%*	*0,0%*	*9,1%*
[Data for commercial ops >20 FTEs, n=6]	*[%]*	*[50,0%]*	*[33,3%]*	*[0,0%]*	*[0,0%]*	*[0,0%]*	*[16,7%]*

Table 52

Results to online survey question 26 (commercial operator)

Q26 – What is your primary means to communicate safety-relevant information within your organisation?		**Verbal only**	**Mainly verbal, occasionally written**	**Balance between verbal and written**	**Mainly written, occasionally verbal**	**Written only**
Commercial air operators (n=11)	n	4	3	2	1	0
	%	*36,4%*	*27,3%*	*18,2%*	*9,1%*	*0,0%*
[Data for commercial ops >20 FTEs, n=6]	*[%]*	*[0,0%]*	*[0,0%]*	*[83,3%]*	*[16,7%]*	*[0,0%]*

Theme 2: resources for safety

Table 53

Results to online survey question 1 (commercial operator)

Q1 – How would you characterise the resources for safety in your operation?		Scarce	Generally limited	Readily available
Commercial air operators (n=11)	n	0	8	3
	%	*0,0%*	*72,7%*	*27,3%*
[Data for commercial ops with >20 FTEs, n=7]	*[%]*	*[28,6%]*	*[42,9%]*	*[28,6%]*

Table 54

Results to online survey question 5 (commercial operator)

Q5 – How does your organisation generally deal with ancillary tasks (e.g., accounting, administration, management systems, etc.) that are not directly related or a prerequisite to flying activities?		Deadlines/ requirements commonly missed	Deadlines/ requirements occasionally missed	Few or no missed deadlines/ requirements
Commercial air operators (n=11)	n	1	9	1
	%	*9,1%*	*81,8%*	*9,1%*
[Data for commercial ops with >20 FTEs, n=7]	*[%]*	*[28,6%]*	*[28,6%]*	*[42,9%]*

Table 55

Results to online survey question 13 (commercial operator)

Q13 – Has your organisation been involved in an aviation incident or accident?		In the past year	In the past 5 years	In the past 10 years	Over a decade ago	No
Commercial air operators (n=11)	n	4	0	1	0	6
	%	*36,4%*	*0,0%*	*9,1%*	*0,0%*	*54,6%*
[Data for commercial ops with >20 FTEs, n=7]	*[%]*	*[28,6%]*	*[14,3%]*	*[28,6%]*	*[0,0%]*	*[28,6%]*

Table 56

Results to online survey question 29 (commercial operator)

Q29 – Does your organisation have a Safety Manager?		Yes, full-time	Yes, part-time	Yes, contracted	No
Commercial air operators (n=11)	n	1	7	1	2
	%	*9,1%*	*63,6%*	*9,1%*	*18,2%*
[Data for commercial ops with >20 FTEs, n=6]	*[%]*	*[50,0%]*	*[33,3%]*	*[0,0%]*	*[16,7%]*

Table 57

Results to online survey question 16 (commercial operator)

Q16 – Are any of the SMS components particularly difficult to implement or to keep up and running in daily operations?		Safety Policy and Objectives	Safety Risk Management	Safety Assurance	Safety Comms.
Commercial air operators (n=11)	n	5	5	7	6
[Data for commercial ops with >20 FTEs, n=6]	*n*	*3*	*3*	*3*	*4*

Table 58

Results to online survey question 24 (commercial operator)

Q24 –How would you characterise the company efforts during the implementation of SMS?		Very difficult	Difficult	Balanced between difficult and easy	Easy	Very easy
Commercial air operator (n=11)	n	0	5	5	1	0
	%	*0,0%*	*45,5%*	*45,5%*	*9,1%*	*0,0%*
[Data for commercial ops with >20 FTEs, n=6]	*[%]*	*[16,7%]*	*[33,3%]*	*[50,0%]*	*[0,0%]*	*[0,0%]*

Table 59

Results to online survey question 25 (commercial operator)

Q25 – Did your organisation seek the help of an independent consultant or firm to facilitate the SMS implementation?		Yes, the 3rd party managed almost completely, with our support	Yes, in a support role; we managed it	No	Don't know
Commercial air operators (n=11)	n	2	2	7	0
	%	*18,2%*	*18,2%*	*63,6%*	*0,0%*
[Data for commercial ops >20 FTEs, n=6]	*[%]*	*[0,0%]*	*[33,3%]*	*[66,7%]*	*[0,0%]*

Table 60

Results to online survey question 19 (commercial operator)

Q19 – How would you characterize the hazard identification processes in your organisation?		Superficial	Varies between superficial and comprehensive	Comprehensive	Don't know
Commercial air operators (n=11)	n	4	5	2	0
	%	*36,4%*	*45,5%*	*18,2%*	*0,0%*
[Data for commercial ops >20 FTEs, n=6]	*[%]*	*[16,7%]*	*[16,7%]*	*[66,7%]*	*[0,0%]*

Table 61

Results to online survey question 31 (commercial operator)

Q31 – On average, how often does your organisation complete formal risk management activities that include the risk assessment itself, the mitigation and the recording of the activity?		Never	Once or twice per year	About five times per year	About ten times per year	More than ten times per year
Commercial air operators (n=11)	n	3	5	0	0	3
	%	*27,3%*	*45,5%*	*0,0%*	*0,0%*	*27,3%*
[Data for commercial ops >20 FTEs, n=6]	*[%]*	*[16,7%]*	*[33,3%]*	*[16,7%]*	*[0,0%]*	*[33,3%]*

Table 62

Results to online survey question 32 (commercial operator)

Q32 – Does your organisation use what's commonly known as a Flight Risk Assessment Tool before dispatch?		No	Yes, on a minority of flights	Yes, on most flights	Yes, on every flight
Commercial air operators (n=11)	n	3	3	2	3
	%	*27,3%*	*27,3%*	*18,2%*	*27,3%*

Table 63

Results to online survey question 30 (commercial operator)

Q30 – How often are occurrences such as accidents and incidents formally investigated internally?		Never	Rarely	Only when required by law	Often	Always	Don't know
Commercial air operators (n=11)	n	2	1	2	2	3	1
	%	*18,2%*	*9,1%*	*18,2%*	*18,2%*	*27,3%*	*9,1%*
[Data for commercial ops >20 FTEs, n=6]	*[%]*	*[16,7%]*	*[16,7%]*	*[0,0%]*	*[16,7%]*	*[50,0%]*	*[0,0%]*

Table 64

Results to online survey question 28 (commercial operator)

