THE EFFECTS ON LANGUAGE AND CURRICULUM OF FLIGHT SAFETY TRAINING USED IN HELICOPTER EMERGENCY MEDICAL SERVICE AFTER IMPLEMENTING A SAFETY MANAGEMENT SYSTEM

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ABSTRACT

The trend in contemporary aviation is to enhance safety by implementing a Safety Management System (SMS). This trend has also become a part of the medical rotary industry. As a part of a SMS, Flight Safety Training (FST) is included, which consist of Human factors, Crew Resource Management (CRM) -training and the creation/shaping of attitudes and safety culture. During 2012 a SMS was implemented in Scandinavian MediCopter Ab. This study attempts to discover if the implementation of the FST tool in the SMS has an effect on how professional aviators speak about safety and how the training curriculum is affected.

For the qualitative research nine professional pilots and flight instructors working with FST and duty in a Helicopter Emergency Medical Service (HEMS)-organization were interviewed about how they perceive the language and syllabus change during the last five years. Additionally the training curriculum was reviewed both before and after the implementation of the SMS. The results imply that language change is difficult to connect to implementing a SMS alone. The change can arguably be seen as being intertwined with deeper phenomena and is a result of a broader change, which does come incrementally. The study hints that as a part of such a change, the SMS helps people to have a more open and transparent approach to safety and increased incident/accident reporting. Changes in the curriculum could be found, which in part are also connected to other aspects, like authority and customer requirements. Additionally the results suggest that the SMS can contribute in making FST and reporting actually feel less bureaucratic, which is a phenomenon usually attributed to SMS.

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GLOSSARY

ATSB	Australian Transport Safety Bureau
CFIT	Controlled Flight Into Terrain
CRM	Crew Resource Management
CTA	Cognitive Task Analysis
EHEST	European Helicopter Safety Team
EHSIT	European Helicopter Safety Implementation Team
FAA	Federal Aviation Administration
FST	Flight Safety Training
FTD	Flight Training Device
HCM	Hems Crew Member
HEMS	Helicopter Emergency Medical Service
HRO	High Reliability Organization
HRT	High Reliability Theory
ICAO	International Civil Aviation Organization
IHST	International Helicopter Safety Team
IMC	Instrument Meteorology Conditions
JAA	Joint Aviation Administration
MPS	Medical Passenger
OM	Operations Manual
ORM	Operational Risk Management
STAMP	Systems Theoretic Accident Model and Processes
RE	Resilience Engineering
SMM	Safety Management Manual
SMS	Safety Management System
SOP	Standard Operating Procedure

VFR   Visual Flight Rules

VSM   Viable System Model

INTRODUCTION

Accident rates in the helicopter industry have severely lagged compared to those of fixed wing aviation from the times that the first helicopter was flown. As fixed wing aviation became more common it subsequently also became safer. The development of helicopter operations has not enjoyed a similar trend and still many accidents occur. Despite the technological advances, many lethal accidents are still quite common. Between 1991 and 2005, around 200 helicopter accidents per year were still recorded (IHST, 2011). As a comparison, in 2005, 42 fixed wing accidents were recorded, furthermore it is noteworthy, that fixed wing aviation is more common and more aircraft exist (Aviation accident rates, 2012). This translates to a safety level of civil helicopter flight to 10^{-4}, compared to 10^{-7} of that of the airlines (Dekker, 2012). This comparison makes it painstakingly clear, that there is a very long way to go for the helicopter industry, if safety is to be developed even close to that of fixed wing operations.

In the nineties the helicopter industry and communities started to wake up to this worrying trend and the International Helicopter Safety Team (IHST) saw daylight to tackle the issue of reducing helicopter accident rates. Canada hosted the first ever International Helicopter Safety Symposium in 2005, where represents of thirteen countries attended. Among them were operators, manufacturers, maintenance organizations, regulatory and accident investigation agencies (IHST, 2011). The symposium resulted in setting an ambitious goal to decrease helicopter accident rates by 80 per cent by the year 2016. This goal is to be reached by using data-driven safety recommendations. The IHST has a sub-branch in Europe (EHEST), formed in 2006, to help with this big task, with special focus on European operations, since Europe operates under slightly different rules and regulations (Federal Aviation Rules vs. Joint Aviation Rules).

According to statistics the primary "causal" factor is human performance, representing over 60 per cent of the cases, hence the biggest effort is put into give pilots and companies tools to battle this. The plan is to develop safety on multiple levels, including systemic, operational and emerging issues, and as a big part of all of the above, focus is on human factors (EHEST, 2012).

One way to increase safety performance in the helicopter industry is implementing a Safety Management System (SMS) that includes tools like the Operational Risk Management (ORM) tool and flight safety training (ICAO, 2011). The main idea of the SMS is to "tailor" the system to the company, so it can be implemented in small, large, less or more complex companies (EHSIT, 2011, p20). The SMS system is not designed to be added as an additional system, but is to be integrated into the existing management system structure, which extends to every level. The typical SMS consists of the following components:

(EHSIT, 2011, p27)

In order to address the safety issues plaguing the rotary industry, a recommendation of implementing a SMS has been issued by the International Helicopter Safety Team (IHST, 2009). The SMS is designed as a tool to shed the responsibility of flight safety from the regulator towards the self-control of the organization. The main idea is for the regulator to oversee the effectiveness of the SMS, and the organization is to provide the day to day functions. According

to the SMS toolkit, the primary goal of the SMS is to have accountability between managers and employers (IHST, 2009). This is accomplished by "identifying, eliminating or mitigating any deficiencies in conditions, policies and procedures, and by ensuring staff consider, at all times, the safety implications of their own actions and those of their colleagues" (IHST, 2009). This seems like a somewhat simplistic and Newtonian-Cartesian approach, where the system is viewed as basically safe and the staff is seen as an (variable) component (Dekker, 2009).

The concept of Safety Management Systems (SMS) is a fairly new in helicopter aviation, and great hopes are put into such systems to contribute to safety and turn the accident rates to a decreasing trend worldwide. The current accident rate is considered as unacceptable, and the three recurring problems contributing to helicopter accidents have been identified by the International Helicopter Safety Team as follows:

-Pilot Judgment

-Safety Culture/Management

-Ground duties (IHST, 2011)

As an implemental tool, the SMS incorporates Flight Safety Training (FST) in the recurrent training of pilots working in a company, to address issues concerning human factors, Crew Resource Management (CRM) and safety culture. Flight Safety Training includes classroom and simulator training, where special emphasis is put on creating a safety focused approach in decision-making and promoting a safety culture. This is done primarily by focusing on always giving strong support on prioritizing safety in issues like sacrifice decisions, where other aspects, such as i.e. efficiency should never be prioritized over safety when making a decision.

Because most helicopter accidents are seen by the IHST (2011) as having a connection to pilot judgment, which is addressed in Flight Safety Training, questions arises how implementing an SMS affects the language and curriculum used in flight safety training.

SCOPING THE PROBLEM

The regulatory requirement of implementing a safety management system in rotary aviation can be seen as a challenge and/or a possibility to develop safety. Our understanding and experience of the implementation of an SMS in HEMS-operations is still very limited, and further research in the field can be seen as beneficial, although some light has been shed on certain aspects of the SMS in the rotary aviation business (Gomes et al., 2012; Kontogiannis & Malakis, 2012).

The latest literature presents knowledge gaps regarding how implementing a SMS changes the way safety is perceived and approached in HEMS operations. As Flight Safety Training in Finnish HEMS-operations has been considered as standard prior to the requirement of Flight Safety Training (as required in the SMS), the question arises whether the implemental tool of Flight Safety Training changes the way people view and speak about safety in training and how the curriculum potentially has been affected. Results could be seen as possibly implicating that implementing a SMS changes the way people views and speaks about safety, as well as leading to changes in the curriculum and reporting.

The literature presents several interesting questions and knowledge gaps about if and how implementing a SMS alters the perception of safety, and is the implementation of a SMS seen ultimately as beneficial to a helicopter company conducting HEMS-operations. Furthermore, information about possible changes after implementing an SMS would serve to further develop the SMS and FST in a direction that better considers such approaches like the high reliability and

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resilience engineering theories, where emphasis is on encouraging people to understand what to monitor, how to anticipate situations and how to learn and provide feedback from adverse events in medical rotary operations (Dekker & Woods, 2010).

