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Interpersonal Skills in a Sociotechnical System: A Training Gap in Flight Decks

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Abstract

This research analyzed the perceptions of interpersonal skills on established aviation safety models, Crew Resource Management (CRM), and Threat and Error Management (TEM) using feedback from industry pilots. The flight deck is a sociotechnical system where much research has focused on the *technical* aspect, whereas we spotlight its *socio* aspect. The aviation industry must invest in training pilots on interpersonal skills to enhance safety through increased efficacy of safety models integrated throughout existing training programs. A 34-question survey was disseminated across both commercial and business aviation pilots (N=822). We explored three research questions regarding pilots' perceived training on interpersonal skills and Federal Aviation Administration-recommended training content as well as the impact of psychological safety on the efficacy of CRM. Safety models lost efficacy when an individual felt a reduction in team psychological safety. Pilots experiencing reduced psychological safety within the flight deck were less likely to admit mistakes, share safety concerns, or ask for help. While regulatory authorities recommend interpersonal skills training, feedback from industry pilots revealed a perceived training gap. The results of this research demonstrate that interpersonal skills training (e.g., bias literacy, psychological safety, and interpersonal communication) is correlated with overall safety in the flight deck as it enhances the ability to activate safety voice, a necessary, albeit lacking, aspect of current industry safety models.

Keywords: crew resource management, bias literacy, psychological safety, interpersonal communication, threat and error management

Introduction

The concept of a *sociotechnical system* emerged as the world shifted from assembly-line manufacturing to the modern necessity of forging cognitive skills. The safe and efficient functioning of many complex systems is a harmonic operation of several technological, social, and human factors. Such a conception of work environments, known as *sociotechnical systems* (STS), was proposed by Geoffrey Bowker et al. (1997) and has since been developed to provide a conceptual framework for the interdependency of *technological* (e.g., machine, equipment, tools, etc.) and *social* processes (e.g., individuals comprising a team, the necessity to coordinate, crew collaboration, etc.) (Carayon, 2006; Carayon et al., 2015).

A flight deck is a sociotechnical system, comprised of advanced flight deck technology and integrated avionics systems as the *technical* part while the pilots (Haavik et al., 2017) (and flight attendants, ramp employees, air traffic controllers, dispatchers, and gate agents) encompass the *social* aspect of the system. As such, any understanding of the safe and effective functioning of flight decks through an STS lens must operate along both parts of the system. This is especially true when analyzing accidents, and the importance of social and human factors on the flight deck in preventing future accidents.

STS provided a much-needed development in safety management because major accidents (e.g., Space Shuttle Challenger and the 737 MAX design) demonstrated the need to better understand and train on the systemic causes of accidents in safety-critical environments (Swuste et al., 2020). In particular, prevailing human factors explanations tended to over-simplify technological and individual aspects as detached and asocial processes (Ropohl, 1999).

To address the social and dynamic nature of accidents, STS has inspired training programs in aviation such as Crew Resource Management (CRM; see Helmreich & Foushee, 2010) and

Threat and Error Management (TEM; see Maurino, 2005) that aim to promote effective safety-related collaboration between pilots. By emphasizing the dynamic interplay between advanced avionics equipment and individuals' mental states, the introduction of CRM training has been associated with an increase in flight crew speaking up to prevent aviation accidents (Noort et al., 2021). However, despite their widespread adoption, it remains unclear to what extent flight crew training programs effectively address sociotechnical factors. This is important because without addressing these factors, flight crew collaboration may remain ineffective as training gaps remain, safety management may deteriorate, and ultimately avoidable accidents may continue to occur.

In this paper, we perform an analysis of an industry-wide survey of active commercial and corporate professional pilots to highlight some of these training gaps within CRM, and the limited focus on human performance, such as flight deck microculture and interpersonal skills, within existing training programs. We ground our observations within theoretical underpinnings of psychological safety, arguing that the training gaps within CRM lead to lower psychological safety on the flight deck, which in turn lowers overall aircraft safety.