Q28 – Overall, how often does your organisation record safety information learned through company experience?		Never	Rarely	Only when required by law	Often	Always
Commercial air operators (n=11)	n	0	3	4	2	2
	%	*0,0%*	*27,3%*	*36,4%*	*18,2%*	*18,2%*
[Data for commercial ops >20 FTEs, n=6]	*[%]*	*[16,7%]*	*[0,0%]*	*[16,7%]*	*[16,7%]*	*[50,0%]*

Theme 3: institutional environment

Table 65

Results to online survey question 9 (commercial operator)

Q9 – How often is your organisation inspected or audited by a CAA? This doesn't include ramp inspections such as SAFA checks.		Never	Possibly once every four years	About once every two years	Once a year	More than once a year	Don't know, or no inspection yet
Commercial air operators (n=11)	n	1	2	4	2	2	0
	%	*9,1%*	*18,2%*	*36,4%*	*18,2%*	*18,2%*	*0,0%*
[Data for commercial ops >20 FTEs, n=7]	*[%]*	*[0,0%]*	*[0,0%]*	*[0,0%]*	*[42,9%]*	*[57,1%]*	*[0,0%]*

Table 66

Results to online survey question 22 (commercial operator)

Q22 – What is your perception on the availability of resources at your national aviation authority?		Clearly under-resourced	Just enough resources	Well resourced
Commercial air operators (n=11)	n	5	4	2
	%	*45,5%*	*36,4%*	*18,2%*
[Data for commercial ops >20 FTEs, n=6]	*[%]*	*[100,0%]*	*[0,0%]*	*[0,0%]*

Table 67

Results to online survey question 21 (commercial operator)

Q21 – How would you characterize your authority's understanding and application of SMS?		Knowledge and experience higher than ours	Knowledge and experience quite comparable to ours	Knowledge and experience clearly lower than ours	Don't know, no interactions on SMS yet
Commercial air operators (n=11)	n	2	5	1	3
	%	*18,2%*	*45,5%*	*9,1%*	*27,3%*
[Data for commercial ops >20 FTEs, n=6]	*[%]*	*[16,7%]*	*[16,7%]*	*[66,7%]*	*[0,0%]*

Table 68

Results to online survey question 17 (commercial operator)

Q17 – How much influence do you think the smallest operators have in your country/region, in order to steer the regulatory framework and regulations?		None	Very little	Some	A significant amount	A lot
Commercial air operators (n=11)	n	3	6	2	0	0
	%	*27,3%*	*54,6%*	*18,2%*	*0,0%*	*0,0%*
[Data for commercial ops >20 FTEs, n=6]	*[%]*	*[33,3%]*	*[16,7%]*	*[50,0%]*	*[0,0%]*	*[0,0%]*

Table 69

Results to online survey question 15 (commercial operator)

Q15 – How often does your organisation participate in the activities of industry association(s) on safety or regulatory matters?		We are not members of any association	We're members, but rarely participate	We're members, sometimes participate	We're members, regularly participate
Commercial air operators (n=11)	n	3	2	4	2
	%	*27,3%*	*18,2%*	*36,4%*	*18,2%*
[Data for commercial ops >20 FTEs, n=6]	*[%]*	*[33,3%]*	*[16,7%]*	*[33,3%]*	*[16,7%]*

Theme 4: legitimacy

Table 70

Free text submitted in addition to selecting "other"

	Underlying themes
"Contract requirements when submitting a request for proposal (RFP)"	Legitimacy, compliance

Table 71

Results to online survey question 2 (commercial operator)

Q2 – What was the prime argument to implement SMS in your organisation?		Compliance (legitimacy)	Safety	Efficiency	Don't know
Commercial air operator (n=11)	n	8	2	0	1
	%	*72,7%*	*18,2%*	*0,0%*	*9,1%*
[Data for commercial ops >20 FTEs, n=7]	*[%]*	*[42,9%]*	*[57,1%]*	*[0,0%]*	*[0,0%]*

Table 72

Results to online survey question 3 (commercial operator)

Q3 – Was there a secondary argument to start implementing an SMS in your organisation?		Compliance (legitimacy)	Safety	Efficiency	No other reason than the first	Don't know
Commercial air operator (n=11)	n	3	4	0	4	0
	%	*27,3%*	*36,4%*	*0,0%*	*36,4%*	*0,0%*
[Data for commercial ops >20 FTEs, n=7]	*[%]*	*[42,9%]*	*[14,3%]*	*[14,3%]*	*[28,6%]*	*[0,0%]*

Table 73

Results to online survey question 7 (commercial operator)

Q7 – To what degree has your organisation tailored the Operations Manuals and company documentation?		**There's no specific manual**	**Template not tailored, not used**	**OMs reflect very little**	**Only on the most important topics**	**Accurate reflection of actual daily ops**
Commercial air operator (n=11)	n	0	1	1	4	5
	%	*0,0%*	*9,1%*	*9,1%*	*36,4%*	*45,5%*
[Data for commercial ops >20 FTEs, n=7]	*[%]*	*[14,3%]*	*[0,0%]*	*[14,3%]*	*[0,0%]*	*[71,4%]*

Table 74

Results to online survey question 18 (commercial operator)

Q18 – When did the SMS implementation formally start?		**Well in advance of any regulatory mandate**	**Once the framework was published but ahead of the deadline**	**Near the regulatory deadline**	**Well after the regulatory deadline**
Commercial air operator (n=11)	n	2	3	4	2
	%	*18,2%*	*27,3%*	*36,4%*	*18,2%*
[Data for commercial ops >20 FTEs, n=6]	*[%]*	*[66,7%]*	*[0,0%]*	*[0,0%]*	*[33,3%]*

Table 75

Results to online survey question 20 (commercial operator)

Q20 – Has the structure of your organisation changed because of the SMS implementation?		**No (i.e., largely unchanged)**	**Partly (i.e., some changes, new positions)**	**Yes (i.e., significantly different)**
Commercial air operator (n=11)	n	5	4	2
	%	*45,6%*	*36,4%*	*18,2%*
[Data for commercial ops >20 FTEs, n=7]	*[%]*	*[16,7%]*	*[66,7%]*	*[16,7%]*

Appendix 5 - Responses from corporate flight departments

Theme 1: socio-demographics

Table 76

Results to online survey question 6 (corporate flight department)