STUDIES CONCERNING ROTARY OPERATIONS AND SMS

HEMS-operations have been increasing during the last twenty years, with a worrying safety trend and the Federal Aviation Administration (FAA) have recognized the following safety threats in the medical rotary business:

-Inadvertent encounter with Instrument Meteorological Conditions (IMC)
-Night time flights based on Visual Flight Rules (VFR)
-Controlled Flight Into Terrain (CFIT) (Kontogiannis, Malakis, 2012)

The European scene is similarly problematic, with an identified difficulty to obtain valuable data and learning from accidents (Kontogiannis, Malakis, 2012). Kontogiannis and Malakis (2012) studied three Hellenic HEMS accidents using Beer´s Viable System Model (VSM) and Leveson´s Systems Theoretic Accident Model and Processes (STAMP), in order to reveal the complicated interactions that lead to the tragic events. The STAMP-model is based, and focuses on, the concepts of constraints, hierarchical levels of control and process models, which are to be controlled by system development and system operations (Leveson, Daouk, Dulac, & Marais, 2003).

The research by Kontogiannis and Malakis (2012) studies the control flaws with the organizational breakdown by the linking of a "control theoretic accident model (i.e. STAMP) and a cybernetic model of organizational viability (i.e. VSM)". The models were compared for results

and while STAMP analysis was able to show the relations between organizations and recognizing how important tasks were distributed between various individuals and organizations, the VSM was able to closer examine the control flaws (Kontogiannis & Malakis, 2012). The findings indicated that that the STAMP and VSM analysis can help analysts model the complicated relations across levels. At the same time it was recognized that a more pro-active system was needed to help accentuate critical organizational problems (Kontogiannis & Malakis, 2012).

As Amalberti says "One problem is the focus upon what organizations label as errors, which are often associated with visible or measurable non-acceptable consequences instead of what psychologists define as erroneous acts, whatever the consequence, or level at which they are detected or recovered" (Amalberti, 2001). Although Kontogiannis and Malakis (2012) argue that VSM analysis can be useful when used proactively in auditing, Dekker and Woods (2010) argue that auditing is often based on decomposition assumptions, which is not necessarily applicable in complex systems like aviation. The main issue with a decomposition view is that subsystems are often viewed as independent and having linear interactions (Dekker & Woods, 2010). As with many unwanted events, it can be argued, that this is often not the case. Snook brings forth the issue with non-linear and dependent interactions between subsystems in the accidental shootdown of two U.S. Black Hawk helicopters over Northern Iraq, where all components were working and procedures followed (2000). Despite fully functioning systems and adherence to procedures, the situation led to a tragic result, which at the time being seemed as incomprehensible.

The rotary industry is considered statistically to be a so called regulated system (vs. i.e. an ultra-safe system), with an accident rate of 10^{-4}, and the traditional approaches of adding regulations and having error resistant designs can improve the safety of the system up to a level, where accidents only occur once every 10 million operations, this is arguably not the only way to

enhance safety performance (Amalberti, 2001). While it may be seen as a good approach to head in, in order to reach better safety performance, the implementing of an SMS as such might not take us all the way to reach an ultra-safe level in the rotary world. The SMS in its basic form (as the IHST SMS-toolkit) might not be the ideal solution, with the reductionist-mechanistic approach it presents, but it presents some basic concepts that might be of value in enhancing safety performance, i.e. identifying systemic weaknesses and having commitment to safety across different levels and being pro-active, rather than just concentrating on history and being re-active (IHST, 2009).

The existing literature regarding SMS includes a study by the Australian Transport Safety Bureau (ATSB), which systematically reviews the effectiveness of SMS in transport systems and work health and safety (2011). The birth and history of the SMS can be seen as quite organic, collecting "best practices" from prescriptive regulations to a more comprehensive system, which extends over the whole organization (ATSB, 2011). This could also be seen as an evolution that is, at least in part, derived from High Reliability Organizations (HRO) (Dekker & Woods, 2010):

-Not taking past success as a guarantee of future safety

-Distancing through differencing

-Fragmented problem solving

-The courage to say no

-The ability to bring in fresh perspectives

-Knowing the gap between work-as-imagined vs. work-as-practiced

-Monitoring of safety monitoring

The review of SMS effectiveness by the ATSB concluded that it is unclear what may be the driving force of safety performance, and it may be problematic to assess with such metrics,

especially in high risk-low probability industries (ATSB, 2011, Lofquist, 2010). Despite the lack of scientific evidence on SMS effectiveness, the application is seen as the norm in contemporary high-risk industries and is even a requirement of the legislator (ATSB, 2011, Dekker, Woods, 2010). The review by the ATSB concluded that the results gained by a deconstruction of the system and looking at the separate components did not give definitive answers about the effectiveness of the system, and that the effectiveness of the system may not lie in one component alone (ATSB 2011). Albeit the difficulties in assessing the effectiveness of an SMS, a well implemented is considered to be related to enhanced safety (ATSB, 2011).

As with all low probability-high risk industries, assessing safety is problematic (Lofquist, 2010, ATSB, 2011, Dekker, 2006). Admittedly studying the effects of implementing a SMS is in general problematic, as is measuring safety in high risk industries, by using traditional metrics (Lofquist, 2010). The argument is that a better indicator of safety is a SMS "that monitors safety as a process in three temporal phases embedded in an organizational culture" (Lofquist, 2010, p1523). These phases include proactive, interactive and reactive methods that are not time sensitive but considers context (Lofquist, 2010). According to Dekker and Woods (2010), good quality control combined with a well implemented SMS may help aviation enhancing their safety, with SMS getting managers to focus on risk management and safety issues both of organizational and technological change, in a proactive way that documents how the risk is to be dealt with.

The Resilience Engineering (RE) perspective

Resilience Engineering aspires to understand a system as a whole, by articulating the local tasks and restrictions with the macro-organizational issues and help people in different positions in the organization make better sacrifice judgments (Gomes et al., 2012). Hollnagel (2010) defines resilience as the natural ability of a system adapt its functions prior, during or after changes or

disturbances, so it can continue needed operations under both expected and not expected conditions.

In order to avoid undesired events, there is a need for foresight, to track the system safety level, to identify sacrifice decisions, to understand how people create success during normal daily tasks and are able to learn and change their behavior in order to create safety (Gomes et al., 2012). Therefore safety is seen as something a system does and not as something it has (Dekker, Woods, 2010). Gomez et al. examined the resilience and brittleness of an offshore helicopter transport system using a qualitative approach in their case study (2012). The research work included cognitive task analysis of the crew, management and quality people.

Lofquist conducted a three year case study on the Norwegian Air Navigation Service provider AVINOR to determine how an intentional organization change influences on how air safety quality is perceived (2010). In his study he combined three disconnected quantitative and qualitative sets of data in two separate phases and questionnaires and semi-structured interviews were conducted (Lofquist, 2010). Lofquist´s findings indicated that according the collected data, safety had substantially decreased, though no such change was showing in traditional safety measurements of incident and accident reporting (Lofquist, 2010).

A SMS appreciating the RE argument should provide means for people, who do not necessarily consider or think about possible paths to failure, resulting from locally rational behavior they use in order to get their task done, to be able to monitor, create insight, to learn and to give feedback to the organization (Gomez et al., 2012). A resilient system can also absorb and adapt to disturbances and unexpected events (Dekker & Woods, 2010). Gomez et al. used Cognitive Task Analysis (CTA) to scope the complexity of the offshore helicopter transport system and applied resilience engineering as the methodological framework (Gomez et al., 2012). There are

organizational and financial pressures, as well as other conflicting goals, that have to be considered when deciding on operations. Because of the management structure of the helicopter company, each operator had their own locally rational goals. This led to the rise of conflicting goals, especially considering the helicopter pilots, who had to balance between safety, reliability and financial pressures (Gomez et al., 2012). The conclusion of this study was that a pro-active SMS should be able to recognize and understand weak points that may lead to adverse events through a combination of local, situated and organizational factors (Gomez et al., 2012). According to Dekker and Woods, HRT also supports this, as past success is seen as no guarantee for future success and operators treating the environment as naturally and actively hostile (2010). The conclusion of a pro-active SMS is also reverberated by Lofquist, who proposes an approach, where safety is monitored as a three phased process (pro-active, interactive and reactive) separated in time and considering external and internal factors, embedded in the organizational culture (2010).
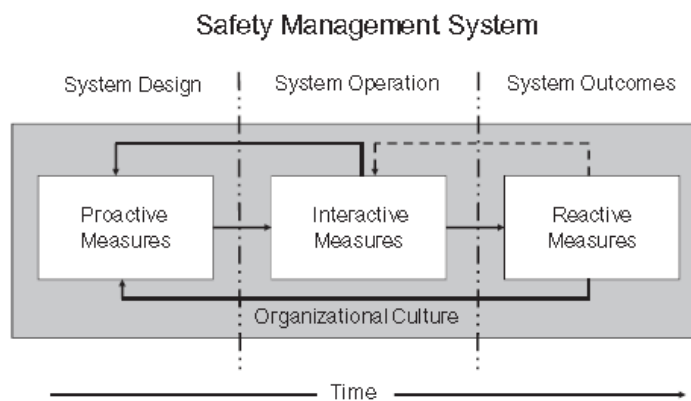
(Lofquist, 2010)