Safety Voice, and Operationalizing the CRM/TEM Model with Safety Voice

Crew communication, in terms of safety-critical information, can be broken down into four categories: safety voice (speaking up), safety listening (actively listening to safety concerns), muted safety voice (speaking in a passive or hushed way), and safety silence (remaining silent regarding safety) (Bienefeld & Grote, 2012; Conchie et al., 2012; Noort et al., 2021). These categories provide the nuance necessary to understand the sharing of safety-pertinent information in the flight deck and lay the foundation for questioning the assumptions on which the system was designed.

At its core, the CRM/TEM model intends to increase aviation safety by enhancing safety-critical collaboration, which often boils down to effective communication and collaboration within the flight crew. Indeed, the 2004 FAA Advisory Circular *Crew Resource Management Training* states "the importance of clear and unambiguous communication … and external influences on interpersonal communications" (AC 120-51E, p. 10) as central to the success of CRM.

Within aviation, prior research (Bienefeld & Grote, 2012; Conchie et al., 2012; Noort et al., 2021) has demonstrated an inseparable link between safety voice and overall safety of the aircraft. Current CRM training procedures are inadequate in creating cultures for pilots to exercise their safety voices as research shows that when the flight deck microculture is not inclusive, pilots shift from safety voice to muted safety voice or safety silence (Perkins et al., 2022). In this study, we advocate for designing and incorporating training modules on interpersonal and intragroup communication through the development of interpersonal skills, to facilitate a psychologically safe (Edmondson, 1999) flight deck for pilots to exercise their safety voices.

Terminology

To best define and determine concepts that could enhance crew collaboration, we grounded our composition of conceptual framework in FAA and ICAO safety documentation. See FAA Advisory Circular 120-51E (2004) and ICAO Doc 9859 (2018) and Doc 9868 (2020). Rounds of qualitative analytic coding produced the following emergent themes for interpersonal skills: *interpersonal communication, bias literacy*, and *psychological safety*.

In this section, we establish definitions for those terms, in the context of aviation.

Interpersonal Communication

For the optimal functioning of sociotechnical systems, effective communication is a central requirement (Bowker et al., 1997). Conceptualized through various academic frameworks (e.g., Babrow & Striley, 2014), *interpersonal communication* is voluntary interaction between independent parties with the intent of interpreting messages (Galvin & Cooper, 2003) and generating meaning (Braithwaite & Schrodt, 2014).

Within the U.S. aviation industry, the FAA Advisory Circular 120-51E mentions the word *interpersonal* nine times across six of the twenty-five pages (p. 2, 8, 10, 11, 12, 19), in the contexts of both relationships and communication (i.e., interpersonal relationships and interpersonal communication). Though the Advisory Circular does not provide an explicit definition, we can infer one from the listed behavioral markers indicative of quality interpersonal relationships, such as "crewmembers show sensitivity and ability to adapt to the personalities of others" and ensuring the "tone in the cockpit is friendly, relaxed, and supportive" (p. 4). These markers reflect a requirement of pilots to be able to see others for their unique personalities and recognize each other's states of mind, adjusting and adapting how they relay information.

Similar ideas are also expressed in another, more recent, FAA Advisory Circular (121-42) *Leadership and Command Training for Pilots in Command* (PIC) where "PICs should consider how they can adapt their personal leadership and supervision styles to varying situations, including the experience and attributes of other crewmembers" (p. 6). Grounded in aviation literature, we define *interpersonal communication* in a CRM/TEM setting as the exchange of social or emotional messages between persons that relies on a shared or mutual understanding of each individual.

Bias Literacy

As human beings, we all hold individual opinions and biases that shape the ways in which we make sense of the world around us. Biases are not necessarily negative; they are altogether unavoidable (Ross, 2020) and form an integral part of group dynamics. Humans create groups and social categories, derive identity from these categories to form groups, and gain a sense of belonging from group membership (Tajfel, 1974). People are likely to be more positively disposed toward others they perceive to be like them (i.e., in their in-group), as opposed to someone they perceive to be in their out-group (Greenwald & Banaji, 1995). This sense of belonging produces intergroup and intragroup emotions that direct behavior.

This phenomenon is an important subset to enhancing CRM as it informs behavior that can contribute to or distract from creating a flight deck microculture conducive to team collaboration. This is especially important because pilots might find themselves sharing the space with others either in their in-groups or out-groups, which might subconsciously dictate how they interact. Therefore, it warrants discussion on how individual biases and in-group/out-group membership affects the culture and should be explored within CRM training.