Q6 - How would you characterise the knowledge of SMS regulatory requirements amongst your management team (or team leaders, if no formal structure is in place)?		**Very aware**	**Somewhat aware**	**Not so aware**	**Not at all aware**
Corporate flight department (n=12)	n	4	6	2	0
	%	*33,3%*	*50,0%*	*16,7%*	*0,0%*
[Data for corp. flt. dpt. >20 FTEs, n=4]	*[%]*	*[50,0%]*	*[25,0%]*	*[25,0%]*	*[0,0%]*

Table 77

Results to online survey question 8 (corporate flight department)

Q8 – How would you characterise the attitude of the (aviation) managers towards SMS?		**Staff are encouraged, incentivised and actively involved. Involvement is expected.**	**Staff are mildly encouraged and incentivised. Involvement is appreciated.**	**Staff are not encouraged nor incentivised. Involvement is purely optional.**
Corporate flight department (n=12)	n	6	5	1
	%	*50,0%*	*41,7%*	*9,1%*
[Data for corp. flt. dpt. >20 FTEs, n=4]	*[%]*	*[75,0%]*	*[0,0%]*	*[25,0%]*

Table 78

Results to online survey question 23 (corporate flight department)

Q23 – What is the level of involvement of the company owner(s) or founder(s) in the aviation operations?		**Daily**	**Frequent**	**Occasional**	**Only when needed**	**Extremely rare**	**No involvement at all**
Corporate flight department (n=10)	n	2	2	2	1	2	1
	%	*20,0%*	*20,0%*	*20,0%*	*10,0%*	*20,0%*	*10,0%*
[Data for corp. flt. dpt. >20 FTEs, n=4]	*[%]*	*[25,0%]*	*[25,0%]*	*[25,0%]*	*[0,0%]*	*[0,0%]*	*[25,0%]*

Table 79

Results to online survey question 26 (corporate flight department)

Q26 – What is your primary means to communicate safety-relevant information within your organisation?		**Verbal only**	**Mainly verbal, occasionally written**	**Balance between verbal and written**	**Mainly written, occasionally verbal**	**Written only**
Corporate flight department (n=10)	n	0	1	4	4	1
	%	*0,0%*	*10,0%*	*40,0%*	*40,0%*	*10,0%*
[Data for corp. flt. dpt. >20 FTEs, n=4]	*[%]*	*[0,0%]*	*[0,0%]*	*[25,0%]*	*[75,0%]*	*[0,0%]*

Theme 2: resources for safety

Table 80

Results to online survey question 1 (corporate flight department)

Q1 – How would you characterise the resources for safety in your operation?		Scarce	Generally limited	Readily available
Corporate flight department (n=12)	n	1	4	7
	%	*8,3%*	*33,3%*	*58,3%*
[Data for corp. flt. dpt. >20 FTEs, n=4]	*[%]*	*[0,0%]*	*[0,0%]*	*[100,0%]*

Table 81

Results to online survey question 5 (corporate flight department)

Q5 – How does your organisation generally deal with ancillary tasks (e.g., accounting, administration, management systems, etc.) that are not directly related or a prerequisite to flying activities?		Deadlines/ requirements commonly missed	Deadlines/ requirements occasionally missed	Few or no missed deadlines/ requirements
Corporate flight department (n=12)	n	2	5	5
	%	*16,7%*	*41,7%*	*41,7%*
[Data for corp. flt. dpt. >20 FTEs, n=4]	*[%]*	*[0,0%]*	*[50,0%]*	*[50,0%]*

Table 82

Results to online survey question 13 (corporate flight department)

Q13 – Has your organisation been involved in an aviation incident or accident?		In the past year	In the past 5 years	In the past 10 years	Over a decade ago	No
Corporate flight department (n=12)	n	1	1	0	3	7
	%	*8,3%*	*8,3*	*0,0%*	*25,0%*	*58,3%*
[Data for corp. flt. dpt. >20 FTEs, n=4]	*[%]*	*[0,0%]*	*[25,0%]*	*[0,0%]*	*[0,0%]*	*[75,0%]*

Table 83

Results to online survey question 29 (corporate flight department)

Q29 – Does your organisation have a Safety Manager?		Yes, full-time	Yes, part-time	Yes, contracted	No
Corporate flight department (n=10)	n	3	6	0	1
	%	*30,0%*	*60,0%*	*0,0%*	*10,0%*
[Data for corp. flt. dpt. >20 FTEs, n=4]	*[%]*	*[75,0%]*	*[25,0%]*	*[0,0%]*	*[0,0%]*

Table 84

Results to online survey question 16 (corporate flight department)

Q16 – Are any of the SMS components particularly difficult to implement or to keep up and running in daily operations?		Safety Policy and Objectives	Safety Risk Management	Safety Assurance	Safety Comms.
Corporate flight department (n=11)	n	3	4	6	4
[Data for corp. flt. dpt. >20 FTEs, n=4]	*n*	*1*	*1*	*3*	*2*

Table 85

Results to online survey question 24 (corporate flight department)

Q24 –How would you characterise the company efforts during the implementation of SMS?		Very difficult	Difficult	Balanced between difficult and easy	Easy	Very easy
Corporate flight department (n=10)	n	0	2	5	2	1
	%	*0,0%*	*20,0%*	*50,0%*	*20,0%*	*10,0%*
[Data for corp. flt. dpt. >20 FTEs, n=4]	*[%]*	*[0,0%]*	*[25,0%]*	*[75,0%]*	*[0,0%]*	*[0,0%]*

Table 86

Results to online survey question 25 (corporate flight department)

Q25 – Did your organisation seek the help of an independent consultant or firm to facilitate the SMS implementation?		Yes, the 3rd party managed almost completely, with our support	Yes, in a support role; we managed it	No	Don't know
Corporate flight department (n=10)	n	2	4	4	0
	%	*20,0%*	*40,0%*	*40,0%*	*0,0%*
[Data for corp. flt. dpt. >20 FTEs, n=4]	*[%]*	*[0,0%]*	*[25,0%]*	*[50,0%]*	*[25,0%]*

Table 87

Results to online survey question 19 (corporate flight department)

Q19 – How would you characterize the hazard identification processes in your organisation?		Superficial	Varies between superficial and comprehensive	Comprehensive	Don't know
Corporate flight department (n=11)	n	2	5	4	0
	%	*18,2%*	*45,5%*	*36,4%*	*0,0%*
[Data for corp. flt. dpt. >20 FTEs, n=4]	*[%]*	*[25,0%]*	*[0,0%]*	*[50,0%]*	*[25,0%]*

Table 88

Results to online survey question 31 (corporate flight department)