A matter of perception

The literature concerning how implementing an SMS affects people´s attitudes includes a study by Remawi et al. (2011). The research by Remawi et al. examines the relationship between implementing a SMS and the attitudes towards safety by comparing two international airports,

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where one of the airports was about to implement a SMS (1ˢᵗ airport) and the other had an operating SMS (2ⁿᵈ airport) (Remawi et al., 2011). The hypothesis of the study was that implementing an SMS would have a positive effect in attitudes of the workers towards safety after implementing an SMS (Remawi et al., 2011). Furthermore another hypothesis was that unlike emphasis concerning safety matters at the two airports would lead to different results in possible changes in attitudes (Remawi et al., 2011). In order to gather information about the attitudes on safety culture, a safety culture survey was conducted both before and after the implementation period of twelve months on both airports (Remawi et al., 2011). Nine different variables were examined to determine the effects and six variables where used for the final analysis. The average score on the subjects of communication, safety rules, supportive environment, personal risk appreciation, work environment and involvement rose markedly at the first airport after implementation, as well as scores for seeing safety rules as impractical (Remawi et al., 2011). Accordingly scores for safety concerns as of little interest and consensus on that safety culture focused on condition (as compared to blaming people) decreased significantly after the implementation of the SMS at the first airport (Remawi et al., 2011). At the second airport, that already had an operating SMS in place, no corresponding change could be determined concerning changes in safety culture (Remawi et al., 2011). The findings suggested that implementing a SMS leads to a change in attitudes towards safety (Remawi et al., 2011). Based on the study by Remawi et al. the hypothesis would be to see a positive change after implementing a SMS.

METHODOLOGY FOR THE RESEARCH

This case study was conducted using a qualitative approach for studying whether the implemental tool of a SMS affects the perception of safety. The qualitative approach allows collecting deeper

and more detailed information about the subject, and utilises documents, interviews and observation to collect the data (Blaxter, Hughes, Tight, 2010). The qualitative approach principles used in this study are:

-Understanding behaviour from actors point of view

-Subjective

-Close to the data

-Grounded, discovery oriented, expansionist, descriptive, inductive

-Process oriented

-Valid: real, rich, deep data

-Ungeneralizable (singe case studies)

-Holistic

-Assumes a dynamic reality (Blaxter, Hughes, Tight, 2010)

Methods for data collecting

Since the perceptions of people concerned with training in an aeromedical company was examined, arguably a good way to gather data was by conducting interviews and performing document analysis of training related guidance and documents.

Data gathering and ethical considerations

The data gathering of this research was done using a qualitative method, and consisted of document analysis and interviews. The reason for this approach was that qualitative methods help gaining a richer understanding of how people think, what kind of attitudes, experiences and anticipations they have (Rowley, 2012). This study focuses on how safety is perceived in a company that has recently implemented a Safety Management System, and if it has been affected

since implementation. Data gathered from the interviews was compared with different safety related literature published by the company, followed by analysis. Special emphasis was put on the language used and comparing and studying procedures and policies, in order to determine if there is a distinguishable difference in before and after the implementation period. Prior knowledge of the area of the research and language used (especially acronyms and technical terms) can be argued to have been beneficial, as it shortened the time of transcription and analysis as well. On the other hand, consideration had to be used, as biases and opinions were likely to be accompanied in the research and influenced it on several levels.

Document Analysis

Training manuals used in the company before and after the implementation of the SMS, as well as the company Safety Management Manual were analysed, in order to find out changes in the language used and to determine if the direction of development was indeed towards a more High Reliability Theory and Resilience type of approach of the curriculum, where the focus is on why things go right in changing conditions, instead of worrying about having things not go bad (Hollnagel, 2010). Furthermore training manuals, which have been implemented in the company before 2012, were compared to more recent manuals, to establish an understanding of their meaning and their relation to each other based on their author, position, biases, the reason for producing the document, what the context was for producing the document, the underlying assumptions, what the document has to say and what it does not say and how the document relates to the ones after (Blaxter, Hughes, Tight, 2010). The analysis of the selected documents revealed information about differences and changes in language and attitudes in the SMS concerning training, it revealed changes in training curriculums and it shed additional light to the results received from the interviews.

Interviews

The interviews consisted of 6-8 semi-structured questions that were designed to gather information about how safety has been perceived before implementation of the SMS in the training department of an aeromedical company, and how it is seen now, after the implementation period. The interviews took place individually, depending on the availability. The interviews were conducted in Finnish, this way richer data could be gathered, because people were able to speak in their native tongue. The interviews were carried out verbally in "neutral" settings, either at the home of the interviewee or at their workplace (Blaxter, Hughes, Tight, 2010). A recorder device, as well as note-taking was used to record the information from the interviewee. An e-mail covering the topics to be discussed was sent to the subjects as well as general background information about the research. Before commencing the interview, a general briefing about the research and related issues were covered and explained to the interviewee, as well as signing of the participant consent-form. Before starting the actual interview the subject had a chance to ask questions concerning the research and the interview. After this, 6-8 semi-structured questions were presented to the subjects concerning their role in the company, their view on safety in training related matters (see Annex 1). Further questions were presented to subjects, themes being the change in safety attitudes and training curriculums prior and after the implementation of the Safety Management Manual. This presented data that provided an understanding how the implementation process has affected the view of safety related to flight safety training. The duration for each interview was planned to last from 30 minutes to an hour. If the need arose, subsequent questions were sent by e-mail to the participants, to gather additional information.

Participant selection

A group of 10 subjects were selected from a company performing HEMS operations in Finland for the interviews of this study. The selection criteria for the candidates was to have a broad understanding of FST and have experience of the HEMS-industry, which could be utilized for the study, and to either act as a commander, first officer or/and as a flight instructor in the company. The involvement was based on voluntary participation and the subject´s works as instructors or pilots within the aeromedical company performing HEMS-operations, with a deep understanding of the work and the operations. The subjects were pilots and flight instructors, functioning at different HEMS-bases in the company, with an experience typically of five to ten years in HEMS-operations. The above mentioned experience can be seen as typical in the HEMS industry. The subjects had quite variable experience, background, age and present position within the company, which arguably can be seen in the results. All subjects had an HEMS experience of more than four years and most had civil flight training (six out of nine), the rest having a military/paramilitary background and the age ranged from 29 years to 49 years. Among the subjects there were one first officer and eight commanders, of which four also acts as flight instructors. Two of the pilots act as base-commanders, two of the flight instructors also act as flight inspectors for the authority and furthermore one of the instructors acts as a deputy training manager in the company. The subjects worked at one or two of a total of three bases, of which two bases operate a Eurocopter EC-135 P2 and one base a Eurocopter AS365 N2/N3 Dauphin. One subject flew both types and the remaining subjects flew only one type. Prior to sending out e-mails to candidates, approval for the research was acquired by the company management as well as a briefing about the research to be conducted was presented to the candidates. Because of time constraints, only 9 of the subjects were interviewed and their transcripts studied. Before commencing interviews, approval for the research was obtained from Scandinavian Air Ambulance Ab and Scandinavian MediCopter Ab. Furthermore the participant consent was

acquired from the subjects, which included information about the research (e.g. how safety is perceived now vs. earlier), a participant consent form was presented, where the following topics were addressed:

-The name of the interviewee will be anonymous in any research related data analysis and publications

-Confidentiality of the interviewee will be assured

-The information received will be confidential, the session will be audio recorded, in the case the participant has agreed to this, and that audio recordings will not be used for other purposes than for the research in question. The interview can be conducted without recording it.