Within FAA Advisory Circular 120-51E, discussions of bias and intergroup theory are not well explored. Such topics are tangentially referenced within Curriculum Topic b-2 (p. 12) under “Interpersonal Relationships/Group Climate,” which refers to setting tones of conversation within the flight deck. There are other discussions on external factors for decision-making (Topic a-5, p. 11) and communication barriers due to aspects of identity such as racial or gender differences (Topic a-1, p. 10). We believe that these topics begin to touch upon discussions of bias and the importance of recognizing personal biases, but do not go far enough. As such, we define *bias literacy* within the CRM setting as the recognition of one’s own explicit and implicit

biases; the cognitive, affective, and behavioral manifestation of bias; and the impact of such biases on interpersonal communication.

If policy aims to address intragroup behavior, as CRM training does, it must provide education on intragroup and intergroup emotion and provide actionable ways to operationalize collaborative engagement, which could be facilitated through bias literacy.

Psychology Safety

Within team environments such as the flight deck, there is significant academic research on team dynamics (e.g., see Grant & Ashford, 2008; Driskell et al., 2018). Within safety-critical environments, the most prominent theory is that of *psychological safety*. Recently popularized by Dr. Amy Edmondson (1999), it refers to "a collective environment where there is a shared belief that the team is safe for interpersonal risk taking" (p,354), a definition we also adopt for our use. A psychologically safe environment is one where team members feel respected and valued, even when sharing dissenting opinions. It goes beyond team cohesion or being nice to each other because those can come at the cost of self-silencing in favor of keeping the peace (Bienefeld & Grote, 2012; Edmondson, 1999, 2019). Rather, it is about candor and a willingness to engage in productive debate as an opportunity to learn from one another (Edmondson, 2019).

Prior research within aviation shows how pilots have felt silenced and unable to speak up in safety-critical situations due to low psychological safety in the flight deck (Perkins et al., 2022), which can have drastic effects on overall safety (Noort et al., 2019; 2021), demonstrating an absence of training on why and how to create psychologically safe flight decks.

The FAA Advisory Circular 120-51E *Crew Resource Management Training* does not address training toward ensuring a psychologically safe culture on the flight deck. Current training modules that can address psychological safety are topics a-4 and b-2 under "Conflict

Resolution" (p. 10) and "Interpersonal Relationships/Group Climate" (p. 12) referring to establishing friendly environments and handling disagreements. These topics touch upon psychological safety but do not go far enough.

The Current Study

In this study, we explore the perceived effectiveness of current CRM training by querying industry pilots on their perceived level of training on topics relevant to interpersonal skills (RQ1 and RQ2). In addition, we aim to understand how psychological safety manifests in the flight deck through lived experiences of industry pilots (RQ3).

The flight deck is a sociotechnical system requiring interpersonal skills training to effectively function in a crew environment. In RQ1, we explore whether industry pilots perceive to have received training in these interpersonal skills (drawn from the FAA verbiage).

RQ1*: How have the concepts of interpersonal communication, bias literacy, and psychological safety been addressed through CRM training?*

We have shown the importance of *adaptability* and *sensitivity* as critical elements of interpersonal communication, both conceptually through social psychology and academic communication literature as well as through regulatory authority's expectation of good CRM. The FAA recommended behavioral markers for interpersonal communication of *showing sensitivity toward others* informed our second research question.

RQ2*: Do industry pilots perceive that they have received training on showing sensitivity toward others as part of CRM training?*

We also consider the following indicators of psychological safety: admitting mistakes (Edmondson, 1999), asking for help (Edmondson, 2012), and feeling like a valued team member (Edmondson, 2019). These are used to examine whether the concept of psychological safety is

adequately trained by soliciting the lived experiences of industry pilots through the perception of getting along with the other pilot in the flight deck. This premise informed the third research question.

RQ3: How does the perception of getting along impact psychological safety within the context of the flight deck and pilot-to-pilot interaction?