Q31 – On average, how often does your organisation complete formal risk management activities that include the risk assessment itself, the mitigation and the recording of the activity?		Never	Once or twice per year	About five times per year	About ten times per year	More than ten times per year
Corporate flight department (n=10)	n	1	5	4	0	0
	%	*10,0%*	*50,0%*	*40,0%*	*0,0%*	*0,0%*
[Data for corp. flt. dpt. >20 FTEs, n=4]	*[%]*	*[0,0%]*	*[50,0%]*	*[25,0%]*	*[0,0%]*	*[25,0%]*

Table 89

Results to online survey question 32 (corporate flight department)

Q32 – Does your organisation use what's commonly known as a Flight Risk Assessment Tool before dispatch?		No	Yes, on a minority of flights	Yes, on most flights	Yes, on every flight
Corporate flight department (n=10)	n	3	1	0	6
	%	*30,0%*	*10,0%*	*0,0%*	*60,0%*
[Data for corp. flt. dpt. >20 FTEs, n=4]	*[%]*	*[0,0%]*	*[0,0%]*	*[0,0%]*	*[100,0%]*

Table 90

Results to online survey question 30 (corporate flight department)

Q30 – How often are occurrences such as accidents and incidents formally investigated internally?		**Never**	**Rarely**	**Only when required by law**	**Often**	**Always**	**Don't know (never happened)**
Corporate flight department (n=10)	n	0	0	1	1	6	2
	%	*0,0%*	*0,0%*	*10,0%*	*10,0%*	*60,0%*	*20,0%*
[Data for corp. flt. dpt. >20 FTEs, n=4]	*[%]*	*[0,0%]*	*[0,0%]*	*[0,0%]*	*[50,0%]*	*[25,0%]*	*[25,0%]*

Table 91

Results to online survey question 28 (corporate flight department)

Q28 – Overall, how often does your organisation record safety information learned through company experience?		**Never**	**Rarely**	**Only when required by law**	**Often**	**Always**
Corporate flight department (n=10)	n	0	3	0	3	4
	%	*0,0%*	*30,0%*	*0,0%*	*30,0%*	*40,0%*
[Data for corp. flt. dpt. >20 FTEs, n=4]	*[%]*	*[0,0%]*	*[0,0%]*	*[0,0%]*	*[50,0%]*	*[50,0%]*

Theme 3: institutional environment

Table 92

Results to online survey question 9 (corporate flight department)

Q9 – How often is your organisation inspected or audited by a CAA? This doesn't include ramp inspections such as SAFA checks.		Never	Possibly once every four years	About once every two years	Once a year	More than once a year	Don't know, or no inspection yet
Corporate flight department (n=12)	n	4	2	0	2	2	2
	%	*33,3%*	*16,7%*	*0,0%*	*16,7%*	*16,7%*	*16,7%*
[Data for corp. flt. dpt. >20 FTEs, n=4]	*[%]*	*[0,0%]*	*[25,0%]*	*[50,0%]*	*[0,0%]*	*[0,0%]*	*[25,0%]*

Table 93

Results to online survey question 22 (corporate flight department)

Q22 – What is your perception on the availability of resources at your national aviation authority?		Clearly under-resourced	Just enough resources	Well resourced
Corporate flight department (n=11)	n	6	3	2
	%	*54,6%*	*27,3%*	*18,2%*
[Data for corp. flt. dpt. >20 FTEs, n=4]	*[%]*	*[75,0%]*	*[0,0%]*	*[25,0%]*

Table 94

Results to online survey question 21 (corporate flight department)

Q21 – How would you characterize your authority's understanding and application of SMS?		Knowledge and experience higher than ours	Knowledge and experience quite comparable to ours	Knowledge and experience clearly lower than ours	Don't know, no interactions on SMS yet
Corporate flight department (n=11)	n	1	8	0	2
	%	*9,1%*	*72,73%*	*0,0%*	*18,2%*
[Data for corp. flt. dpt. >20 FTEs, n=4]	*[%]*	*[0,0%]*	*[50,0%]*	*[25,0%]*	*[25,0%]*

Table 95

Results to online survey question 17 (corporate flight department)

Q17 – How much influence do you think the smallest operators have in your country/region, in order to steer the regulatory framework and regulations?		None	Very little	Some	A significant amount	A lot
Corporate flight department (n=11)	n	1	6	4	0	0
	%	*9,1%*	*54,6%*	*36,4%*	*0,0%*	*0,0%*
[Data for corp. flt. dpt. >20 FTEs, n=4]	*[%]*	*[25,0%]*	*[25,0%]*	*[25,0%]*	*[25,0%]*	*[0,0%]*

Table 96

Results to online survey question 15 (corporate flight department)

Q15 – How often does your organisation participate in the activities of industry association(s) on safety or regulatory matters?		We're not members	We're members, and rarely participate	We're members, sometimes participate	We're members, regularly participate
Corporate flight department (n=11)	n	2	2	3	4
	%	*18,2%*	*18,2%*	*27,3%*	*36,4%*
[Data for corp. flt. dpt. >20 FTEs, n=4]	*[%]*	*[0,0%]*	*[0,0%]*	*[25,0%]*	*[75,0%]*

Theme 4: legitimacy

Table 97

Free text submitted in addition to selecting "other"

	Underlying themes
"View of safety challenges without emotion and identifying trends"	Safety

Table 98

Results to online survey question 2 (corporate flight department)

Q2 – What was the prime argument to implement SMS in your organisation?		**Compliance (legitimacy)**	**Safety**	**Efficiency**	**Don't know**
Corporate flight department (n=12)	n	6	6	0	0
	%	50,0%	50,0%	0,0%	0,0%
[Data for corp. flt. dpt. >20 FTEs, n=4]	*[%]*	*[50,0%]*	*[50,0%]*	*[0,0%]*	*[0,0%]*

Table 99

Results to online survey question 3 (corporate flight department)

Q3 – Was there a secondary argument to start implementing SMS in your organisation?		**Compliance (legitimacy)**	**Safety**	**Efficiency**	**No other reason than the first**	**Don't know**
Corporate flight department (n=12)	n	2	5	0	4	1
	%	16,7%	41,7%	0,0%	33,3%	8,3%
[Data for corp. flt. dpt. >20 FTEs, n=4]	*[%]*	*[0,0%]*	*[25,0%]*	*[0,0%]*	*[75,0%]*	*[0,0%]*

Table 100

Results to online survey question 63 (corporate flight department)