-The complete transcript from the interview will be sent to the participant for commenting and approval

For detailed information of participant information & consent form, refer to Annex B. In addition to participant anonymity and participant consent, the legality and professionalism aspect has to be addressed in this research (Blaxter, Hughes, Tight, 2010).

Data Analysis

The recording from the interview was listened to for initial analysis as soon as possible, when additional notes could be written (Rowley, 2012). After this the recordings were translated to English and transcribed in order to start an analysis and the transcripts were sent to the interviewee for commenting and approval. Subsequently data was organized in a database, which after the data was categorized, studied and analysed (Rowley, 2012). This helped in finding common nominators and categories to assist in the analysis to gain insight, and an answer for the initial research question. The analysis was done in a similar manner to Braun and Clarke as cited in Blaxter et al.:

1. Familiarize yourself with your data. Transcribing data (if necessary), reading and re-reading the data, noting down initial ideas.

2. Generating initial codes. Coding interesting features of the data in systematic fashion across the entire data set, collating data relevant to each code.

3. Searching for themes. Collating codes into potential themes, gathering all data relevant to each potential theme

4. Reviewing themes. Checking if the themes work in relation to the coded extracts (Level 1) and the entire data set (Level 2), generating a thematic "map" of the analysis.

5. Defining and naming themes. On-going analysis to refine the specifics of each theme, and the overall story the analysis tells, generating clear definitions and names for each theme

6. Producing the report. The final opportunity for analysis. Selection of vivid, compel
ling extract examples, final analysis of selected extracts, relating back of the analysis to the research question and literature producing a scholarly report of the analysis.

(Braun and Clarke 2006, 87, as cited in Blaxter et. al, 2010, 233)

After the analysis was completed the findings are presented in this written thesis report. Finally the written report was reviewed, in order to find possible flaws and further research problems within the subject. Quotes of the subjects are printed in *italics* and further clarifications by the author are marked with brackets [ ].

RESULTS

The results presented here are based on the viewpoints that the 9 subjects presented in the interviews and on the different documents (training manuals and the Safety Management Manual of Scandinavian MediCopter Ab) studied. In order to better determine the possible change, the results were determined in advance to be categorized in pre-SMS implementation findings, findings 18 months after the launching of the SMS (post-SMS implementation findings), and how people talk about the future of FST. All the categories are also divided in identified main themes associated with the categories that emerged from the data.

Pre-SMS findings

The results concerning the time before the implementation period can be seen as somewhat varied. The reasons for the variety of how safety was perceived before a SMS existed in the organization can partly be explained by history and context. The subjects represented a quite heterogenic group, with variable history in helicopter operations, all having worked in diverse companies before joining the present aeromedical company. Furthermore no aeromedical company in Finland implemented a SMS at the time, albeit the authority presented safety related requirements for the aeromedical helicopter companies, aimed at raising the level and performance:

There were some requirements…training people for multi-crew operations and CRM, night vision equipment, instrument operations, and maybe most importantly , relating to refreshment training, periodical training as a crew. (P9)

The authority requirements were seen in most companies mostly as bureaucratic accountability and therefore the FST was not utilized effectively:

Because of the authority requirements, the forms were filled and checked, but in reality the core of the matter was never approached, we lived in a situation that was, ok, we have these [safety training] things and they are mentioned, but after that they were forgotten. (P2)

CRM-training has been a necessary evil in both at company A and B, it´s good we have some variation to that as well. (P1)

The interviews did not present rich data directly concerning language and the respondents had trouble giving answers concerning FST focus points and emphasis. However, the lack of standardization and the development of the reporting system in conjunction to FST were extensively discussed by all respondents. The Safety Management Manual (SMM) of the organization describes continuous improvement of the SMS to be an aim and reporting is named as one tool for improving the SMS. The main themes that were identified during the interviews in the pre-SMS findings were:

-Standardization

-Reporting culture

Standardization

The lack of standardization was considered an issue in FST and many perceived that there was little standardization in the operations or the FST before having an SMS:

Even if there had been HEMS flights for a long time, there were no safety or detailed Standard Operations Procedures (SOP:s), in too much detail, between the pilot, flight assistant [now called Hems Crew Member] and the doctor…the shedding of the workload was maybe not standardized or the distribution of tasks…(P9)

Variations in standardization were also seen in instruction guidelines, which inherently lead to differences in training:

The procedures of the instructors were not standardized, so slowly harmonization was brought in. Decision making was one part to think about, but a big thing as well, was according to whom we decide, according to the chief instructor or the training manager or the most experienced flight instructor. (P9)

The standardization issue can also be seen in other companies, where the training syllabus was seen as varied by the respondents and changing each time:

…there were inquiries to the work community beforehand about what people wanted the focus to be, and if there was no such thing, the Flight Operations Manager / persons in charge felt that there is some specific issues…that need to be emphasized, i.e. night flying…the emphasis was on these things… (P4)

The approach in some companies was perceived as being "hands-on", and the theoretical part only scratched the surface:

…it was pretty much plain, practice oriented…it was in my personal opinion quite shallow, the practical training, in theory they were opened up a bit, nice things and concepts, but on a practical level…we just tried to apply it to the practical world…(P3)

Even most respondents had experienced some kind of FST, there also were a few subjects that had received minimal FST:

I started flying HEMS during the shift of 2007-2008, if we start from there, and at that time there was in practice no CRM training, and the flight training in my case…was three night time landings, before my first duty shift… (P2)

The standards and levels of FST was arguably varied, and while some organizations had a more practical approach, where the syllabus was influenced by what the operative people thought important, the other extreme presented in practice no FST. The variations in FST suggest that while authorities presented requirements, these were seen as a potential tool to enhance safety in some organizations and in others they were perceived as a constraining obligation.

The CRM-training prior to an SMS was seen by many as not being industry specific with the main aim being to fulfill authority requirements

…the same CRM teacher spoke for ten years about the same airplane matters, which kind of gave the impression that this is just some compulsory thing, that you need to take care of, and it did not deal with the problems of helicopter operations. (P5)

When asked about participation in CRM training before the SMS implementation, it was considered to be diverse in different organizations, but typically it had concerned only pilots, or pilots and Hems Crew Members[1]:

…the flight assistants [now called HEMS Crew Members] have always been included, regarding HEMS operations and simulator training. (P5)

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There were also some organizations that included the Medical Passengers[2] in the CRM classroom training, or at least in part of it:

…and the Medical Passengers were in my mind earlier present, when they [the topics]were kind of combined, if we spoke about fire safety or how to evacuate the helicopter or something of that sort, then they were present… (P4)

Reporting culture

Reporting culture before the implementation period of the SMS was a theme that was referred to repeatedly. The reporting systems and culture were perceived as somewhat twofold. The reporting systems were seen by most respondents as something companies considered as compulsory and most often only reports required by the authority were filed:

… there was not really any reporting, some things were reported maybe a bird strike or something to TraFi [The Finnish Aviation Authority]…*(P1)*

The reporting and safety culture of the time was experienced typically as rather punitive and reporting an incident might have typically even led to blaming personnel for "screwing up" or being "difficult":

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[1]Hems Crew Members (HCM) are trained medics with theoretical and practical flight training, but lacks a pilot´s license and does therefore not have the legal right to operate the helicopter.

[2]Medical Passengers (MPS) are trained emergency physicians, who have a theoretical and practical training for HEMS-operations and are considered as part of the crew, despite the term passenger.