Method

Participants

Participants were recruited using social media platforms (LinkedIn, Facebook, and an aviation-themed podcast) and pilot-specific social groups (Female Aviators Sticking Together [FAST], Professional Jet Pilots, Gulfstream G-650, Lady Aviators, Pilot Moms, and Professional Gulfstream Pilots). Within the recruitment posting, they were provided a link to a Google Form where the responses were anonymously recorded.

The survey received 822 responses from active industry pilots, both commercial and corporate, and within and outside the United States. We categorized pilots flying for airlines (operating under FAA Part 121) and charter companies (operating under FAA Part 135) as "commercial" and pilots operating in business aviation (FAA Part 91) as "corporate." As Crew Resource Management is required for airline and charter pilots (see FAA AC 120-51E 4.), we note that 525 pilot participants (64.9%) identified as commercial pilots and 284 (35.1%) as corporate pilots.

Demographic questions were optional, and some overviews are provided in Table 1. Most respondents (N = 504) voluntarily answered the demographic questions with "None of the Above," indicating that they identify as white, cisgender, able-bodied men. Table 2 provides a

full breakdown of U.S.-trained or U.S.-operating versus international pilots and pilot experience in terms of the First Officer and Captain experience and total flight hours.

Table 1

Survey Self-Reported Demographic Data

Variable	Response
A woman	27.6% (N=217)
BIPOC (Black, Indigenous, Person of Color)	5.3% (N=42)
LGBTQ+ (lesbian, gay, bi-sexual, transgender, queer)	3.8% (N=30)
Disabled	1.4% (N=11)
Other	4.1% (N=32)
None of the above	64% (N=504)

Note. Some participants selected more than one demographic variable, resulting in a total count of demographic variables (n=836) being higher than the total count of actual individuals (n=822). This is not uncommon as many people identify with more than one demographic variable. The total participant count of the study is 822 individual participants.

Table 2

Geographical Location and Experience (CA vs. FO and Total Flight Hours)

Geographical Location (based or trained)	% of total	N
United States	85.4%	695
Other than United States	14.6%	119
Pilot Experience (Position)		
Captain	85.1%	695
First Officer	14.9%	122
Pilot Experience (Flight Hours)		
1500 - 3000	16.4%	135
3001 - 5000	14.7%	121
5000 - 10,000	29.4%	242
10,000+	38.1%	313
Unreported	1.3%	11

Study Design

The study instrument used was a 34-question survey consisting of binary, multiple choice, and write-in response type questions, approved by the authors' Institutional Review Board. Nine survey questions focused on pilot experience and demographics, eighteen focused on CRM training and crew dynamics, and seven were based on examining pilots' views across Hofstede's (1980) cultural dimensions.

Before conducting the survey, all participants were provided with a statement regarding the transparency of objectives. The survey began with questions on flight experience (total hours flown) and pilot position (Captain vs. First Officer), demographic information, and experience with CRM training.

To answer RQ1, we identified fifteen interpersonal skills across the three concepts (e.g., interpersonal communication, bias literacy, and psychology safety) from within the FAA Advisory Circular 120-51E, *Crew Resource Management Training*. Using the exact verbiage of the Advisory Circular, we asked pilots: Reflecting on your past CRM training, have these topics been addressed (choose as many as applicable)? We analyzed responses in aggregate form and then measured only pilots who self-reported to be operating in U.S. air carrier operations (e.g., operating under FAA Part 121). See Table 3 for the FAA-recommended concepts categorized into three interpersonal skills: interpersonal communication, bias literacy, and psychological safety.

Table 3

FAA AC 120-51E Training Facets Categorized by Interpersonal Skills

AC 120-51E	CRM Training Curriculum Concepts	Interpersonal Skill
p. 10, 12. a.	*Communication*	Interpersonal Communication
p. 10, 12. a.	*The importance of clear and unambiguous communication*	
p. 10, 12. a.	*Speaking Skills*	
p. 10, 12. a.	*Listening Skills*	
p. 11, 12. b.	*Interpersonal relationships and practices*	
p. 10, 12. a.	*External influences on interpersonal communications*	
p. 11, 12.a.(5)	*The influence of biases on decision quality*	Bias Literacy
p.11, 12.a.(5)	*The influence of cognitive factors on decision quality*	
p. 10, 12. a.	*Definitions of and/or solutions for interpersonal communication barriers such as rank, age, and gender*	
p. 10, 12. a.	*Strategies to handle conflict*	

p. 6, 9.b.(3)	*Ways to behave to foster crew effectiveness*	Psychological Safety
Apdx. 1, p. 4, (1)	*Remaining calm under stressful conditions*	
p. 11, b. (2)	*The value in maintaining a friendly environment*	
p. 6, b. (6)	*Effective team behaviors during normal and routine operations*	
p. 11, 12.a.(3)	*Illustrating the value of feedback*	