Q7 – To what degree has your organisation tailored the Operations Manuals and company documentation?		**There's no specific manual**	**Template not tailored, not used**	**OMs reflect very little**	**Only on the most important topics**	**Accurate reflection of actual daily ops**
Corporate flight department (n=12)	n	0	0	0	5	7
	%	*0,0%*	*0,0%*	*0,0%*	*41,7%*	*58,3%*
[Data for corp. flt. dpt. >20 FTEs, n=4]	*[%]*	*[0,0%]*	*[0,0%]*	*[0,0%]*	*[50,0%]*	*[50,0%]*

Table 101

Results to online survey question 64 (corporate flight department)

Q18 – When did the SMS implementation formally start?		**Well in advance of any regulatory mandate**	**Once the framework was public but ahead of the deadline**	**Near the regulatory deadline**	**Well after the regulatory deadline**	**Don't know, not applicable**
Corporate flight department (n=11)	n	4	1	1	1	4
	%	*36,4%*	*14,3%*	*14,3%*	*14,3%*	*36,4%*
[Data for corp. flt. dpt. >20 FTEs, n=4]	*[%]*	*[50,0%]*	*[0,0%]*	*[25,0%]*	*[0,0%]*	*[25,0%]*

Table 102

Results to online survey question 20 (corporate flight department)

Q20 – Has the structure of your organisation changed because of the SMS implementation?		**No (i.e., largely unchanged)**	**Partly (i.e., some changes, new positions)**	**Yes (i.e., significantly different)**
Corporate flight department (n=11)	n	3	6	2
	%	*27,3%*	*54,6%*	*18,2%*
[Data for corp. flt. dpt. >20 FTEs, n=4]	*[%]*	*[25,0%]*	*[25,0%]*	*[50,0%]*

Appendix 6 - Responses from non-commercial air operators

Theme 1: socio-demographics

Table 103

Results to online survey question 6 (non-commercial operator)

Q6 - How would you characterise the knowledge of SMS regulatory requirements amongst your management team (or team leaders, if no formal structure is in place)?		Very aware	Somewhat aware	Not so aware	Not at all aware
Non-commercial air operator (n=8)	n	1	2	4	1
	%	*12,5%*	*25,0%*	*50,0%*	*12,5%*
[Data for non-commercial ops >20 FTEs, n=2]	*[%]*	*[50,0%]*	*[50,0%]*	*[0,0%]*	*[0,0%]*

Table 104

Results to online survey question 8 (non-commercial operator)

Q8 – How would you characterise the attitude of the (aviation) managers towards SMS?		Staff are encouraged, incentivised and actively involved. Involvement is expected.	Staff are mildly encouraged and incentivised. Involvement is appreciated.	Staff are not encouraged nor incentivised. Involvement is purely optional.
Non-commercial air operator (n=8)	n	0	7	1
	%	*0,0%*	*87,5%*	*12,5%*
[Data for non-commercial ops >20 FTEs, n=2]	*[%]*	*[0,0%]*	*[50,0%]*	*[50,0%]*

Table 105

Results to online survey question 23 (non-commercial operator)

Q23 – What is the level of involvement of the company owner(s) or founder(s) in the aviation operations?		Daily	Frequent	Occasional	Only when needed	Extremely rare	No involvement at all
Non-commercial air operator (n=8)	n	1	2	1	3	0	1
	%	*12,5%*	*25,0%*	*12,5%*	*37,5%*	*0,0%*	*12,5%*
[Data for non-commercial ops >20 FTEs, n=2]	*[%]*	*[0,0%]*	*[0,0%]*	*[100,0%]*	*[0,0%]*	*[0,0%]*	*[0,0%]*

Table 106

Results to online survey question 26 (non-commercial operator)

Q26 – What is your primary means to communicate safety-relevant information within your organisation?		Verbal only	Mainly verbal, occasionally written	Balance between verbal and written	Mainly written, occasionally verbal	Written only
Non-commercial air operator (n=8)	n	0	4	1	3	0
	%	*0,0%*	*50,0%*	*12,5%*	*37,5%*	*0,0%*
[Data for non-commercial ops >20 FTEs, n=2]	*[%]*	*[0,0%]*	*[0,0%]*	*[100,0%]*	*[0,0%]*	*[0,0%]*

Theme 2: resources for safety

Table 107

Results to online survey question 1 (non-commercial operator)

Q1 – How would you characterise the resources for safety in your operation?		Scarce	Generally limited	Readily available
Non-commercial air operator (n=7)	n	1	1	5
	%	*14,3%*	*14,3%*	*71,4%*
[Data for non-commercial ops >20 FTEs, n=2]	*[%]*	*[0,0%]*	*[100,0%]*	*[0,0%]*

Table 108

Results to online survey question 5 (non-commercial operator)

Q5 – How does your organisation generally deal with ancillary tasks (e.g., accounting, administration, management systems, etc.) that are not directly related or a prerequisite to flying activities?		Deadlines/ requirements commonly missed	Deadlines/ requirements occasionally missed	Few or no missed deadlines/ requirements
Non-commercial air operator (n=8)	n	2	4	2
	%	*25,0%*	*50,0%*	*25,0%*
[Data for non-commercial ops >20 FTEs, n=2]	*[%]*	*[0,0%]*	*[50,0%]*	*[50,0%]*

Table 109

Results to online survey question 13 (non-commercial operator)

Q13 – Has your organisation been involved in an aviation incident or accident?		In the past year	In the past 5 years	In the past 10 years	Over a decade ago	No
Non-commercial air operator (n=8)	n	2	2	0	0	4
	%	*25,0%*	*25,0%*	*0,0%*	*0,0%*	*50,0%*
[Data for non-commercial ops >20 FTEs, n=2]	*[%]*	*[0,0%]*	*[25,0%]*	*[0,0%]*	*[0,0%]*	*[75,0%]*

Table 110

Results to online survey question 29 (non-commercial operator)

Q29 – Does your organisation have a Safety Manager?		Yes, full-time	Yes, part-time	Yes, contracted	No
Non-commercial air operator (n=8)	n	2	4	0	2
	%	*25,0%*	*50,0%*	*0,0%*	*25,0%*
[Data for non-commercial ops >20 FTEs, n=2]	*[%]*	*[0,0%]*	*[100,0%]*	*[0,0%]*	*[0,0%]*

Table 111

Results to online survey question 16 (non-commercial operator)

Q16 – Are any of the SMS components particularly difficult to implement or to keep up and running in daily operations?		Safety Policy and Objectives	Safety Risk Management	Safety Assurance	Safety Comms.
Non-commercial air operator (n=8)	n	4	4	4	4
[Data for non-commercial ops >20 FTEs, n=2]	*n*	*1*	*0*	*2*	*1*