If you imagine hypothetically a pilot who is not necessarily suited by personality and attitude to the operations…how strict a report do I dare to file, if the result is that the pilot gets fired and the operations stop because of a lack of pilots. (P3)

Many of the respondents perceived reports were filed in order not to get sanctioned by the authority for not reporting a serious incident, which authority regulations required to report:

The personnel were unwilling to report, because they feared for their jobs…reports were surely written mainly only about serious incidents, where the information had been spread wide publically. So you had to report, in order not to get sanctions… (P9)

The aim with the reporting system seemed at the time to be to simply fulfill authority requirements, which left the potential of the system unused:

I have to admit, that their [the previous company] game was that the "condition of the day" was what decided, and corrections where made to fix past issues, and little thought was given about the future. (P2)

Also people might not have been too accustomed to think of reports as a potential safety tool:

In many places [companies] I noted, in the beginning, that there were no reports, because there typically was no reporting. With many having such a background, the thinking has been quite different, someone would ask after the helicopter was lying in pieces on a tree stump, we don´t need to report this, do we, because we survived, right? (P6)

Another aspect that emerged was that in some organizations there were no instructions or training concerning the reporting system:

There was never any actual recommendation or instruction what to report… (P5)

This suggests people did simply not know when or what to report, which inevitably affects the reporting. According to some respondents there were, however, some organizations that aspired to have a more active and proactive approach to the reporting system:

The point was to get their hands on the problems in the company, which otherwise would go unnoticed or unobserved… (P3)

The feedback and analysis of the reports were in this case, nonetheless, seen as somewhat selective and there were no consistent feedback :

There was an unwillingness to analyze the reports, because they are too cumbersome and surpasses the resources of the company, financial and personnel resources, but at times it felt that some reports were welcomed… (P3)

The varied reporting culture was partially seen by subjects as being dependent on the results of having a reporting system and not getting tangible benefits would result in decreased reporting:

Of course one thing is, that if people experience that it [the reporting] doesn´t show anywhere, it´s not utilized, that the summaries are not reviewed or trained, and the results or statements are not presented, that guys, have you noticed this or that thing, that lessons would be learned, it becomes foreign and it´s not considered important. (P6)

Post SMS implementation findings

After the implementation of the SMS the main consensus among most of the subjects was that recently the FST-training have changed for the better, and that the heading is now good and the training is now more industry specific, as well as offering additional safety tools and procedures. The change in the documentation can be seen as a more accurate description of all the training related matters. The new training manual describes in great detail training related matters with over 150 pages of different training programs, whereas the "pre-SMS" training manual has more general guidelines, lacks the detailed descriptions and consists of 65 pages. The CRM training for Medical Passengers (MPS) has become customer-dependent in the syllabus, while earlier it was a company requirement in the training manual. Regarding flight training the change is considerable. Both initial and recurrent flight training was examined. Both manuals describe roughly the same amount of flight training programs, but the items vary. When asked about what the respondents perceived as the single biggest change regarding the FST, after implementing the SMS, there was no clear consensus. However, many believed the information is now shared more than before and that there are more talks about safety in general and about SMS related matters:

Information is shared and it´s important to get the people involved, which has been the case. (P6)

The awareness of safety aspects as well as an aspiration to enhance the safety culture was considered to be different:

The company has changed a lot, the personnel knows or the knowledge is also available, what the safety culture is or what the SMS is and training related to that…there are clear procedures and instructions, what the elements are which strive to improve the culture. (P9)

On a general level people experienced that the information flow has changed and is now more open and that there has been an attitude change in the industry:

The openness of the company has increased, the openness of the information, a big thing is that people are not scared to raise concerns or issues…and we feel that we together develop our safety culture, when everyone has access to the information and we can all have an effect on it with our actions, as a part of a group, or a team, as we often are in the helicopter and at accident sites, as well as at the base of course… (P9)

The change could also be seen as an increased general awareness of the subject:

When I started [flying] the SMS was a bit of a freak, it was a familiar concept, but it was not used anywhere, it was a bit of a new thing, but the talks about it have increased all the time. (P3)

The information flow was considered to be heading in a good direction, also having people in the management sharing the knowledge:

The direction is good in that sense…information is shared or there are persons in charge that ensures…that the information is forwarded and available, and that possible training sessions are held… (P6)

The main themes that emerged when speaking about the post SMS implementation period were identified as:
-Holistic approach
-Reporting culture

Holistic approach

Most of the subjects agreed that FST today is seen as being more holistic and more specific, including and involving the entire crew and having an high emphasis on Helicopter Emergency Operations Services (HEMS):

Today we naturally take care of the training appropriately as required by the authorities and there is an aspiration to develop the operations based on observed matters. (P2)

One of the subjects described the contemporary CRM training being more inclusive and HEMS oriented:

Today everyone participates, doctors, flight-assistants, pilots, we even sometimes discuss company reports, what´s happened and then we cover HEMS operations in general and risks related to that. We try to find some kind of solution for them… (P1)

A curriculum change was perceived by the respondents in the flight training, specifically in simulator, or flight training device[5] (FTD) training:

…there is more emphasis on Standard Operating Procedures, we go through them thoroughly. And there is mission specific SOP:s, and those we work on. That was something we didn´t have before. Another thing that´s increased is scenario based training. Now we train more the same scenarios that we meet in our real operations. (P5)

Most pilots agreed on a general level, that among the biggest changes after implementing the SMS were the simulator or Flight Training Device[3] (FTD)-training, and that it has evolved on several levels since the introduction of the SMS:

…the focus has shifted to standard operating procedures, SOP:s, there are more of them in use, we practice them more, we use them in everyday operations, that´s good. Another thing is the scenario based training, we create the same scenarios, that we may encounter on our duty missions, it´s not just generic flying. We land in confined spaces and stuff like that… (P5)

This suggests that the contemporary FST now incorporates a more holistic approach which is more context-specific that strives to mimic real world scenarios met in everyday HEMS-operations. Development of the training and operations was considered to be more holistic and context specific:

…now we gather information and we try to develop the training and reporting and the whole system based on that, and to find helicopter specific practices and elements, that serves this type of operation, and to develop the training and reporting of this company, partly from the already existing database… (P2)

Incorporating the HCM in the training was considered as an important addition, making the pilot and HCM act more as a traditional flight crew:

…there has been a significant change, how we act in our operations with a flight assistant [now called HCM], in single pilot operations…now the flight assistant fulfills more of the co-pilot role. (P5)

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[3] Flight Training Devices are designed and approved for flight training, but they lack motion that full flight simulators have and are not equally certified.

Flight exercises performed while on duty was experienced as a welcomed development in safety as well as professional development:

…along with safety and training, which are intertwined, we have the possibility to train difficult things, which we are told to do. That, in my mind, is a big positive step in developing our expertise, we can train during the day, or in the dusk, night or in bad weather, flying instrument flights or using night vision systems…to my understanding, we were earlier unable to do this… (P9)

Furthermore this was seen as significantly raising the awareness and professional know-how of the crew:

Now we raise our base level as a team to a much higher level, the starting level of consciousness is so much higher, our situation awareness is so much higher at that point. And that gives a higher level of safety. (P9)

The increased amount of flight exercises is requirement of the authority and the current customer (FinnHEMS) and no such requirements could be found in the SMS related documentation. The contemporary CRM training was viewed as being headed in the right direction, having a more concrete and more useful approach:

…the CRM training, the last one we had, has taken a lot of steps in the right direction, in my mind, and the simulator training comes along automatically…the syllabus has become more practical and has considerably more meat around the bones, and it´s probably much more fruitful for people… (P7)

Carefully prepared and planned training was perceived as a valuable change, alongside the actual implementation of the SMS:

I think it is the planned training that is the big thing and the assertive running in of the SMS…that´s exclusively the reason for this [planned training]… (P2)

Albeit the approach was found more holistic, some respondents argued the FST training was somewhat variable and two-fold, because of the multi-national division within the AS365 department in the company and the interaction between the two training departments were considered to present challenges:

I find the amount of training good...but the quality and substance is a bit questionable ...there is a twofold training department, two different training departments…and the opinions vary, it seems to be difficult to create a uniform policy… (P3)

The challenge was seen as having to cope with two styles of instructing, as P3 went on to explain:

The Swedish department has a different view than the Finnish department, then people try to figure out a centerline, which is highlighted when we go to be trained by the Swedes in the simulator…if I go to be trained by Finns two months later, you have to switch to the Finnish mode, when you know they want to see it in another way... (P3)

Although on a general level the changes in CRM was considered positive by most, a few respondents considered the CRM presented by fixed wing instructors to be problematic, as well as still having non-industry specific training:

…but still we have a CRM instructor that only has experience in fixed wing, which still presents a problem… (P5)

…we go through these Swiss-cheese models, which are kind of…they don´t grab on…HEMS flying itself and being a part of that crew. (P4)

Some respondents stated that the implementation of the SMS does not show too clearly on an operational level:

Like I said, the SMS is still quite an invisible matter for the regular pilot…when I file a report, I don´t know what kind of a system, or box the quality/safety manager and the deputy quality/safety manager puts it in, does it go somewhere in the SMS system, how does it work, I have no idea… (P3)

The view of the respondent could be seen as a sign of that the SMS is being successfully incorporated in the current management system and therefore not overly visible on the operational level (EHSIT, 2011).