To answer RQ 2 we asked the following question: When being evaluated on CRM skills, must you demonstrate your understanding of the usefulness of showing sensitivity to other crew members' personalities and styles?

RQ3 shifted focus from purely analyzing training to understanding pilots' lived experiences. Participants were asked a series of questions regarding three aspects of psychological safety: admitting mistakes, asking for help, and feeling valued as a team member (Edmondson, 2019), where they could indicate how they experienced these both in situations where they got along or did not get along well with other pilots.

Findings

RQ1. Interpersonal Communication, Bias Literacy and Psychological Safety as a Subset of CRM Training

We evaluated participants' responses to the question on how many aspects of CRM training listed in Table 3 were part of their training programs. The full results are displayed in Table 4, broken down into net aggregate and aggregate for Part 121 pilots (i.e., pilots who are operating at air carriers based in the United States and federally mandated to have received CRM training).

We examined responses to training topics mentioned in the CRM training Advisory Circular. From Table 4, we observed that topics related to psychological safety received moderate to low coverage.

On topics surrounding interpersonal communication, respondents within both Part 121 and overall mentioned some coverage of our spotlighted topics. While a large number of participants (93.9%) mentioned receiving training on topics such as clear and unambiguous communication, fewer mentioned being trained on interpersonal relationships and external influences on interpersonal communication (54% and 48%, respectively). Around bias literacy, a small majority of respondents mentioned receiving training around the influence of biases and cognitive factors (53% and 51%, respectively) on decision-making within their training programs. Such numbers are underwhelming, as industry standards dictate a far wider coverage of such topics within pilot training programs, both in the US and globally. Therefore, we find evidence of topics surrounding interpersonal communication, bias literacy, and psychological safety not being adequately addressed within existing CRM training programs.

Table 4

FAA AC 120-51E Training Facets Categorized by Interpersonal Skills Emergent Themes and Pilots' Perceived Level of Training

Interpersonal Skill	CRM Training Curriculum Concepts	Aggregate (FAA Part121)
Interpersonal Communication	*Communication*	93.9% (94.4%)
	The importance of clear and unambiguous communication	85.9% (84.9%)
	Speaking Skills	51.0% (49.7%)
	Listening Skills	63.6% (66.1%)

	Interpersonal relationships and practices	54.0% (56.6%)
	External influences on interpersonal communications	48.0% (46.3%)
Bias Literacy	*The influence of biases on decision quality*	53.0% (56.6%)
	The influence of cognitive factors on decision quality	51.0% (56.6%)
	Definitions of and/or solutions for interpersonal communication barriers such as rank, age, and gender	47.4% (48.9%)
Psychological Safety	*Strategies to handle conflict*	56.9% (57.7%)
	Ways to behave to foster crew effectiveness	55.2% (59.0%)
	Remaining calm under stressful conditions	56.0% (51.6%)
	The value in maintaining a friendly environment	48.1% (48.4%)
	Effective team behaviors during normal and routine operations	66.7% (67.5%)
	Illustrating the value of feedback	63.6% (68.0%)

RQ2: Showing Sensitivity as a Subset to CRM Training

Eight hundred and ten pilots responded to the survey. Fifty-one percent indicated that they did not need to demonstrate their understanding of the usefulness of showing sensitivity to other crew members' personalities and styles as part of CRM training while the remaining 49% indicated that the material was part of their training.

These findings contribute to demonstrating an absence of training around the concepts of interpersonal communication, bias literacy, and psychological safety not being trained within CRM procedures. In further sections, we address each topic individually.