Table 112

Results to online survey question 24 (non-commercial operator)

Q24 –How would you characterise the company efforts during the implementation of SMS?		**Very difficult**	**Difficult**	**Balanced between difficult and easy**	**Easy**	**Very easy**
Non-commercial air operator (n=8)	n	1	2	5	0	0
	%	*12,5%*	*25,0%*	*62,5%*	*0,0%*	*0,0%*
[Data for non-commercial ops >20 FTEs, n=2]	*[%]*	*[0,0%]*	*[0,0%]*	*[100,0%]*	*[0,0%]*	*[0,0%]*

Table 113

Results to online survey question 25 (non-commercial operator)

Q25 – Did your organisation seek the help of an independent consultant or firm to facilitate the SMS implementation?		**Yes, the 3rd party managed almost completely, with our support**	**Yes, in a support role; we managed it**	**No**	**Don't know**
Non-commercial air operator (n=8)	n	0	3	3	2
	%	*0,0%*	*37,5%*	*37,5%*	*25,0%*
[Data for non-commercial ops >20 FTEs, n=2]	*[%]*	*[0,0%]*	*[0,0%]*	*[100,0%]*	*[0,0%]*

Table 114

Results to online survey question 19 (non-commercial operator)

Q19 – How would you characterize the hazard identification processes in your organisation?		**Superficial**	**Varies between superficial and comprehensive**	**Comprehensive**	**Don't know**
Non-commercial air operator (n=8)	n	3	3	2	0
	%	*37,5%*	*37,5%*	*25,0%*	*0,0%*
[Data for non-commercial ops >20 FTEs, n=2]	*[%]*	*[50,0%]*	*[50,0%]*	*[0,0%]*	*[0,0%]*

Table 115

Results to online survey question 31 (non-commercial operator)

Q31 – On average, how often does your organisation complete formal risk management activities that include the risk assessment itself, the mitigation and the recording of the activity?		**Never**	**Once or twice per year**	**About five times per year**	**About ten times per year**	**More than ten times per year**
Non-commercial air operator (n=8)	n	3	3	0	1	1
	%	*37,5%*	*37,5%*	*0,0%*	*12,5%*	*12,5%*
[Data for non-commercial ops >20 FTEs, n=2]	*[%]*	*[0,0%]*	*[50,0%]*	*[0,0%]*	*[50,0%]*	*[0,0%]*

Table 116

Results to online survey question 32 (non-commercial operator)

Q32 – Does your organisation use what's commonly known as a Flight Risk Assessment Tool before dispatch?		**No**	**Yes, on a minority of flights**	**Yes, on most flights**	**Yes, on every flight**
Non-commercial air operator (n=8)	n	3	2	1	2
	%	*37,5%*	*25,0%*	*12,5%*	*25,0%*
[Data for non-commercial ops >20 FTEs, n=2]	*[%]*	*[0,0%]*	*[0,0%]*	*[0,0%]*	*[100,0%]*

Table 117

Results to online survey question 30 (non-commercial operator)

Q30 – How often are occurrences such as accidents and incidents formally investigated internally?		Never	Rarely	Only when required by law	Often	Always	Don't know (never happened)
Non-commercial air operator (n=8)	n	1	3	1	0	2	1
	%	*12,5%*	*37,5%*	*12,5%*	*0,0%*	*25,0%*	*12,5%*
[Data for non-commercial ops >20 FTEs, n=2]	*[%]*	*[0,0%]*	*[0,0%]*	*[0,0%]*	*[0,0%]*	*[100,0%]*	*[0,0%]*

Table 118

Results to online survey question 28 (non-commercial operator)

Q28 – Overall, how often does your organisation record safety information learned through company experience?		Never	Rarely	Only when required by law	Often	Always
Non-commercial air operator (n=8)	n	2	1	1	3	1
	%	*25,0%*	*12,5%*	*12,5%*	*37,5%*	*12,5%*
[Data for non-commercial ops >20 FTEs, n=2]	*[%]*	*[0,0%]*	*[0,0%]*	*[0,0%]*	*[50,0%]*	*[50,0%]*

Theme 3: institutional environment

Table 119

Results to online survey question 9 (non-commercial operator)

Q9 – How often is your organisation inspected or audited by a CAA? This doesn't include ramp inspections such as SAFA checks.		Never	Possibly once every four years	About once every two years	Once a year	More than once a year	Don't know, or no inspection yet
Non-commercial air operator (n=8)	n	3	0	2	3	0	0
	%	*37,5%*	*0,0%*	*25,0%*	*37,5%*	*0,0%*	*0,0%*
[Data for non-commercial ops >20 FTEs, n=2]	*[%]*	*[50,0%]*	*[0,0%]*	*[50,0%]*	*[0,0%]*	*[0,0%]*	*[0,0%]*

Table 120

Results to online survey question 22 (non-commercial operator)

Q22 – What is your perception on the availability of resources at your national aviation authority?		Clearly under-resourced	Just enough resources	Well resourced
Non-commercial air operator (n=8)	n	5	3	0
	%	*62,5%*	*37,5%*	*0,0%*
[Data for non-commercial ops >20 FTEs, n=2]	*[%]*	*[50,0%]*	*[0,0%]*	*[50,0%]*

Table 121

Results to online survey question 21 (non-commercial operator)

Q21 – How would you characterize your authority's understanding and application of SMS?		**Knowledge and experience higher than ours**	**Knowledge and experience quite comparable to ours**	**Knowledge and experience clearly lower than ours**	**Don't know, no interactions on SMS yet**
Non-commercial air operator (n=8)	n	0	2	5	1
	%	*0,0%*	*25,0%*	*62,5%*	*12,5%*
[Data for non-commercial ops >20 FTEs, n=2]	*[%]*	*[0,0%]*	*[50,0%]*	*[50,0%]*	*[0,0%]*

Table 122

Results to online survey question 17 (non-commercial operator)

Q17 – How much influence do you think the smallest operators have in your country/region, in order to steer the regulatory framework and regulations?		**None**	**Very little**	**Some**	**A significant amount**	**A lot**
Non-commercial air operator (n=8)	n	1	6	1	0	0
	%	*12,5%*	*75,0%*	*12,5%*	*0,0%*	*0,0%*
[Data for non-commercial ops >20 FTEs, n=2]	*[%]*	*[50,0%]*	*[50,0%]*	*[0,0%]*	*[0,0%]*	*[0,0%]*

Table 123

Results to online survey question 15 (non-commercial operator)