Reporting culture

In the SMM of the organization, reporting is named as a tool to improve the Safety Management System, and the FST as a part of it. When asked about the contemporary reporting culture, most pilots thought it as having taken a leap towards a more open and pro-active atmosphere, where you don´t have to be scared of reprisal to raise a concern. This signifies that people can also freely report and give feedback about the FST, which can reveal issues or worrying trends concerning FST. The reporting system was found by most to be technically good and the threshold for reporting was considered substantially lower to prior times:

Now we have a phase, where there isn´t a big threshold to report and the reporting is increasing and becoming more active all the time. (P2)

The lowering of the reporting threshold suggests that people feel more at ease reporting and also now have tools for knowing what and how to report:

… the atmosphere is such, that we are not being punished as individuals for reporting…and there is no need to find any culprits, but to find the procedure which has led our people to this situation… we have clear guidelines what to report, how to report, where to find the reporting forms and there is feedback as well… (P9)

The amount of reports was experienced as having increased and the quality of the reports likewise become more evolved:

There have probably been about 95% more reports, compared to the old employers. (P1)

…people have started to report somewhat more analytically, there is feedback from the analysis department… (P9)

Although it was not possible to acquire reporting statistics from previous organizations, the trend indicates that reporting has increased in the contemporary company since the implementation of the SMS. The reporting was also seen as now having changed towards more pro-active and analytical:

…people are not used to report about matters, at least in Finnish culture…they tend to report when the spring has almost broke…now it is earlier in the process so we can stop the worst possibility, a crash or crack, or the disappearance of someone or burnouts and other things All this, the whole spectrum, is naturally broad, but it [the problem] emerges earlier and people can speak their minds about it and the issue can be dealt with. (P9)

Other subjects also perceived the system to be more proactive:

…it can clearly be seen that there are thoughts that concerns more the future, than the past. This will get us to fix future problems. (P2)

The changes experienced in reporting culture arguably is a result of the respondents changing to the same employer, where as they previously worked for different operators using different reporting procedures and having a different reporting culture. One factor which arguably affects the reporting is the usability of the system, which was now found by most as satisfactory:

…it´s technically functional and we are able to see the comments and what the persons in charge thinks of it, what the corrective actions are…you can do it [report] with a smartphone from bed if you have an internet connection. (P3)

Slightly more critical views were presented by a few subjects when asked about the contemporary reporting system, saying that despite a technically well working system, there are some problems in the analysis of the reports:

…it should be more interactive, and there should be an option that says, this comment does not satisfy me, there should be a right to veto, that you can´t bloody close this report like this…there are a lot of office people commenting on matters, and then it´s closed. (P7)

This kind of language suggests that it is considered important not only to have a reporting system, but a reporting system, that includes analysis by relevant people and communication about what is to be done about a certain issue:

…the analysis should appoint the people who will intervene with the observed deviation, there should be a deadline and an announcement who will fix the problem and how it is to be fixed, which should also be informed publically. (P9)

The future of the SMS

As a result of the implementation of the SMS a natural evolution of the effects it has on language is the future the SMS holds. The eagerness the respondents presented in speaking about how the FST could be developed in the future, represents one dimension of how language is affected on a more practical level and is a sign of pro-activity. This is echoed by the Safety Management Manual that states, that although the Quality Manager and Deputy Quality Manager are mainly responsible for the development of FST, the aim is to embrace the principles of a learning organization and to continuously develop the SMS (SMC Ab SMM). The clear majority of the people agreed that developing FST would lead to greater safety, efficiency and longtime financial benefits. There were two main themes that emerged when discussing development:

-Training

-Reporting

Training

The training in general was seen by all respondents as an area that would benefit from development on several levels. Although there was a division between respondents working on bases operating the EC-135 and the AS 365 about what needed development, some common topics were also presented.

All respondents felt that FST would benefit from giving flight instructors more harmonizing training, which would enhance the awareness and operations in the daily operations as well:

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…there would be a need to train the instructors as well and to make the training identical…harmonizing of the training, by the training captain, which would include SMS or training related stuff, changes or notifications or reports, if there is something that specifically should be considered, because in many cases the instructors are the easiest and straightest channel to the field and the pilots. (P6)

The overall quality of the contemporary training was perceived as variable by some:

The quality of training should be standardized and efforts to standardize should be put in, now it´s erratic, sometimes we have good training and sometimes it´s a waste of time. Regarding training, some kind of quality control would be good. (P3)

Also the time management of the simulator training raised concerns in some respondents, regarding the effectiveness and quality of the simulator sessions:

…every time we go to do simulator training there should not be one idle hour, there should clearly be some greater goal for being there…that way we could get more out of the training. (P4)

The contemporary training methods and procedures in the FTD were seen as somewhat varied, with different instructors teaching procedures in slightly different ways, which presented problems:

The training of the instructors, standardizing it somehow, so that the instructors would instruct in the same way. There can be three opinions about the same thing, this creates, in my opinion, confusion and that should be more standardized… (P5)

Pilots flying the EC-135 experienced that they would benefit from training in a full flight simulator, instead of training in the FTD:

…with simulator training you get to train so many situations, which you can´t with the real helicopter, so we need more simulator training in a better [full flight] simulator… (P5)

The main development ideas were aimed at synthetic flight training, but CRM training also got proposals about how to progress, context specific experience was regarded highly valuable:

…if you speak about flight safety and about related subjects, my opinion is that you need experience in the business, it´s not enough that you are book smart and…the same goes for simulator training or when we get flight training, we need guys who have experience and are able to give genuine and real training…so that it does not just look that this guy is proficient on paper. (P4)

One suggestion was to better put CRM training into practice and operationalize it more efficiently by operators in everyday work, so the pilots could share their knowledge of the subject with the rest of the crew:

…we have purely HEMS-oriented training and combining that with CRM is such a magic subject, that it would need development, and in such a fashion that CRM would be included in every training opportunity and creating concepts compatible with that, so that the basic pilot could give the training… (P2)

The examination of the documentation revealed no restrictions for pilots giving CRM training to other crewmembers in connection to everyday operations or exercises.

Reporting

Discussing the reporting system, development proposals mainly were associated with the analysis and interactive features. Regarding the technical solution the system was found satisfactory (P3, P7). An emerging issue was the analysis of the reporting system:

The analysis and commenting of the reports do not give the reporter a picture that it´s [the report] being analyzed in a meaningful fashion, even if the person can see, in real time, that this and that person is analyzing it. What if the reporter thinks that it´s not a technical issue, and the technical department is analyzing the report. What if the reporter had something else in mind than a technical matter? (P7)

The solution for this was seen by a respondent to be having trained people assisting in formulating the reports:

There needs to be professional people, who would help people with how to report, to ask them to give certain basic information and certain self-analysis, because the one filing the report might think about the matter in a slightly different way, or his/her aim with the report is something different than the analyst gives feedback on. (P9)

Further increasing the reporting activity was seen by many as a desirable target for development in order to get a bigger database to utilize for development:

…to report about the human errors, the small human errors, which really would help develop the procedures in a fashion that we avoid these things. (P2)

Little information was found on reports concerned directly with the development of FST and the SMS of the organization does not have any specific instructions of how to inform the training

curriculum, but a feedback form specifically directed concerned with training has been introduced to the organization recently.

Getting access to more data for the database was an issue that was repeatedly mentioned by many:

…we should get data about what´s not reported. And that´s where you have the interesting data, which doesn´t show on the current analysis structure. (P7)

There were also suggestions that reporting is sometimes considered cumbersome and all potentially interesting data might not be reported:

…who has the energy to report and about what, maybe you could report more often, but you don´t bother about all the small things. (P8)

DISCUSSION

This research was conducted in order to find out if and how implementing an SMS affects how professionals working with the Flight Safety Training of a company conducting HEMS-operations speak about safety and if it affects the curriculum. The interviews were conducted using a form containing a slightly different topic (The effects on the perception of safety after implementing a SMS vs. The effects on language and curriculum after implementing a SMS), than initially was planned, but the questions on the form used were the same. It is however possible, that the results were slightly affected by the different topic, but arguably the changes are small. Although the results did not present an unambiguous answer to the question asked, the research

suggests that implementing an SMS positively influences how people experience and speak about safety, and that it has an effect on the syllabus that is generally considered positive. The change in curriculum, albeit being in close relation to authority requirements, was seen to have been developed towards a more holistic and context specific approach in FST and feeling less bureaucratic.