RQ3: Measuring the Microculture of the Flight Deck and Facets of Psychological Safety

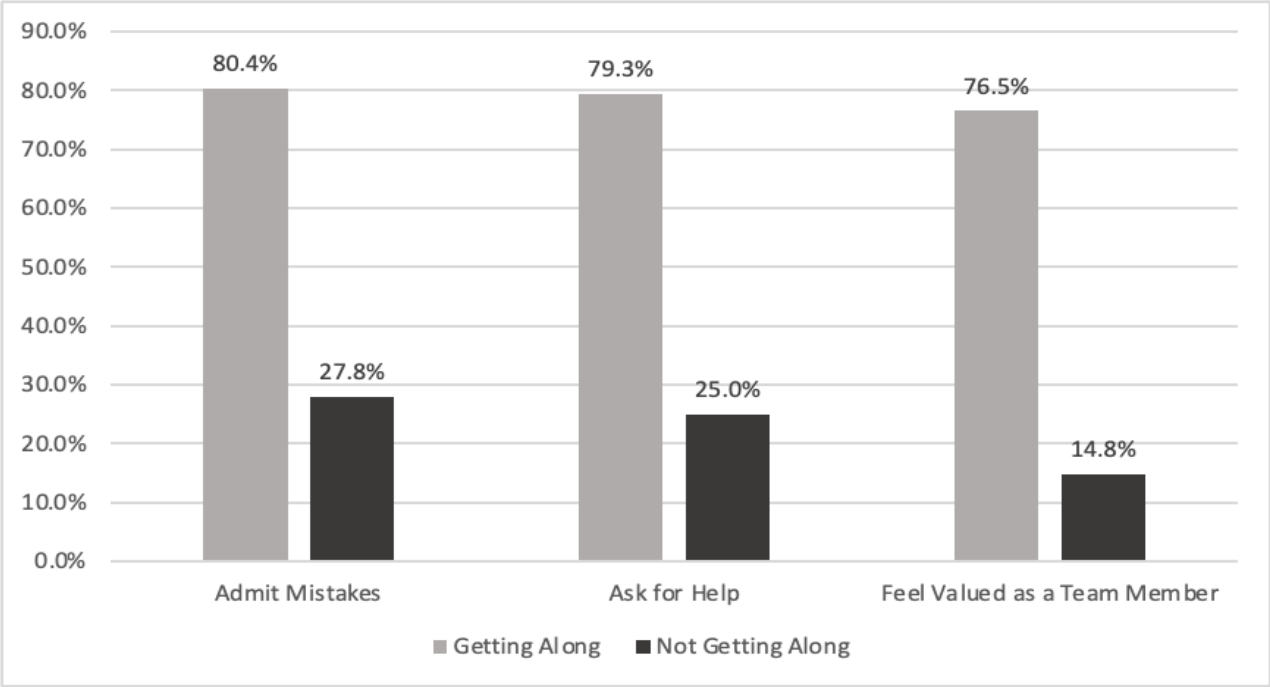
We analyzed the correlation between speaking up to admit mistakes or asking for help depending on whether pilot participants believed they got along or didn't get along with the other pilot. There was also an impact on presumed psychological safety when the perception of getting along with the other pilot was weakened. A five-item scale captured feelings of comfort and safety in the cockpit. Because these individual items were highly correlated for both scenarios in which the pilots got along (Cronbach's $\alpha = .80$) and did not get along (Cronbach's $\alpha = .90$), a single variable was created for each.

A paired t-test showed that pilots (N=788) reported a decrease in psychological safety when they perceived not getting along with the other pilot in the flight deck. On the 5-point scale (with 1 indicating *the most safety* and 5 indicating *the least safety*), we observed a statistically significant difference ($p<0.01$) between pilots' comfort levels when they got along with the other pilot (mean = 1.25, SD = 0.39) as opposed to when they did not (mean = 2.5, SD = 1.01).

Figure 1 highlights the impact of pilot-to-pilot psychological safety through three facets: admitting mistakes, asking for help, and feeling valued as a team member. The data highlights that there is a negative impact on safety voice when the flight deck does not feel psychologically safe.