Q15 – How often does your organisation participate in the activities of industry association(s) on safety or regulatory matters?		**We're not members**	**We're members, and rarely participate**	**We're members, sometimes participate**	**We're members, regularly participate**
Non-commercial air operator (n=8)	n	1	1	3	3
	%	*12,5%*	*12,5%*	*37,5%*	*37,5%*
[Data for non-commercial ops >20 FTEs, n=2]	*[%]*	*[50,0%]*	*[50,0%]*	*[0,0%]*	*[0,0%]*

Theme 4: legitimacy

Table 124

Free text submitted in addition to selecting "other"

	Underlying themes
"Competitive advantage"	Legitimacy
"Standardisation of training, procedures, and accountability"	Safety
"Safety and best practices; marketing to passengers"	Safety (primary theme); legitimacy (secondary theme)

Table 125

Results to online survey question 2 (non-commercial operator)

Q2 – What was the prime argument to implement SMS in your organisation?		**Compliance (legitimacy)**	**Safety**	**Efficiency**	**Don't know**
Non-commercial air operator (n=8)	n	3	5	0	0
	%	37,5%	62,5%	0,0%	0,0%
[Data for non-commercial ops >20 FTEs, n=2]	*[%]*	*[100,0%]*	*[0,0%]*	*[0,0%]*	*[0,0%]*

Table 126

Results to online survey question 3 (non-commercial operator)

Q3 – Was there a secondary argument to start implementing SMS in your organisation?		**Compliance (legitimacy)**	**Safety**	**Efficiency**	**No other reason than the first**	**Don't know**
Non-commercial air operator (n=8)	n	4	0	1	2	1
	%	50,0%	0,0%	12,5%	25,0%	12,5%
[Data for non-commercial ops >20 FTEs, n=2]	*[%]*	*[0,0%]*	*[100,0%]*	*[0,0%]*	*[0,0%]*	*[0,0%]*

Table 127

Results to online survey question 7 (non-commercial operator)

Q7 – To what degree has your organisation tailored the Operations Manuals and company documentation?		**There's no specific manual**	**Template not tailored, not used**	**OMs reflect very little**	**Only on the most important topics**	**Accurate reflection of actual daily ops**
Non-commercial air operator (n=8)	n	1	0	1	4	2
	%	*12,5%*	*0,0%*	*12,5%*	*50,0%*	*25,0%*
[Data for non-commercial ops >20 FTEs, n=2]	*[%]*	*[0,0%]*	*[0,0%]*	*[0,0%]*	*[100,0%]*	*[0,0%]*

Table 128

Results to online survey question 18 (non-commercial operator)

Q18 – When did the SMS implementation formally start?		**Well in advance of any regulatory mandate**	**Once the framework was public but ahead of the deadline**	**Near the regulatory deadline**	**Well after the regulatory deadline**	**Don't know, not applicable**
Non-commercial air operator (n=8)	n	2	2	1	0	3
	%	*25,0%*	*25,0%*	*12,5%*	*0,0%*	*37,5%*
[Data for non-commercial ops >20 FTEs, n=2]	*[%]*	*[0,0%]*	*[50,0%]*	*[50,0%]*	*[0,0%]*	*[0,0%]*

Table 129

Results to online survey question 92 (non-commercial operator)

Q20 – Has the structure of your organisation changed because of the SMS implementation?		**No (i.e., largely unchanged)**	**Partly (i.e., some changes, new positions)**	**Yes (i.e., significantly different)**
Non-commercial air operator (n=8)	n	5	2	1
	%	*62,5%*	*25,0%*	*12,5%*
[Data for non-commercial ops >20 FTEs, n=2]	*[%]*	*[50,0%]*	*[50,0%]*	*[0,0%]*

Appendix 7 – Experiment with survey data

The research question addresses a sector and issues that are both multifaceted, rich and complex. Analyses of both the pilot survey and the online survey support the perspective that business aviation operators with twenty FTEs or less cannot be grouped into a monolithic block due to the heterogeneity of their responses. Though imperfect, a quick experiment was performed to try and determine if the gap between the three types of operations could somehow be put into numbers like in the pilot survey, which then allowed to identify similarities and contrasts between the three types of operations a little bit better. To this end, the answers to each close-ended question were compared on two aspects: the ranking of the various answers to a question and the difference in the percentage of each answer in one type of operation with the percentage of the corresponding answer for another type of operation. One of four possible scores was then assigned to each comparison (see appendix 4 for detailed scores):

- The score given to the comparison was (-2) if the percentage achieved by one specific answer was at least the double of the percentage achieved by the same answer in the other type of operation, and if the ranking of the answers was different,
- The score given was (-1) if the gap between the answers per operation type was large, or the ranking of the answers was different between one type of operation and the other,
- The score given was (+1) if the percentage achieved by one specific answer was less than half the percentage achieved by the same answer in the other type of operation, or the ranking of the answers was identical,
- The score given was (+2) if there was a small gap between one type of operation and the other, and the ranking of the answers was identical.

Since the online survey did not only contain multiple-choice questions, the comparison was done for 28 of the 32 questions. This created a continuum ranging from a potential total score of -56 (i.e., the two types of operations being compared are totally different) to +56 (i.e., the two types of operations are identical). From one question to the other, the operators diverge or converge according to their specificities, needs and constraints. Once all the scores are aggregated, a total close to zero indicates that the differences and similarities between two types of operations eventually neutralize. Table 130 (overleaf) shows the total score achieved when comparing the answers to the 28 survey questions.

Table 130

Scores from the comparisons between two types of operations

Scores given to try and compare the differences and similarities between two types of operations.

- -2: large percentage gap (>50%) and different ranking of the answers
- -1: large percentage gap (>50%) or different ranking of the answers
- +1: small percentage gap (<50%) or identical ranking of the answers
- +2: small percentage gap (<50%) and identical ranking of the answers

Question	Theme	Commercial operator vs. corporate flight dept.	Corporate vs. non-commercial operator	Commercial vs. non-commercial operator
Q1	Resources	-2	1	-2
Q2	Legitimacy	-1	-1	-2
Q3	Legitimacy	2	-1	-2
Q5	Resources	-2	1	-1
Q6	Socio-dem.	2	-2	-2
Q7	Legitimacy	2	-2	-1
Q8	Socio-dem.	1	-2	-2
Q9	Instit. env.	-2	-1	-2
Q12	Socio-dem.	-2	-2	-2
Q13	Resources	-1	-1	-1
Q15	Instit. env.	-1	-1	-1
Q16	Resources	1	1	1
Q17	Instit. env.	-1	1	-1
Q18	Legitimacy	-2	-1	-1
Q19	Resources	-1	-1	-1
Q20	Legitimacy	-1	-2	-1
Q21	Instit. env.	2	-2	-2
Q22	Instit. env.	2	1	1
Q23	Socio-dem.	-1	-1	-2
Q24	Resources	-1	1	-1
Q25	Resources	-1	1	-2
Q26	Socio-dem.	2	-2	-2
Q27	Resources	-1	-1	-1
Q28	Resources	-2	-2	-2
Q29	Resources	1	2	-1
Q30	Resources	-1	-2	-2
Q31	Resources	-1	-2	-2
Q32	Resources	-2	-2	1
	TOTAL	**-11**	**-22**	**-36**