The interviews presented some problems e.g. the interview set-up, where the questions were printed in English only, was used, despite interviews were conducted in Finnish. This resulted that the freely translated questions changed slightly between interviews and with the modified questions the answers naturally varied somewhat because of that. It was also problematic to conduct the face to face interviews in a way, which would present rich data and not constrain the informant too much, i.e. by leading on the subject. This led to situations where the discussion wandered off in directions that were difficult to connect with the research topic. Also having the respondent experiencing that they had nothing more to add to the question and trying to strictly keep to the interview form presented challenges and resulted in some cases to quite short interviews, the shortest being only 16 minutes and 20 seconds. In these cases it might have been useful to revisit the question, in order to attempt to acquire additional data. Whether such a course of action would have presented additional data is however uncertain. Being a practitioner might have offered helpful insights into the respondent statements, but connecting the data with higher level phenomenon and analysis was experienced as challenging.

Coming up with interview questions was somewhat tedious, since the topic was quite abstract and traditionally abstracts might not be considered the foremost strongpoint of rotary aviation professionals. The research in this paper proved to be somewhat ambitious and getting a definite answer was not something that was going to be easily obtained with such a varied background of the respondents. One problem was the fact that there was little or no documentation regarding

the pre-SMS era and the respondents all had different background and experiences from that time.

Wearing hindsight glasses it is safe to say that the questions asked where arguably not best suited to discover issues directly concerning language and questions directly aimed at various training documents could have proved beneficial. However, some light have been shed on how people now speak about safety, and to a greater extent, how they feel about it, but it also presents practical suggestion for the organization on how to make better use of FST and reporting in development. The general view of the respondent suggest that FST was previously experienced more as dealing with bureaucratic accountability and blaming or targeting people was rather common. Conversely today after implementing the SMS subjects experience FST as having a positive impact on their expertise and is considered less of a mean to achieve bureaucratic accountability.

As this is a small research which included the viewpoints of nine aviators, any generalizations should be done with great caution within the rotor industry. Although there was no definitive answer to the question asked, this research presented interesting information about how people experienced implementing a SMS had a positive impact on the safety efforts of the organization and therefore, a more appropriate topic for this thesis could have been "Do people feel implementing a SMS have a positive effect on the safety efforts in the organization?"

The previous research about the effects of applying an SMS appear to show commonalities with the results gained in this study, and how the SMS is implemented arguably seems to be an equally important aspect as having an SMS in general. Further research about how implementing an SMS effects language and curriculum used Flight Safety Training could include a broader research spread over a longer time period, including more participants, when there has been a longer

phase of the implementation, now the implementation period was less than two years and the results would arguably be quite different after three or four years, and richer data about language could arguably be extracted. As FST and SMS implementation is still in the beginning of its early development in the industry more research is highly recommended.

HOW A BUREAUCRATIC STRUCTURE MADE TRAINING FEEL LESS BUREAUCRATIC

Arguably the data did not present enough data to conclude if language indeed has been changed by the implementation of the SMS, but this could be a sign that the process is a greater whole and just analyzing language is in itself reductionist and may arguably not provide an unambiguous answer. However valuable insights regarding how people experienced FST and reporting, as well as how the organization could better utilize the SMS in the future was discovered. The information gathered presented data about how safety was perceived in relation to FST previously and how it is perceived today, as well as what development is desired for the future. The strict regulation of the business could be seen as heavily guiding the activities with rules and regulations, which according to Dekker and Woods, can be seen as "having a way of converging practice onto a common basis of proven performance" (2010, p.127). According to Dekker and Woods "developing error resistant and error tolerant designs helps prevents errors from becoming incidents or accidents" (2010, p.127). This does not imply that people in the system automatically feel that there is no need for active discussion about safety, considering possible threats and constantly trying to improve the system (P1-P5). The changes in the FST syllabus concerning the documentation, is arguably a result of the increased JAR and EASA regulations presented by the authority:

I think that the syllabus, even it is on a topic level basically the same, and it is very regulated… (P7)

The data acquired from the respondents show that while changes in language used in FST might be negligible, the changes in the curriculum and the structure of the curriculum are more explicit, now having more inclusive and industry specific focus (P1/P2/P5/P9). Also the relationship between operations, FST and reporting seems to be changed from previously having focus on following the syllabus in order to simply comply with authority regulations (P1/P2), to now have an impact on FST and even reporting.

The results suggest that before implementing an SMS, FST and reporting has been seen as a mean to mainly achieve bureaucratic accountability, not necessarily as a way to develop or enhance operations. The manner the respondents spoke about FST at the time before the implementation of the SMS was to mainly fulfill requirements and there were little attempts and aspiration to develop FST more than required by the authority, because in most cases it was seen as something extra, something that would just add to the costs, without adding to performance. As one subject put it:

There may be an atmosphere that if the authority or the client does not require it, then it´s a waste of money. (P7)

This hints that it was locally logical to save resources for something considered more important, instead of wasting it on safety measures that were not required by the authority and that would have a negligible impact on safety. This refers to what Dekker calls the efficiency vs. safety dilemma, where local efficiency is traded against safety (2005). Typically other goals are easier to measure (such as performance i.e.), while it is trickier to determine how much safety erodes of such a tradeoff (Dekker 2005, p.149).

Although most respondents felt that prior to the implementation of the SMS, FST felt more bureaucratic, there was an exception which suggested that FST was seen by the practitioners as an opportunity, not a burden (P3/P4). Dekker and Woods (2010, p.136), describes how resilience can be assured by having fragmented problem solving, this can be operationalized by having the operative personnel actively participating in deciding the curriculum of CRM-training (P3/P4).

Today the aim is to develop and inform the operations, reporting and FST based on the reports (P2). Many subjects experienced the contemporary FST to be less bureaucratic and more practical than before:

…now there is practical meat on the bones inside the topics, so to speak. It is no more theoretical discussion, but it´s more meaningful and industry oriented, to our specific operations, and that´s what the future will probably be like. (P7)

As P7 suggests, the respondents now feel the FST has evolved towards a less bureaucratic system. Interestingly the SMS in general have been described as typically being about the system itself; about how it creates and represents bureaucratic accountability (Dekker & WOODS, 2010, p.127). Now the data suggest people feel that implementing a SMS actually has made the FST feel less bureaucratic and that before the SMS, FST was mainly seen as a mean to carry out bureaucratic accountability (P7).

According to a respondent the sole aim with the SMS is not only to have bureaucratic accountability, but to have the operational demand in mind:

I believe the goal is not just to fulfill requirement, the starting point is operational need. (P7)

The duality of the results was arguably affected to some extent by the different type of aircraft operated at the bases, as well as different kinds of cultures the company comprises of. Subjects working on the base operating the AS 365 partially brought forth different arguments regarding how they experienced training and reporting issues and the SMS in general. This signifies that the implementation of a SMS is in itself a rather complex matter that spreads across the whole socio-technical system that is the rotary medicine organization. Language itself can be seen as having become more open and less focus is now put on such notions as blame. The more open atmosphere can be seen as a partial effect of people now working in the same company, whereas they previously were scattered in different companies, with different histories and diverging attitudes and procedures towards FST and concepts such as blame were more commonly used.

The way information is now more openly shared in the organization helps when information is fragmented and assists in offering a base from where potential danger can be spotted by experienced practitioners (Weick, 1993).

The present organization can be seen as treating the surrounding environment as actively hostile (Dekker & WOODS, 2010, p.135) i.e. when speaking about how to conduct operations safely:

All the blocks needs to fall in their right place and the threat is maybe not even realized at the front seats…because it does not have to be a threat directly concerning flight operations…there might be a tip about there being a weapon… this operation includes so many external threats as well, this is unambiguous. (P7)

To help discovering the gap between work-as-imagined vs. work-as-done, safety personnel could monitor FST, as one of the respondents explained (Dekker&Woods, 2010, p. 138):

…one starting point is, when we speak about safety, that safety personnel would come and monitor our training, if we discuss tools. It would give instructions for training and safety… (P9)

The concern presented about having a reporting system which would include active feedback that would define actions of people concerned with the report, having a deadline (P9) and having the possibility to comment the report (P7), are arguably good ways to develop the reporting system to better monitor, respond and learn from reports (Hollnagel, 2010). Having such a reporting system would encourage people to learn from undesired events, which is also a goal mentioned in the organization SMM.