Figure 1

Pilots Who Strongly Agree They Can Admit Mistakes, Ask for Help and Feel Valued as a Team Member When They Get Along vs. Don't Get Along with the Other Pilot in the Flight Deck (n=788)



Discussion

Prior research suggests that pilots operating with a shared mental model make fewer errors (Salas et al., 2006), communicate more effectively (Mohammed, Klimoski, & Rentsch, 2000), and are more willing to work together in the future (Rentsch & Klimoski, 2001). This suggests an opportunity for human factors specialists to allocate resources (e.g., time and money) to train pilots on the importance of interpersonal communication and bias literacy as a mechanism for generating psychological safety to enhance safety listening and safety voice to create a more effective safety system.

Our findings indicate that there is potentially either a training gap between FAA-recommended training concepts and what is currently being offered in the industry or the training topics are not readily accessible in recall of the pilot participants' memory. In either scenario, a pilot's ability to operationalize the interpersonal skills would be limited. Survey respondents report low coverage of recommended topics around interpersonal communication, bias literacy, and psychological safety within current CRM training programs, highlighting a gap between recommended practices and implementation. We specifically share data in aggregate form in comparison to those pilots operating and/or trained in Part 121 environments to highlight that interpersonal skills training is lacking even within the highest regulated tier of FAA operations (Part 121). Since Part 121 pilots are required to have been trained in CRM, a reader might assume that they feel compelled to state that they have, inaccurately, received the training. Secondly, an industry insider might assume that a Part 121 pilot would have received a higher level of interpersonal skills training than a non-Part 121 pilot, but our findings do not support such assumptions.

This training gap is a missed opportunity to advance CRM's goal of encouraging overall aviation safety because low coverage of such topics leads to lower safety voice. The flight deck is a sociotechnical system with its own ecosystem. Producing a healthy ecosystem requires that all users of the system (mechanical and human) be fully functioning. The human-to-human interaction of the microculture of the flight deck impacts the overall health of the ecosystem as it shapes the ability to successfully operate the machine. Of particular importance is the psychological safety of the flight deck, which increases (as evidenced through the use of safety voice) as pilots feel more comfortable with each other and more open to speaking their minds (Perkins et al., 2022).

CRM training was born out of years of research proposing important social psychology and behavioral science theories as training topics. The CRM training facets within the Advisory Circular lay some of the necessary frameworks for promoting interpersonal communication and bias literacy as a method for increasing psychological safety.

Our findings reveal that those training topics were inadequately or ineptly taught as many professional industry pilots did not believe they had received the training. These findings have important implications as to how training may be conducted in the future to enhance safety by focusing on the *socio* aspect of the sociotechnical system.

As one of the researchers is a professional pilot, a limitation of this study is the vulnerability to confirmation bias where researchers may see desired results based on personal experiences and expectations. Another limitation of the study is sample size and composition. A truly representative sample of industry pilots was not achieved, given the recruitment method. While the survey was disseminated across various social media platforms and pilot-specific listservs, pilots not on the distribution list or platforms may not have had direct access to the survey. We also made a specific effort to further recruit and have higher representation of female and gender non-binary pilots, to address the traditional underrepresentation of their voices in aviation conversations and admit that our study sample is skewed as such. Future work could target a broader sample of pilots.

Conclusion

Pilots are part of a sociotechnical system. The safety models designed to enhance the *socio* interactions within the system were built on the assumption that pilots were adequately trained in interpersonal skills. The industry may have made assumptions that CRM inherently generated masters of interpersonal skills: pilots that used their bias literacy to enhance interpersonal

communication to foster psychologically safe flight decks that elicit safety voice and promote safety listening. Our research indicates otherwise. When training programs disregard interpersonal skills--such as adapting leadership styles or showing sensitivity toward others--they do so to the detriment of safety.

We advocate that the next generation of CRM training include a heavier focus on interpersonal skills, specifically interpersonal communication, bias literacy, and psychological safety, to 1) fill the previous training gap and 2) enhance the potential functionality of the sociotechnical system through improved crew collaboration. With the advancements in social psychology literature on intragroup dynamics, human factors training may be made more effective with an updated, FAA-mandated syllabus, and a pedagogical approach that supports continuous learning with competency-based comprehension.

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