Considering the range (i.e., from -56 to +56), the total scores suggest that all three types of operations are indeed different, at varying degrees. In other words, the operators don't seem to be equidistant. As far as the respondents to the online questionnaire are concerned and considering that on average they all have the same fleet sizes, the self-portrait painted in the survey by corporate flight department staffs seems closer to the one painted by commercial operators (i.e., comparative score of -11) than to the one painted by non-commercial operators (i.e., comparative score of -22). This may appear paradoxical since both corporate flight departments and non-commercial operators typically share the same regulatory framework and business model, and both are reportedly reasonably shielded from the struggle for survival that 'pure' commercial air operators constantly face. Yet, commercial and corporate operators appear

to be the "least different", with the greatest contrast appearing between commercial and non-commercial operators (i.e., comparative score of -36). Considering that the research themes didn't have the same number of questions (table 131), it seems prudent to avoid any overall conclusion only based on that criterion alone.

Table 131

Consolidation of the results in table 130 based on the theme used in the online survey.

Survey themes	Commercial operator vs. corporate flight dept.	Corporate vs. non-commercial operator	Commercial vs. non-commercial operator
Socio-demographic attributes *(5 questions)*	2	-9	-10
Resources for safety *(13 questions)*	-13	-4	-14
Institutional environment *(5 questions)*	0	-2	-5
Legitimacy *(5 questions)*	0	-7	-7

Although this experiment certainly doesn't provide any conclusive statements, it points in directions where (dis)agreement – or at least the greatest contrast – between the various types of operators could readily be found, for instance by listing the questions where they seemed to converge or diverge the most (i.e., by having at least a 3-point difference between two comparisons, see appendix 4).

Corporate flight departments converged with commercial operations (and in the process diverged with non-commercial operations) regarding:

- Q3: the secondary argument for implementing SMS (i.e., safety),
- Q6: the managers' knowledge of SMS (i.e., somewhat aware),
- Q7: the tailoring of the Ops Manual to daily operations (i.e., fully done or only on important topics),
- Q8: the managers' attitude toward SMS (i.e., staff involvement is appreciated),
- Q21: the perception of the CAA's understanding of SMS (i.e., comparable to theirs), and
- Q26: the primary means to communicate safety matters (i.e., mix of verbal and written).

On the other hand, corporate flight departments diverged with commercial operations (and in the process converged with non-commercial operations) regarding:

- Q1: the availability of resources for safety (i.e., readily available),
- Q5: the ability to deal with non-core tasks and to meet deadlines (i.e., generally no missed deadline or requirement, although an exception is possible),

Lastly, this experiment unexpectedly resonated and somewhat confirmed a pattern revealed in the pilot survey where, notwithstanding the inevitable little differences, corporate flight departments and commercial operators generated fairly identical answers against which 'owner operations' sharply contrasted. In other words, the respondents to both surveys shared a fairly similar view of their industry (to the best of my knowledge, no respondent participated in both surveys).

Appendix 8 – Origins of business aviation

The operation of aircraft for the purpose of promoting a company's business is almost as old as aviation itself. Historians generally credit a young and rather intrepid aeronaut who achieved an advertising flight aboard a semi-rigid motorized balloon called the Gelatine over Portland, Oregon on 16 September 1905 for making the very first flight for business purposes. It then took a few more years before an airplane, and not an airship, was used. In 1910, at the request of the president of a local dry store, the Wright brothers used their historic Flyer to transport a bolt of silk material from Dayton to Columbus, Ohio (Cannon, 2012).

Between the Gelatine and World War I, aircraft were rarely used for personal or business purposes. On the one hand, the open-cockpit biplanes of that era necessitated the wearing of goggles and specific clothing which weren't very practical for executive travel. On the other hand, those airplanes weren't reliable enough to ensure safe and convenient transport. The first aircraft with an enclosed cabin appeared in the 1920s. This truly marked the beginning of corporate aviation, with a few forward-thinking and wealthy companies such as Shell Oil, Gulf Oil and Pepsi-Cola purchasing the Stinson Reliant to fly their customers and executives around the US (Cannon, 2012).

At the end of World War II, the growth of business aviation was initially fuelled by the availability of both cheap war-surplus aircraft and the many new airports built to support war efforts. General aviation manufacturers such as Cessna, Gulfstream and Piper also saw the potential for growth and developed new airplanes and new engines to meet the demand, thereby contributing to the explosive expansion of business aviation. Although it looks more like the jet trainer it was intended to be, the 4-seater Morane-Saulnier MS.760 Paris is considered as the first business jet. It has been operated by the Timken Roller Bearing Co. since 1958, and by the Italian oil company ENI since 1960. Approximately at the same time, airliner manufacturer Lockheed first flew it 4-engine JetStar, which was the first dedicated business jet to enter service (in 1961). This era also coincides with the introduction of helicopters in corporate flight departments, primarily to fly personnel and supplies to and from oil rigs in the Gulf of Mexico (Cannon, 2012).

Many aircraft and designs equipped with various types of engines followed their path, partly fuelled by the rise and the specific needs of multinational corporations in the 1980s.

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Last but definitely not least, this journey cannot end without profusely thanking Dr Laura Maguire for putting me on course towards Lund precisely four years ago. I prefer not to think about an alternative history where we don't meet in Liège during REA'17.

You do look, my son, in a mov'd sort,
As if you were dismay'd; be cheerful, sir.
Our revels now are ended. These our actors,
As I foretold you, were all spirits, and
Are melted into air, into thin air;
And, like the baseless fabric of this vision,
The cloud-capp'd towers, the gorgeous palaces,
The solemn temples, the great globe itself,
Yea, all which it inherit, shall dissolve,
And, like this insubstantial pageant faded,
Leave not a rack behind. We are such stuff
As dreams are made on; and our little life
Is rounded with a sleep.

(Shakespeare, The Tempest)