Most of the proposals that emerged in the interviews were linked to either improving the training or reporting systems, which hints towards that previous success is not seen as automatically leading to a safe future (Dekker & WOODS, 2010, p.135). This also entails great opportunities for the organization to develop the SMS further in a direction that can take consideration on how to respond, monitor, anticipate and learn.

The results imply that the while language change and change of curriculum cannot be determined unambiguously after implementing an SMS, information about what is considered to be important by practitioners in FST and reporting was discovered. Although implementing a SMS has usually been connected to achieve bureaucratic accountability the results seem to point towards that the implementation has in this case made FST and reporting feel like being a tool that does not mainly aim for achieving such bureaucratic accountability, but instead focus is on informing and transforming FST and reporting. In addition the majority of the respondents felt that the implementation of a SMS has improved transparency and flow of information. The curriculum change in the documentation consisted of more detailed guidance, meaning the instructors now have the possibility to better focus on operationalizing the curriculum and plan

for upcoming FST. The development of FST towards a more holistic entirety can be seen as a change that can, at least to a degree, be attributed to implementing the SMS. The more holistic approach suggests that FST can now be utilized more effectively, giving better readiness for the entire HEMS-crew to operate safely. Reporting can be seen as an important tool to inform and transform FST, the operations and even reporting itself. However, it is important people feel their reports are considered important and feedback is given in a meaningful fashion, otherwise there is a big risk that the reporting system will seize to inform and transform FST. This can lead to people experiencing that reporting is useless, because reports do not lead to any changes, or no feedback is received (P6).

Concerning what practitioners can hope to gain from this study, there are some concrete suggestions or recommendations that might be of use for people working in the rotary medicine industry. In order to better operationalize the SMS, the FST can benefit from having pre-planned, harmonized, industry specific training by industry experienced instructors and utilizing full flight simulators whenever possible (P3/P4/P5). The reports can benefit from being written in a self-analytical fashion, in order for the analysis department to be able to better assess and address the systemic issues the reports raise (P9). Additionally the analysis of the reports can benefit from being open and interactive in a fashion that allows people to comment on the report before it is closed and having deadlines and actions described and declared regarding the report (P7/P9).

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Annex A: Interview set up

Below is a suggested set-up for conducting the interviews.

Introduction

-Short introduction of the research

-Short introduction of progress and procedures for the interview (audio recording, notes etc.)

The aim with this interview is to gain insight about how implementing the SMS have affected your perception of safety related to flight safety training now, versus how you perceived it to be before the implementation period. This will hopefully contribute to the understanding and identifying how the SMS has changed the way safety is approached in flight safety training now, compared to earlier.

1. Please tell me about yourself (age, position in the company, experience etc.)

   Relevance: This will present the background and general information of interviewee

2. Please describe how you viewed safety being approached in flight safety training prior to implementing the SMS in 2011 (Who participated, what was the curriculum, what was the focus, what was emphasized etc.)?

   Relevance: This will present information about viewpoints of flight safety training prior to 2011

3. Please describe how you view safety being approached in flight safety training now, after the implementation of the SMS (Who participates, what is the curriculum, what is the focus, what is emphasized etc.)?

Relevance: This will present information about contemporary viewpoints of flight safety training

4. What do you view as the most significant change in flight safety training during the last three years and why?

Relevance: This will present information about additional information on what is seen as having changed

5. According to your view, could the existing flight safety training be further developed and if, how and why?

Relevance: This will present information on what might be issues with the current system

Concluding:

6. Questions by the interviewee about the research?

Relevance: This will present the opportunity for clarifying any points, that might have been unclear or that needs additional information.

7. Would you like to add something to this interview?

Relevance: This will give the opportunity for the interviewee to give additional information that might have been left out for some reason.

Annex B: Participant information & Consent Form

Research title:

The effects of language and curriculum in Flight Safety Training after the implementation of a Safety Management System

Researcher:

Ralf Molander, MSc Human Factors & System Safety (candidate), Lund University

Supervisor:

Dr. Johan Bergström, Lund University, Sweden

Assessor:

Dr. Eder Henriqson, Lund University, Sweden

Background and purpose

Implementing an SMS is seen as a system that enhances the way people approach and view safety, leading towards an increased safety performance. As a implemental tool Flight Safety Training is used, where focus is on Crew Resource Management and simulator training, supporting sacrifice judgements and risk assessment. This qualitative study is conducted to gain insight on how implementing an SMS alters the way practitioners view and approach safety differently than before the implementation period. Presently there is very little knowledge about how implementing an SMS affects the way practitioners view safety in HEMS-operations. The research conducted is part of the fulfilment of the requirements of the Master of Sciences of Human Factors and System Safety at Lund University, Sweden.

Who is requested to participate in study?

Professionals working with tasks related to training in a Nordic aeromedical company conducting Helicopter Emergency Medical Service (HEMS)-operations are requested to voluntarily take part in this study. The aim is to get 6-10 participants performing tasks linked to flight safety training within the company to take part.

How is the study to be conducted?

The study will include semi-structured interviews either conducted face to face at HEMS-bases the company operates located in Finland and Sweden, or at the home of the interviewee. Another possibility is conducting the interview via teleconferencing (Skype i.e.). The interview will last for approximately one hour, and if accepted, the session will be audio recorded to help with transcription and analysis. The audio recording of the interview is not necessary and the interview can be conducted without recording the interview. Also, no reason has to be presented, if recording is not desired.

The names and the specific contents of the interview will be confidential. Only de-identified and summarized information will be used in the analysis and results. In practice this means nothing said in the interviews can be traced back to any specific person.

What risks are related to taking part in the study?

Ethics approval will be issued by Scandinavian Air Ambulance / Scandinavian MediCopter Ab. There will be no risks involved in participating or not participating in this research. The findings of this research will be shared only with Lund University and Scandinavian Air Ambulance / Scandinavian MediCopter Ab.

The primary researcher also acts as a Commander on one of the HEMS-bases, and approval for this study has been granted by the C.E.O. and Flight Operations Manager of Scandinavian Air Ambulance Ab.

Are there benefits in participating in the research?

There are some benefits in participating in this research. One benefit is being an important source for helping gaining insight in how practitioners view safety after implementing a Safety Management System (SMS), compared to views before implementing the SMS and contribute to the knowledge how the perception of safety is altered. At the same time a deeper understanding will be gained on how the view on safety has evolved.

How will data be kept confidential?

The recordings, transcription print outs, notes as well as other paper documents will be kept in the researcher´s home in a locked cabinet to be protected from unauthorized access. All electronic material, including interview notes, transcriptions and results, will be stored on the researcher computer, which is secured by password and a biometric identification system. The audio recordings will be deleted after the final thesis has been completed. Back-up of electronic material (excluding recordings) will be stored on an external hard-drive, secured by password, for a period one year after the publication of the thesis, which after they will be deleted, along with

all other research related electronic material. Any paper documents concerning the research will be destroyed by a paper shredding device.

The final results of the gathered data will be shared with people working within the human factors field and/or helicopter industry in the form of papers or presentations. Approval for sharing this information will be requested with the consent form. A copy of the signed consent form will be given to all participants of the research if requested. Participant information will be kept confidential during and after the research.

What if I want to abandon my participation?

This research if based on complete voluntariness, and refusal or withdrawal is possible at all stages of this study. After withdrawal, the information collected from the interviews will not be used in the study, if so requested. There will be no consequences for the participant, if participation is refused or withdrawn at any stage.

Who can I get additional information concerning the research?

If any questions or concerns arise regarding this research, Ralf Molander, +358 401604090 shall be contacted. If there is an interest in receiving a copy of the final results of this research, please add your contact information at the end of this form.

Consent

With the signature below the participant confirms that the "Participant Information & Consent Form" has been read in its entirety, and that the participant agrees to voluntarily participate in this research.

Participant signature:
Participant Name:
Place & Time:
Permission to record interviews:
Witness signature

Participant e-mail for sending a copy of final results
Participant mail address for sending a copy of final results